

Product Selector

Control Products
Circuit Protective Devices
Power Quality
Systems



ABB... Your complete low voltage solution!

Products referenced in other publications



Timers and Controls – ABB and SSAC products

Programmable timers & controls • Time delay relays • Solid state timing modules
Solid state flashers • Three phase voltage monitors • AC & DC current sensors
Motor protection controls • Alternating relays • Liquid level controls
HVAC/R timers & controls • Obstruction lighting controls • Vending timers
DIN rail mount timers, flashers, voltage & current monitors, liquid level controls and motor monitoring relays

Literature: SS3 Timers & Controls on-line catalog: www.ssac.com
SS3 [1TRC 001 009 C0201] ABB SSAC Timers & Controls catalog
SS3 [1TRC 001 010 C0203] ABB SSAC Timers & Controls CD-ROM catalog



Automation products

AC010 Micro Controllers • AC 31 Programmable Controllers, I/O modules, & connection modules • AC500 PLCs • PM Modular PLCs and Remote I/O • PM ASI Bus modules • S500 Remote I/O • Field bus plug • Bridgeport radio fieldbus • CX Touch screens & CE Touch computers • Wiring interface modules • Power supplies • Low power surge protection • Diode logic modules • Serial data converters • Analog signal converters • Plug-in relays • Interface relays • Optocoupler modules • Sensors • Wireless proximity detectors

Literature: LV020 [1SXU 000 020 C0201] - Automation Products



HVAC Products

A collection of control products designed for HVAC and Refrigeration applications including: Combination starters • Across the line starters • MSSP single phase manual starters • Enclosed pilot devices • Enclosed disconnect switches • Softstarters

Literature: LV018 [1SXU133018C0201] - HVAC Products



Terminal blocks

The largest assortment of terminal blocks and connection systems available. Functions include feed through blocks, fuse blocks, protection blocks, & switch blocks in single to triple deck models. Connection choices include screw terminals, spring terminals and ADO insulation displacement connectors. The ABB terminal block line includes power blocks, distribution blocks, 5.08mm blocks, mini blocks, railway blocks and ATEX blocks. Accessories include popular DIN rail styles, a complete marking system including tags, software, and plotter. Absolute Rail Design product configurator available for download on www.abb-control.com; also available on CD.

Literature: LV006 [1SXU 160 006 C0201] - Terminal Blocks



Switchboard MaxSB

UL 891 low voltage switchboard
Main breakers up to 5000 amps
Plated copper bus
Single & group mounted feeder breakers
Expandable frame based enclosure
Large cable area, easy access to terminals
NEMA Type 12 and full glass doors available

Switchgear MaxSG

ANSI C37.20.1, C37.51 & UL1558
Modular frame arrangements
Emax 1066 UL Listed power circuit breakers up to 5000A
Closed door draw out w/safety shutters
Plated copper bus
Trip unit visible with door closed
Plug-in UL accessories can be field installed

Literature: AC1800 Switchgear MaxSB brochure, AC1801 Switchgear MaxSG brochure

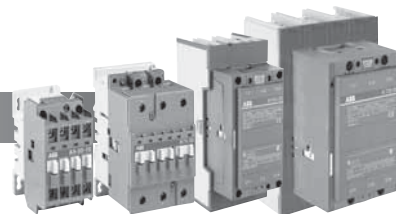


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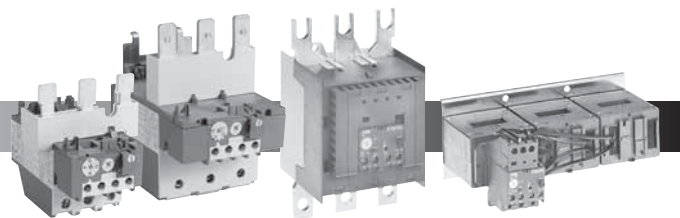
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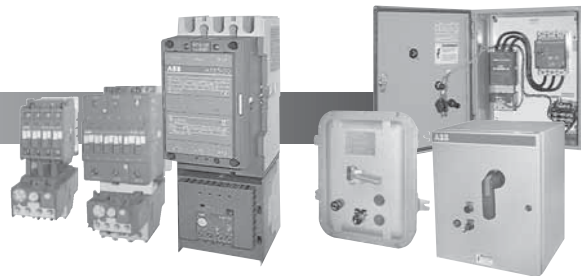
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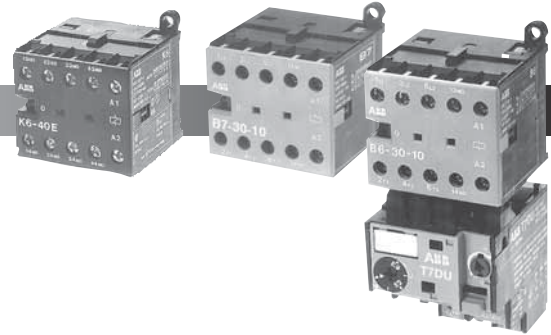
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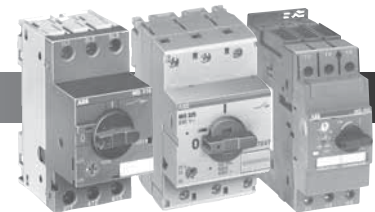
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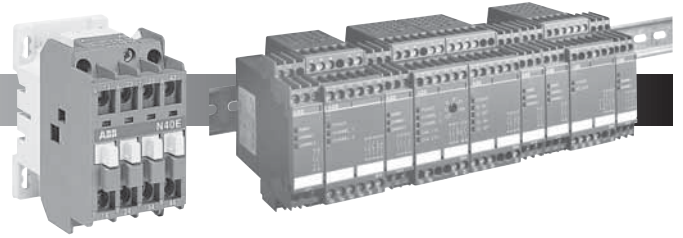
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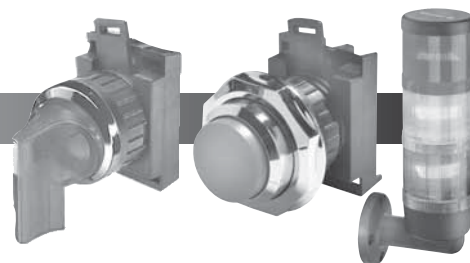
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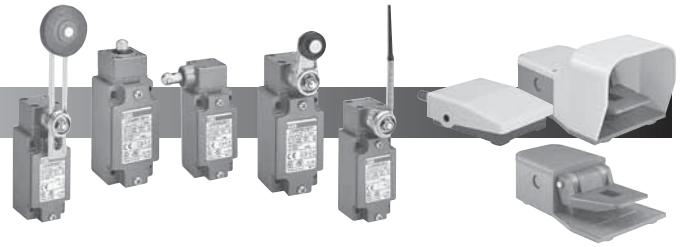
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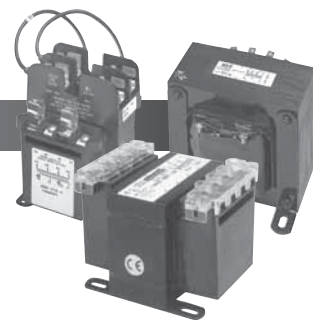
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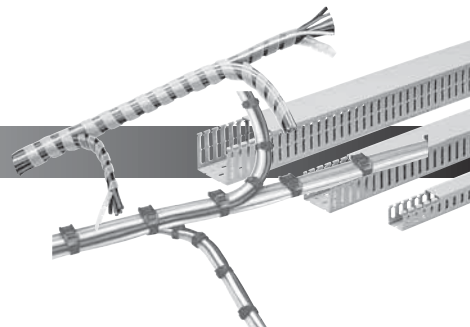
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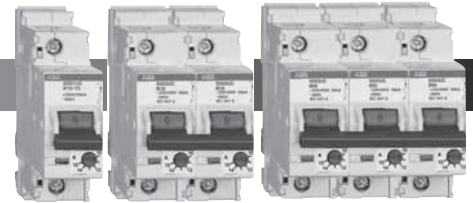
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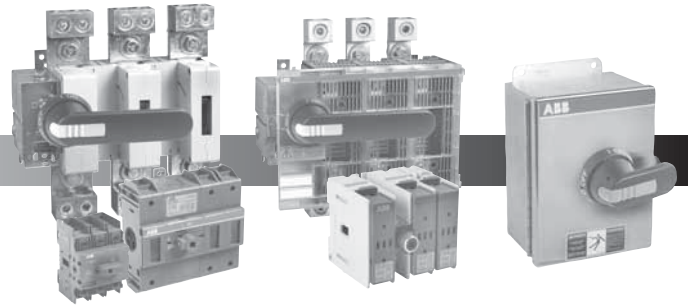
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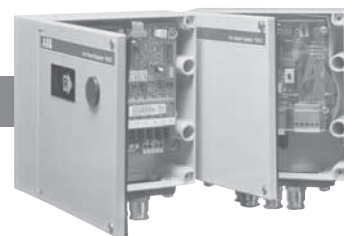
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Arc Guard Systems

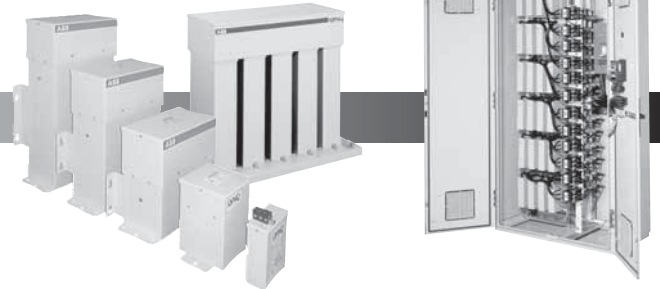
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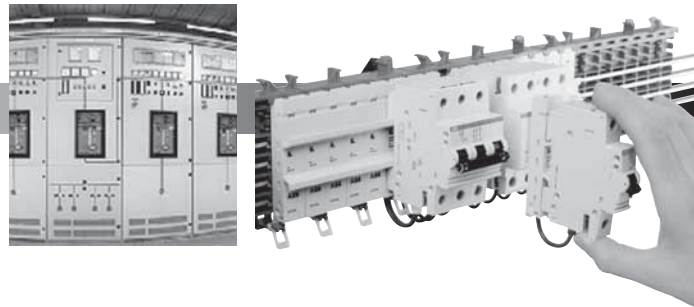
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05085	13.4	05415	13.6	18290	13.17	1SAF 118 522 R 1001	10.3	1SAF 328 853 R 1100	10.5
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05093	13.4	05932	13.7	18376	13.6	1SAF 123 111 R 1000	10.4	1SAF 430 555 R 8002	10.5
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05095	13.4	12404	14.22	18382	13.6	1SAF 125 111 R 1000	10.4	1SAF 430 651 R 3002	10.5
05096	13.4	12406	14.22	18384	13.6	1SAF 130 111 R 1000	10.3	1SAF 430 653 R 1002	10.5
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05147	13.4	18010	13.16	1SAF 108 123 R 1000	10.2	1SAF 130 122 R 3200	10.3	1SAF 912 115 R 4000	10.54
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05151	13.4	18012	13.16	1SAF 108 511 R 1000	10.2	1SAF 130 122 R 6100	10.3	1SAF 912 225 R 3100	10.54
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05163	13.4	18014	13.16	1SAF 108 511 R 3001	10.2	1SAF 130 511 R 1001	10.3	1SAF 950 988 R 9402	10.54
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05260	13.7	18160	13.16	1SAF 118 111 R 3000	10.3	1SAF 323 242 R 1000	10.5	1SAF900800R1220	10.75

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1SL5314A00	13.7	A110SH2-84**	3.81	A123010RT-84	1.10	A12ST4-84*2*	3.23	A145NSRF4-84*6E	3.55
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20.032.86351	20.18	A110SHX-84**	3.81	A12R-30-10-84	1.3	A12STP-84*2*	3.23	A145NSRM2-84***	3.63
20.032.86363	20.18	A110SM1-84***	3.56	A12S1-84*	3.14	A12STX-84*1*	3.21	A145NSRM3-84***	3.62
20.032.86364	20.18	A110SM2-84***	3.57	A12S2-84*	3.15	A12STX-84*2*	3.23	A145NSRM4-84***	3.63
20.032.86365	20.18	A110SM3-84***	3.56	A12S3-84*	3.14	A12SX-84*	3.15	A145NSRMP-84***	3.63
20.032.86366	20.18	A110SM4-84***	3.57	A12S4-84*	3.15	A145-30-00-84	1.116	A145NSRNX-84***	3.63
20.032.86367	20.18	A110SM7-84***	3.57	A12S7-84*	3.15	A145-30-11-84	1.3	A145NSRP-84*	3.19
20.032.86370	20.18	A110SMP-84***	3.57	A12S-84*	3.14	A145C3P1-84	1.116	A145NSRX-84*	3.19
20.032.86371	20.18	A110SMX-84***	3.57	A12SD-84*	3.24	A145M-30-11-84	1.3	A145NST1-84*1*	3.20
20.032.86372	20.18	A110SN1-84*	3.50	A12SD-84*A	3.24	A145N4-30-11-84	1.11	A145NST1-84*2*	3.22
20.032.86373	20.18	A110SN2-84*	3.51	A12SD-84*R	3.24	A145N4M-11-84	1.11	A145NST2-84*1*	3.21
20.910.86783	20.18	A110SN3-84*	3.50	A12SF1-84*6A	3.52	A145N4R-11-84	1.11	A145NST2-84*2*	3.23
20.910.86784	20.18	A110SN4-84*	3.51	A12SF2-84*6A	3.53	A145N4S-84*	3.14	A145NST3-84*1*	3.21
2152 0357-1	8.27	A110SNP-84*	3.51	A12SF3-84*6A	3.52	A145N4SA-84*	3.74	A145NST3-84*2*	3.23
2154 373-1	8.18	A110SNX-84*	3.51	A12SF4-84*6A	3.53	A145N4SG-84**	3.76	A145NST4-84*1*	3.21
2949 1468-2	8.63	A110SP-84*	3.15	A12SFP-84*6A	3.53	A145N4SH-84**	3.80	A145NST4-84*2*	3.23
2949 1469-2	8.63	A110SR1-84*	3.18	A12SFX-84*6A	3.53	A145N4SR-84*	3.18	A145NSTP-84*1*	3.21
2949 1725-1	8.26	A110SR2-84*	3.19	A12SM1-84***	3.56	A145N4ST-84*1*	3.20	A145NSTP-84*2*	3.23
4950 512-1	8.25	A110SR3-84*	3.19	A12SM2-84***	3.57	A145N4ST-84*2*	3.22	A145NSTX-84*1*	3.21
4950 512-2	8.25	A110SR4-84*	3.19	A12SM3-84***	3.56	A145N4SY-84**	3.78	A145NSTX-84*2*	3.23
4950 512-3	8.25	A110SR-84*	3.18	A12SM4-84***	3.57	A145NS1-84*	3.14	A145NSX-84*	3.15
5396 0543-1	8.45	A110SRF1-84*6D	3.54	A12SM7-84***	3.57	A145NS2-84*	3.15	A145NSY1-84**	3.78
5911 086-11	8.24	A110SRF2-84*6D	3.55	A12SMP-84***	3.57	A145NS3-84*	3.14	A145NSY2-84**	3.79
5911 086-11	8.36	A110SRF3-84*6D	3.54	A12SMX-84***	3.57	A145NS4-84*	3.15	A145NSY3-84**	3.79
5911 086-12	8.24	A110SRF4-84*6D	3.55	A12SN1-84*	3.50	A145NS7-84*	3.15	A145NSY4-84**	3.79
5911 086-12	8.36	A110SRFP-84*6D	3.55	A12SN2-84*	3.51	A145NSA1-84*	3.74	A145NSYX-84**	3.79
5911 086-13	8.24	A110SRFX-84*6D	3.55	A12SN3-84*	3.50	A145NSA2-84*	3.75	A145R-30-11-84	1.3
5911 086-13	8.36	A110SRM1-84***	3.60	A12SN4-84*	3.51	A145NSA3-84*	3.75	A145S1-84*	3.14
5911 086-14	8.24	A110SRM2-84***	3.61	A12SNP-84*	3.51	A145NSA4-84*	3.75	A145S2-84*	3.15
5911 086-14	8.36	A110SRM3-84***	3.60	A12SNX-84*	3.51	A145NSAX-84*	3.75	A145S3-84*	3.14
5911 086-15	8.24	A110SRM4-84***	3.61	A12SP-84*	3.15	A145NSF1-84*6E	3.52	A145S4-84*	3.15
5911 086-15	8.36	A110SRMP-84***	3.61	A12SR1-84*	3.18	A145NSF2-84*6E	3.53	A145S7-84*	3.15
5911 086-4	8.24	A110SRMX-84***	3.61	A12SR2-84*	3.19	A145NSF3-84*6E	3.52	A145S-84*	3.14
5911 086-4	8.36	A110SRP-84*	3.19	A12SR3-84*	3.19	A145NSF4-84*6E	3.53	A145SA1-84*	3.74
5911 086-5	8.24	A110SRX-84*	3.19	A12SR4-84*	3.19	A145NSFP-84*6E	3.53	A145SA2-84*	3.75
5911 086-5	8.36	A110SS1-84*	3.16	A12SR-84*	3.18	A145NSFX-84*6E	3.53	A145SA3-84*	3.75
5911 086-7	8.24	A110SS2-84*	3.17	A12SRF1-84*6A	3.54	A145NSG1-84**	3.76	A145SA4-84*	3.75
5911 086-7	8.36	A110SS3-84*	3.17	A12SRF2-84*6A	3.55	A145NSG2-84**	3.77	A145SA-84*	3.74
A1103000RT-84	1.10	A110SS4-84*	3.17	A12SRF3-84*6A	3.54	A145NSG3-84**	3.77	A145SAX-84*	3.75
A110-30-11-84	1.3	A110SS-84*	3.16	A12SRF4-84*6A	3.55	A145NSG4-84**	3.77	A145SF1-84*6E	3.52
A110M-30-11-84	1.3	A110SSP-84*	3.17	A12SRFP-84*6A	3.55	A145NSGX-84**	3.77	A145SF2-84*6E	3.53
A110R-30-11-84	1.3	A110SSX-84*	3.17	A12SRFX-84*6A	3.55	A145NSH1-84**	3.80	A145SF3-84*6E	3.52
A110S1-84*	3.14	A110ST1-84*1*	3.20	A12SRM1-84***	3.60	A145NSH2-84**	3.81	A145SF4-84*6E	3.53
A110S2-84*	3.15	A110ST1-84*2*	3.22	A12SRM2-84***	3.61	A145NSH3-84**	3.81	A145SFP-84*6E	3.53
A110S3-84*	3.14	A110ST2-84*1*	3.21	A12SRM3-84***	3.60	A145NSH4-84**	3.81	A145SFX-84*6E	3.53
A110S4-84*	3.15	A110ST2-84*2*	3.23	A12SRM4-84***	3.61	A145NSHX-84**	3.81	A145SG1-84**	3.76
A110S7-84*	3.15	A110ST3-84*1*	3.21	A12SRMP-84***	3.61	A145NSM1-84***	3.58	A145SG2-84**	3.77
A110S-84*	3.14	A110ST3-84*2*	3.23	A12SRMX-84***	3.61	A145NSM2-84***	3.59	A145SG3-84**	3.77
A110SA1-84*	3.74	A110ST4-84*1*	3.21	A12SRP-84*	3.19	A145NSM3-84***	3.58	A145SG4-84**	3.77
A110SA2-84*	3.75	A110ST4-84*2*	3.23	A12SRX-84*	3.19	A145NSM4-84***	3.59	A145SG-84**	3.76
A110SA3-84*	3.75	A110ST-84*1*	3.20	A12SS1-84*	3.16	A145NSM7-84***	3.59	A145SGX-84**	3.77
A110SA4-84*	3.75	A110ST-84*2*	3.22	A12SS2-84*	3.17	A145NSMP-84***	3.59	A145SH1-84**	3.80
A110SA-84*	3.74	A110STP-84*1*	3.21	A12SS3-84*	3.17	A145NSMX-84***	3.59	A145SH2-84**	3.81
A110SAX-84*	3.75	A110STP-84*2*	3.23	A12SS4-84*	3.17	A145NSN1-84*	3.50	A145SH3-84**	3.81
A110SF1-84*6D	3.52	A110STX-84*1*	3.21	A12SS-84*	3.16	A145NSN2-84*	3.51	A145SH4-84**	3.81
A110SF2-84*6D	3.53	A110STX-84*2*	3.23	A12SSD-84*	3.24	A145NSN3-84*	3.50	A145SH-84**	3.80
A110SF3-84*6D	3.52	A110SX-84*	3.15	A12SSD-84*A	3.24	A145NSN4-84*	3.51	A145SHX-84**	3.81
A110SF4-84*6D	3.53	A110SY1-84**	3.78	A12SSD-84*R	3.24	A145NSNP-84*	3.51	A145SM1-84***	3.56
A110SFP-84*6D	3.53	A110SY2-84**	3.79	A12SSP-84*	3.17	A145NSNX-84*	3.15	A145SM2-84***	3.57
A110SFX-84*6D	3.53	A110SY3-84**	3.79	A12SSX-84*	3.17	A145NSP-84*	3.51	A145SM3-84***	3.56
A110SG1-84**	3.76	A110SY4-84**	3.79	A12ST1-84*1*	3.20	A145NSR1-84*	3.18	A145SM4-84***	3.57
A110SG2-84**	3.77	A110SY-84**	3.78	A12ST1-84*2*	3.22	A145NSR2-84*	3.19	A145SM7-84***	3.57
A110SG3-84**	3.77	A110SYX-84**	3.79	A12ST2-84*1*	3.21	A145NSR3-84*	3.19	A145SMP-84***	3.57
A110SG4-84**	3.77	A110W-30-11-84	1.122	A12ST2-84*2*	3.23	A145NSR4-84*	3.19	A145SMX-84***	3.57
A110SG-84**	3.76	A12-30-01-84	1.3	A12ST3-84*1*	3.21	A145NSRF1-84*6E	3.54	A145SN1-84*	3.50
A110SGX-84**	3.77	A123001RT-84	1.10	A12ST3-84*2*	3.23	A145NSRF2-84*6E	3.55	A145SN2-84*	3.51

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A145SN3-84*	3.50	A16-80L-00-84	1.116	A16NSMX-84***	3.59	A16SN2-84*	3.51	A185SFX-84*6E	3.53
A145SN4-84*	3.51	A16C12NCP1-84	1.116	A16NSN1-84*	3.50	A16SN3-84*	3.50	A185SG1-84**	3.76
A145SNP-84*	3.51	A16C12P1-84	1.116	A16NSN2-84*	3.51	A16SN4-84*	3.51	A185SG2-84**	3.77
A145SNX-84*	3.51	A16C12PL1-84	1.116	A16NSN3-84*	3.50	A16SNP-84*	3.51	A185SG3-84**	3.77
A145SP-84*	3.15	A16C22P1-84	1.116	A16NSN4-84*	3.51	A16SNX-84*	3.51	A185SG4-84**	3.77
A145SR1-84*	3.18	A16C4NCP1-84	1.116	A16NSNP-84*	3.51	A16SP-84*	3.15	A185SG-84**	3.76
A145SR2-84*	3.19	A16C4P1-84	1.116	A16NSNX-84*	3.51	A16SR1-84*	3.18	A185SGX-84**	3.77
A145SR3-84*	3.19	A16C4PL1-84	1.116	A16NSP-84*	3.15	A16SR2-84*	3.19	A185SH1-84**	3.80
A145SR4-84*	3.19	A16C8NCP1-84	1.116	A16NSR1-84*	3.18	A16SR3-84*	3.19	A185SH2-84**	3.81
A145SR-84*	3.18	A16C8P1-84	1.116	A16NSR2-84*	3.19	A16SR4-84*	3.19	A185SH3-84**	3.81
A145SRF1-84*6E	3.54	A16C8PL1-84	1.116	A16NSR3-84*	3.19	A16SR-84*	3.18	A185SH4-84**	3.81
A145SRF2-84*6E	3.55	A16L-012-00-84	1.116	A16NSR4-84*	3.19	A16SRF1-84*6A	3.54	A185SH-84**	3.80
A145SRF3-84*6E	3.54	A16L-04-00-84	1.116	A16NSRF1-84*6A	3.54	A16SRF2-84*6A	3.55	A185SHX-84**	3.81
A145SRF4-84*6E	3.55	A16L-08-00-84	1.116	A16NSRF2-84*6A	3.55	A16SRF3-84*6A	3.54	A185SM1-84***	3.56
A145SRFP-84*6E	3.55	A16L-120-00-84	1.116	A16NSRF3-84*6A	3.54	A16SRF4-84*6A	3.55	A185SM2-84***	3.57
A145SRFX-84*6E	3.55	A16L-120L-00-84	1.116	A16NSRF4-84*6A	3.55	A16SRFP-84*6A	3.55	A185SM3-84***	3.56
A145SRM1-84***	3.60	A16L-22-00-84	1.116	A16NSRFP-84*6A	3.55	A16SRFX-84*6A	3.55	A185SM4-84***	3.57
A145SRM2-84***	3.61	A16L-40-00-84	1.116	A16NSRFX-84*6A	3.55	A16SRM1-84***	3.60	A185SM7-84***	3.57
A145SRM3-84***	3.60	A16L-40L-00-84	1.116	A16NSRM1-84***	3.62	A16SRM2-84***	3.61	A185SMP-84***	3.57
A145SRM4-84***	3.61	A16L-80-00-84	1.116	A16NSRM2-84***	3.63	A16SRM3-84***	3.60	A185SMX-84***	3.57
A145SRMP-84***	3.61	A16L-80L-00-84	1.116	A16NSRM3-84***	3.62	A16SRM4-84***	3.61	A185SN1-84*	3.50
A145SRMX-84***	3.61	A16LC12NCP1-84	1.116	A16NSRM4-84***	3.63	A16SRMP-84***	3.61	A185SN2-84*	3.51
A145SRP-84*	3.19	A16LC12P1-84	1.116	A16NSRMP-84***	3.63	A16SRMX-84***	3.61	A185SN3-84*	3.50
A145SRX-84*	3.19	A16LC12PL1-84	1.116	A16NSRMX-84***	3.63	A16SRP-84*	3.19	A185SN4-84*	3.51
A145SS1-84*	3.16	A16LC22P1-84	1.116	A16NSRP-84*	3.19	A16SRX-84*	3.19	A185SNP-84*	3.51
A145SS2-84*	3.17	A16LC4NCP1-84	1.116	A16NSRX-84*	3.19	A16SS1-84*	3.16	A185SNX-84*	3.51
A145SS3-84*	3.17	A16LC4P1-84	1.116	A16NST1-84*1*	3.20	A16SS2-84*	3.17	A185SP-84*	3.15
A145SS4-84*	3.17	A16LC4PL1-84	1.116	A16NST1-84*2*	3.22	A16SS3-84*	3.17	A185SR1-84*	3.18
A145SS-84*	3.16	A16LC8NCP1-84	1.116	A16NST2-84*1*	3.21	A16SS4-84*	3.17	A185SR2-84*	3.19
A145SSP-84*	3.17	A16LC8P1-84	1.116	A16NST2-84*2*	3.23	A16SS-84*	3.16	A185SR3-84*	3.19
A145SSX-84*	3.17	A16LC8PL1-84	1.116	A16NST3-84*1*	3.21	A16SSD-84*	3.24	A185SR4-84*	3.19
A145ST1-84*1*	3.20	A16M-30-01-84	1.3	A16NST3-84*2*	3.23	A16SSD-84*A	3.24	A185SR-84*	3.18
A145ST1-84*2*	3.22	A16M-30-10-84	1.3	A16NST4-84*1*	3.21	A16SSD-84*R	3.24	A185SRF1-84*6E	3.54
A145ST2-84*1*	3.21	A16N0-30-10-84	1.11	A16NST4-84*2*	3.23	A16SSP-84*	3.17	A185SRF2-84*6E	3.55
A145ST2-84*2*	3.23	A16N0M-10-84	1.11	A16NSTP-84*1*	3.23	A16SSX-84*	3.17	A185SRF3-84*6E	3.54
A145ST3-84*1*	3.21	A16N0R-10-84	1.11	A16NSTP-84*2*	3.23	A16ST1-84*1*	3.20	A185SRF4-84*6E	3.55
A145ST3-84*2*	3.23	A16N0S-84*	3.14	A16NSTX-84*1*	3.21	A16ST1-84*2*	3.22	A185SRFP-84*6E	3.55
A145ST4-84*1*	3.21	A16N0SA-84*	3.74	A16NSTX-84*2*	3.23	A16ST2-84*1*	3.21	A185SRFX-84*6E	3.55
A145ST4-84*2*	3.23	A16N0SP-84*	3.17	A16NSX-84*	3.15	A16ST2-84*2*	3.23	A185SRM1-84***	3.60
A145ST-84*1*	3.20	A16N0SR-84*	3.18	A16R-30-01-84	1.3	A16ST3-84*1*	3.21	A185SRM2-84***	3.61
A145ST-84*2*	3.22	A16N0SS1-84*	3.16	A16R-30-10-84	1.3	A16ST3-84*2*	3.23	A185SRM3-84***	3.60
A145STP-84*1*	3.21	A16N0SS2-84*	3.17	A16S1-84*	3.14	A16ST4-84*1*	3.21	A185SRM4-84***	3.61
A145STP-84*2*	3.23	A16N0SS3-84*	3.17	A16S2-84*	3.15	A16ST4-84*2*	3.23	A185SRMP-84***	3.61
A145STX-84*1*	3.21	A16N0SS4-84*	3.17	A16S3-84*	3.14	A16ST-84*1*	3.20	A185SRMX-84***	3.61
A145STX-84*2*	3.23	A16N0SS-84*	3.16	A16S4-84*	3.15	A16ST-84*2*	3.22	A185SRP-84*	3.19
A145SX-84*	3.15	A16N0ST-84*1*	3.20	A16S7-84*	3.15	A16STP-84*1*	3.21	A185SRX-84*	3.19
A145SY1-84**	3.78	A16N0ST-84*2*	3.22	A16S-84*	3.14	A16STP-84*2*	3.23	A185SS1-84*	3.16
A145SY2-84**	3.79	A16N0SX-84*	3.17	A16SA1-84*	3.74	A16STX-84*1*	3.21	A185SS2-84*	3.17
A145SY3-84**	3.79	A16NS1-84*	3.14	A16SA2-84*	3.75	A16STX-84*2*	3.23	A185SS3-84*	3.17
A145SY4-84**	3.79	A16NS2-84*	3.15	A16SA3-84*	3.75	A16SX-84*	3.15	A185SS4-84*	3.17
A145SY-84**	3.78	A16NS3-84*	3.14	A16SA4-84*	3.75	A185-30-11-84	1.3	A185SS-84*	3.16
A145SYX-84**	3.79	A16NS4-84*	3.15	A16SA-84*	3.74	A185M-30-11-84	1.3	A185SSP-84*	3.17
A145W-20-11-84	1.122	A16NS7-84*	3.15	A16SAX-84*	3.75	A185R-30-11-84	1.3	A185SSX-84*	3.17
A145W-30-11-84	1.122	A16NSA1-84*	3.74	A16SD-84*	3.24	A185S1-84*	3.14	A185ST1-84*1*	3.20
A16-012-00-84	1.116	A16NSA2-84*	3.75	A16SD-84*A	3.24	A185S2-84*	3.15	A185ST1-84*2*	3.22
A16-04-00-84	1.13	A16NSA3-84*	3.75	A16SD-84*R	3.24	A185S3-84*	3.14	A185ST2-84*1*	3.21
A16-04-00-84	1.116	A16NSA4-84*	3.75	A16SF1-84*6A	3.52	A185S4-84*	3.15	A185ST2-84*2*	3.23
A16-08-00-84	1.116	A16NSAX-84*	3.75	A16SF2-84*6A	3.53	A185S7-84*	3.15	A185ST3-84*1*	3.21
A16-120-00-84	1.116	A16NSF1-84*6A	3.52	A16SF3-84*6A	3.52	A185S-84*	3.14	A185ST3-84*2*	3.23
A16-120L-00-84	1.116	A16NSF2-84*6A	3.53	A16SF4-84*6A	3.53	A185SA1-84*	3.74	A185ST4-84*1*	3.21
A16-22-00-84	1.13	A16NSF3-84*6A	3.52	A16SFP-84*6A	3.53	A185SA2-84*	3.75	A185ST4-84*2*	3.23
A16-22-00-84	1.116	A16NSF4-84*6A	3.53	A16SFX-84*6A	3.53	A185SA3-84*	3.75	A185ST-84*1*	3.20
A16-30-01-84	1.3	A16NSFP-84*6A	3.53	A16SM1-84***	3.56	A185SA4-84*	3.75	A185ST-84*2*	3.22
A163001RT-84	1.10	A16NSFX-84*6A	3.53	A16SM2-84***	3.57	A185SA-84*	3.74	A185STP-84*1*	3.21
A16-30-10-84	1.3	A16NSM1-84***	3.58	A16SM3-84***	3.56	A185SAX-84*	3.75	A185STP-84*2*	3.23
A163010RT-84	1.10	A16NSM2-84***	3.59	A16SM4-84***	3.57	A185SF1-84*6E	3.52	A185STX-84*1*	3.21
A16-40-00-84	1.13	A16NSM3-84***	3.58	A16SM7-84***	3.57	A185SF2-84*6E	3.53	A185STX-84*2*	3.23
A16-40-00-84	1.116	A16NSM4-84***	3.59	A16SMP-84***	3.57	A185SF3-84*6E	3.52	A185SX-84*	3.15
A16-40L-00-84	1.116	A16NSM7-84***	3.59	A16SMX-84***	3.57	A185SF4-84*6E	3.53	A185SY1-84**	3.78
A16-80-00-84	1.116	A16NSMP-84***	3.59	A16SN1-84*	3.50	A185SFP-84*6E	3.53	A185SY2-84**	3.79

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A185SY3-84**	3.79	A210SRMP-84***	3.61	A260NSM3-84***	3.58	A260SG-84**	3.76	A26-40-00-84	1.116
A185SY4-84**	3.79	A210SRMX-84***	3.61	A260NSM4-84***	3.59	A260SGX-84**	3.77	A26-80-00-84	1.116
A185SY-84**	3.78	A210SRP-84*	3.19	A260NSMP-84***	3.59	A260SH1-84**	3.80	A26C12P1-84	1.116
A185SYX-84**	3.79	A210SRX-84*	3.19	A260NSMX-84***	3.59	A260SH2-84**	3.81	A26C22P1-84	1.116
A185W-20-11-84	1.122	A210ST1-84*1*	3.20	A260NSN1-84*	3.50	A260SH3-84**	3.81	A26C4P1-84	1.116
A185W-30-11-84	1.122	A210ST1-84*2*	3.22	A260NSN2-84*	3.51	A260SH4-84**	3.81	A26C8P1-84	1.116
A210-30-00-84	1.116	A210ST2-84*1*	3.21	A260NSN3-84*	3.50	A260SH-84**	3.80	A26L-120-00-84	1.116
A210-30-11-84	1.3	A210ST2-84*2*	3.23	A260NSN4-84*	3.51	A260SHX-84**	3.81	A26L-22-00-84	1.116
A210C3P1-84	1.116	A210ST3-84*1*	3.21	A260NSNP-84*	3.51	A260SM1-84***	3.56	A26L-40-00-84	1.116
A210M-30-11-84	1.3	A210ST3-84*2*	3.23	A260NSNX-84*	3.51	A260SM2-84***	3.57	A26L-80-00-84	1.116
A210R-30-11-84	1.3	A210ST4-84*1*	3.21	A260NSP-84*	3.15	A260SM3-84***	3.56	A26LC12P1-84	1.116
A210S1-84*	3.14	A210ST4-84*2*	3.23	A260NSR1-84*	3.18	A260SM4-84***	3.57	A26LC22P1-84	1.116
A210S2-84*	3.15	A210ST-84*1*	3.20	A260NSR2-84*	3.19	A260SMP-84***	3.57	A26LC4P1-84	1.116
A210S3-84*	3.14	A210ST-84*2*	3.22	A260NSR3-84*	3.19	A260SMX-84***	3.57	A26LC8P1-84	1.116
A210S4-84*	3.15	A210STP-84*1*	3.21	A260NSR4-84*	3.19	A260SN1-84*	3.50	A26M-30-01-84	1.3
A210S7-84*	3.15	A210STP-84*2*	3.23	A260NSRF1-84*6E	3.54	A260SN3-84*	3.50	A26M-30-10-84	1.3
A210S-84*	3.14	A210STX-84*1*	3.21	A260NSRF2-84*6E	3.55	A260SN4-84*	3.51	A26N1-30-10-84	1.11
A210SA1-84*	3.74	A210STX-84*2*	3.23	A260NSRF3-84*6E	3.54	A260SNP-84*	3.51	A26N1M-10-84	1.11
A210SA2-84*	3.75	A210SX-84*	3.15	A260NSRF4-84*6E	3.55	A260SNX-84*	3.51	A26N1R-10-84	1.11
A210SA3-84*	3.75	A210SY1-84**	3.78	A260NSRFP-84*6E	3.55	A260SP-84*	3.15	A26N1S-84*	3.14
A210SA4-84*	3.75	A210SY2-84**	3.79	A260NSRFX-84*6E	3.55	A260SR1-84*	3.18	A26N1SA-84*	3.74
A210SA-84*	3.74	A210SY3-84**	3.79	A260NSRM1-84***	3.62	A260SR2-84*	3.19	A26N1SG-84**	3.76
A210SAX-84*	3.75	A210SY4-84**	3.79	A260NSRM2-84***	3.63	A260SR3-84*	3.19	A26N1SH-84**	3.80
A210SF1-84*6E	3.52	A210SY-84**	3.78	A260NSRM3-84***	3.62	A260SR4-84*	3.19	A26N1SP-84*	3.17
A210SF2-84*6E	3.53	A210SYX-84**	3.79	A260NSRM4-84***	3.63	A260SR-84*	3.18	A26N1SR-84*	3.18
A210SF3-84*6E	3.52	A210W-20-11-84	1.122	A260NSRMP-84***	3.63	A260SRF1-84*6E	3.54	A26N1SS1-84*	3.16
A210SF4-84*6E	3.53	A210W-30-11-84	1.122	A260NSRMX-84***	3.63	A260SRF2-84*6E	3.55	A26N1SS2-84*	3.17
A210SFP-84*6E	3.53	A25SRFP-84*6B	3.55	A260NSRP-84*	3.19	A260SRF3-84*6E	3.54	A26N1SS3-84*	3.17
A210SFX-84*6E	3.53	A25SY1-84**	3.78	A260NSRX-84*	3.19	A260SRF4-84*6E	3.55	A26N1SS4-84*	3.17
A210SG1-84**	3.76	A260-30-11-84	1.3	A260NST1-84*1*	3.20	A260SRFP-84*6E	3.55	A26N1SS-84*	3.16
A210SG2-84**	3.77	A260M-30-11-84	1.3	A260NST1-84*2*	3.22	A260SRFX-84*6E	3.55	A26N1ST-84*1*	3.20
A210SG3-84**	3.77	A260N5-30-11-84	1.11	A260NST2-84*1*	3.21	A260SRM1-84***	3.60	A26N1ST-84*2*	3.22
A210SG4-84**	3.77	A260N5M-11-84	1.11	A260NST2-84*2*	3.23	A260SRM2-84***	3.61	A26N1SX-84*	3.17
A210SG-84**	3.76	A260N5R-11-84	1.11	A260NST3-84*1*	3.21	A260SRM3-84***	3.60	A26N1SY-84**	3.78
A210SGX-84**	3.77	A260N5S-84*	3.14	A260NST3-84*2*	3.23	A260SRM4-84***	3.61	A26N1S-84*	3.14
A210SH1-84**	3.80	A260N5SA-84*	3.74	A260NST4-84*1*	3.21	A260SRMP-84***	3.61	A26NS2-84*	3.15
A210SH2-84**	3.81	A260N5SG-84**	3.76	A260NST4-84*2*	3.23	A260SRMX-84***	3.61	A26NS3-84*	3.14
A210SH3-84**	3.81	A260N5SH-84**	3.80	A260NSTP-84*1*	3.21	A260SRP-84*	3.19	A26NS4-84*	3.15
A210SH4-84**	3.81	A260N5SR-84*	3.18	A260NSTP-84*2*	3.23	A260SRX-84*	3.19	A26NS7-84*	3.15
A210SH-84**	3.80	A260N5ST-84*1*	3.20	A260NSTX-84*1*	3.21	A260ST1-84*1*	3.20	A26NSA1-84*	3.74
A210SHX-84**	3.81	A260N5ST-84*2*	3.22	A260NSTX-84*2*	3.23	A260ST1-84*2*	3.22	A26NSA2-84*	3.75
A210SM1-84***	3.56	A260N5SY-84**	3.78	A260NSX-84*	3.15	A260ST2-84*1*	3.21	A26NSA3-84*	3.75
A210SM2-84***	3.57	A260NSY1-84*	3.14	A260NSY1-84**	3.78	A260ST2-84*2*	3.23	A26NSA4-84*	3.75
A210SM3-84***	3.56	A260NS2-84*	3.15	A260NSY2-84**	3.79	A260ST3-84*1*	3.21	A26NSAX-84*	3.75
A210SM4-84***	3.57	A260NS3-84*	3.14	A260NSY3-84**	3.79	A260ST3-84*2*	3.23	A26NSF1-84*6A	3.52
A210SM7-84***	3.57	A260NS4-84*	3.15	A260NSY4-84**	3.79	A260ST4-84*1*	3.21	A26NSF1-84*6B	3.52
A210SMP-84***	3.57	A260NS7-84*	3.15	A260NSYX-84**	3.79	A260ST4-84*2*	3.23	A26NSF2-84*6A	3.53
A210SMX-84***	3.57	A260NSA1-84*	3.74	A260R-30-11-84	1.3	A260ST-84*1*	3.20	A26NSF2-84*6B	3.53
A210SN1-84*	3.50	A260NSA2-84*	3.75	A260S1-84*	3.14	A260ST-84*2*	3.22	A26NSF3-84*6A	3.52
A210SN2-84*	3.51	A260NSA3-84*	3.75	A260S2-84*	3.15	A260STP-84*1*	3.21	A26NSF3-84*6B	3.52
A210SN3-84*	3.50	A260NSA4-84*	3.75	A260S3-84*	3.14	A260STP-84*2*	3.23	A26NSF4-84*6A	3.53
A210SN4-84*	3.51	A260NSAX-84*	3.75	A260S4-84*	3.15	A260STX-84*1*	3.21	A26NSF4-84*6B	3.53
A210SNP-84*	3.51	A260NSF1-84*6E	3.52	A260S7-84*	3.15	A260STX-84*2*	3.23	A26NSFP-84*6A	3.53
A210SNX-84*	3.51	A260NSF2-84*6E	3.53	A260S-84*	3.14	A260SX-84*	3.15	A26NSFP-84*6B	3.53
A210SP-84*	3.15	A260NSF3-84*6E	3.52	A260SA1-84*	3.74	A260SY1-84**	3.78	A26NSFX-84*6A	3.53
A210SR1-84*	3.18	A260NSF4-84*6E	3.53	A260SA2-84*	3.75	A260SY2-84**	3.79	A26NSFX-84*6B	3.53
A210SR2-84*	3.19	A260NSFP-84*6E	3.53	A260SA3-84*	3.75	A260SY3-84**	3.79	A26NSG1-84**	3.76
A210SR3-84*	3.19	A260NSFX-84*6E	3.53	A260SA4-84*	3.75	A260SY4-84**	3.79	A26NSG2-84**	3.77
A210SR4-84*	3.19	A260NSG1-84**	3.76	A260SA-84*	3.74	A260SY-84**	3.78	A26NSG3-84**	3.77
A210SR-84*	3.18	A260NSG2-84**	3.77	A260SAX-84*	3.75	A260SYX-84**	3.79	A26NSG4-84**	3.77
A210SRF1-84*6E	3.54	A260NSG3-84**	3.77	A260SF1-84*6E	3.52	A260W-20-11-84	1.122	A26NSGX-84**	3.77
A210SRF2-84*6E	3.55	A260NSG4-84**	3.77	A260SF2-84*6E	3.53	A260W-30-11-84	1.122	A26NSH1-84**	3.80
A210SRF3-84*6E	3.54	A260NSGX-84**	3.77	A260SF3-84*6E	3.52	A26-120-00-84	1.116	A26NSH2-84**	3.81
A210SRF4-84*6E	3.55	A260NSH1-84**	3.80	A260SF4-84*6E	3.53	A26-22-00-84	1.13	A26NSH3-84**	3.81
A210SRFP-84*6E	3.55	A260NSH2-84**	3.81	A260SFP-84*6E	3.53	A26-22-00-84	1.116	A26NSH4-84**	3.81
A210SRFX-84*6E	3.55	A260NSH3-84**	3.81	A260SFX-84*6E	3.53	A26-30-01-84	1.3	A26NSHX-84**	3.81
A210SRM1-84***	3.60	A260NSH4-84**	3.81	A260SG1-84**	3.76	A263001RT-84	1.10	A26NSM1-84***	3.58
A210SRM2-84***	3.61	A260NSHX-84**	3.81	A260SG2-84**	3.77	A26-30-10-84	1.3	A26NSM2-84***	3.59
A210SRM3-84***	3.60	A260NSM1-84***	3.58	A260SG3-84**	3.77	A263010RT-84	1.10	A26NSM3-84***	3.58
A210SRM4-84***	3.61	A260NSM2-84***	3.59	A260SG4-84**	3.77	A26-40-00-84	1.13	A26NSM4-84***	3.59

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A26NSM7-84***	3.59	A26SFP-84*6B	3.53	A26SY4-84**	3.79	A300ST1-84*1*	3.20	A30SP-84*	3.15
A26NSMP-84***	3.59	A26SFX-84*6B	3.53	A26SY-84**	3.78	A300ST1-84*2*	3.22	A30SR1-84*	3.18
A26NSMX-84***	3.59	A26SG1-84**	3.76	A26SYX-84**	3.79	A300ST2-84*1*	3.21	A30SR2-84*	3.19
A26NSN1-84*	3.50	A26SG2-84**	3.77	A300-30-00-84	1.116	A300ST2-84*2*	3.23	A30SR3-84*	3.19
A26NSN2-84*	3.51	A26SG3-84**	3.77	A300-30-11-84	1.3	A300ST3-84*1*	3.21	A30SR4-84*	3.19
A26NSN3-84*	3.50	A26SG4-84**	3.77	A300C3P1-84	1.116	A300ST3-84*2*	3.23	A30SR-84*	3.18
A26NSN4-84*	3.51	A26SG-84**	3.76	A300M-30-11-84	1.3	A300ST4-84*1*	3.21	A30SRF1-84*6B	3.54
A26NSNP-84*	3.51	A26SGX-84**	3.77	A300R-30-11-84	1.3	A300ST4-84*2*	3.23	A30SRF2-84*6B	3.55
A26NSNX-84*	3.51	A26SH1-84**	3.80	A300S1-84*	3.14	A300ST-84*1*	3.20	A30SRF3-84*6B	3.54
A26NSP-84*	3.15	A26SH2-84**	3.81	A300S2-84*	3.15	A300ST-84*2*	3.22	A30SRF4-84*6B	3.55
A26NSR1-84*	3.18	A26SH3-84**	3.81	A300S3-84*	3.14	A300STP-84*1*	3.21	A30SRFP-84*6B	3.55
A26NSR2-84*	3.19	A26SH4-84**	3.81	A300S4-84*	3.15	A300STP-84*2*	3.23	A30SRFX-84*6B	3.55
A26NSR3-84*	3.19	A26SH-84**	3.80	A300S7-84*	3.15	A300STX-84*1*	3.21	A30SRM1-84***	3.60
A26NSR4-84*	3.19	A26SHX-84**	3.81	A300S-84*	3.14	A300STX-84*2*	3.23	A30SRM2-84***	3.61
A26NSRF1-84*6A	3.54	A26SM1-84***	3.56	A300SA1-84*	3.74	A300SX-84*	3.15	A30SRM3-84***	3.60
A26NSRF1-84*6B	3.54	A26SM2-84***	3.57	A300SA2-84*	3.75	A300SY1-84**	3.78	A30SRM4-84***	3.61
A26NSRF2-84*6A	3.55	A26SM3-84***	3.56	A300SA3-84*	3.75	A300SY2-84**	3.79	A30SRMP-84***	3.61
A26NSRF2-84*6B	3.55	A26SM4-84***	3.57	A300SA4-84*	3.75	A300SY3-84**	3.79	A30SRMX-84***	3.61
A26NSRF3-84*6A	3.54	A26SM7-84***	3.57	A300SA-84*	3.74	A300SY4-84**	3.79	A30SRP-84*	3.19
A26NSRF3-84*6B	3.54	A26SMP-84***	3.57	A300SAX-84*	3.75	A300SY-84**	3.78	A30SRX-84*	3.19
A26NSRF4-84*6A	3.55	A26SMX-84***	3.57	A300SF1-84*6E	3.52	A300SYX-84**	3.79	A30SS1-84*	3.16
A26NSRF4-84*6B	3.55	A26SN1-84*	3.50	A300SF2-84*6E	3.53	A300W-20-11-84	1.122	A30SS2-84*	3.17
A26NSRFP-84*6A	3.55	A26SN2-84*	3.51	A300SF3-84*6E	3.52	A300W-30-11-84	1.122	A30SS3-84*	3.17
A26NSRFP-84*6B	3.55	A26SN3-84*	3.50	A300SF4-84*6E	3.53	A30-30-01-84	1.3	A30SS4-84*	3.17
A26NSRFX-84*6A	3.55	A26SN4-84*	3.51	A300SFP-84*6E	3.53	A30-30-10-84	1.3	A30SS-84*	3.16
A26NSRFX-84*6B	3.55	A26SNP-84*	3.51	A300SFX-84*6E	3.53	A30-30-10-84	1.116	A30SSP-84*	3.17
A26NSRM1-84***	3.62	A26SNX-84*	3.51	A300SG1-84**	3.76	A30C3P1-84	1.116	A30SSX-84*	3.17
A26NSRM2-84***	3.63	A26SP-84*	3.15	A300SG2-84**	3.77	A30L-30-10-84	1.116	A30ST1-84*1*	3.20
A26NSRM3-84***	3.62	A26SR1-84*	3.18	A300SG3-84**	3.77	A30LC3P1-84	1.116	A30ST1-84*2*	3.22
A26NSRM4-84***	3.63	A26SR2-84*	3.19	A300SG4-84**	3.77	A30M-30-01-84	1.3	A30ST2-84*1*	3.21
A26NSRMP-84***	3.63	A26SR3-84*	3.19	A300SG-84**	3.76	A30M-30-10-84	1.3	A30ST2-84*2*	3.23
A26NSRMX-84***	3.63	A26SR4-84*	3.19	A300SGX-84**	3.77	A30R-30-01-84	1.3	A30ST3-84*1*	3.21
A26NSRP-84*	3.19	A26SR-84*	3.18	A300SH1-84**	3.80	A30R-30-10-84	1.3	A30ST3-84*2*	3.23
A26NSRX-84*	3.19	A26SRF1-84*6B	3.54	A300SH2-84**	3.81	A30S1-84*	3.14	A30ST4-84*1*	3.21
A26NST1-84*1*	3.20	A26SRF2-84*6B	3.55	A300SH3-84**	3.81	A30S2-84*	3.15	A30ST4-84*2*	3.23
A26NST1-84*2*	3.22	A26SRF3-84*6B	3.54	A300SH4-84**	3.81	A30S3-84*	3.14	A30ST-84*1*	3.20
A26NST2-84*1*	3.21	A26SRF4-84*6B	3.55	A300SH-84**	3.80	A30S4-84*	3.15	A30ST-84*2*	3.22
A26NST2-84*2*	3.23	A26SRFX-84*6B	3.55	A300SHX-84**	3.81	A30S7-84*	3.15	A30STP-84*1*	3.21
A26NST3-84*1*	3.21	A26SRM1-84***	3.60	A300SM1-84***	3.56	A30S-84*	3.14	A30STP-84*2*	3.23
A26NST3-84*2*	3.23	A26SRM2-84***	3.61	A300SM2-84***	3.57	A30SF1-84*6B	3.52	A30STX-84*1*	3.21
A26NST4-84*1*	3.21	A26SRM3-84***	3.60	A300SM3-84***	3.56	A30SF2-84*6B	3.53	A30STX-84*2*	3.23
A26NST4-84*2*	3.23	A26SRM4-84***	3.61	A300SM4-84***	3.57	A30SF3-84*6B	3.52	A30SX-84**	3.15
A26NSTP-84*1*	3.21	A26SRMP-84***	3.61	A300SMP-84***	3.57	A30SF4-84*6B	3.53	A30SY1-84**	3.78
A26NSTP-84*2*	3.23	A26SRMX-84***	3.61	A300SMX-84***	3.57	A30SFP-84*6B	3.53	A30SY2-84**	3.79
A26NSTX-84*1*	3.21	A26SRP-84*	3.19	A300SN1-84*	3.50	A30SFX-84*6B	3.53	A30SY3-84**	3.79
A26NSTX-84*2*	3.23	A26SRX-84*	3.19	A300SN2-84*	3.51	A30SG1-84**	3.76	A30SY4-84**	3.79
A26NSX-84*	3.15	A26SS1-84*	3.16	A300SN3-84*	3.50	A30SG2-84**	3.77	A30SY-84**	3.78
A26NSY1-84**	3.78	A26SS2-84*	3.17	A300SN4-84*	3.51	A30SG3-84**	3.77	A30SYX-84**	3.79
A26NSY2-84**	3.79	A26SS3-84*	3.17	A300SNP-84*	3.51	A30SG4-84**	3.77	A400S1-70*	3.14
A26NSY3-84**	3.79	A26SS4-84*	3.17	A300SNX-84*	3.51	A30SG-84**	3.76	A400S2-70*	3.15
A26NSY4-84**	3.79	A26SS-84*	3.16	A300SP-84*	3.15	A30SGX-84**	3.77	A400S3-70*	3.14
A26NSYX-84**	3.79	A26SSP-84*	3.17	A300SR1-84*	3.18	A30SH1-84**	3.80	A400S4-70*	3.15
A26R-30-01-84	1.3	A26SSX-84*	3.17	A300SR2-84*	3.19	A30SH2-84**	3.81	A400S-70*	3.14
A26R-30-10-84	1.3	A26ST1-84*1*	3.20	A300SR3-84*	3.19	A30SH3-84**	3.81	A400SA1-70*	3.74
A26S1-84*	3.14	A26ST1-84*2*	3.22	A300SR4-84*	3.19	A30SH4-84**	3.81	A400SA2-70*	3.75
A26S2-84*	3.15	A26ST2-84*1*	3.21	A300SR-84*	3.18	A30SH-84**	3.80	A400SA3-70*	3.75
A26S3-84*	3.14	A26ST2-84*2*	3.23	A300SRF1-84*6E	3.54	A30SHX-84**	3.81	A400SA4-70*	3.75
A26S4-84*	3.15	A26ST3-84*1*	3.21	A300SRF2-84*6E	3.55	A30SM1-84***	3.56	A400SA-70*	3.74
A26S7-84*	3.15	A26ST3-84*2*	3.23	A300SRF3-84*6E	3.54	A30SM2-84***	3.57	A400SAX-70*	3.75
A26S-84*	3.14	A26ST4-84*1*	3.21	A300SRF4-84*6E	3.55	A30SM3-84***	3.56	A400SF1-70*6F	3.52
A26SA1-84*	3.74	A26ST4-84*2*	3.23	A300SRFP-84*6E	3.55	A30SM4-84***	3.57	A400SF2-70*6F	3.53
A26SA2-84*	3.75	A26ST-84*1*	3.20	A300SRFX-84*6E	3.55	A30SM7-84***	3.57	A400SF3-70*6F	3.52
A26SA3-84*	3.75	A26ST-84*2*	3.22	A300SRM1-84***	3.60	A30SMP-84***	3.57	A400SF4-70*6F	3.53
A26SA4-84*	3.75	A26STP-84*1*	3.21	A300SRM2-84***	3.61	A30SMX-84***	3.57	A400SFX-70*6F	3.53
A26SA-84*	3.74	A26STP-84*2*	3.23	A300SRM3-84***	3.60	A30SN1-84*	3.50	A400SG1-70**	3.76
A26SAX-84*	3.75	A26STX-84*1*	3.21	A300SRM4-84***	3.61	A30SN2-84*	3.51	A400SG2-84**	3.77
A26SF1-84*6B	3.52	A26STX-84*2*	3.23	A300SRMP-84***	3.61	A30SN3-84*	3.50	A400SG3-84**	3.77
A26SF2-84*6B	3.53	A26SX-84*	3.15	A300SRMX-84***	3.61	A30SN4-84*	3.51	A400SG4-84**	3.77
A26SF3-84*6B	3.52	A26SY2-84**	3.79	A300SRP-84*	3.19	A30SNP-84*	3.51	A400SG-70**	3.76
A26SF4-84*6B	3.53	A26SY3-84**	3.79	A300SRX-84*	3.19	A30SNX-84*	3.51	A400SGX-84**	3.77

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A400SH1-70**	3.80	A40SA3-84*	3.75	A40ST-84*1*	3.20	A460NSR1-70*	3.18	A460SM2-70***	3.57
A400SH2-70**	3.81	A40SA4-84*	3.75	A40ST-84*2*	3.22	A460NSR2-70*	3.19	A460SM3-70***	3.56
A400SH3-70**	3.81	A40SA-84*	3.74	A40STP-84*1*	3.21	A460NSR3-70*	3.19	A460SM4-70***	3.57
A400SH4-70**	3.81	A40SAX-84*	3.75	A40STP-84*2*	3.23	A460NSR4-70*	3.19	A460SMX-70***	3.57
A400SH-70*	3.80	A40SF1-84*6B	3.52	A40STX-84*1*	3.21	A460NSRF1-70*6F	3.54	A460SN1-70*	3.50
A400SHX-70**	3.81	A40SF2-84*6B	3.53	A40STX-84*2*	3.23	A460NSRF1-70*6G	3.54	A460SN2-70*	3.51
A400SM1-70***	3.56	A40SF3-84*6B	3.52	A40SX-84*	3.15	A460NSRF2-70*6F	3.55	A460SN3-70*	3.50
A400SM2-70***	3.57	A40SF4-84*6B	3.53	A40SY1-84**	3.78	A460NSRF2-70*6G	3.55	A460SN4-70*	3.51
A400SM3-70***	3.56	A40SFP-84*6B	3.53	A40SY2-84**	3.79	A460NSRF3-70*6F	3.54	A460SNX-70*	3.51
A400SM4-70***	3.57	A40SFX-84*6B	3.53	A40SY3-84**	3.79	A460NSRF3-70*6G	3.54	A460SR1-70*	3.18
A400SMX-70***	3.57	A40SG1-84**	3.76	A40SY4-84**	3.79	A460NSRF4-70*6F	3.55	A460SR2-70*	3.19
A400SN1-70*	3.50	A40SG2-84**	3.77	A40SY-84**	3.78	A460NSRF4-70*6G	3.55	A460SR3-70*	3.19
A400SN2-70*	3.51	A40SG3-84**	3.77	A40SYX-84**	3.79	A460NSRFX-70*6F	3.55	A460SR4-70*	3.19
A400SN3-70*	3.50	A40SG4-84**	3.77	A45-22-00-84	1.13	A460NSRFX-70*6G	3.55	A460SR-70*	3.18
A400SN4-70*	3.51	A40SG-84**	3.76	A45-22-00-84	1.116	A460NSRM1-70***	3.62	A460SRF1-70*6F	3.54
A400SNX-70*	3.51	A40SGX-84**	3.77	A45-40-00-84	1.13	A460NSRM2-70***	3.63	A460SRF1-70*6G	3.54
A400SR1-70*	3.18	A40SH1-84**	3.80	A45-40-00-84	1.116	A460NSRM3-70***	3.62	A460SRF2-70*6F	3.55
A400SR2-70*	3.19	A40SH2-84**	3.81	A45C22CP1-84	1.116	A460NSRM4-70***	3.63	A460SRF2-70*6G	3.55
A400SR3-70*	3.19	A40SH3-84**	3.81	A45C4P1-84	1.116	A460NSRMX-70***	3.63	A460SRF3-70*6F	3.54
A400SR4-70*	3.19	A40SH4-84**	3.81	A45L-22-00-84	1.116	A460NSRX-70*	3.19	A460SRF3-70*6G	3.54
A400SR-70*	3.18	A40SH-84**	3.80	A45L-40-00-84	1.116	A460NST1-70*1*	3.20	A460SRF4-70*6F	3.55
A400SRF1-70*6F	3.54	A40SHX-84**	3.81	A45LC22CP1-84	1.116	A460NST1-70*2*	3.22	A460SRF4-70*6G	3.55
A400SRF2-70*6F	3.55	A40SM1-84***	3.56	A45LC4P1-84	1.116	A460NST2-70*1*	3.21	A460SRFX-70*6F	3.55
A400SRF3-70*6F	3.54	A40SM2-84***	3.57	A460N6S-70*	3.14	A460NST2-70*2*	3.23	A460SRFX-70*6G	3.55
A400SRF4-70*6F	3.55	A40SM3-84***	3.56	A460N6SA-70*	3.74	A460NST3-70*1*	3.21	A460SRM1-70***	3.60
A400SRFP-70*6F	3.55	A40SM4-84***	3.57	A460N6SG-70**	3.76	A460NST3-70*2*	3.23	A460SRM2-70***	3.61
A400SRFX-70*6F	3.55	A40SM7-84***	3.57	A460N6SH-70**	3.80	A460NST4-70*1*	3.21	A460SRM3-70***	3.60
A400SRM1-70***	3.60	A40SMP-84***	3.57	A460N6SR-70*	3.18	A460NST4-70*2*	3.23	A460SRM4-70***	3.61
A400SRM2-70***	3.61	A40SMX-84***	3.57	A460N6ST-70*1*	3.20	A460NSTX-70*1*	3.21	A460SRMX-70***	3.61
A400SRM3-70***	3.60	A40SN1-84*	3.50	A460N6ST-70*2*	3.22	A460NSTX-70*2*	3.23	A460SRX-70*	3.19
A400SRM4-70***	3.61	A40SN2-84*	3.51	A460N6SY-70**	3.78	A460NSX-70*	3.15	A460ST1-70*1*	3.20
A400SRMX-70***	3.61	A40SN3-84*	3.50	A460NSY1-70*	3.14	A460NSY1-70**	3.78	A460ST1-70*2*	3.22
A400SRX-70*	3.19	A40SN4-84*	3.51	A460NS2-70*	3.15	A460NSY2-70**	3.79	A460ST2-70*1*	3.21
A400ST1-70*1*	3.20	A40SNP-84*	3.51	A460NS3-70*	3.14	A460NSY3-70**	3.79	A460ST2-70*2*	3.23
A400ST1-70*2*	3.22	A40SNX-84*	3.51	A460NS4-70*	3.15	A460NSY4-70**	3.79	A460ST3-70*1*	3.21
A400ST2-70*1*	3.21	A40SP-84*	3.15	A460NSA1-70*	3.74	A460NSYX-70**	3.79	A460ST3-70*2*	3.23
A400ST2-70*2*	3.23	A40SR1-84*	3.18	A460NSA2-70*	3.75	A460S1-70*	3.14	A460ST4-70*1*	3.21
A400ST3-70*1*	3.21	A40SR2-84*	3.19	A460NSA3-70*	3.75	A460S2-70*	3.15	A460ST4-70*2*	3.23
A400ST3-70*2*	3.23	A40SR3-84*	3.19	A460NSA4-70*	3.75	A460S3-70*	3.15	A460ST-70*1*	3.20
A400ST4-70*1*	3.21	A40SR4-84*	3.19	A460NSAX-70*	3.75	A460S4-70*	3.15	A460ST-70*2*	3.22
A400ST4-70*2*	3.23	A40SR-84*	3.18	A460NSF1-70*6F	3.52	A460S-70*	3.14	A460STX-70*1*	3.21
A400ST-70*1*	3.20	A40SRF1-84*6B	3.54	A460NSF1-70*6G	3.52	A460SA1-70*	3.74	A460STX-70*2*	3.23
A400ST-70*2*	3.22	A40SRF2-84*6B	3.55	A460NSF2-70*6F	3.53	A460SA2-70*	3.75	A460SX-70*	3.15
A400STX-70*1*	3.21	A40SRF3-84*6B	3.54	A460NSF2-70*6G	3.53	A460SA3-70*	3.75	A460SY1-70**	3.78
A400STX-70*2*	3.23	A40SRF4-84*6B	3.55	A460NSF3-70*6F	3.52	A460SA4-70*	3.75	A460SY2-70**	3.79
A400SX-70*	3.15	A40SRFP-84*6B	3.55	A460NSF3-70*6G	3.52	A460SA-70*	3.74	A460SY3-70**	3.79
A400SY1-70**	3.78	A40SRFX-84*6B	3.55	A460NSF4-70*6F	3.53	A460SAX-70*	3.75	A460SY4-70**	3.79
A400SY2-70**	3.79	A40SRM1-84***	3.60	A460NSF4-70*6G	3.53	A460SF1-70*6F	3.52	A460SY-70**	3.78
A400SY3-70**	3.79	A40SRM2-84***	3.61	A460NSFX-70*6F	3.53	A460SF1-70*6G	3.52	A460SYX-70**	3.79
A400SY4-70**	3.79	A40SRM3-84***	3.60	A460NSFX-70*6G	3.53	A460SF2-70*6F	3.53	A4D100B10A	20.32
A400SY-70**	3.78	A40SRM4-84***	3.61	A460NSG1-70**	3.76	A460SF2-70*6G	3.53	A4D100B2A	20.32
A400SYX-70**	3.79	A40SRMP-84***	3.61	A460NSG2-70**	3.77	A460SF3-70*6F	3.52	A4D1100B11A	20.32
A40-30-01-84	1.3	A40SRMX-84***	3.61	A460NSG3-70**	3.77	A460SF3-70*6G	3.52	A4D1200B12A	20.32
A40-30-10-84	1.3	A40SRP-84*	3.19	A460NSG4-70**	3.77	A460SF4-70*6F	3.53	A4D125B3B	20.32
A40-30-10-84	1.116	A40SRX-84*	3.19	A460NSGX-70**	3.77	A460SF4-70*6G	3.53	A4D150B3A	20.32
A40C3P1-84	1.116	A40SS1-84*	3.16	A460NSH1-70**	3.80	A460SFX-70*6F	3.53	A4D175B4B	20.32
A40L-30-10-84	1.116	A40SS2-84*	3.17	A460NSH2-70**	3.81	A460SFX-70*6G	3.53	A4D200B4A	20.32
A40LC3P1-84	1.116	A40SS3-84*	3.17	A460NSH3-70**	3.81	A460SG1-70**	3.76	A4D225B5B	20.32
A40M-30-01-84	1.3	A40SS4-84*	3.17	A460NSH4-70**	3.81	A460SG2-70**	3.77	A4D250B5A	20.32
A40M-30-10-84	1.3	A40SS-84*	3.16	A460NSHX-70**	3.81	A460SG3-70**	3.77	A4D300B6A	20.32
A40R-30-01-84	1.3	A40SSP-84*	3.17	A460NSM1-70***	3.58	A460SG4-70**	3.77	A4D350B7A	20.32
A40R-30-10-84	1.3	A40SSX-84*	3.17	A460NSM2-70***	3.59	A460SG-70**	3.76	A4D400B8A	20.32
A40S1-84*	3.14	A40ST1-84*1*	3.20	A460NSM3-70***	3.58	A460SGX-70**	3.77	A4D450B9A	20.32
A40S2-84*	3.15	A40ST1-84*2*	3.22	A460NSM4-70***	3.59	A460SH1-70**	3.80	A4D500B10A	20.32
A40S3-84*	3.14	A40ST2-84*1*	3.21	A460NSMX-70***	3.59	A460SH2-70**	3.81	A4D550B11A	20.32
A40S4-84*	3.15	A40ST2-84*2*	3.23	A460NSN1-70*	3.50	A460SH3-70**	3.81	A4D600B12A	20.32
A40S7-84*	3.15	A40ST3-84*1*	3.21	A460NSN2-70*	3.51	A460SH4-70**	3.81	A4D650B7B	20.32
A40S-84*	3.14	A40ST3-84*2*	3.23	A460NSN3-70*	3.50	A460SH-70**	3.80	A4D700B7A	20.32
A40SA1-84*	3.74	A40ST4-84*1*	3.21	A460NSN4-70*	3.51	A460SHX-70**	3.81	A4D800B8A	20.32
A40SA2-84*	3.75	A40ST4-84*2*	3.23	A460NSNX-70*	3.51	A460SM1-70***	3.56	A4D900B9A	20.32

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A4G1000B2A	20.32	A50N2SY-84**	3.78	A50NSX-84*	3.15	A50SS1-84*	3.16	A580SR4-70*	3.19
A4G1100B11A	20.32	A50NS1-84*	3.14	A50NSY1-84**	3.78	A50SS2-84*	3.17	A580SR-70*	3.18
A4G1200B12A	20.32	A50NS2-84*	3.15	A50NSY2-84**	3.79	A50SS3-84*	3.17	A580SRF1-70*6H	3.54
A4G125B3B	20.32	A50NS3-84*	3.14	A50NSY3-84**	3.79	A50SS4-84v	3.17	A580SRF2-70*6H	3.55
A4G150B3A	20.32	A50NS4-84*	3.15	A50NSY4-84**	3.79	A50SS-84*	3.16	A580SRF3-70*6H	3.54
A4G175B4B	20.32	A50NS7-84*	3.15	A50NSYX-84**	3.79	A50SSP-84*	3.17	A580SRF4-70*6H	3.55
A4G200B4A	20.32	A50NSA1-84*	3.74	A50R-30-11-84	1.3	A50SSX-84*	3.17	A580SRFX-70*6H	3.55
A4G225B5B	20.32	A50NSA2-84*	3.75	A50S1-84*	3.14	A50ST1-84*1*	3.20	A580SRM1-70***	3.60
A4G250B5A	20.32	A50NSA3-84*	3.75	A50S2-84*	3.15	A50ST1-84*2*	3.22	A580SRM2-70***	3.61
A4G300B6A	20.32	A50NSA4-84*	3.75	A50S3-84*	3.14	A50ST2-84*1*	3.21	A580SRM3-70***	3.60
A4G350B7A	20.32	A50NSAX-84*	3.75	A50S4-84*	3.15	A50ST2-84*2*	3.23	A580SRM4-70***	3.61
A4G400B8A	20.32	A50NSF1-84*6B	3.52	A50S7-84*	3.15	A50ST3-84*1*	3.21	A580SRMX-70***	3.61
A4G450B9A	20.32	A50NSF2-84*6B	3.53	A50S-84*	3.14	A50ST3-84*2*	3.23	A580SRX-70*	3.19
A4G500B10A	20.32	A50NSF3-84*6B	3.52	A50SA1-84*	3.74	A50ST4-84*1*	3.21	A580ST1-70*1*	3.20
A4G550B11A	20.32	A50NSF4-84*6B	3.53	A50SA2-84*	3.75	A50ST4-84*2*	3.23	A580ST1-70*2*	3.22
A4G600B12A	20.32	A50NSFP-84*6B	3.53	A50SA3-84*	3.75	A50ST-84*1*	3.20	A580ST2-70*1*	3.21
A4G650B7B	20.32	A50NSFX-84*6B	3.53	A50SA4-84*	3.75	A50ST-84*2*	3.22	A580ST2-70*2*	3.23
A4G700B7A	20.32	A50NSG1-84**	3.76	A50SA-84*	3.74	A50STP-84*1*	3.21	A580ST3-70*1*	3.21
A4G800B8A	20.32	A50NSG2-84**	3.77	A50SAX-84*	3.75	A50STP-84*2*	3.23	A580ST3-70*2*	3.23
A4G900B9A	20.32	A50NSG3-84**	3.77	A50SF1-84*6C	3.52	A50STX-84*1*	3.21	A580ST4-70*1*	3.21
A4R1000B10A	20.32	A50NSG4-84**	3.77	A50SF2-84*6C	3.53	A50STX-84*2*	3.23	A580ST4-70*2*	3.23
A4R100B2A	20.32	A50NSGX-84**	3.77	A50SF3-84*6C	3.52	A50SX-84*	3.15	A580ST-70*1*	3.20
A4R1100B11A	20.32	A50NSH1-84**	3.80	A50SF4-84*6C	3.53	A50SY1-84**	3.78	A580ST-70*2*	3.22
A4R1200B12A	20.32	A50NSH2-84**	3.81	A50SFP-84*6C	3.53	A50SY2-84**	3.79	A580STX-70*1*	3.21
A4R125B3B	20.32	A50NSH3-84**	3.81	A50SFX-84*6C	3.53	A50SY3-84**	3.79	A580STX-70*2*	3.23
A4R145B4B	20.32	A50NSH4-84**	3.81	A50SG1-84**	3.76	A50SY4-84**	3.79	A580SX-70*	3.15
A4R150B3A	20.32	A50NSHX-84**	3.81	A50SG2-84**	3.77	A50SY-84**	3.78	A580SY1-70**	3.78
A4R200B4A	20.32	A50NSM1-84***	3.58	A50SG3-84**	3.77	A50SYX-84**	3.79	A580SY2-70**	3.79
A4R225B5B	20.32	A50NSM2-84***	3.59	A50SG4-84**	3.77	A50NSY2-70**	3.79	A580SY3-70**	3.79
A4R250B5A	20.32	A50NSM3-84***	3.58	A50SG-84**	3.76	A580S1-70*	3.14	A580SY4-70**	3.79
A4R300B6A	20.32	A50NSM4-84***	3.59	A50SGX-84**	3.77	A580S2-70*	3.15	A580SY-70**	3.78
A4R350B7A	20.32	A50NSM7-84***	3.59	A50SH1-84**	3.80	A580S3-70*	3.14	A580SYX-70**	3.79
A4R400B8A	20.32	A50NSMP-84***	3.59	A50SH2-84**	3.81	A580S4-70*	3.15	A63-30-00-84	1.116
A4R450B9A	20.32	A50NSMX-84***	3.59	A50SH3-84**	3.81	A580S-70*	3.14	A633000RT-84	1.10
A4R500B10A	20.32	A50NSN1-84*	3.50	A50SH4-84**	3.81	A580SA1-70*	3.74	A63-30-11-84	1.3
A4R550B11A	20.32	A50NSN2-84*	3.51	A50SH-84**	3.80	A580SA2-70*	3.75	A63C3P1-84	1.116
A4R600B12A	20.32	A50NSN3-84*	3.50	A50SHX-84**	3.81	A580SA3-70*	3.75	A63L-30-00-84	1.116
A4R650B7B	20.32	A50NSN4-84*	3.51	A50SM1-84***	3.56	A580SA4-70*	3.75	A63LC3P1-84	1.116
A4R700B7A	20.32	A50NSNP-84*	3.51	A50SM2-84***	3.57	A580SA-70*	3.74	A63M-30-11-84	1.3
A4R800B8A	20.32	A50NSNX-84*	3.51	A50SM3-84***	3.56	A580SAX-70*	3.75	A63R-30-11-84	1.3
A4R900B9A	20.32	A50NSP-84*	3.15	A50SM4-84***	3.57	A580SF1-70*6H	3.52	A63S1-84*	3.14
A50-30-00-84	1.116	A50NSR1-84*	3.18	A50SM7-84***	3.57	A580SF2-70*6H	3.53	A63S2-84*	3.15
A503000RT-84	1.10	A50NSR2-84*	3.19	A50SMP-84***	3.57	A580SF3-70*6H	3.52	A63S3-84*	3.14
A50-30-11-84	1.3	A50NSR3-84*	3.19	A50SMX-84***	3.57	A580SF4-70*6H	3.53	A63S4-84*	3.15
A50-40-00-84	1.13	A50NSR4-84*	3.19	A50SN1-84*	3.50	A580SFX-70*6H	3.53	A63S7-84*	3.15
A50-40-00-84	1.116	A50NSRF1-84*6B	3.54	A50SN2-84*	3.51	A580SG1-70**	3.76	A63S-84*	3.14
A50C3P1-84	1.116	A50NSRF2-84*6B	3.55	A50SN3-84*	3.50	A580SG2-70**	3.77	A63SA1-84*	3.74
A50C4P1-84	1.116	A50NSRF4-84*6B	3.55	A50SN4-84*	3.51	A580SG3-70**	3.77	A63SA2-84*	3.75
A50L-30-00-84	1.116	A50NSRFP-84*6B	3.55	A50SNP-84*	3.51	A580SG4-70**	3.77	A63SA3-84*	3.75
A50L-40-00-84	1.116	A50NSRFX-84*6B	3.55	A50SNX-84*	3.51	A580SG-70**	3.76	A63SA4-84*	3.75
A50LC3P1-84	1.116	A50NSRM1-84***	3.62	A50SP-84*	3.15	A580SGX-70**	3.77	A63SA-84*	3.74
A50LC4P1-84	1.116	A50NSRM2-84***	3.63	A50SR1-84*	3.18	A580SH1-70**	3.80	A63SAX-84*	3.75
A50M-30-11-84	1.3	A50NSRM3-84***	3.62	A50SR2-84*	3.19	A580SH2-70**	3.81	A63SF1-84*6C	3.52
A50N2-30-11-84	1.11	A50NSRM4-84***	3.63	A50SR3-84*	3.19	A580SH3-70**	3.81	A63SF2-84*6C	3.53
A50N2M-11-84	1.11	A50NSRMP-84***	3.63	A50SR4-84*	3.19	A580SH4-70**	3.81	A63SF3-84*6C	3.52
A50N2R-11-84	1.11	A50NSRMX-84***	3.63	A50SR-84*	3.18	A580SH-70**	3.80	A63SF4-84*6C	3.53
A50N2S-84*	3.14	A50NSRP-84*	3.19	A50SRF1-84*6C	3.54	A580SHX-70**	3.81	A63SFP-84*6C	3.53
A50N2SA-84*	3.74	A50NSRX-84*	3.19	A50SRF2-84*6C	3.55	A580SM1-70***	3.56	A63SFX-84*6C	3.53
A50N2SG-84**	3.76	A50NST1-84*1*	3.20	A50SRF3-84*6C	3.54	A580SM2-70***	3.57	A63SG1-84**	3.76
A50N2SH-84**	3.80	A50NST1-84*2*	3.22	A50SRF4-84*6C	3.55	A580SM3-70***	3.56	A63SG2-84**	3.77
A50N2SP-84*	3.17	A50NST2-84*1*	3.21	A50SRFP-84*6C	3.55	A580SM4-70***	3.57	A63SG3-84**	3.77
A50N2SR-84*	3.18	A50NST2-84*2*	3.23	A50SRFX-84*6C	3.55	A580SMX-70***	3.57	A63SG4-84**	3.77
A50N2SS1-84*	3.16	A50NST3-84*1*	3.21	A50SRF2-84*6C	3.55	A580SN1-70*	3.50	A63SG-84**	3.76
A50N2SS2-84*	3.17	A50NST3-84*2*	3.23	A50SRM2-84***	3.61	A580SN2-70*	3.51	A63SGX-84**	3.77
A50N2SS3-84*	3.17	A50NST4-84*1*	3.21	A50SRM3-84***	3.60	A580SN3-70*	3.50	A63SH1-84**	3.80
A50N2SS4-84*	3.17	A50NST4-84*2*	3.23	A50SRM4-84***	3.61	A580SN4-70*	3.51	A63SH2-84**	3.81
A50N2SS-84*	3.16	A50NSTP-84*1*	3.21	A50SRMP-84***	3.61	A580SNX-70*	3.51	A63SH3-84**	3.81
A50N2ST-84*1*	3.20	A50NSTP-84*2*	3.23	A50SRMX-84***	3.61	A580SR1-70*	3.18	A63SH4-84**	3.81
A50N2ST-84*2*	3.22	A50NSTX-84*1*	3.21	A50SRP-84*	3.19	A580SR2-70*	3.19	A63SH-84**	3.80

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A63SHX-84**	3.81	A6D225B5B	20.32	A750NSA4-70*	3.75	A750SF3-70*6H	3.52	A75L-22-00-84	1.116
A63SM1-84***	3.56	A6D250B5A	20.32	A750NSAX-70*	3.75	A750SF4-70*6H	3.53	A75L-30-00-84	1.116
A63SM2-84***	3.57	A6D300B6A	20.32	A750NSF1-70*6H	3.52	A750SFX-70*6H	3.53	A75L-40-00-84	1.116
A63SM3-84***	3.56	A6D350B7A	20.32	A750NSF2-70*6H	3.53	A750SG1-70**	3.76	A75LC22CP1-84	1.116
A63SM4-84***	3.57	A6D400B8A	20.32	A750NSF3-70*6H	3.52	A750SG2-70**	3.77	A75LC3P1-84	1.116
A63SM7-84***	3.57	A6D450B9A	20.32	A750NSF4-70*6H	3.53	A750SG3-70**	3.77	A75LC4P1-84	1.116
A63SMP-84***	3.57	A6D500B10A	20.32	A750NSFX-70*6H	3.53	A750SG4-70**	3.77	A75M-30-11-84	1.3
A63SMX-84***	3.57	A6D550B11A	20.32	A750NSG1-70**	3.76	A750SG-70**	3.76	A75N3-30-11-84	1.11
A63SN1-84*	3.50	A6D600B12A	20.32	A750NSG2-70**	3.77	A750SGX-70**	3.77	A75N3M-11-84	1.11
A63SN2-84*	3.51	A6D650B7A	20.32	A750NSG3-70**	3.77	A750SH1-70**	3.80	A75N3R-11-84	1.11
A63SN3-84*	3.50	A6D700B7A	20.32	A750NSG4-70**	3.77	A750SH2-70**	3.81	A75N3S-84*	3.14
A63SN4-84*	3.51	A6D800B8A	20.32	A750NSGX-70**	3.77	A750SH3-70**	3.81	A75N3SA-84*	3.74
A63SNP-84*	3.51	A6D900B9A	20.32	A750NSH1-70**	3.80	A750SH4-70**	3.81	A75N3SG-84**	3.76
A63SNX-84*	3.51	A6G1000B10A	20.32	A750NSH2-70**	3.81	A750SH-70**	3.80	A75N3SH-84**	3.80
A63SP-84*	3.15	A6G100B2A	20.32	A750NSH3-70**	3.81	A750SHX-70**	3.81	A75N3SR-84*	3.18
A63SR1-84*	3.18	A6G1100B11A	20.32	A750NSH4-70**	3.81	A750SM1-70***	3.56	A75N3ST-84*1*	3.20
A63SR2-84*	3.19	A6G1200B12A	20.32	A750NSHX-70**	3.81	A750SM2-70***	3.57	A75N3ST-84*2*	3.22
A63SR3-84*	3.19	A6G125B3B	20.32	A750NSM1-70***	3.58	A750SM3-70***	3.56	A75N3SY-84**	3.78
A63SR4-84*	3.19	A6G150B3A	20.32	A750NSM2-70***	3.59	A750SM4-70***	3.57	A75NS1-84*	3.14
A63SR-84*	3.18	A6G175B4B	20.32	A750NSM3-70***	3.58	A750SMX-70***	3.57	A75NS2-84*	3.15
A63SRF1-84*6C	3.54	A6G200B4A	20.32	A750NSM4-70***	3.59	A750SN1-70*	3.50	A75NS3-84*	3.14
A63SRF2-84*6C	3.55	A6G225B5B	20.32	A750NSMX-70***	3.59	A750SN2-70*	3.51	A75NS4-84*	3.15
A63SRF3-84*6C	3.54	A6G250B5A	20.32	A750NSN1-70*	3.50	A750SN3-70*	3.50	A75NS7-84*	3.15
A63SRF4-84*6C	3.55	A6G300B6A	20.32	A750NSN2-70*	3.51	A750SN4-70*	3.51	A75NSA1-84*	3.74
A63SRFP-84*6C	3.55	A6G350B7A	20.32	A750NSN3-70*	3.50	A750SNX-70*	3.51	A75NSA2-84*	3.75
A63SRFX-84*6C	3.55	A6G400B8A	20.32	A750NSN4-70*	3.51	A750SR1-70*	3.18	A75NSA3-84*	3.75
A63SRM1-84***	3.60	A6G450B9A	20.32	A750NSNX-70*	3.51	A750SR2-70*	3.19	A75NSA4-84*	3.75
A63SRM2-84***	3.61	A6G500B10A	20.32	A750NSR1-70*	3.18	A750SR3-70*	3.19	A75NSAX-84*	3.75
A63SRM3-84***	3.60	A6G550B11A	20.32	A750NSR2-70*	3.19	A750SR4-70*	3.19	A75NSF1-84*6C	3.52
A63SRM4-84***	3.61	A6G600B12A	20.32	A750NSR3-70*	3.19	A750SR-70*	3.18	A75NSF1-84*6D	3.52
A63SRMP-84***	3.61	A6G650B7B	20.32	A750NSR4-70*	3.19	A750SRF1-70*6H	3.54	A75NSF2-84*6C	3.53
A63SRMX-84***	3.61	A6G700B7A	20.32	A750NSRF1-70*6H	3.54	A750SRF2-70*6H	3.55	A75NSF2-84*6D	3.53
A63SRP-84*	3.19	A6G800B8A	20.32	A750NSRF2-70*6H	3.55	A750SRF3-70*6H	3.54	A75NSF3-84*6C	3.52
A63SRX-84*	3.19	A6G900B9A	20.32	A750NSRF3-70*6H	3.54	A750SRF4-70*6H	3.55	A75NSF3-84*6D	3.52
A63SS1-84*	3.16	A6R1000B10A	20.32	A750NSRF4-70*6H	3.55	A750SRFX-70*6H	3.55	A75NSF4-84*6C	3.53
A63SS2-84*	3.17	A6R100B2A	20.32	A750NSRFX-70*6H	3.55	A750SRM1-70***	3.60	A75NSF4-84*6D	3.53
A63SS3-84*	3.17	A6R1100B11A	20.32	A750NSRM1-70***	3.62	A750SRM2-70***	3.61	A75NSFP-84*6C	3.53
A63SS4-84*	3.17	A6R1200B12A	20.32	A750NSRM2-70***	3.63	A750SRM3-70***	3.60	A75NSFP-84*6D	3.53
A63SS-84*	3.16	A6R125B3B	20.32	A750NSRM3-70***	3.62	A750SRM4-70***	3.61	A75NSFX-84*6C	3.53
A63SSP-84*	3.17	A6R150B3A	20.32	A750NSRM4-70***	3.63	A750SRMX-70***	3.61	A75NSFX-84*6D	3.53
A63SSX-84*	3.17	A6R175B4B	20.32	A750NSRMX-70***	3.63	A750SRX-70*	3.19	A75NSG1-84**	3.76
A63ST1-84*1*	3.20	A6R200B4A	20.32	A750NSRX-70*	3.19	A750ST1-70*1*	3.20	A75NSG2-84**	3.77
A63ST1-84*2*	3.22	A6R225B5B	20.32	A750NST1-70*1*	3.20	A750ST1-70*2*	3.22	A75NSG3-84**	3.77
A63ST2-84*1*	3.21	A6R250B5A	20.32	A750NST1-70*2*	3.22	A750ST2-70*1*	3.21	A75NSG4-84**	3.77
A63ST2-84*2*	3.23	A6R300B6A	20.32	A750NST2-70*1*	3.21	A750ST2-70*2*	3.23	A75NSGX-84**	3.77
A63ST3-84*1*	3.21	A6R350B7A	20.32	A750NST2-70*2*	3.23	A750ST3-70*1*	3.21	A75NSH1-84**	3.80
A63ST3-84*2*	3.23	A6R400B8A	20.32	A750NST3-70*1*	3.21	A750ST3-70*2*	3.23	A75NSH2-84**	3.81
A63ST4-84*1*	3.21	A6R450B9A	20.32	A750NST3-70*2*	3.23	A750ST4-70*1*	3.21	A75NSH3-84**	3.81
A63ST4-84*2*	3.23	A6R500B10A	20.32	A750NST4-70*1*	3.21	A750ST4-70*2*	3.23	A75NSH4-84**	3.81
A63ST-84*1*	3.20	A6R550B11A	20.32	A750NST4-70*2*	3.23	A750ST-70*1*	3.20	A75NSHX-84**	3.81
A63ST-84*2*	3.22	A6R600B12A	20.32	A750NSTX-70*1*	3.21	A750ST-70*2*	3.22	A75NSM1-84***	3.58
A63STP-84*1*	3.21	A6R650B7B	20.32	A750NSTX-70*2*	3.23	A750STX-70*1*	3.21	A75NSM2-84***	3.59
A63STP-84*2*	3.23	A6R700B7A	20.32	A750NSX-70*	3.15	A750STX-70*2*	3.23	A75NSM3-84***	3.58
A63STX-84*1*	3.21	A6R800B8A	20.32	A750NSY1-70**	3.78	A750SX-70*	3.15	A75NSM4-84***	3.59
A63STX-84*2*	3.23	A6R900B9A	20.32	A750NSY3-70**	3.79	A750SY1-70**	3.78	A75NSM7-84***	3.59
A63SX-84*	3.15	A750N7S-70*	3.14	A750NSY4-70**	3.79	A750SY2-70**	3.79	A75NSMP-84***	3.59
A63SY1-84**	3.78	A750N7SA-70*	3.74	A750NSYX-70**	3.79	A750SY3-70**	3.79	A75NSMX-84***	3.59
A63SY2-84**	3.79	A750N7SG-70**	3.76	A750S1-70*	3.14	A750SY4-70**	3.79	A75NSN1-84*	3.50
A63SY3-84**	3.79	A750N7SH-70**	3.80	A750S2-70*	3.15	A750SY-70**	3.78	A75NSN2-84*	3.51
A63SY4-84**	3.79	A750N7SR-70*	3.18	A750S3-70*	3.14	A750SYX-70**	3.79	A75NSN3-84*	3.50
A63SY-84**	3.78	A750N7ST-70*1*	3.20	A750S4-70*	3.15	A75-22-00-84	1.13	A75NSN4-84*	3.51
A63SYX-84**	3.79	A750N7ST-70*2*	3.22	A750S-70*	3.14	A75-22-00-84	1.116	A75NSNP-84*	3.51
A6D1000B10A	20.32	A750N7SY-70**	3.78	A750SA1-70*	3.74	A75-30-00-84	1.116	A75NSNX-84*	3.51
A6D100B2A	20.32	A750NS1-70*	3.14	A750SA2-70*	3.75	A753000RT-84	1.10	A75NSP-84*	3.15
A6D1100B11A	20.32	A750NS2-70*	3.15	A750SA3-70*	3.75	A75-30-11-84	1.3	A75NSR1-84*	3.18
A6D1200B12A	20.32	A750NS3-70*	3.14	A750SA4-70*	3.75	A75-40-00-84	1.13	A75NSR2-84*	3.19
A6D125B3B	20.32	A750NS4-70*	3.15	A750SA-70*	3.74	A75-40-00-84	1.116	A75NSR3-84*	3.19
A6D150B3A	20.32	A750NSA1-70*	3.74	A750SAX-70*	3.75	A75C22CP1-84	1.116	A75NSR4-84*	3.19
A6D175B4B	20.32	A750NSA2-70*	3.75	A750SF1-70*6H	3.52	A75C3P1-84	1.116	A75NSRF1-84*6C	3.54
A6D200B4A	20.32	A750NSA3-70*	3.75	A750SF2-70*6H	3.53	A75C4P1-84	1.116	A75NSRF1-84*6D	3.54

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A75NSRF2-84*6C	3.55	A75SM4-84***	3.57	A95C3P1-84	1.116	A95SS-84*	3.16	A9NSMX-84***	3.59
A75NSRF2-84*6D	3.55	A75SM7-84***	3.57	A95M-30-11-84	1.3	A95SSP-84*	3.17	A9NSN1-84*	3.50
A75NSRF3-84*6C	3.54	A75SMP-84***	3.57	A95R-30-11-84	1.3	A95SSX-84*	3.17	A9NSN2-84*	3.51
A75NSRF3-84*6D	3.54	A75SMX-84***	3.57	A95S1-84*	3.14	A95ST1-84*1*	3.20	A9NSN3-84*	3.50
A75NSRF4-84*6C	3.55	A75SN1-84*	3.50	A95S2-84*	3.15	A95ST1-84*2*	3.22	A9NSN4-84*	3.51
A75NSRF4-84*6D	3.55	A75SN2-84*	3.51	A95S3-84*	3.14	A95ST2-84*1*	3.21	A9NSNP-84*	3.51
A75NSRFP-84*6C	3.55	A75SN3-84*	3.50	A95S4-84*	3.15	A95ST2-84*2*	3.23	A9NSNX-84*	3.51
A75NSRFP-84*6D	3.55	A75SN4-84*	3.51	A95S7-84*	3.15	A95ST3-84*1*	3.21	A9NSP-84*	3.15
A75NSRFX-84*6C	3.55	A75SNP-84*	3.51	A95S-84*	3.14	A95ST3-84*2*	3.23	A9NSR1-84*	3.18
A75NSRFX-84*6D	3.55	A75SNX-84*	3.51	A95SA1-84*	3.74	A95ST4-84*1*	3.21	A9NSR2-84*	3.19
A75NSRM1-84***	3.62	A75SP-84*	3.15	A95SA2-84*	3.75	A95ST4-84*2*	3.23	A9NSR3-84*	3.19
A75NSRM2-84***	3.63	A75SR1-84*	3.18	A95SA3-84*	3.75	A95ST-84*1*	3.20	A9NSR4-84*	3.19
A75NSRM3-84***	3.62	A75SR2-84*	3.19	A95SA4-84*	3.75	A95ST-84*2*	3.22	A9NSRF1-84*6A	3.54
A75NSRM4-84***	3.63	A75SR3-84*	3.19	A95SA-84*	3.74	A95STP-84*1*	3.21	A9NSRF2-84*6A	3.55
A75NSRMP-84***	3.63	A75SR4-84*	3.19	A95SAX-84*	3.75	A95STP-84*2*	3.23	A9NSRF3-84*6A	3.54
A75NSRMX-84***	3.63	A75SR-84*	3.18	A95SF1-84*6D	3.52	A95STX-84*1*	3.21	A9NSRF4-84*6A	3.55
A75NSRP-84*	3.19	A75SRF1-84*6D	3.54	A95SF2-84*6D	3.53	A95STX-84*2*	3.23	A9NSRFP-84*6A	3.55
A75NSRX-84*	3.19	A75SRF2-84*6D	3.55	A95SF3-84*6D	3.52	A95SX-84*	3.15	A9NSRFX-84*6A	3.55
A75NST1-84*1*	3.20	A75SRF3-84*6D	3.54	A95SF4-84*6D	3.53	A95SY1-84**	3.78	A9NSRM1-84***	3.62
A75NST1-84*2*	3.22	A75SRF4-84*6D	3.55	A95SFP-84*6D	3.53	A95SY2-84**	3.79	A9NSRM2-84***	3.63
A75NST2-84*1*	3.21	A75SRFP-84*6D	3.55	A95SFX-84*6D	3.53	A95SY3-84**	3.79	A9NSRM3-84***	3.62
A75NST2-84*2*	3.23	A75SRFX-84*6D	3.55	A95SG1-84**	3.76	A95SY4-84**	3.79	A9NSRM4-84***	3.63
A75NST3-84*1*	3.21	A75SRM1-84***	3.60	A95SG2-84**	3.77	A95SY-84**	3.78	A9NSRMP-84***	3.63
A75NST3-84*2*	3.23	A75SRM2-84***	3.61	A95SG3-84**	3.77	A95SYX-84**	3.79	A9NSRMX-84***	3.63
A75NST4-84*1*	3.21	A75SRM3-84***	3.60	A95SG4-84**	3.77	A9-80-00-84	1.116	A9NSRNP-84*	3.19
A75NST4-84*2*	3.23	A75SRM4-84***	3.61	A95SG-84**	3.76	A9C12P1-84	1.116	A9NSRX-84*	3.19
A75NSTP-84*1*	3.21	A75SRMP-84***	3.61	A95SGX-84**	3.77	A9C22P1-84	1.116	A9NST1-84*1*	3.20
A75NSTP-84*2*	3.23	A75SRMX-84***	3.61	A95SH1-84**	3.80	A9C4P1-84	1.116	A9NST1-84*2*	3.22
A75NSTX-84*1*	3.21	A75SRP-84*	3.19	A95SH2-84**	3.81	A9C8P1-84	1.116	A9NST2-84*1*	3.21
A75NSTX-84*2*	3.23	A75SRX-84*	3.19	A95SH3-84**	3.81	A9L-120-00-84	1.116	A9NST2-84*2*	3.23
A75NSX-84*	3.15	A75SS1-84*	3.16	A95SH4-84**	3.81	A9L-22-00-84	1.116	A9NST3-84*1*	3.21
A75NSY1-84**	3.78	A75SS2-84*	3.17	A95SH-84**	3.80	A9L-40-00-84	1.116	A9NST3-84*2*	3.23
A75NSY2-84**	3.79	A75SS3-84*	3.17	A95SHX-84**	3.81	A9L-80-00-84	1.116	A9NST4-84*1*	3.21
A75NSY3-84**	3.79	A75SS4-84*	3.17	A95SM1-84***	3.56	A9LC12P1-84	1.116	A9NST4-84*2*	3.23
A75NSY4-84**	3.79	A75SS-84*	3.16	A95SM2-84***	3.57	A9LC22P1-84	1.116	A9NSTP-84*1*	3.21
A75NSYX-84**	3.79	A75SSP-84*	3.17	A95SM3-84***	3.56	A9LC4P1-84	1.116	A9NSTP-84*2*	3.23
A75R-30-11-84	1.3	A75SSX-84*	3.17	A95SM4-84***	3.57	A9LC8P1-84	1.116	A9NSTX-84*1*	3.21
A75S1-84*	3.14	A75ST1-84*1*	3.20	A95SM7-84***	3.57	A9M-30-01-84	1.3	A9NSTX-84*2*	3.23
A75S2-84*	3.15	A75ST1-84*2*	3.22	A95SMP-84***	3.57	A9M-30-10-84	1.3	A9NSX-84*	3.15
A75S3-84*	3.14	A75ST2-84*1*	3.21	A95SMX-84***	3.57	A9N00-30-10-84	1.11	A9R-30-01-84	1.3
A75S4-84*	3.15	A75ST2-84*2*	3.23	A95SN1-84*	3.50	A9N00M-10-84	1.11	A9R-30-10-84	1.3
A75S7-84*	3.15	A75ST3-84*1*	3.21	A95SN2-84*	3.51	A9N00R-10-84	1.11	A9S1-84*	3.14
A75S-84*	3.14	A75ST3-84*2*	3.23	A95SN3-84*	3.50	A9N00S-84*	3.14	A9S2-84*	3.15
A75SA1-84*	3.74	A75ST4-84*1*	3.21	A95SN4-84*	3.51	A9N00SP-84*	3.17	A9S3-84*	3.14
A75SA2-84*	3.75	A75ST4-84*2*	3.23	A95SNP-84*	3.51	A9N00SR-84*	3.18	A9S4-84*	3.15
A75SA3-84*	3.75	A75ST-84*1*	3.20	A95SNX-84*	3.51	A9N00SS1-84*	3.16	A9S7-84*	3.15
A75SA4-84*	3.75	A75ST-84*2*	3.22	A95SP-84*	3.15	A9N00SS2-84*	3.17	A9S-84*	3.14
A75SA-84*	3.74	A75STP-84*1*	3.21	A95SR1-84*	3.18	A9N00SS3-84*	3.17	A9SD-84*	3.24
A75SAX-84*	3.75	A75STP-84*2*	3.23	A95SR2-84*	3.19	A9N00SS4-84*	3.17	A9SD-84*A	3.24
A75SF1-84*6D	3.52	A75STX-84*1*	3.21	A95SR3-84*	3.19	A9N00SS-84*	3.16	A9SD-84*R	3.24
A75SF2-84*6D	3.53	A75STX-84*2*	3.23	A95SR4-84*	3.19	A9N00ST-84*1*	3.20	A9SF1-84*6A	3.52
A75SF3-84*6D	3.52	A75SX-84*	3.15	A95SR-84*	3.18	A9N00ST-84*2*	3.22	A9SF2-84*6A	3.53
A75SF4-84*6D	3.53	A75SY1-84**	3.78	A95SRF1-84*6D	3.54	A9N00SX-84*	3.17	A9SF3-84*6A	3.52
A75SFP-84*6D	3.53	A75SY2-84**	3.79	A95SRF2-84*6D	3.55	A9NS1-84*	3.14	A9SF4-84*6A	3.53
A75SFX-84*6D	3.53	A75SY3-84**	3.79	A95SRF3-84*6D	3.54	A9NS2-84*	3.15	A9SFP-84*6A	3.53
A75SG1-84**	3.76	A75SY4-84**	3.79	A95SRF4-84*6D	3.55	A9NS3-84*	3.14	A9SFX-84*6A	3.53
A75SG2-84**	3.77	A75SY-84**	3.78	A95SRFP-84*6D	3.55	A9NS4-84*	3.15	A9SM1-84***	3.56
A75SG3-84**	3.77	A75SYX-84**	3.79	A95SRFX-84*6D	3.55	A9NS7-84*	3.15	A9SM2-84***	3.57
A75SG4-84**	3.77	A9-120-00-84	1.116	A95SRM1-84***	3.60	A9NSF1-84*6A	3.52	A9SM3-84***	3.56
A75SG-84**	3.76	A9-22-00-84	1.13	A95SRM2-84***	3.61	A9NSF2-84*6A	3.53	A9SM4-84***	3.57
A75SGX-84**	3.77	A9-22-00-84	1.116	A95SRM3-84***	3.60	A9NSF3-84*6A	3.52	A9SM7-84***	3.57
A75SH1-84**	3.80	A9-30-01-84	1.3	A95SRM4-84***	3.61	A9NSF4-84*6A	3.53	A9SMP-84***	3.57
A75SH2-84**	3.81	A93001RT-84	1.10	A95SRMP-84***	3.61	A9NSFP-84*6A	3.53	A9SMX-84***	3.57
A75SH3-84**	3.81	A9-30-10-84	1.3	A95SRMX-84***	3.61	A9NSFX-84*6A	3.53	A9SN1-84*	3.50
A75SH4-84**	3.81	A93010RT-84	1.10	A95SRP-84*	3.19	A9NSM1-84***	3.58	A9SN2-84*	3.51
A75SH-84**	3.80	A9-40-00-84	1.13	A95SRX-84*	3.19	A9NSM2-84***	3.59	A9SN3-84*	3.50
A75SHX-84**	3.81	A9-40-00-84	1.116	A95SS1-84*	3.16	A9NSM3-84***	3.58	A9SN4-84*	3.51
A75SM1-84***	3.56	A95-30-00-84	1.116	A95SS2-84*	3.17	A9NSM4-84***	3.59	A9NSP-84*	3.51
A75SM2-84***	3.57	A953000RT-84	1.10	A95SS3-84*	3.17	A9NSM7-84***	3.59	A9SNX-84*	3.51
A75SM3-84***	3.56	A95-30-11-84	1.3	A95SS4-84*	3.17	A9NSMP-84***	3.59	A9SP-84*	3.15

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A9SR1-84*	3.18	AA4D100B5A	20.31	AE26-30-11-81	1.5	AF260R-30-11-70	1.9	AL12-30-01-81	1.7
A9SR2-84*	3.19	AA4D125B5A	20.31	AE26M-30-11-81	1.5	AF300-30-11-70	1.9	AL12-30-10-81	1.7
A9SR3-84*	3.19	AA4D150B6A	20.31	AE26N1-30-11-81	1.12	AF300M-30-11-70	1.9	AL12M-30-01-81	1.7
A9SR4-84*	3.19	AA4D175B7A	20.31	AE26N1M-11-81	1.12	AF300R-30-11-70	1.9	AL12M-30-10-81	1.7
A9SR-84*	3.18	AA4D200B8A	20.31	AE26N1R-11-81	1.12	AF400-30-11-70	1.9	AL12R-30-01-81	1.7
A9SRF1-84*6A	3.54	AA4D225B9A	20.31	AE26R-30-11-81	1.5	AF400M-30-11-70	1.9	AL12R-30-10-81	1.7
A9SRF2-84*6A	3.55	AA4D250B10A	20.31	AE30-30-11-81	1.5	AF400R-30-11-70	1.9	AL12Z-30-01-15	1.7
A9SRF3-84*6A	3.54	AA4D300B12A	20.31	AE30M-30-11-81	1.5	AF45-22-00-70	1.14	AL12Z-30-10-15	1.7
A9SRF4-84*6A	3.55	AA4D50B3B	20.31	AE30R-30-11-81	1.5	AF45-40-00-70	1.14	AL12ZM-30-01-15	1.7
A9SRFP-84*6A	3.55	AA4D75B5A	20.31	AE40-30-11-81	1.5	AF460-30-11-70	1.9	AL12ZM-30-10-15	1.7
A9SRFX-84*6A	3.55	AA4G100B5A	20.31	AE40M-30-11-81	1.5	AF460M-30-11-70	1.9	AL12ZR-30-01-15	1.7
A9SRM1-84***	3.60	AA4G125B5A	20.31	AE40R-30-11-81	1.5	AF460N6-3011-70	1.11	AL12ZR-30-10-15	1.7
A9SRM2-84***	3.61	AA4G150B6A	20.31	AE45-22-00-86	1.13	AF460N6-3011-70	1.12	AL16-22-00-81	1.13
A9SRM3-84***	3.60	AA4G175B7A	20.31	AE45-40-00-86	1.13	AF460N6M-11-70	1.11	AL16-30-01-81	1.7
A9SRM4-84***	3.61	AA4G200B8A	20.31	AE503000RT-81	1.10	AF460N6M-11-70	1.12	AL16-30-10-81	1.7
A9SRMP-84***	3.61	AA4G225B9A	20.31	AE50-30-11-81	1.5	AF460N6R-11-70	1.11	AL16-40-00-81	1.13
A9SRMX-84***	3.61	AA4G250B10A	20.31	AE50-40-00-86	1.13	AF460N6R-11-70	1.12	AL16M-30-01-81	1.7
A9SRP-84*	3.19	AA4G300B12A	20.31	AE50M-30-11-81	1.5	AF460R-30-11-70	1.9	AL16M-30-10-81	1.7
A9SRX-84*	3.19	AA4G50B3B	20.31	AE50N2-30-11-81	1.12	AF460W-30-11-70	1.122	AL16N0-30-10-81	1.12
A9SS1-84*	3.16	AA4G75B5A	20.31	AE50N2M-11-81	1.12	AF50-30-11-70	1.9	AL16N0M-10-81	1.12
A9SS2-84*	3.17	AA4R100B5A	20.31	AE50N2R-11-81	1.12	AF50-40-00-70	1.14	AL16N0R-10-81	1.12
A9SS3-84*	3.17	AA4R125B5A	20.31	AE50R-30-11-81	1.5	AF50M-30-11-70	1.9	AL16R-30-01-81	1.7
A9SS4-84*	3.17	AA4R150B6A	20.31	AE633000RT-81	1.10	AF50R-30-11-70	1.9	AL16R-30-10-81	1.7
A9SS-84*	3.16	AA4R175B7A	20.31	AE63-30-11-81	1.5	AF580-30-11-70	1.9	AL16Z-30-01-15	1.7
A9SSD-84*	3.24	AA4R200B8A	20.31	AE63M-30-11-81	1.5	AF580M-30-11-70	1.9	AL16Z-30-10-15	1.7
A9SSD-84*A	3.24	AA4R225B9A	20.31	AE63R-30-11-81	1.5	AF580R-30-11-70	1.9	AL16ZM-30-01-15	1.7
A9SSD-84*R	3.24	AA4R250B10A	20.31	AE75-22-00-86	1.13	AF63-30-11-70	1.9	AL16ZM-30-10-15	1.7
A9SSP-84*	3.17	AA4R300B12A	20.31	AE753000RT-81	1.10	AF63M-30-11-70	1.9	AL16ZR-30-01-15	1.7
A9SSX-84*	3.17	AA4R50B3B	20.31	AE75-30-11-81	1.5	AF63R-30-11-70	1.9	AL16ZR-30-10-15	1.7
A9ST1-84*1*	3.20	AA4R75B5A	20.31	AE75-40-00-86	1.13	AF750-30-11-70	1.9	AL230	14.40
A9ST1-84*2*	3.22	AA6D100B5A	20.31	AE75M-30-11-81	1.5	AF750M-30-11-70	1.9	AL24	14.40
A9ST2-84*1*	3.21	AA6D125B5A	20.31	AE75N3-30-11-81	1.12	AF750N7-3011-70	1.11	AL26-22-00-81	1.13
A9ST2-84*2*	3.23	AA6D150B6A	20.31	AE75N3M-11-81	1.12	AF750N7-3011-70	1.12	AL26-30-01-81	1.7
A9ST3-84*1*	3.21	AA6D175B7A	20.31	AE75N3R-11-81	1.12	AF750N7M-11-70	1.11	AL26-30-10-81	1.7
A9ST3-84*2*	3.23	AA6D200B8A	20.31	AE75R-30-11-81	1.5	AF750N7M-11-70	1.12	AL26-40-00-81	1.13
A9ST4-84*1*	3.21	AA6D225B9A	20.31	AE93000RT-81	1.10	AF750N7R-11-70	1.11	AL26M-30-01-81	1.7
A9ST4-84*2*	3.23	AA6D250B10A	20.31	AE9-30-11-81	1.5	AF750N7R-11-70	1.12	AL26M-30-10-81	1.7
A9ST-84*1*	3.20	AA6D300B12A	20.31	AE953000RT-81	1.10	AF750R-30-11-70	1.9	AL26N1-30-10-81	1.12
A9ST-84*2*	3.22	AA6G100B5A	20.31	AE95-30-11-81	1.5	AF75-22-00-70	1.14	AL26N1M-10-81	1.12
A9STP-84*1*	3.21	AA6G125B5A	20.31	AE95M-30-11-81	1.5	AF75-30-11-70	1.9	AL26N1R-10-81	1.12
A9STP-84*2*	3.23	AA6G150B6A	20.31	AE95R-30-11-81	1.5	AF75-40-00-70	1.14	AL26R-30-01-81	1.7
A9STX-84*1*	3.21	AA6G175B7A	20.31	AE9M-30-11-81	1.5	AF75M-30-11-70	1.9	AL26R-30-10-81	1.7
A9STX-84*2*	3.23	AA6G200B8A	20.31	AE9N00-30-11-81	1.12	AF75R-30-11-70	1.9	AL30-30-01-81	1.7
A9SX-84*	3.15	AA6G225B9A	20.31	AE9N00M-11-81	1.12	AF95-30-11-70	1.9	AL30-30-10-81	1.7
AA1-110	5.4	AA6G250B10A	20.31	AE9N00R-11-81	1.12	AF95M-30-11-70	1.9	AL30M-30-01-81	1.7
AA1-230	5.4	AA6G300B12A	20.31	AE9R-30-11-81	1.5	AF95R-30-11-70	1.9	AL30M-30-10-81	1.7
AA1-24	5.4	AA6R100B5A	20.31	AF110-30-11-70	1.9	AGS-AM240	19.2	AL30R-30-01-81	1.7
AA1-400	5.4	AA6R125B5A	20.31	AF110M-30-11-70	1.9	AGS-AM48	19.2	AL30R-30-10-81	1.7
AA2D100B8A	20.31	AA6R150B6A	20.31	AF110R-30-11-70	1.9	AGS-CP5	19.2	AL40-30-01-81	1.7
AA2D125B10A	20.31	AA6R175B7A	20.31	AF1350-30-11-70	1.9	AGS-CP1	19.2	AL40-30-10-81	1.7
AA2D150B12A	20.31	AA6R200B8A	20.31	AF145-30-11-70	1.9	AGS-CP10	19.2	AL40M-30-01-81	1.7
AA2D25B5A	20.31	AA6R225B9A	20.31	AF145M-30-11-70	1.9	AGS-CP15	19.2	AL40M-30-10-81	1.7
AA2D50B5A	20.31	AA6R250B10A	20.31	AF145N4-3011-70	1.12	AGS-CP2	19.2	AL40R-30-01-81	1.7
AA2D75B6A	20.31	AA6R300B12A	20.31	AF145N4M-11-70	1.12	AGS-CP20	19.2	AL40R-30-10-81	1.7
AA2G100B8A	20.31	AE1103000RT-81	1.10	AF145N4R-11-70	1.12	AGS-CP4	19.2	AL48	14.40
AA2G125B10A	20.31	AE110-30-11-81	1.5	AF145R-30-11-70	1.9	AGS-CP6	19.2	AL500	14.40
AA2G150B12A	20.31	AE110M-30-11-81	1.5	AF1650-30-11-70	1.19	AGS-CP8	19.2	AL9-22-00-81	1.13
AA2G25B5A	20.31	AE110R-30-11-81	1.5	AF1650N83011-70	1.11	AGS-CS240	19.2	AL9-30-01-81	1.7
AA2G50B5A	20.31	AE123000RT-81	1.10	AF1650N83011-70	1.12	AGS-DP10	19.2	AL9-30-10-81	1.7
AA2G75B6A	20.31	AE12-30-11-81	1.5	AF185-30-11-70	1.9	AGS-DP15	19.2	AL9-40-00-81	1.13
AA2R100B8A	20.31	AE12M-30-11-81	1.5	AF185M-30-11-70	1.9	AGS-DP2	19.2	AL9M-30-01-81	1.7
AA2R125B10A	20.31	AE12R-30-11-81	1.5	AF185R-30-11-70	1.9	AGS-DP20	19.2	AL9M-30-10-81	1.7
AA2R150B12A	20.31	AE163000RT-81	1.10	AF210-30-11-70	1.9	AGS-DP30	19.2	AL9N00-30-10-81	1.12
AA2R25B5A	20.31	AE16-30-11-81	1.5	AF210M-30-11-70	1.9	AGS-DP4	19.2	AL9N00M-10-81	1.12
AA2R50B5A	20.31	AE16M-30-11-81	1.5	AF210R-30-11-70	1.9	AGS-DP6	19.2	AL9N00R-10-81	1.12
AA2R75B6A	20.31	AE16N0-30-11-81	1.12	AF260-30-11-70	1.9	AGS-DP8	19.2	AL9R-30-01-81	1.7
AA4-110	5.16	AE16N0M-11-81	1.12	AF260M-30-11-70	1.9	AGS-FMS	19.2	AL9R-30-10-81	1.7
AA4-24	5.16	AE16N0R-11-81	1.12	AF260N5-3011-70	1.12	AGS-MB	19.2	AL9Z-30-01-15	1.7
AA4-240	5.16	AE16R-30-11-81	1.5	AF260N5M-11-70	1.12	AL110	14.40	AL9Z-30-10-15	1.7
AA4-415	5.16	AE263000RT-81	1.10	AF260N5R-11-70	1.12	AL12	14.40	AL9ZM-30-01-15	1.7

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AL9ZR-30-01-15	1.7	BC6FP-01-1.4	4.4	BEA750/S6	1.30	C201G7.5	20.16	C244G2-3FI	20.12
AL9ZR-30-10-15	1.7	BC6FP-01-2.4	4.4	BEA750D/S6	1.30	C201G7.5SC	20.17	C244G3	20.9
AMTD-1	14.57	BC6FP-1.4	4.4	BEA750H/S6	1.30	C23W9V2	10.64	C244G3.5	20.9
ATK1350/4	1.25	BC6FP-2.4	4.4	BED110U	1.28	C23W9V6	10.64	C244G3.5-3FI	20.12
ATK1350/4HK	2.22	BC6S-**	4.7	BED145U	1.28	C23WSV2	10.63	C244G3-3FI	20.12
ATK1650/4	1.25	BC6S-01*	4.7	BED185U	1.28	C23WSV6	10.63	C244G4	20.9
ATK1650/6	1.25	BC6SP-01-1.4	4.4	BED210U	1.28	C241G1	20.16	C244G4-3FI	20.12
ATK185	1.25	BC6SP-01-2.4	4.4	BED300U	1.28	C241G1.5	20.16	C244G5	20.9
ATK185	2.22	BC6SP-1.4	4.4	BED400U	1.28	C241G1.5SC	20.17	C244G5-3FI	20.12
ATK300	1.25	BC6SP-2.4	4.4	BED40U	1.28	C241G10	20.16	C244G6	20.9
ATK300	2.22	BC6SR-**	4.7	BED460U	1.28	C241G10SC	20.17	C244G6-3FI	20.12
ATK300/2	1.25	BC6SR-01*	4.7	BED50U	1.28	C241G1SC	20.17	C244G7	20.9
ATK300/2	2.22	BC6SS-**	4.8	BED580U	1.28	C241G2	20.16	C244G7.5	20.9
ATK300/2HK	2.7	BC6SS-01*	4.8	BED750U	1.28	C241G2.5	20.16	C244G7.5-3FI	20.12
ATK300HK	2.7	BC7-01-1.4	4.4	BED75U	1.28	C241G2.5SC	20.17	C244G7-3FI	20.12
ATK580/2	1.25	BC7-01-2.4	4.4	BED95U	1.28	C241G2SC	20.17	C244G8	20.9
ATK580/2HK	2.22	BC7-1.4	4.4	BEM110-30	1.28	C241G3.5	20.16	C244G8-3FI	20.12
ATK750/3	1.25	BC7-2.4	4.4	BEM16-30	1.28	C241G3.5SC	20.17	C244G9	20.9
ATK750/3HK	2.22	BC7C-*	4.2	BEM185-30	1.28	C241G5	20.16	C244R1	20.9
B6C-*	4.2	BC7C-01	4.2	BEM26-30	1.28	C241G5SC	20.17	C244R1.5	20.9
B6C-01	4.2	BC7CFP-*	4.2	BEM40-30	1.28	C241G7.5	20.16	C244R1.5-3FI	20.12
B6C4P-*	4.2	BC7CFP-01	4.2	BEM460-30	1.28	C241G7.5SC	20.17	C244R10	20.9
B6C4PFP-*	4.2	BC7CSP-*	4.2	BEM750-30	1.28	C244D1	20.9	C244R11	20.9
B6C4PSP-*	4.2	BC7CSP-01	4.2	BEM75-30	1.28	C244D1.5	20.9	C244R12	20.9
B6CFP-*	4.2	BC7FP-01-1.4	4.4	BEMA300-30	1.28	C244D1.5-3FI	20.12	C244R12.5	20.9
B6CFP-01	4.2	BC7FP-01-2.4	4.4	BES110-30	1.28	C244D10	20.9	C244R1-3FI	20.12
B6CSP-*	4.2	BC7FP-1.4	4.4	BES185-30	1.28	C244D11	20.9	C244R14	20.9
B6CSP-01	4.2	BC7FP-2.4	4.4	BES460-30	1.28	C244D12	20.9	C244R15	20.9
B6S-**	4.7	BC7S-**	4.7	BES750-30	1.28	C244D12.5	20.9	C244R17	20.9
B6S-01*	4.7	BC7S-01*	4.7	BES75-30	1.28	C244D1-3FI	20.12	C244R2	20.9
B6SC-01-1.7	4.5	BC7SP-01-1.4	4.4	BESA300-30	1.28	C244D14	20.9	C244R2.5	20.9
B6SC-01-2.8	4.5	BC7SP-01-2.4	4.4	BEXT-75	1.29	C244D15	20.9	C244R2.5-3FI	20.12
B6SC-1.7	4.5	BC7SP-1.4	4.4	BIT-PZ1	14.23	C244D17	20.9	C244R20	20.9
B6SC-2.8	4.5	BC7SP-2.4	4.4	BIT-PZ2	14.23	C244D2	20.9	C244R2-3FI	20.12
B6SR-**	4.7	BC7SR-**	4.7	BN6	4.11	C244D2.5	20.9	C244R3	20.9
B6SR-01*	4.7	BC7SR-01*	4.7	BP-12P	14.22	C244D2.5-3FI	20.12	C244R3.5	20.9
B6SS-**	4.8	BC7SS-**	4.8	BP-1P	14.22	C244D20	20.9	C244R3.5-3FI	20.12
B6SS-01*	4.8	BC7SS-01*	4.8	BS	14.22	C244D2-3FI	20.12	C244R3-3FI	20.12
B7C-*	4.2	BEA110/495	5.16	BS1/40	14.22	C244D3	20.9	C244R4	20.9
B7C-01	4.2	BEA110/T3	1.30	BSM6-30	4.12	C244D3.5	20.9	C244R4-3FI	20.12
B7C4P-*	4.2	BEA16/116	5.5	C13W9LNV2	10.57	C244D3.5-3FI	20.12	C244R5	20.9
B7C4PFP-*	4.2	BEA16/116AL	5.5	C13W9LPV2	10.57	C244D3-3FI	20.12	C244R5-3FI	20.12
B7C4PSP-*	4.2	BEA16/325	5.13	C13W9V2	10.56	C244D4	20.9	C244R6	20.9
B7CFP-*	4.2	BEA16/325AL	5.13	C13W9V4	10.56	C244D4-3FI	20.12	C244R6-3FI	20.12
B7CFP-01	4.2	BEA185/S3/S4	1.30	C13WSV2	10.55	C244D5	20.9	C244R7	20.9
B7CSP-*	4.2	BEA185/T3	1.30	C13WSV4	10.55	C244D5-3FI	20.12	C244R7.5	20.9
B7CSP-01	4.2	BEA185-20D/S3S4	1.122	C14W9V2	10.59	C244D6	20.9	C244R7.5-3FI	20.12
B7S-**	4.7	BEA185D/S3/S4	1.30	C14W9V4	10.59	C244D6-3FI	20.12	C244R7-3FI	20.12
B7S-01*	4.7	BEA185H/S4	1.30	C14WSV2	10.58	C244D7	20.9	C244R8	20.9
B7SC-01-1.7	4.5	BEA210/S4	1.30	C14WSV4	10.58	C244D7.5	20.9	C244R8-3FI	20.12
B7SC-01-2.8	4.5	BEA210-20D/S4	1.122	C15W9V2	10.61	C244D7.5-3FI	20.12	C244R9	20.9
B7SC-1.7	4.5	BEA210D/S4	1.30	C15W9V4	10.61	C244D7-3FI	20.12	C245D10-3FI	20.12
B7SC-2.8	4.5	BEA210H/S4	1.30	C15WSV2	10.60	C244D8	20.9	C245D11-3FI	20.12
B7SR-**	4.7	BEA26/116	5.5	C15WSV4	10.60	C244D8-3FI	20.12	C245D12.5-3FI	20.12
B7SR-01*	4.7	BEA26/325	5.13	C1XW9	10.62	C244D9	20.9	C245D12-3FI	20.12
B7SS-**	4.8	BEA26/325AL	5.13	C1XWS	10.62	C244G1	20.9	C245D14-3FI	20.12
B7SS-01*	4.8	BEA300/S5	1.30	C201G0.8	20.16	C244G1.5	20.9	C245D22.5	20.9
BA50	4.11	BEA300-20D/S5	1.122	C201G0.8SC	20.17	C244G1.5-3FI	20.12	C245D25	20.9
BA5-50	1.25	BEA300D/S5	1.30	C201G1.1	20.16	C244G10	20.9	C245D30	20.9
BA5-50	7.23	BEA300H/S5	1.30	C201G1.1SC	20.17	C244G11	20.9	C245D35	20.9
BC6-01-1.4	4.4	BEA40/450	5.16	C201G2	20.16	C244G12	20.9	C245D40	20.9
BC6-01-2.4	4.4	BEA400/S5	1.30	C201G2.5	20.16	C244G12.5	20.9	C245D9-3FI	20.12
BC6-1.4	4.4	BEA400D/S5	1.30	C201G2.5SC	20.17	C244G1-3FI	20.12	C245G10-3FI	20.12
BC6-2.4	4.4	BEA400H/S5	1.30	C201G2SC	20.17	C244G14	20.9	C245G11-3FI	20.12
BC6C-*	4.2	BEA460H/S6	1.30	C201G3	20.16	C244G15	20.9	C245G12.5-3FI	20.12
BC6C-01	4.2	BEA50/450	5.16	C201G3SC	20.17	C244G17	20.9	C245G12-3FI	20.12
BC6CFP-*	4.2	BEA7/116	5.5	C201G4	20.16	C244G2	20.9	C245G14-3FI	20.12
BC6CFP-01	4.2	BEA7/325	5.13	C201G4SC	20.17	C244G2.5	20.9	C245G22.5	20.9
BC6CSP-*	4.2	BEA75/495	5.16	C201G5	20.16	C244G2.5-3FI	20.12	C245G25	20.9

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C245G35	20.9	C2SS110 -10	8.34	C484D24	20.10	C484G6	20.16	C485D32.5	20.10
C245G40	20.9	C2SS110 -11	8.34	C484D25	20.10	C484G6-3FI	20.13	C485D35	20.10
C245G9-3FI	20.12	C2SS110 -20	8.34	C484D27	20.10	C484G7.5	20.10	C485D37.5	20.10
C245R10-3FI	20.12	C2SS210 -01	8.34	C484D3	20.10	C484G7.5	20.16	C485D40	20.10
C245R11-3FI	20.12	C2SS210 -02	8.34	C484D30	20.10	C484G7.5-3FI	20.13	C485D42.5	20.10
C245R12.5-3FI	20.12	C2SS210 -10	8.34	C484D3-3FI	20.13	C484G8	20.10	C485D45	20.10
C245R12-3FI	20.12	C2SS210 -11	8.34	C484D4	20.10	C484G8	20.16	C485D47.5	20.10
C245R14-3FI	20.12	C2SS210 -20	8.34	C484D4-3FI	20.13	C484G8-3FI	20.13	C485D50	20.10
C245R22.5	20.9	C2SS310 -01	8.34	C484D5	20.10	C484G9	20.10	C485G17.5-3FI	20.13
C245R25	20.9	C2SS310 -02	8.34	C484D5-3FI	20.13	C484G9	20.16	C485G17-3FI	20.13
C245R30	20.9	C2SS310 -10	8.34	C484D6	20.10	C484G9-3FI	20.13	C485G18-3FI	20.13
C245R35	20.9	C2SS310 -11	8.34	C484D6-3FI	20.13	C484R1.5	20.10	C485G19-3FI	20.13
C245R40	20.9	C2SS310 -20	8.34	C484D7.5	20.10	C484R1.5-3FI	20.13	C485G20-3FI	20.13
C245R9-3FI	20.12	C3SS110 -02	8.34	C484D7.5-3FI	20.13	C484R10	20.10	C485G21-3FI	20.13
C246D15-3FI	20.12	C3SS110 -11	8.34	C484D8	20.10	C484R10-3FI	20.13	C485G22.5-3FI	20.13
C246D17-3FI	20.12	C3SS110 -20	8.34	C484D8-3FI	20.13	C484R12	20.10	C485G22-3FI	20.13
C246D20-3FI	20.12	C3SS210 -02	8.34	C484D9	20.10	C484R12.5	20.10	C485G24-3FI	20.13
C246D22.5-3FI	20.12	C3SS210 -11	8.34	C484D9-3FI	20.13	C484R12.5-3FI	20.13	C485G25-3FI	20.13
C246D25-3FI	20.12	C3SS210 -20	8.34	C484G0.9	20.16	C484R12-3FI	20.13	C485G27-3FI	20.13
C246D30-3FI	20.12	C3SS310 -02	8.34	C484G1.5	20.10	C484R13	20.10	C485G32.5	20.10
C246D35-3FI	20.12	C3SS310 -11	8.34	C484G1.5	20.16	C484R13.5	20.10	C485G35	20.10
C246D40-3FI	20.12	C3SS310 -20	8.34	C484G1.5-3FI	20.13	C484R13.5-3FI	20.13	C485G37.5	20.10
C246D45	20.9	C3SS710 -02	8.34	C484G10	20.10	C484R13-3FI	20.13	C485G40	20.10
C246D50	20.9	C3SS710 -11	8.34	C484G10	20.16	C484R14	20.10	C485G42.5	20.10
C246D55	20.9	C3SS710 -20	8.34	C484G10-3FI	20.13	C484R14-3FI	20.13	C485G45	20.10
C246D60	20.9	C481G0.9SC	20.17	C484G12	20.10	C484R15	20.10	C485G47.5	20.10
C246D70	20.9	C481G1.5SC	20.17	C484G12.5	20.10	C484R15-3FI	20.13	C485G50	20.10
C246D80	20.9	C481G10SC	20.17	C484G12.5-3FI	20.13	C484R16	20.10	C485R17.5-3FI	20.13
C246G15-3FI	20.12	C481G14SC	20.17	C484G12-3FI	20.13	C484R16-3FI	20.13	C485R17-3FI	20.13
C246G17-3FI	20.12	C481G15SC	20.17	C484G13	20.10	C484R17	20.10	C485R18-3FI	20.13
C246G20-3FI	20.12	C481G17SC	20.17	C484G13.5	20.10	C484R17.5	20.10	C485R19-3FI	20.13
C246G22.5-3FI	20.12	C481G2.5SC	20.17	C484G13.5-3FI	20.13	C484R18	20.10	C485R20-3FI	20.13
C246G25-3FI	20.12	C481G2SC	20.17	C484G13-3FI	20.13	C484R19	20.10	C485R21-3FI	20.13
C246G30-3FI	20.12	C481G3.5SC	20.17	C484G14	20.10	C484R2	20.10	C485R22.5-3FI	20.13
C246G35-3FI	20.12	C481G4SC	20.17	C484G14	20.16	C484R2.5	20.10	C485R22-3FI	20.13
C246G40-3FI	20.12	C481G5SC	20.17	C484G14-3FI	20.13	C484R2.5-3FI	20.13	C485R24-3FI	20.13
C246G45	20.9	C481G6SC	20.17	C484G15	20.10	C484R20	20.10	C485R25-3FI	20.13
C246G50	20.9	C481G7.5SC	20.17	C484G15	20.16	C484R21	20.10	C485R27-3FI	20.13
C246G55	20.9	C481G8SC	20.17	C484G15-3FI	20.13	C484R22	20.10	C485R32.5	20.10
C246G60	20.9	C481G9SC	20.17	C484G16	20.10	C484R22.5	20.10	C485R35	20.10
C246G70	20.9	C484D1.5	20.10	C484G16-3FI	20.13	C484R2-3FI	20.13	C485R37.5	20.10
C246G80	20.9	C484D1.5-3FI	20.13	C484G17	20.10	C484R24	20.10	C485R40	20.10
C246R15-3FI	20.12	C484D10	20.10	C484G17	20.16	C484R25	20.10	C485R42.5	20.10
C246R17-3FI	20.12	C484D10-3FI	20.13	C484G17.5	20.10	C484R27	20.10	C485R45	20.10
C246R20-3FI	20.12	C484D12	20.10	C484G18	20.10	C484R3	20.10	C485R47.5	20.10
C246R22.5-3FI	20.12	C484D12.5	20.10	C484G19	20.10	C484R30	20.10	C485R50	20.10
C246R25-3FI	20.12	C484D12.5-3FI	20.13	C484G2	20.10	C484R3-3FI	20.13	C486D30-3FI	20.13
C246R30-3FI	20.12	C484D12-3FI	20.13	C484G2	20.16	C484R4	20.10	C486D32.5-3FI	20.13
C246R35-3FI	20.12	C484D13	20.10	C484G2.5	20.10	C484R4-3FI	20.13	C486D35-3FI	20.13
C246R40-3FI	20.12	C484D13.5	20.10	C484G2.5	20.16	C484R5	20.10	C486D37.5-3FI	20.13
C246R45	20.9	C484D13.5-3FI	20.13	C484G2.5-3FI	20.13	C484R5-3FI	20.13	C486D40-3FI	20.13
C246R50	20.9	C484D13-3FI	20.13	C484G20	20.10	C484R6	20.10	C486D42.5-3FI	20.13
C246R55	20.9	C484D14	20.10	C484G21	20.10	C484R6-3FI	20.13	C486D45-3FI	20.13
C246R60	20.9	C484D14-3FI	20.13	C484G22	20.10	C484R7.5	20.10	C486D47.5-3FI	20.13
C246R70	20.9	C484D15	20.10	C484G22.5	20.10	C484R7.5-3FI	20.13	C486D50-3FI	20.13
C246R80	20.9	C484D15-3FI	20.13	C484G2-3FI	20.13	C484R8	20.10	C486D52.5	20.10
C248D45-3FI	20.12	C484D16	20.10	C484G24	20.10	C484R8-3FI	20.13	C486D55	20.10
C248D50-3FI	20.12	C484D16-3FI	20.13	C484G25	20.10	C484R9	20.10	C486D57.5	20.10
C248D55-3FI	20.12	C484D17	20.10	C484G27	20.10	C484R9-3FI	20.13	C486D60	20.10
C248D60-3FI	20.12	C484D17.5	20.10	C484G3	20.10	C485D17.5-3FI	20.13	C486D62.5	20.10
C248G45-3FI	20.12	C484D18	20.10	C484G3.5	20.16	C485D17-3FI	20.13	C486D65	20.10
C248G50-3FI	20.12	C484D19	20.10	C484G30	20.10	C485D18-3FI	20.13	C486D70	20.10
C248G55-3FI	20.12	C484D2	20.10	C484G3-3FI	20.13	C485D19-3FI	20.13	C486D75	20.10
C248G60-3FI	20.12	C484D2.5	20.10	C484G4	20.10	C485D20-3FI	20.13	C486D77.5	20.10
C248R45-3FI	20.12	C484D2.5-3FI	20.13	C484G4	20.16	C485D21-3FI	20.13	C486G30-3FI	20.13
C248R50-3FI	20.12	C484D20	20.10	C484G4-3FI	20.13	C485D22.5-3FI	20.13	C486G32.5-3FI	20.13
C248R55-3FI	20.12	C484D21	20.10	C484G5	20.10	C485D22-3FI	20.13	C486G35-3FI	20.13
C248R60-3FI	20.12	C484D22	20.10	C484G5	20.16	C485D24-3FI	20.13	C486G37.5-3FI	20.13
C2SS110 -01	8.34	C484D22.5	20.10	C484G5-3FI	20.13	C485D25-3FI	20.13	C486G40-3FI	20.13

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C486G45-3FI	20.13	C488R110	20.10	C604D2.2-3FI	20.14	C605R30-3FI	20.14	C608R95	20.11
C486G47.5-3FI	20.13	C488R115	20.10	C604D20	20.11	C605R35	20.11	C609D100-3FI	20.14
C486G50-3FI	20.13	C488R120	20.10	C604D20-3FI	20.14	C605R40	20.11	C609D105-3FI	20.14
C486G52.5	20.10	C488R52.5-3FI	20.13	C604D25	20.11	C605R45	20.11	C609D110-3FI	20.14
C486G55	20.10	C488R55-3FI	20.13	C604D3	20.11	C605R50	20.11	C609D115-3FI	20.14
C486G57.5	20.10	C488R57.5-3FI	20.13	C604D30	20.11	C606D35-3FI	20.14	C609D120-3FI	20.14
C486G60	20.10	C488R60-3FI	20.13	C604D3-3FI	20.14	C606D40-3FI	20.14	C609D125-3FI	20.14
C486G62.5	20.10	C488R62.5-3FI	20.13	C604D4	20.11	C606D45-3FI	20.14	C609D130-3FI	20.14
C486G65	20.10	C488R65-3FI	20.13	C604D4-3FI	20.14	C606D50-3FI	20.14	C609D135-3FI	20.14
C486G70	20.10	C488R70-3FI	20.13	C604D5	20.11	C606D60	20.11	C609D90-3FI	20.14
C486G75	20.10	C488R75-3FI	20.13	C604D5-3FI	20.14	C606D70	20.11	C609D95-3FI	20.14
C486G77.5	20.10	C488R77.5-3FI	20.13	C604D7.5	20.11	C606D75	20.11	C609G100-3FI	20.14
C486G77.5-3FI	20.13	C488R80	20.10	C604D7.5-3FI	20.14	C606D80	20.11	C609G105-3FI	20.14
C486R30-3FI	20.13	C488R85	20.10	C604G10	20.11	C606G35-3FI	20.14	C609G110-3FI	20.14
C486R32.5-3FI	20.13	C488R87.5	20.10	C604G10-3FI	20.14	C606G40-3FI	20.14	C609G115-3FI	20.14
C486R35-3FI	20.13	C488R90	20.10	C604G14	20.11	C606G45-3FI	20.14	C609G120-3FI	20.14
C486R37.5-3FI	20.13	C488R95	20.10	C604G14-3FI	20.14	C606G50-3FI	20.14	C609G125-3FI	20.14
C486R40-3FI	20.13	C489D100-3FI	20.13	C604G15	20.11	C606G60	20.11	C609G130-3FI	20.14
C486R42.5-3FI	20.13	C489D105-3FI	20.13	C604G15-3FI	20.14	C606G70	20.11	C609G135-3FI	20.14
C486R45-3FI	20.13	C489D110-3FI	20.13	C604G17.5	20.11	C606G75	20.11	C609G90-3FI	20.14
C486R47.5-3FI	20.13	C489D115-3FI	20.13	C604G17.5-3FI	20.14	C606G80	20.11	C609G95-3FI	20.14
C486R50-3FI	20.13	C489D120-3FI	20.13	C604G2.2	20.11	C606R35-3FI	20.14	C609R100-3FI	20.14
C486R52.5	20.10	C489D80-3FI	20.13	C604G2.2-3FI	20.14	C606R40-3FI	20.14	C609R105-3FI	20.14
C486R55	20.10	C489D85-3FI	20.13	C604G20	20.11	C606R45-3FI	20.14	C609R110-3FI	20.14
C486R57.5	20.10	C489D87.5-3FI	20.13	C604G20-3FI	20.14	C606R50-3FI	20.14	C609R115-3FI	20.14
C486R60	20.10	C489D90-3FI	20.13	C604G25	20.11	C606R60	20.11	C609R120-3FI	20.14
C486R62.5	20.10	C489D95-3FI	20.13	C604G3	20.11	C606R70	20.11	C609R125-3FI	20.14
C486R65	20.10	C489G100-3FI	20.13	C604G30	20.11	C606R75	20.11	C609R130-3FI	20.14
C486R70	20.10	C489G105-3FI	20.13	C604G3-3FI	20.14	C606R80	20.11	C609R135-3FI	20.14
C486R75	20.10	C489G110-3FI	20.13	C604G4	20.11	C608D100	20.11	C609R90-3FI	20.14
C486R77.5	20.10	C489G115-3FI	20.13	C604G4-3FI	20.14	C608D105	20.11	C609R95-3FI	20.14
C488D100	20.10	C489G120-3FI	20.13	C604G5	20.11	C608D110	20.11	C73W9V2	10.66
C488D105	20.10	C489G80-3FI	20.13	C604G5-3FI	20.14	C608D115	20.11	C73W9V6	10.66
C488D110	20.10	C489G85-3FI	20.13	C604G7.5	20.11	C608D120	20.11	C73WSV2	10.65
C488D115	20.10	C489G87.5-3FI	20.13	C604G7.5-3FI	20.14	C608D125	20.11	C73WSV6	10.65
C488D120	20.10	C489G90-3FI	20.13	C604R10	20.11	C608D130	20.11	C83W9LNV2	10.69
C488D52.5-3FI	20.13	C489G95-3FI	20.13	C604R10-3FI	20.14	C608D135	20.11	C83W9LPV2	10.69
C488D55-3FI	20.13	C489R100-3FI	20.13	C604R14	20.11	C608D60-3FI	20.14	C83W9V2	10.68
C488D57.5-3FI	20.13	C489R105-3FI	20.13	C604R14-3FI	20.14	C608D70-3FI	20.14	C83W9V6	10.68
C488D60-3FI	20.13	C489R110-3FI	20.13	C604R15	20.11	C608D75-3FI	20.14	C83WSV2	10.67
C488D62.5-3FI	20.13	C489R115-3FI	20.13	C604R15-3FI	20.14	C608D80-3FI	20.14	C83WSV6	10.67
C488D65-3FI	20.13	C489R120-3FI	20.13	C604R17.5	20.11	C608D90	20.11	CA1-8075	8.38
C488D70-3FI	20.13	C489R80-3FI	20.13	C604R17.5-3FI	20.14	C608D95	20.11	CA1-8076	8.37
C488D75-3FI	20.13	C489R85-3FI	20.13	C604R2.2	20.11	C608G100	20.11	CA1-8077	8.37
C488D77.5-3FI	20.13	C489R87.5-3FI	20.13	C604R2.2-3FI	20.14	C608G105	20.11	CA1-8078	8.37
C488D80	20.10	C489R90-3FI	20.13	C604R20	20.11	C608G110	20.11	CA5-01	1.16
C488D85	20.10	C489R95-3FI	20.13	C604R20-3FI	20.14	C608G115	20.11	CA5-01	1.118
C488D87.5	20.10	C601G10	20.16	C604R25	20.11	C608G120	20.11	CA5-01	7.23
C488D90	20.10	C601G10SC	20.17	C604R3	20.11	C608G125	20.11	CA5-04E	1.16
C488D95	20.10	C601G15	20.16	C604R30	20.11	C608G130	20.11	CA5-04M	1.16
C488G100	20.10	C601G15SC	20.17	C604R3-3FI	20.14	C608G135	20.11	CA5-04N	7.23
C488G105	20.10	C601G2	20.16	C604R4	20.11	C608G60-3FI	20.14	CA5-10	1.16
C488G110	20.10	C601G2SC	20.17	C604R4-3FI	20.14	C608G70-3FI	20.14	CA5-10	1.118
C488G115	20.10	C601G3	20.16	C604R5	20.11	C608G75-3FI	20.14	CA5-10	7.23
C488G120	20.10	C601G3SC	20.17	C604R5-3FI	20.14	C608G80-3FI	20.14	CA5-11/11E	1.16
C488G52.5-3FI	20.13	C601G4	20.16	C604R7.5	20.11	C608G90	20.11	CA5-11/11M	1.16
C488G55-3FI	20.13	C601G4SC	20.17	C604R7.5-3FI	20.14	C608G95	20.11	CA5-13M	1.16
C488G57.5-3FI	20.13	C601G5	20.16	C605D25-3FI	20.14	C608R100	20.11	CA5-22E	1.16
C488G60-3FI	20.13	C601G5SC	20.17	C605D30-3FI	20.14	C608R105	20.11	CA5-22ERT	1.10
C488G62.5-3FI	20.13	C601G7.5	20.16	C605D35	20.11	C608R110	20.11	CA5-22M	1.16
C488G65-3FI	20.13	C601G7.5SC	20.17	C605D40	20.11	C608R115	20.11	CA5-22M	1.118
C488G70-3FI	20.13	C604D10	20.11	C605D45	20.11	C608R120	20.11	CA5-22N	7.23
C488G75-3FI	20.13	C604D10-3FI	20.14	C605D50	20.11	C608R125	20.11	CA5-31E	1.16
C488G80	20.10	C604D14	20.11	C605G25-3FI	20.14	C608R130	20.11	CA5-31ERT	1.10
C488G85	20.10	C604D14-3FI	20.14	C605G30-3FI	20.14	C608R135	20.11	CA5-31M	1.16
C488G87.5	20.10	C604D15	20.11	C605G35	20.11	C608R60-3FI	20.14	CA5-31M	1.118
C488G90	20.10	C604D15-3FI	20.14	C605G40	20.11	C608R70-3FI	20.14	CA5-40E	1.16
C488G95	20.10	C604D17.5	20.11	C605G45	20.11	C608R75-3FI	20.14	CA5-40ERT	1.10
C488R100	20.10	C604D17.5-3FI	20.14	C605G50	20.11	C608R80-3FI	20.14	CA5-40N	1.16

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CA5D-01	1.110	CE5-10D2	1.16	CP210*-11	8.32	DT800/AF750S	2.22	E271/63	14.55
CA5D-11	1.110	CE5-10W0.1	1.16	CP210*-20	8.32	DTS7/1	14.57	E271/80	14.55
CA6-11E	4.11	CE5-10W2	1.16	CP310*-01	8.32	DX25	2.7	E272/100	14.55
CA6-11E-F	4.11	CK-11	5.13	CP310*-02	8.32	DX495	5.17	E272/63	14.55
CA6-11E-P	4.11	CL-100C	8.35	CP310*-10	8.32	E10/110	14.56	E272/80	14.55
CA6-11K	4.11	CL-100G	8.35	CP310*-11	8.32	E10/220	14.56	E273/100	14.55
CA6-11K-F	4.11	CL-100L	8.35	CP310*-20	8.32	E10/24	14.56	E273/63	14.55
CA6-11K-P	4.11	CL-100R	8.35	CP3310B-01	8.32	E1173	14.56	E273/80	14.55
CA6-11M	4.11	CL-100W	8.35	CP410*-01	8.32	E1174	14.56	E274/100	14.55
CA6-11M-F	4.11	CL-100Y	8.35	CP410*-02	8.32	E1175	14.56	E274/63	14.55
CA6-11M-P	4.11	CL-501G	8.35	CP410*-10	8.32	E1175-C	14.56	E274/80	14.55
CA6-11N	4.11	CL-501L	8.35	CP410*-11	8.32	E1250DU1250	2.21	E320DU320	2.21
CA6-11N-F	4.11	CL-501R	8.35	CP410*-20	8.32	E16DU0.32-10	2.21	E500DU500	2.21
CA6-11N-P	4.11	CL-501W	8.35	CXBY67121	18.85	E16DU0.32-20	2.21	E800DU800	2.21
CADP40-10	1.98	CL-501Y	8.35	CXBY68005	18.22	E16DU0.32-30	2.21	EHDB220C-1L	1.107
CADP40-11	1.98	CL-502G	8.35	CXBY68100	18.22	E16DU1.0-10	2.21	EHDB220C2P-1L	1.107
CADP60-10	1.98	CL-502L	8.35	CXBY68135	18.11	E16DU1.0-20	2.21	EHDB220M-1L	1.108
CAF6-02E	4.11	CL-502R	8.35	CXBY68140	18.19	E16DU1.0-30	2.21	EHDB220M2P-1L	1.108
CAF6-02K	4.11	CL-502W	8.35	CXBY68306	18.11	E16DU18.9-10	2.21	EHDB280C-1L	1.107
CAF6-02M	4.11	CL-502Y	8.35	CXBY68362	18.88	E16DU18.9-20	2.21	EHDB280C2P-1L	1.107
CAF6-02N	4.11	CL-504G	8.35	CXBY68419/1	18.11	E16DU18.9-30	2.21	EHDB280M-1L	1.108
CAF6-11E	4.11	CL-504L	8.35	CXBY68674	18.88	E16DU2.7-10	2.21	EHDB280M2P-1L	1.108
CAF6-11K	4.11	CL-504R	8.35	CXBY68794	18.88	E16DU2.7-20	2.21	EHDB360C-1L	1.107
CAF6-11M	4.11	CL-504W	8.35	DA75-20-11-84	1.106	E16DU2.7-30	2.21	EHDB360C2P-1L	1.107
CAF6-11N	4.11	CL-504Y	8.35	DA75-21-21-84	1.106	E16DU6.3-10	2.21	EHDB360M-1L	1.108
CAF6-20E	4.11	CL-505G	8.35	DA75-21A-11-84	1.106	E16DU6.3-20	2.21	EHDB360M2P-1L	1.108
CAF6-20K	4.11	CL-505L	8.35	DA75M-20-11-84	1.108	E16DU6.3-30	2.21	EHDB520C-1L	1.107
CAF6-20M	4.11	CL-505R	8.35	DA75M-21A-11-84	1.108	E200DU200	2.21	EHDB520C2P-1L	1.107
CAF6-20N	4.11	CL-505W	8.35	DB16E	2.22	E221-10	14.54	EHDB520M-1L	1.108
CAL16-11A	1.109	CL-505Y	8.35	DB200	2.7	E221-11	14.54	EHDB520M2P-1L	1.108
CAL16-11B	1.109	CL-513G	8.35	DB25/25A	2.7	E221-20	14.54	EHDB650C-1L	1.107
CAL16-11C	1.109	CL-513L	8.35	DB25/32A	2.7	E221-22	14.54	EHDB650C2P-1L	1.107
CAL16-11D	1.109	CL-513R	8.35	DB80	2.7	E221-30	14.54	EHDB650M-1L	1.108
CAL16-11E	1.109	CL-513W	8.35	DIN RAIL	18.13	E221-31	14.54	EHDB650M2P-1L	1.108
CAL16-11N	1.109	CL-513Y	8.35	DP30C1P-F	1.98	E221-4	14.54	EHDB800C-1L	1.107
CAL16-11P	1.109	CL-515G	8.35	DP30C2P-F	1.98	E221-4/2	14.54	EHDB800C2P-1L	1.107
CAL18-11	1.16	CL-515L	8.35	DP30C3P-F	1.98	E221-40	14.54	EHDB800M-1L	1.108
CAL18-11	1.16	CL-515R	8.35	DP30C4P-F	1.98	E221-6	14.54	EHDB800M2P-1L	1.108
CAL18-11	1.118	CL-515W	8.35	DP40C2P-F	1.98	E221-6/2	14.54	EHDB960C-1L	1.107
CAL18-11B	1.16	CL-515Y	8.35	DP40C3P-F	1.98	E222-10	14.54	EHDB960C2P-1L	1.107
CAL18-11B	1.118	CL-520G	8.35	DP40C4P-F	1.98	E222-11	14.54	EHDB960M-1L	1.108
CAL5-11	1.16	CL-520L	8.35	DP60C3P-F	1.98	E222-20	14.54	EHDB960M2P-1L	1.108
CAL5-11	1.118	CL-520R	8.35	DR25-A-110	2.8	E222-30	14.54	EHDBAS220	1.109
CAL5-11	7.23	CL-520W	8.35	DR25-A-220/380	2.8	E222-4	14.54	EHDBAS220-2	1.109
CBK-XSWG	8.27	CL-520Y	8.35	DR25-A-24	2.8	E222-40	14.54	EHDBAS280	1.109
CBK-XSWL	8.27	CL-523G	8.35	DR25-A-48	2.8	E222-6	14.54	EHDBAS280-2	1.109
CC5-01	1.16	CL-523L	8.35	DR25-A-500	2.8	E225-11B	14.56	EHDBAS360	1.109
CC5-10	1.16	CL-523R	8.35	DS25-A-110	2.8	E225-11C	14.56	EHDBAS360-2	1.109
CCL18-01	1.26	CL-523W	8.35	DS25-A-220/380	2.8	E225-11D	14.56	EHDBAS520	1.109
CE3K1-10R-02	8.33	CL-523Y	8.35	DS25-A-24	2.8	E225-11E	14.56	EHDBAS520-2	1.109
CE3K1-10R-11	8.33	CL-530G	8.35	DS25-A-48	2.8	E225-11F	14.56	EHDBAS650	1.109
CE3P-10R-02	8.33	CL-530L	8.35	DS25-A-500	2.8	E225-11G	14.56	EHDBAS650-2	1.109
CE3P-10R-11	8.33	CL-530R	8.35	DSFHN-HS12	18.35	E227-10B/110	14.56	EHDBAS800	1.109
CE3T-10R-01	8.33	CL-530W	8.35	DSFHN-HS12	18.97	E227-10C/110	14.56	EHDBAS800-2	1.109
CE3T-10R-02	8.33	CL-530Y	8.35	DSFHN-HS4	18.35	E227-10D/110	14.56	EHDBAS960	1.109
CE3T-10R-11	8.33	CL-541G	8.35	DSFHN-HS4	18.97	E227-10E/110	14.56	EHDBAS960-2	1.109
CE3T-10R-20	8.33	CL-541L	8.35	DSFHS-12	18.35	E227-10G/110	14.56	EHDBCK220-2	1.110
CE4K1-10R-02	8.33	CL-541R	8.35	DSFHS-12	18.97	E229-B/110	14.56	EHDBCK220-NC	1.110
CE4K1-10R-11	8.33	CL-541W	8.35	DSFHS-17	18.35	E229-C/110	14.56	EHDBCK280-2	1.110
CE4P-10R-02	8.33	CL-541Y	8.35	DSFHS-17	18.97	E229-D/110	14.56	EHDBCK280-NC	1.110
CE4P-10R-11	8.33	CP110*-01	8.32	DSFHS-22	18.35	E229-E/110	14.56	EHDBCK360-2	1.110
CE4T-10R-01	8.33	CP110*-02	8.32	DSFHS-22	18.97	E229-G/110	14.56	EHDBCK360-NC	1.110
CE4T-10R-02	8.33	CP110*-10	8.32	DS-SA1	18.13	E233-120/60	14.56	EHDBCK520-2	1.110
CE4T-10R-11	8.33	CP110*-11	8.32	DS-SA2	18.13	E233-24/60	14.56	EHDBCK520-NC	1.110
CE4T-10R-20	8.33	CP110*-20	8.32	DS-SA3	18.13	E233-240/60	14.56	EHDBCK650-2	1.110
CE5-01D0.1	1.16	CP1110W-10	8.32	DT450/A185	2.7	E241/45	14.55	EHDBCK650-NC	1.110
CE5-01D2	1.16	CP1210W-10	8.32	DT450/A300	2.7	E242/45	14.55	EHDBCK800-2	1.110
CE5-01W0.1	1.16	CP210*-01	8.32	DT500/AF460L	2.22	E243/45	14.55	EHDBCK800-NC	1.110
CE5-01W2	1.16	CP210*-02	8.32	DT500/AF460S	2.22	E244/45	14.55	EHDBCK960-2	1.110

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EHDBRC360-*	1.109	F246D90	20.23	F486G140-3FI	20.25	F488G350	20.23	F608D350	20.24
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EHDRC280-*	1.109	F246G100-3FI	20.25	F486G220	20.23	F488G360-3FI	20.25	F608D360-3FI	20.26
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EHTK210	1.110	F246G110-3FI	20.25	F486G225	20.23	F488G400-3FI	20.25	F608D400-3FI	20.26
EHTK210	2.7	F246G120	20.23	F486G225-3FI	20.25	F488G450	20.23	F608D500	20.24
EHTK550N	1.110	F246G120-3FI	20.25	F486R125	20.23	F488G450-3FI	20.25	F608D500-3FI	20.26
EHTK700	1.110	F246G120-3FI	20.25	F486R125-3FI	20.25	F488G475	20.23	F608D600	20.24
EHTK800	1.110	F246G130	20.23	F486R130-3FI	20.25	F488G475-3FI	20.25	F608D600-3FI	20.26
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EK1000C4P-PL	1.13	F246G150-3FI	20.25	F486R140-3FI	20.25	F488G500-3FI	20.25	F608G200-3FI	20.26
EK110C4P-1L	1.13	F246G160	20.23	F486R150	20.23	F488G600	20.23	F608G270	20.24
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EK210C4P-1L	1.13	F246G250	20.23	F486R8130	20.23	F488R180	20.23	F608G360	20.24
EK210C4P-PL	1.13	F246G250-3FI	20.25	F488D160	20.23	F488R180-3FI	20.25	F608G360-3FI	20.26
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FJ100P-2PB8B	18.149	FJ304-6PB6B	18.150	FJ6003-3B6B	18.151	FL8002-6P8B	18.150	IPSH2A11	9.104
FJ100P-3MB8B	18.147	FJ30P-3BB6B	18.151	FJ6003-3MB4B	18.150	FL8003-2PB4B	18.149	IPSH2A22	9.104
FJ100P-3PB8B	18.151	FJ30P-3PB6B	18.150	FJ6003-3PB4B	18.147	FL8003-3B6B	18.151	IPSH2D11	9.104
FJ100P-4PB8B	18.149	FJ30P-3TB6B	18.151	FJ6003-3TB4B	18.151	FL8003-3PB4B	18.147	IPSH2D22	9.104
FJ100P-6PB4B	18.150	FJ30P-3TB8B	18.151	FJ6003-4PB4B	18.149	FL8003-3TB4B	18.151	IPSH3A11	9.104
FJ100X-2PB8B	18.149	FJ30P-4PB6B	18.149	FJ6003-6P8B	18.150	FL8003-4PB4B	18.149	IPSH3A22	9.104
FJ100X-3MB8B	18.150	FJ30P-6PB6B	18.150	FJ6004-2PB4B	18.149	FL8003-6P8B	18.150	IPSH3D11	9.104
FJ100X-3PB8B	18.147	FJ30X-3BB8B	18.151	FJ6004-3B6B	18.151	FL8004-2PB4B	18.149	IPSH3D22	9.104
FJ100X-3TB8B	18.151	FJ30X-3MB6B	18.150	FJ6004-3MB4B	18.150	FL8004-3B6B	18.151	K3DMB	15.96
FJ100X-4PB8B	18.149	FJ30X-3PB6B	18.147	FJ6004-3PB4B	18.147	FL8004-3MB4B	18.150	K3FHD-12S12	15.94
FJ100X-6PB4B	18.150	FJ30X-3TB6B	18.151	FJ6004-3TB4B	18.151	FL8004-3PB4B	18.147	K3FHD-12S4	15.94
FJ2001-2PB8C	18.149	FJ30X-4PB6B	18.149	FJ6004-4PB4B	18.149	FL8004-3TB4B	18.151	K3FHD-17S12	15.94
FJ2001-3B8C	18.151	FJ30X-6PB6B	18.150	FJ6004-6P8B	18.150	FL8004-4PB4B	18.149	K3FHD-17S4	15.94
FJ2001-3MB8C	18.150	FJ4001-2PB4B	18.149	FJ600P-2PB4B	18.149	FL8004-6P8B	18.150	K3FHD-22S12	15.94
FJ2001-3PB8C	18.147	FJ4001-3B6B	18.151	FJ600P-3B6B	18.151	FL800P-2PB4B	18.149	K3FHD-22S4	15.94
FJ2001-3TB8C	18.151	FJ4001-3MB4B	18.150	FJ600P-3MB4B	18.150	FL800P-3B6B	18.151	K3MI-H	15.96
FJ2001-4PB8C	18.149	FJ4001-3PB4B	18.147	FJ600P-3PB4B	18.147	FL800P-3MB4B	18.150		

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K3PFF	15.97	K4TER	15.92	K5PR	15.97	K6FHD-17S12	15.94	K7FCH4	18.99
K3PFR	15.97	K4TES	15.69	K5RC	15.97	K6FHD-17S4	15.94	K7FHD-HS12	15.94
K3PR	15.97	K4TES	15.73	K5RH	15.93	K6FHD-22S12	15.94	K7FHD-HS12	15.94
K3TA	15.69	K4TES	15.92	K5S1	15.89	K6FHD-22S4	15.94	K7FHD-HS12	15.94
K3TA	15.92	K4TN	15.92	K5S2	15.89	K6FPM	15.95	K7FHD-HS12	15.94
K3TA-2	15.69	K4WF	15.97	K5S4	15.89	K6LC	15.96	K7FHD-HS4	15.94
K3TA-2	15.92	K4WFF	15.97	K5S7	15.89	K6LCH	15.96	K7FHD-HS4	15.94
K3WF	15.97	K4WFR	15.97	K5S8	15.89	K6LC-S	15.96	K7FHD-HS4	15.94
K3WFF	15.97	K4WMK	15.97	K5S9	15.89	K6LD	15.96	K7FHD-HS4	15.94
K3WFR	15.97	K4WR	15.97	K5SA	15.89	K6LDW	15.96	K7FHD-S12	15.94
K3WR	15.97	K5AS	15.90	K5SB	15.89	K6M2	15.91	K7FHD-S12	15.94
K4DMB	15.96	K5BA	15.90	K5TF	15.77	K6M4	15.91	K7FHD-S12	15.94
K4ET-250	15.69	K5C036	15.28	K5TF	15.92	K6M7	15.91	K7FHD-S12	15.94
K4ET-250	15.73	K5C036	15.32	K5TF-2	15.77	K6M8	15.91	K7FHD-S12	15.94
K4ET-250	15.92	K5C036	18.37	K5TF-2	15.92	K6MI-H	15.96	K7FHD-S12	15.94
K4FCT	15.97	K5C036	18.99	K5TF-2C	15.92	K6MI-V	15.96	K7FHD-S12	15.94
K4FCT	15.97	K5C048	15.28	K5TFC	15.92	K6NCT-600	15.81	K7FHD-S12	15.94
K4FHD-12S12	15.94	K5C048	15.32	K5TG	15.77	K6NCT-800	15.81	K7FHD-S17	15.94
K4FHD-12S4	15.94	K5C048	18.37	K5TG	15.92	K6RC	15.97	K7FHD-S17	15.94
K4FHD-17S12	15.94	K5C048	18.99	K5TG-2	15.77	K6RH	15.93	K7FHD-S17	15.94
K4FHD-17S4	15.94	K5C060	15.28	K5TG-2	15.92	K6TH	15.81	K7FHD-S17	15.94
K4FHD-22S12	15.94	K5C060	15.32	K5TG-2C	15.92	K6TH	15.92	K7FHD-S17	15.94
K4FHD-22S4	15.94	K5C060	18.37	K5TGC	15.92	K6TH-2	15.81	K7FHD-S17	15.94
K4FPM	15.95	K5C060	18.99	K5TGD	15.92	K6TH-2	15.92	K7FHD-S17	15.94
K4LC	15.96	K5C072	15.28	K5TGR	15.77	K6TH-2C	15.92	K7FHD-S17	15.94
K4LCH	6.8	K5C072	18.37	K5TGR	15.92	K6THC	15.92	K7FHD-S22	15.94
K4LCH	15.96	K5C072	18.99	K5TGS	15.77	K6THR	15.81	K7FHD-S22	15.94
K4MI-H	15.96	K5C084	15.32	K5TGS	15.92	K6THR	15.92	K7FHD-S22	15.94
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K4NCT-100	15.73	K5C108	15.32	K5U2	15.89	K6TJ	15.81	K7FHD-S22	15.94
K4NCT-250	15.73	K5C120	15.32	K5U3	15.89	K6TJ-2	15.81	K7FHD-S22	15.94
K4PF	15.97	K5DMB	15.96	K5U4	15.89	K6TJ-2	15.92	K7FHD-S22	15.94
K4PFF	15.97	K5ET-400	15.77	K5U5	15.89	K6TJ-2C	15.92	K7FHD-S22	15.94
K4PFR	15.97	K5ET-400	15.92	K5U6	15.89	K6TJC	15.92	K7FPM	15.95
K4PMK	15.97	K5FCH	15.28	K5U7	15.89	K6TJR	15.81	K7KL	15.96
K4PMK	15.97	K5FCH	15.32	K5U8	15.89	K6TJR	15.92	K7KL	15.96
K4PR	15.97	K5FCH	15.95	K5VD-H	15.93	K6VD-M	15.93	K7KL-2	15.96
K4RC	15.97	K5FCH	18.37	K5VD-LSS	15.93	K6VD-M	15.93	K7KL-2	15.96
K4TB	15.69	K5FCH	18.99	K5VD-M	15.93	K6WF	15.97	K7KL-EO	15.96
K4TB	15.73	K5FCH4	15.28	K5VD-M	15.93	K6WFF	15.97	K7KL-EO-2	15.96
K4TB	15.92	K5FCH4	15.32	K5VD-S12	15.93	K6WFR-H	15.97	K7LC	15.96
K4TB-2	15.69	K5FCH4	15.95	K5WF	15.97	K6WFR-V	15.97	K7LD	15.96
K4TB-2	15.73	K5FCH4	18.37	K5WFF	15.97	K6WMK	15.97	K7LDW	15.96
K4TB-2	15.92	K5FCH4	18.99	K5WFR	15.97	K6WR-H	15.97	K7M2	15.91
K4TB-2C	15.92	K5FCT	15.97	K5WMK	15.97	K6WR-V	15.97	K7M4	15.91
K4TBC	15.92	K5FHD-12S12	15.94	K5WR	15.97	K7AS	15.90	K7M7	15.91
K4TC	15.69	K5FHD-12S4	15.94	K622-*	4.9	K7BA	15.90	K7M8	15.91
K4TC	15.73	K5FHD-17S12	15.94	K622FP-*	4.9	K7BA-3	15.90	K7MI-H	15.96
K4TC	15.92	K5FHD-17S4	15.94	K622SP-*	4.9	K7C048	18.37	K7MI-V	15.96
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K4TC-2	15.92	K5FPM	15.95	K631SP-*	4.9	K7C060	18.99	K7RC	15.97
K4TC-2C	15.92	K5KL-EO	15.96	K640-*	4.9	K7C072	18.37	K7RH	15.93
K4TCC	15.92	K5KL-EO-2	15.96	K640FP-*	4.9	K7C072	18.99	K7S1	15.89
K4TD	15.69	K5LC	15.96	K640SP-*	4.9	K7C084	18.37	K7S2	15.89
K4TD	15.73	K5LCH	6.8	K6C-AB	15.90	K7C084	18.99	K7S4	15.89
K4TD	15.92	K5LCH	15.96	K6C-ABP	15.90	K7C-AB	15.90	K7S7	15.89
K4TD-2	15.69	K5LD	15.96	K6C-M	15.91	K7C-ABP	15.90	K7S8	15.89
K4TD-2	15.73	K5LDW	15.96	K6C-M	15.91	K7C-M	15.91	K7S9	15.89
K4TD-2	15.92	K5M2	15.91	K6C-MP	15.91	K7C-MP	15.91	K7SA	15.89
K4TD-2C	15.92	K5M4	15.91	K6C-SU	15.89	K7C-SU	15.89	K7SB	15.89
K4TDC	15.92	K5M7	15.91	K6C-SU	15.89	K7C-SU	15.89	K7TK	15.85
K4TE	15.73	K5M8	15.91	K6C-SUP	15.89	K7C-SUP	15.89	K7TK	15.92
K4TE	15.92	K5MI-H	15.96	K6C-SUP	15.89	K7C-SUP	15.89	K7TK-2	15.85
K4TE-2	15.73	K5MI-V	15.96	K6ET-600	15.81	K7DB	15.96	K7TK-2	15.92
K4TE-2	15.92	K5NCT-400	15.77	K6ET-600	15.92	K7ET-1250	15.85	K7TK-2C	15.92
K4TE-2C	15.92	K5PF	15.97	K6ET-800	15.81	K7ET-1250	15.92	K7TKC	15.92
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K7U8	15.89	KA1-8093	8.26	KA2-2135	8.36	KE2CT250	16.29	KE6CT6300	16.29
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K7VD-M	15.93	KA1-8095	8.26	KA2-2141	8.36	KE2CT800	16.29	KE6FHRVR	16.31
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K7WF	15.97	KA1-8098	8.26	KA2-2143	8.36	KE2NCT-1200	16.29	KE6KKB-E3W	16.31
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K8NCT-2500	15.88	KA1-8114	8.26	KA2-2223	8.36	KE3CT1250	16.29	KE6KL2	16.27
K8RT2500	15.88	KA1-8115	8.26	KA2-2224	8.24	KE3CT1600	16.29	KE6KL3	16.27
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KA1-8024	8.25	KA2-2021	8.24	KC622FP-*	4.9	KE3NCT-250	16.29	KE6MLC-HC	16.30
KA1-8027	8.26	KA2-2021	8.36	KC622SP-*	4.9	KE3NCT-2500	16.29	KE6MLC-HD	16.30
KA1-8028	8.26	KA2-2022	8.24	KC631-*	4.9	KE3NCT-400	16.29	KE6MLC-VA	16.30
KA1-8029	8.26	KA2-2022	8.36	KC631-1.4	4.10	KE3NCT-800	16.29	KE6MLC-VB	16.30
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KA1-8030	8.26	KA2-2023	8.36	KC631FP-*	4.9	KE3PS4	16.27	KE6MLC-VD	16.30
KA1-8030	8.38	KA2-2024	8.24	KC631FP-1.4	4.10	KE4CT1600	16.29	KE6MLP	16.30
KA1-8031	8.26	KA2-2024	8.36	KC631FP-2.4	4.10	KE4CT2000	16.29	KE6NCT-3200	16.29
KA1-8032	8.26	KA2-2025	8.24	KC631SP-*	4.9	KE4CT2500	16.29	KE6NCT-4000	16.29
KA1-8033	8.26	KA2-2025	8.36	KC631SP-1.4	4.10	KE4CT3200	16.29	KE6NCT-5000	16.29
KA1-8034	8.26	KA2-2041	8.24	KC631SP-2.4	4.10	KE4CT3600	16.29	KE6NCT-6300	16.29
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KA1-8045	8.45	KA2-2042	8.24	KC640-1.4	4.10	KE4FHRVR	16.31	KE6PG	16.27
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KA1-8046MR	8.19	KA2-2043	8.24	KC640FP-*	4.9	KE4NCT-1600	16.29	KE6PL2	16.27
KA1-8047	8.19	KA2-2043	8.36	KC640FP-1.4	4.10	KE4NCT-2000	16.29	KE6PL3	16.27
KA1-8052	8.25	KA2-2044	8.24	KC640FP-2.4	4.10	KE4NCT-2500	16.29	KE6PL4	16.27
KA1-8052	8.37	KA2-2044	8.36	KC640SP-*	4.9	KE4NCT-3200	16.29	KE6PL5	16.27
KA1-8053	8.25	KA2-2045	8.24	KC640SP-1.4	4.10	KE4NCT-3600	16.29	KE6PLA	16.27
KA1-8072	8.25	KA2-2045	8.36	KC640SP-2.4	4.10	KE4NCT-4000	16.29	KE6PS1	16.27
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KA1-8081	8.26	KA2-2055	8.24	KDH3R	15.28	KE6C1	16.26	KE6S3	16.26
KA1-8082	8.26	KA2-2055	8.36	KDH3R	15.32	KE6C2	16.26	KE6S3-2	16.26
KA1-8083	8.26	KA2-2131	8.24	KDH3R	15.95	KE6C3	16.26	KE6S4	16.26
					18.36	KE6C4	16.26	KE6S4-2	16.26

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KE6S5	16.26	KPR4-100R	8.19	KT3RH	15.26	KT5EF-4	15.31	LB6	4.11
KE6S5-2	16.26	KPR4-100W	8.19	KT3S1	15.25	KT5FLD	15.30	LB6-CA	4.11
KE6S6	16.26	KPR4-105B	8.19	KT3S2	15.25	KT5FLDW	15.30	LC26-B1	2.7
KE6S6-2	16.26	KPR4-105R	8.19	KT3S3	15.25	KT5FPM	15.32	LC30-T	2.7
KE6S7	16.26	KT-100B	8.21	KT3S4	15.25	KT5HTC-3	15.31	LD-110	1.29
KE6S8	16.26	KT-105B	8.21	KT3S7	15.25	KT5HTC-4	15.31	LD-16	1.29
KE6S8-2	16.26	KT-110B	8.21	KT3S8	15.25	KT5LTC-3	15.31	LD-26	1.29
KE6S9	16.26	KT1HTC-3	15.27	KT3S9	15.25	KT5LTC-4	15.31	LD-40	1.29
KE6S9-2	16.26	KT1HTC-4	15.27	KT3TN	15.26	KT5M2	15.29	LD-75	1.29
KE6SC	16.26	KT1LTC-3	15.27	KT3U1	15.25	KT5M4	15.29	LF75	1.30
KE6SP	16.27	KT1LTC-4	15.27	KT3U2	15.25	KT5M7	15.29	LK110	1.17
KE6TBA	16.26	KT2100-3	15.26	KT3U3	15.25	KT5M8	15.29	LK75-A	1.17
KE6TL3	16.31	KT2100-4	15.26	KT3U4	15.25	KT5MA	15.29	LK75-A1	1.17
KE6TL5	16.31	KT2AS-E	15.25	KT3U5	15.25	KT5MIR-HB	15.31	LP185	1.30
KE6TL7	16.31	KT2DIN	15.27	KT3U7	15.25	KT5MIR-PA	15.31	LP300	1.30
KE6TL8	16.31	KT2EF-3	15.26	KT3U8	15.25	KT5MIR-PB	15.31	LP460	1.30
KE6TL9	16.31	KT2EF-4	15.26	KT3VD-H	15.26	KT5MIR-PC	15.31	LP750	1.30
KE6TSM	16.26	KT2FPM	15.28	KT3VD-M	15.26	KT5MIR-PD	15.31	LS35P10B02	9.6
KE6U0	16.27	KT2HTC-3	15.27	KT3VD-S	15.26	KT5MIR-PE	15.31	LS35P10B11	9.6
KE6U1	16.27	KT2HTC-4	15.27	KT4100-2	15.30	KT5MIR-PF	15.31	LS35P10C11	9.6
KE6U2	16.27	KT2LTC-3	15.27	KT4100-2C	15.30	KT5MIR-VB	15.31	LS35P10D11	9.6
KE6U3	16.27	KT2LTC-4	15.27	KT4100-3	15.30	KT5PFEF	15.30	LS35P10L02	9.6
KE6U4	16.27	KT2PFF	15.27	KT4100-3C	15.30	KT5PFHR	15.30	LS35P10L20	9.6
KE6U5	16.27	KT2PMK	15.27	KT4100-4	15.30	KT5PFVR	15.30	LS35P11B02	9.6
KE6U6	16.27	KT2R-3	15.26	KT4100-4C	15.30	KT5PMK	15.30	LS35P11B02-R	9.90
KE6U7	16.27	KT2R-4	15.26	KT4250-2	15.30	KT5R-3	15.31	LS35P11B11	9.6
KE6U8	16.27	KT-300B	8.21	KT4250-2C	15.30	KT5R-4	15.31	LS35P11C11	9.6
KE6U9	16.27	KT-305B	8.21	KT4250-3	15.30	KT5RH	15.30	LS35P11D11	9.6
KE6UE01	16.27	KT3060-3	15.26	KT4250-3C	15.30	KT5RHW	15.30	LS35P11D11-R	9.90
KE6UE10	16.27	KT3060-4	15.26	KT4250-4	15.30	KT5S1	15.29	LS35P11L02	9.6
KH210-*	1.27	KT3100-3	15.26	KT4250-4C	15.30	KT5S2	15.29	LS35P11L02-R	9.90
KH210-*	1.27	KT3100-3C	15.26	KT4EF-3	15.31	KT5S3	15.29	LS35P11L20	9.6
KH300-*	1.27	KT3100-4	15.24	KT4EF-4	15.31	KT5S4	15.29	LS35P12B02-R	9.90
KH300-*	1.27	KT3100-4C	15.26	KT4FPM	15.32	KT5S7	15.29	LS35P12D11-R	9.90
KH800-*	1.27	KT-310B	8.21	KT4HTC-3	15.31	KT5S8	15.29	LS35P12L02-R	9.90
KH800-*	1.27	KT3150-3	15.26	KT4HTC-4	15.31	KT5S9	15.29	LS35P13B02	9.7
KP6-40B	8.18	KT3150-3C	15.26	KT4LTC-3	15.31	KT5SP4	15.29	LS35P13B02-R	9.90
KP6-40G	8.18	KT3150-4	15.26	KT4LTC-4	15.31	KT5SP8	15.29	LS35P13B11	9.7
KP6-40R	8.18	KT3150-4C	15.26	KT4PFEF	15.30	KT5TGD	15.31	LS35P13C11	9.7
KPR1-100B	8.19	KT3225-3	15.26	KT4PFHR	15.30	KT5U1	15.29	LS35P13D11	9.7
KPR1-100G	8.19	KT3225-3C	15.26	KT4PFVR	15.30	KT5U2	15.29	LS35P13D11-R	9.90
KPR1-100L	8.19	KT3225-4	15.26	KT4PMK	15.30	KT5U3	15.29	LS35P13L02	9.7
KPR1-100R	8.19	KT3225-4C	15.26	KT4R-3	15.31	KT5U4	15.29	LS35P13L02-R	9.90
KPR1-100W	8.19	KT3AS	15.25	KT4R-4	15.31	KT5U5	15.29	LS35P13L20	9.7
KPR1-100Y	8.19	KT3AS3	15.25	KT4TN	15.31	KT5U7	15.29	LS35P15B02	9.6
KPR1-101L	8.19	KT3AS3-AU	15.25	KT4WFEF	15.30	KT5U8	15.29	LS35P15B11	9.6
KPR1-101W	8.19	KT3DIN	15.27	KT4WFHR	15.30	KT5VD-H	15.30	LS35P15C11	9.6
KPR1-102W	8.19	KT3EF-3	15.26	KT4WFVR	15.30	KT5VD-M	15.30	LS35P15D11	9.6
KPR1-103G	8.19	KT3EF-4	15.26	KT5300-2	15.30	KT5VD-S	15.30	LS35P15L02	9.6
KPR1-103W	8.19	KT3FPM	15.28	KT5300-2C	15.30	KT5WFEF	15.30	LS35P15L20	9.6
KPR1-104B	8.19	KT3HTC-3	15.27	KT5300-3	15.30	KT5WFHR	15.30	LS35P16B02	9.6
KPR2-100B	8.19	KT3HTC-4	15.27	KT5300-3C	15.30	KT5WFVR	15.30	LS35P16B11	9.6
KPR2-100R	8.19	KT3LD	15.24	KT5300-4	15.30	KTR1-1001	8.23	LS35P16C11	9.6
KPR2-100W	8.19	KT3LDO	15.24	KT5300-4C	15.30	KTR1-1002	8.23	LS35P16D11	9.6
KPR2-105B	8.19	KT3LTC-3	15.27	KT5400-2	15.30	KTR1-1003	8.23	LS35P16L02	9.6
KPR2-105R	8.19	KT3LTC-4	15.27	KT5400-2C	15.30	KTR1-1003	8.23	LS35P16L20	9.6
KPR3-100B	8.19	KT3M1	15.23	KT5400-3	15.30	KTR1-1005	8.23	LS35P30B02	9.7
KPR3-100G	8.19	KT3M2	15.23	KT5400-3C	15.30	KTR1-1011	8.23	LS35P30B11	9.7
KPR3-100L	8.19	KT3MIF2	15.27	KT5400-4	15.30	KTR1-1012	8.23	LS35P30C11	9.7
KPR3-100R	8.19	KT3MIF3	15.27	KT5400-4C	15.30	KTR1-1013	8.23	LS35P30D11	9.7
KPR3-100W	8.19	KT3PC-12	15.27	KT5600-2	15.30	KTR1-1014	8.23	LS35P30L02	9.7
KPR3-100Y	8.19	KT3PC-12CK	15.27	KT5600-3	15.30	KTR1-2001	8.23	LS35P30L20	9.7
KPR3-101L	8.19	KT3PC-2CK	15.27	KT5600-4	15.30	KTR1-2002	8.23	LS35P31B02	9.7
KPR3-101W	8.19	KT3PC-3	15.27	KT5ADP-10	15.29	KTR1-2003	8.23	LS35P31B02-R	9.91
KPR3-102W	8.19	KT3PC-6	15.27	KT5ADP-12	15.29	KTR1-2004	8.23	LS35P31B11	9.7
KPR3-103G	8.19	KT3PC-6CK	15.27	KT5ADP-6	15.29	KTR1-2005	8.23	LS35P31C11	9.7
KPR3-103W	8.19	KT3PFF	15.27	KT5AS	15.29	KTR1-2011	8.23	LS35P31D11	9.7
KPR3-104B	8.19	KT3PMK	15.27	KT5AS3	15.29	KTR1-2012	8.23	LS35P31D11-R	9.91
KPR3-104BMR	8.19	KT3R-3	15.26	KT5AS3-AU	15.29	KTR1-2013	8.23	LS35P31L02	9.7
KPR4-100B	8.19	KT3R-4	15.26	KT5EF-3	15.31	KTR1-2014	8.23	LS35P31L02-R	9.91

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LS35P32B02	9.7	LS35P76D11-S	9.78	LS45M11L20	9.36	LS45M44D11	9.39	LS45P00B11	9.22
LS35P32B02-R	9.91	LS35P76L02-S	9.78	LS45M12B02	9.36	LS45M44L02	9.39	LS45P00C11	9.22
LS35P32B11	9.7	LS35P77C11-S	9.79	LS45M12B11	9.36	LS45M44L20	9.39	LS45P00D11	9.22
LS35P32C11	9.7	LS35P77D11-S	9.79	LS45M12C11	9.36	LS45M51B02	9.39	LS45P00L02	9.22
LS35P32D11	9.7	LS35P77L02-S	9.79	LS45M12D11	9.36	LS45M51B11	9.39	LS45P00L20	9.22
LS35P32D11-R	9.91	LS35P80C11-S	9.68	LS45M12L02	9.36	LS45M51C11	9.39	LS45P11B02	9.14
LS35P32L02	9.7	LS35P80C11-S	9.68	LS45M12L20	9.36	LS45M51D11	9.39	LS45P11B11	9.14
LS35P32L02-R	9.91	LS35P80C11-S	9.69	LS45M13B02	9.36	LS45M51L02	9.39	LS45P11C11	9.14
LS35P32L20	9.7	LS35P80C11-S	9.69	LS45M13B11	9.36	LS45M51L20	9.39	LS45P11D11	9.14
LS35P34B02	9.7	LS35P80C11-S	9.69	LS45M13C11	9.36	LS45M52B02	9.39	LS45P11L02	9.14
LS35P34B11	9.7	LS35P80C11-S	9.70	LS45M13D11	9.36	LS45M52B11	9.39	LS45P11L20	9.14
LS35P34C11	9.7	LS35P80C11-S	9.70	LS45M13L02	9.36	LS45M52C11	9.39	LS45P12B02	9.14
LS35P34D11	9.7	LS35P80D11-S	9.68	LS45M13L20	9.36	LS45M52D11	9.39	LS45P12B11	9.14
LS35P34L02	9.7	LS35P80D11-S	9.68	LS45M21B02	9.36	LS45M52L02	9.39	LS45P12C11	9.14
LS35P34L20	9.7	LS35P80D11-S	9.69	LS45M21B11	9.36	LS45M52L20	9.39	LS45P12D11	9.14
LS35P40B02	9.12	LS35P80D11-S	9.69	LS45M21C11	9.36	LS45M53B02	9.39	LS45P12L02	9.14
LS35P40B11	9.12	LS35P80D11-S	9.69	LS45M21D11	9.36	LS45M53B11	9.39	LS45P12L20	9.14
LS35P40C11	9.12	LS35P80D11-S	9.70	LS45M21L02	9.36	LS45M53C11	9.39	LS45P13B02	9.14
LS35P40D11	9.12	LS35P80D11-S	9.70	LS45M21L20	9.36	LS45M53D11	9.39	LS45P13B11	9.14
LS35P40L02	9.12	LS35P80L02-S	9.68	LS45M22B02	9.37	LS45M53L02	9.39	LS45P13C11	9.14
LS35P40L20	9.12	LS35P80L02-S	9.68	LS45M22B11	9.37	LS45M53L20	9.39	LS45P13D11	9.14
LS35P41B02	9.8	LS35P80L02-S	9.69	LS45M22C11	9.37	LS45M54B02	9.40	LS45P13L02	9.14
LS35P41B02-R	9.91	LS35P80L02-S	9.69	LS45M22D11	9.37	LS45M54B11	9.40	LS45P13L20	9.14
LS35P41B11	9.8	LS35P80L02-S	9.69	LS45M22L02	9.37	LS45M54C11	9.40	LS45P31B02	9.14
LS35P41C11	9.8	LS35P80L02-S	9.70	LS45M22L20	9.37	LS45M54D11	9.40	LS45P31B11	9.14
LS35P41D11	9.8	LS35P80L02-S	9.70	LS45M23B02	9.37	LS45M54L02	9.40	LS45P31C11	9.14
LS35P41D11-R	9.91	LS35P81C11-S	9.72	LS45M23B11	9.37	LS45M54L20	9.40	LS45P31D11	9.14
LS35P41L02	9.8	LS35P81C11-S	9.72	LS45M23C11	9.37	LS45M61B02	9.40	LS45P31L02	9.14
LS35P41L02-R	9.91	LS35P81C11-S	9.73	LS45M23D11	9.37	LS45M61B11	9.40	LS45P31L20	9.14
LS35P41L20	9.8	LS35P81C11-S	9.73	LS45M23L02	9.37	LS45M61C11	9.40	LS45P32B02	9.15
LS35P42B02	9.8	LS35P81C11-S	9.73	LS45M23L20	9.37	LS45M61D11	9.40	LS45P32B11	9.15
LS35P42B11	9.8	LS35P81C11-S	9.74	LS45M31B02	9.37	LS45M61L02	9.40	LS45P32C11	9.15
LS35P42C11	9.8	LS35P81C11-S	9.74	LS45M31B11	9.37	LS45M61L20	9.40	LS45P32D11	9.15
LS35P42D11	9.8	LS35P81D11-S	9.72	LS45M31C11	9.37	LS45M62B02	9.40	LS45P32L02	9.15
LS35P42L02	9.8	LS35P81D11-S	9.72	LS45M31D11	9.37	LS45M62B11	9.40	LS45P32L20	9.15
LS35P42L20	9.8	LS35P81D11-S	9.73	LS45M31L02	9.37	LS45M62C11	9.40	LS45P33B02	9.15
LS35P50B02	9.13	LS35P81D11-S	9.73	LS45M31L20	9.37	LS45M62D11	9.40	LS45P33B11	9.15
LS35P50B11	9.13	LS35P81D11-S	9.73	LS45M32B02	9.37	LS45M62L02	9.40	LS45P33C11	9.15
LS35P50C11	9.13	LS35P81D11-S	9.74	LS45M32B11	9.37	LS45M62L20	9.40	LS45P33D11	9.15
LS35P50D11	9.13	LS35P81D11-S	9.74	LS45M32C11	9.37	LS45M71B02	9.40	LS45P33L02	9.15
LS35P50L02	9.13	LS35P81L02-S	9.72	LS45M32D11	9.37	LS45M71B11	9.40	LS45P33L20	9.15
LS35P51B02	9.8	LS35P81L02-S	9.72	LS45M32L02	9.37	LS45M71C11	9.40	LS45P41B02	9.15
LS35P51B11	9.8	LS35P81L02-S	9.73	LS45M32L20	9.37	LS45M71D11	9.40	LS45P41B11	9.15
LS35P51C11	9.8	LS35P81L02-S	9.73	LS45M33B02	9.38	LS45M71L02	9.40	LS45P41C11	9.15
LS35P51D11	9.8	LS35P81L02-S	9.74	LS45M33B11	9.38	LS45M71L20	9.41	LS45P41D11	9.15
LS35P51L02	9.8	LS35P81L02-S	9.74	LS45M33C11	9.38	LS45M72B02	9.41	LS45P41L02	9.15
LS35P51L20	9.8	LS35P81L02-S	9.74	LS45M33D11	9.38	LS45M72B11	9.41	LS45P41L20	9.15
LS35P52B02	9.8	LS35P91B02	9.9	LS45M33L02	9.38	LS45M72C11	9.41	LS45P42B02	9.15
LS35P52B11	9.8	LS35P91B11	9.9	LS45M33L20	9.38	LS45M72D11	9.41	LS45P42B11	9.15
LS35P52C11	9.8	LS35P91C11	9.9	LS45M41B02	9.38	LS45M72L02	9.41	LS45P42C11	9.15
LS35P52D11	9.8	LS35P91D11	9.9	LS45M41B11	9.38	LS45M72L20	9.41	LS45P42D11	9.15
LS35P52L02	9.8	LS35P91L02	9.9	LS45M41C11	9.38	LS45M91B02	9.41	LS45P42L02	9.15
LS35P52L20	9.8	LS35P91L20	9.9	LS45M41D11	9.38	LS45M91B11	9.41	LS45P42L20	9.15
LS35P71B02	9.9	LS35P92B02	9.9	LS45M41L02	9.38	LS45M91C11	9.41	LS45P43B02	9.15
LS35P71B11	9.9	LS35P92C11	9.9	LS45M41L20	9.38	LS45M91D11	9.41	LS45P43B11	9.15
LS35P71C11	9.9	LS35P92D11	9.9	LS45M42B02	9.38	LS45M91L02	9.41	LS45P43C11	9.15
LS35P71D11	9.9	LS35P92D11	9.9	LS45M42B11	9.38	LS45M91L20	9.41	LS45P43D11	9.15
LS35P71L02	9.9	LS35P92L02	9.9	LS45M42C11	9.38	LS45M92B02	9.41	LS45P43L02	9.15
LS35P71L20	9.9	LS35P92L20	9.9	LS45M42D11	9.38	LS45M92B11	9.41	LS45P43L20	9.15
LS35P72B02	9.9	LS45M00B02	9.45	LS45M42L02	9.38	LS45M92C11	9.41	LS45P44B02	9.15
LS35P72B11	9.9	LS45M00B11	9.45	LS45M42L20	9.38	LS45M92D11	9.41	LS45P44B11	9.15
LS35P72C11	9.9	LS45M00C11	9.45	LS45M43B02	9.38	LS45M92L02	9.41	LS45P44C11	9.15
LS35P72D11	9.9	LS45M00D11	9.45	LS45M43B11	9.38	LS45M92L20	9.41	LS45P44D11	9.15
LS35P72L02	9.9	LS45M00L02	9.45	LS45M43C11	9.38	LS45M93B02	9.41	LS45P44L02	9.15
LS35P72L20	9.9	LS45M00L20	9.45	LS45M43D11	9.38	LS45M93B11	9.41	LS45P44L20	9.15
LS35P75C11-S	9.78	LS45M11B02	9.36	LS45M43L02	9.38	LS45M93C11	9.41	LS45P51B02	9.16
LS35P75D11-S	9.78	LS45M11B11	9.36	LS45M43L20	9.38	LS45M93D11	9.41	LS45P51B11	9.16
LS35P75L02-S	9.78	LS45M11C11	9.36	LS45M44B02	9.39	LS45M93L02	9.41	LS45P51C11	9.16
		LS45M11D11	9.36	LS45M44B11	9.39	LS45M93L20	9.41	LS45P51D11	9.16

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LS45P51L20	9.16	LS65M11D11	9.48	LS65M44B11	9.51	LS65M93L20	9.53	LSC40XB02	9.24
LS45P52B02	9.16	LS65M11L02	9.48	LS65M44C11	9.51	LSA30P03	9.68	LSC40XB02	9.47
LS45P52B11	9.16	LS65M11L20	9.48	LS65M44D11	9.51	LSA30P03	9.72	LSC40XB02	9.59
LS45P52C11	9.16	LS65M12B02	9.48	LS65M44L02	9.51	LSA30P04	9.68	LSC40XB11	9.24
LS45P52D11	9.16	LS65M12B11	9.48	LS65M44L20	9.51	LSA30P04	9.72	LSC40XB11	9.47
LS45P52L02	9.16	LS65M12C11	9.48	LS65M51B02	9.51	LSA30P05	9.13	LSC40XB11	9.59
LS45P52L20	9.16	LS65M12D11	9.48	LS65M51B11	9.51	LSA30P05	9.69	LSC40XC11	9.24
LS45P53B02	9.16	LS65M12L02	9.48	LS65M51C11	9.51	LSA30P05	9.73	LSC40XC11	9.47
LS45P53B11	9.16	LS65M12L20	9.48	LS65M51D11	9.51	LSA30P06	9.13	LSC40XC11	9.59
LS45P53C11	9.16	LS65M13B02	9.49	LS65M51L02	9.51	LSA30P06	9.69	LSC40XD11	9.24
LS45P53D11	9.16	LS65M13B11	9.49	LS65M51L20	9.51	LSA30P06	9.73	LSC40XD11	9.47
LS45P53L02	9.16	LS65M13C11	9.49	LS65M52B02	9.51	LSA30P07	9.69	LSC40XD11	9.59
LS45P53L20	9.16	LS65M13D11	9.49	LS65M52B11	9.51	LSA30P07	9.73	LSC40XL02	9.24
LS45P54B02	9.16	LS65M13L02	9.49	LS65M52C11	9.51	LSA30P08	9.70	LSC40XL02	9.47
LS45P54B11	9.16	LS65M13L20	9.49	LS65M52D11	9.51	LSA30P08	9.74	LSC40XL02	9.59
LS45P54C11	9.16	LS65M21B02	9.48	LS65M52L02	9.51	LSA30P09	9.70	LSC40XL20	9.24
LS45P54D11	9.16	LS65M21B11	9.48	LS65M52L20	9.51	LSA30P09	9.74	LSC40XL20	9.47
LS45P54L02	9.16	LS65M21C11	9.48	LS65M53B02	9.51	LSA30X41	9.13	LSC40XL20	9.59
LS45P54L20	9.16	LS65M21D11	9.48	LS65M53B11	9.51	LSA30X42	9.13	LSR1305	9.13
LS45P61B02	9.17	LS65M21L02	9.48	LS65M53C11	9.51	LSA30X51	9.13	LSTE11	9.45
LS45P61B11	9.17	LS65M21L20	9.48	LS65M53D11	9.51	LSA30X52	9.13	LSTE11	9.57
LS45P61C11	9.17	LS65M22B02	9.49	LS65M53L02	9.51	LSA30X71	9.13	LSTE12	9.45
LS45P61D11	9.17	LS65M22B11	9.49	LS65M53L20	9.51	LSA30X72	9.13	LSTE12	9.57
LS45P61L02	9.17	LS65M22C11	9.49	LS65M54B02	9.52	LSA30X73	9.13	LSTE13	9.45
LS45P61L20	9.17	LS65M22D11	9.49	LS65M54B11	9.52	LSA30X74	9.13	LSTE13	9.57
LS45P62B02	9.17	LS65M22L02	9.49	LS65M54C11	9.52	LSA40X41	9.23	LSTE21	9.45
LS45P62B11	9.17	LS65M22L20	9.49	LS65M54D11	9.52	LSA40X41	9.46	LSTE21	9.57
LS45P62C11	9.17	LS65M23B02	9.49	LS65M54L02	9.52	LSA40X41	9.58	LSTE22	9.45
LS45P62D11	9.17	LS65M23B11	9.49	LS65M54L20	9.52	LSA40X42	9.23	LSTE22	9.57
LS45P62L02	9.17	LS65M23C11	9.49	LS65M61B02	9.52	LSA40X42	9.46	LSTE23	9.45
LS45P62L20	9.17	LS65M23D11	9.49	LS65M61B11	9.52	LSA40X42	9.58	LSTE23	9.57
LS45P71B02	9.17	LS65M23L02	9.49	LS65M61C11	9.52	LSA40X43	9.23	LSTE31	9.45
LS45P71B11	9.17	LS65M23L20	9.49	LS65M61D11	9.52	LSA40X43	9.46	LSTE31	9.57
LS45P71C11	9.17	LS65M31B02	9.49	LS65M61L02	9.52	LSA40X43	9.58	LSTE32	9.45
LS45P71D11	9.17	LS65M31B11	9.49	LS65M61L20	9.52	LSA40X44	9.23	LSTE32	9.57
LS45P71L02	9.17	LS65M31C11	9.49	LS65M62B02	9.52	LSA40X44	9.46	LSTE33	9.45
LS45P71L20	9.17	LS65M31D11	9.49	LS65M62B11	9.52	LSA40X44	9.58	LSTE33	9.57
LS45P72B02	9.17	LS65M31L02	9.49	LS65M62C11	9.52	LSA40X51	9.24	LSTE40	9.46
LS45P72B11	9.17	LS65M31L20	9.49	LS65M62D11	9.52	LSA40X51	9.47	LSTE40	9.58
LS45P72C11	9.17	LS65M32B02	9.49	LS65M62L02	9.52	LSA40X51	9.58	LSTE41	9.46
LS45P72D11	9.17	LS65M32B11	9.49	LS65M62L20	9.52	LSA40X52	9.24	LSTE41	9.57
LS45P72L02	9.17	LS65M32C11	9.49	LS65M71B02	9.53	LSA40X52	9.47	LSTE42	9.46
LS45P72L20	9.17	LS65M32D11	9.49	LS65M71B11	9.53	LSA40X52	9.58	LSTE42	9.57
LS45P91B02	9.18	LS65M32L02	9.49	LS65M71C11	9.53	LSA40X53	9.24	LSTE43	9.46
LS45P91B11	9.18	LS65M32L20	9.49	LS65M71D11	9.53	LSA40X53	9.47	LSTE43	9.57
LS45P91C11	9.18	LS65M33B02	9.50	LS65M71L02	9.53	LSA40X53	9.58	LSTE44	9.46
LS45P91D11	9.18	LS65M33B11	9.50	LS65M71L20	9.53	LSA40X54	9.24	LSTE44	9.57
LS45P91L02	9.18	LS65M33C11	9.50	LS65M72B02	9.53	LSA40X54	9.47	LSTE50	9.47
LS45P91L20	9.18	LS65M33D11	9.50	LS65M72B11	9.53	LSA40X54	9.58	LSTE50	9.58
LS45P92B02	9.18	LS65M33L02	9.50	LS65M72C11	9.53	LSA40X61	9.24	LSTE51	9.46
LS45P92B02	9.18	LS65M33L20	9.50	LS65M72D11	9.53	LSA40X61	9.47	LSTE51	9.57
LS45P92B11	9.18	LS65M41B02	9.50	LS65M72L02	9.53	LSA40X61	9.58	LSTE52	9.46
LS45P92C11	9.18	LS65M41B11	9.50	LS65M72L20	9.53	LSA40X62	9.24	LSTE52	9.57
LS45P92D11	9.18	LS65M41C11	9.50	LS65M91B02	9.53	LSA40X62	9.47	LSTE53	9.46
LS45P92L02	9.18	LS65M41D11	9.50	LS65M91B11	9.53	LSA40X62	9.58	LSTE53	9.57
LS45P92L20	9.18	LS65M41L02	9.50	LS65M91C11	9.53	LSA40X71	9.24	LSTE54	9.46
LS45P93B11	9.18	LS65M41L20	9.50	LS65M91D11	9.53	LSA40X71	9.47	LSTE54	9.57
LS45P93C11	9.18	LS65M42B02	9.50	LS65M91L02	9.53	LSA40X71	9.58	LSTE61	9.46
LS45P93D11	9.18	LS65M42B11	9.50	LS65M91L20	9.53	LSA40X72	9.24	LSTE61	9.58
LS45P93L02	9.18	LS65M42C11	9.50	LS65M92B02	9.53	LSA40X72	9.47	LSTE62	9.46
LS45P93L20	9.18	LS65M42D11	9.50	LS65M92B11	9.53	LSA40X72	9.58	LSTE62	9.58
LS65M00B02	9.57	LS65M42L02	9.50	LS65M92C11	9.53	LSA40X73	9.24	LSTE71	9.46
LS65M00B11	9.57	LS65M42L20	9.50	LS65M92D11	9.53	LSA40X73	9.47	LSTE71	9.58
LS65M00C11	9.57	LS65M43B02	9.51	LS65M92L02	9.53	LSA40X73	9.58	LSTE72	9.46
LS65M00D11	9.57	LS65M43B11	9.51	LS65M92L20	9.53	LSC30XB02	9.13	LSTE72	9.58
LS65M00L02	9.57	LS65M43C11	9.51	LS65M93B02	9.53	LSC30XB11	9.13	LSTE73	9.46
LS65M00L20	9.57	LS65M43D11	9.51	LS65M93B11	9.53	LSC30XC11	9.13	LSTE73	9.58
LS65M11B02	9.48	LS65M43L02	9.51	LS65M93C11	9.53	LSC30XD11	9.13	LSTE91	9.46
LS65M11B11	9.48	LS65M43L20	9.51	LS65M93D11	9.53	LSC30XL02	9.13	LSTE91	9.58

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LSTE92	9.46	LW750	6.31	M2SSV2-10B	8.46	M3SS8-11G	8.15	MCBH-00	8.7
LSTE92	9.58	LX185	1.29	M2SSV2-10R	8.46	M3SS8-11L	8.15	MCBH-00	8.8
LSTE93	9.46	LX185	6.31	M2SSV2-11G	8.46	M3SS8-11R	8.15	MCBH-00	8.10
LSTE93	9.58	LX300	1.29	M2SSV2-11R	8.46	M3SS8-11Y	8.15	MCBH-00	8.11
LSTH11	9.22	LX300	6.31	M2SSV2-11Y	8.46	M3SSK1-10	8.16	MCBH-00	8.12
LSTH12	9.22	LX460	1.29	M2SSV3-10B	8.46	M3SSK2-10	8.16	MCBH-00	8.13
LSTH13	9.22	LX460	6.31	M2SSV3-10R	8.46	M3SSK3-10	8.16	MCBH-00	8.14
LSTH14	9.22	LX750	1.29	M2SSV3-11G	8.46	M3SSK4-10	8.16	MCBH-00	8.16
LSTH19	9.22	LX750	6.31	M2SSV3-11R	8.46	M3SSK5-10	8.16	MCBH-00	8.17
LSTH31	9.22	LY110	1.30	M2SSV3-11Y	8.46	M3SSV1-10B	8.47	MCBH-00	8.22
LSTH32	9.22	LY185	1.30	M3SS1-10B	8.13	M3SSV1-10R	8.47	MCBH-001	8.20
LSTH33	9.22	LY460	1.30	M3SS1-10R	8.13	M3SSV1-11G	8.47	MCBH-002	8.20
LSTH35	9.22	LY750	1.30	M3SS1-10U	8.13	M3SSV1-11R	8.47	MCBH-003	8.20
LSTH36	9.22	LYA300	1.30	M3SS1-11C	8.15	M3SSV1-11Y	8.47	MCBH-01	8.4
LSTH37	9.22	M2SS1-10B	8.12	M3SS1-11G	8.15	M3SSV2-10B	8.47	MCBH-01	8.10
LSTH40	9.23	M2SS1-10R	8.12	M3SS1-11L	8.15	M3SSV2-10R	8.47	MCBH-01	8.11
LSTH41	9.23	M2SS1-10U	8.12	M3SS1-11R	8.15	M3SSV2-11G	8.47	MCBH-01	8.12
LSTH42	9.23	M2SS1-11C	8.14	M3SS1-11Y	8.15	M3SSV2-11R	8.47	MCBH-01	8.13
LSTH43	9.23	M2SS1-11G	8.14	M3SS2-10B	8.13	M3SSV2-11Y	8.47	MCBH-01	8.17
LSTH44	9.23	M2SS1-11L	8.14	M3SS2-10R	8.13	M3SSV3-10B	8.47	MCBH-01	8.22
LSTH50	9.24	M2SS1-11R	8.14	M3SS2-10U	8.13	M3SSV3-10R	8.47	MCBH-011	8.5
LSTH51	9.23	M2SS1-11Y	8.14	M3SS2-11C	8.15	M3SSV3-11G	8.47	MCBH-011	8.10
LSTH52	9.23	M2SS2-10B	8.12	M3SS2-11G	8.15	M3SSV3-11R	8.47	MCBH-011	8.11
LSTH53	9.23	M2SS2-10R	8.12	M3SS2-11L	8.15	M3SSV3-11Y	8.47	MCBH-011	8.14
LSTH54	9.23	M2SS2-10U	8.12	M3SS2-11R	8.15	MA5-2005	8.45	MCBH-011	8.22
LSTH61	9.23	M2SS2-11C	8.14	M3SS2-11Y	8.15	MB-3PD	14.22	MCBH-02	8.4
LSTH62	9.23	M2SS2-11G	8.14	M3SS3-10B	8.13	MB-CL	14.22	MCBH-02	8.6
LSTH71	9.23	M2SS2-11L	8.14	M3SS3-10R	8.13	MCB-01	8.4	MCBH-02	8.10
LSTH72	9.23	M2SS2-11R	8.14	M3SS3-10U	8.13	MCB-01	8.5	MCBH-02	8.11
LSTH73	9.23	M2SS2-11Y	8.14	M3SS3-11C	8.15	MCB-01	8.6	MCBH-02	8.12
LSTH91	9.23	M2SS3-10B	8.12	M3SS3-11G	8.15	MCB-01	8.7	MCBH-02	8.13
LSTH92	9.23	M2SS3-10R	8.12	M3SS3-11L	8.15	MCB-01	8.8	MCBH-02	8.16
LSTH93	9.23	M2SS3-10U	8.12	M3SS3-11R	8.15	MCB-01	8.10	MCBH-02	8.17
LT185-AC	1.29	M2SS3-11C	8.14	M3SS3-11Y	8.15	MCB-01	8.11	MCBH-02	8.22
LT185-AC	6.31	M2SS3-11G	8.14	M3SS4-10B	8.13	MCB-01	8.12	MCBH-021	8.5
LT185-AL	1.29	M2SS3-11L	8.14	M3SS4-10R	8.13	MCB-01	8.13	MCBH-021	8.7
LT185-AL	6.31	M2SS3-11R	8.14	M3SS4-10U	8.13	MCB-01	8.14	MCBH-021	8.8
LT185-AY	1.29	M2SS3-11Y	8.14	M3SS4-11C	8.15	MCB-01	8.16	MCBH-021	8.10
LT185-AY	2.7	M2SS4-10B	8.12	M3SS4-11G	8.15	MCB-01	8.17	MCBH-021	8.11
LT200A185	2.7	M2SS4-10R	8.12	M3SS4-11L	8.15	MCB-01	8.18	MCBH-021	8.14
LT200E	2.22	M2SS4-10U	8.12	M3SS4-11R	8.15	MCB-01	8.22	MCBH-021	8.22
LT300-AC	1.29	M2SS4-11C	8.14	M3SS4-11Y	8.15	MCB-01B	8.45	MCBH-03	8.22
LT300-AC	6.31	M2SS4-11G	8.14	M3SS5-10B	8.13	MCB-01BG	8.45	MCBH-10	8.4
LT300-AL	1.29	M2SS4-11L	8.14	M3SS5-10R	8.13	MCB-01G	8.22	MCBH-10	8.10
LT300-AL	6.31	M2SS4-11R	8.14	M3SS5-10U	8.13	MCB-02	8.22	MCBH-10	8.11
LT300-AY	1.29	M2SS4-11Y	8.14	M3SS5-11C	8.15	MCB-02B	8.45	MCBH-10	8.12
LT320E	2.22	M2SS5-10B	8.12	M3SS5-11G	8.15	MCB-10	8.4	MCBH-10	8.13
LT460-AC	1.29	M2SS5-10R	8.12	M3SS5-11L	8.15	MCB-10	8.5	MCBH-10	8.17
LT460-AC	6.31	M2SS5-10U	8.12	M3SS5-11R	8.15	MCB-10	8.6	MCBH-10	8.22
LT460-AC	6.31	M2SS5-11C	8.14	M3SS5-11Y	8.15	MCB-10	8.7	MCBH-101	8.5
LT460-AL	1.29	M2SS5-11G	8.14	M3SS6-10B	8.13	MCB-10	8.8	MCBH-101	8.10
LT460-AL	6.31	M2SS5-11L	8.14	M3SS6-10R	8.13	MCB-10	8.10	MCBH-101	8.11
LT460-AL	6.31	M2SS5-11R	8.14	M3SS6-10U	8.13	MCB-10	8.11	MCBH-101	8.14
LT500E	2.22	M2SS5-11Y	8.14	M3SS6-11C	8.15	MCB-10	8.12	MCBH-101	8.22
LT6-B	4.12	M2SS6-10B	8.12	M3SS6-11G	8.15	MCB-10	8.13	MCBH-11	8.4
LT750-AC	1.29	M2SS6-10R	8.12	M3SS6-11L	8.15	MCB-10	8.14	MCBH-11	8.6
LT750-AC	6.31	M2SS6-10U	8.12	M3SS6-11R	8.15	MCB-10	8.16	MCBH-11	8.10
LT750-AL	1.29	M2SS6-11C	8.14	M3SS6-11Y	8.15	MCB-10	8.17	MCBH-11	8.11
LT750-AL	6.31	M2SS6-11G	8.14	M3SS7-10B	8.13	MCB-10	8.18	MCBH-11	8.12
LT800E	2.22	M2SS6-11L	8.14	M3SS7-10R	8.13	MCB-10	8.22	MCBH-11	8.13
LW110	1.29	M2SS6-11R	8.14	M3SS7-10U	8.13	MCB-10B	8.45	MCBH-11	8.16
LW110	6.31	M2SS6-11Y	8.14	M3SS7-11C	8.15	MCB-10BG	8.45	MCBH-11	8.17
LW-110	1.29	M2SSK1-10	8.16	M3SS7-11G	8.15	MCB-10G	8.22	MCBH-11	8.22
LW185	1.29	M2SSK2-10	8.16	M3SS7-11L	8.15	MCB-11	8.22	MCBH-111	8.5
LW185	6.31	M2SSK3-10	8.16	M3SS7-11R	8.15	MCB-11B	8.45	MCBH-111	8.7
LW300	1.29	M2SSV1-10B	8.46	M3SS7-11Y	8.15	MCB-20	8.22	MCBH-111	8.8
LW300	6.31	M2SSV1-10R	8.46	M3SS8-10B	8.13	MCB-20B	8.45	MCBH-111	8.10
LW460	1.29	M2SSV1-11G	8.46	M3SS8-10R	8.13	MCBH-00	8.4	MCBH-111	8.11
LW460	6.31	M2SSV1-11R	8.46	M3SS8-10U	8.13	MCBH-00	8.5	MCBH-111	8.14
LW750	1.29	M2SSV1-11Y	8.46	M3SS8-11C	8.15	MCBH-00	8.6	MCBH-111	8.22

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MCBH-12	8.22	MP1-KLRPT2*	8.9	MP4-11C	8.5	MPD5-11Y	8.7	MP-NPE29-03	8.57
MCBH-20	8.4	MP1-KLTPN2*	8.9	MP4-11G	8.5	MPD6-11B	8.6	MP-NPE29-04	8.57
MCBH-20	8.6	MP1-KLTPT1*	8.9	MP4-11L	8.5	MPD6-11C	8.7	MP-NPE29-05	8.57
MCBH-20	8.10	MP1-KLTPT2*	8.9	MP4-11R	8.5	MPD6-11G	8.7	MP-NPE29-06	8.57
MCBH-20	8.11	MP1-KLTPT3*	8.9	MP4-11W	8.5	MPD6-11R	8.7	MP-NPE29-07	8.57
MCBH-20	8.12	MP1-KLTPT4*	8.9	MP4-11Y	8.5	MPD6-11Y	8.7	MP-NPE29B-01	8.57
MCBH-20	8.13	MP1-KLTPT5*	8.9	MPD1-11B	8.6	MPD7-11B	8.6	MP-NPE29B-02	8.57
MCBH-20	8.16	MP1-KLTPT6*	8.9	MPD1-11C	8.7	MPD7-11C	8.7	MP-NPE29B-03	8.57
MCBH-20	8.17	MP1-KLTPT7*	8.9	MPD1-11G	8.7	MPD7-11G	8.7	MP-NPE29B-04	8.57
MCBH-20	8.22	MP1-KLTPT8*	8.9	MPD1-11R	8.7	MPD7-11R	8.7	MP-NPE29B-05	8.57
MCBH-201	8.5	MP1-KLTPTL2*	8.9	MPD1-11Y	8.7	MPD7-11Y	8.7	MP-NPE29B-06	8.57
MCBH-201	8.7	MP1-KLTPTL3*	8.9	MPD12-11B	8.6	MPD8-11B	8.6	MP-NPE29B-07	8.57
MCBH-201	8.8	MP1-KLTPTL4*	8.9	MPD12-11C	8.8	MPD8-11C	8.7	MP-NPE29BA-01	8.57
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NF800P-6P8A	18.139	OEMO003/220VDC	18.41	OESA250B3PL1	18.104	OESA-ZX197	18.93	OETL-NF600A-FC	18.37
NF800X-2PB4A	18.137	OEMO003/220VDC	18.108	OESA250B4PL1	18.104	OESA-ZX1-J4T6	18.92	OETL-NF600A-S	18.34
NF800X-3B6A	18.141	OEMO003/230VAC	18.41	OESA250D1PL	18.105	OESA-ZX1-J6T6	18.92	OETL-NF600A2SW	18.26
NF800X-3MB4A	18.142	OEMO003/230VAC	18.108	OESA250D2PL	18.105	OESA-ZX1-L8T6	18.92	OETL-NF600ASW	18.9
NF800X-3PB4A	18.134	OEMO003/240VAC	18.41	OESA250D3PL	18.105	OESAZX1-S10	18.102	OETL-NF800A2SW	18.26

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OETL-NF800A-FC	18.37	OHB145J12	18.9	OHB95L10	15.93	OHY80L6	18.87	OMNX80	11.13
OETL-NF800ASW	18.26	OHB145J12	18.82	OHG125J10	15.93	OHZX1	18.27	OMPBP1	11.13
OETL-NF800ASW	18.9	OHB145L12	18.26	OHG125L10	15.93	OHZX10	18.88	OMPG1	11.13
OETL-ZK19	18.24	OHB145L12	18.30	OHG175J10	15.93	OHZX3	18.27	OMSA2PB	11.12
OETL-ZK19	18.89	OHB145L12	18.91	OHG175L10	15.93	OHZX3	18.32	OMSE158PB	11.10
OETL-ZT 80A*	18.28	OHB175J10	15.93	OHG95J10	15.30	OHZX5	18.21	OMSE2PB	11.12
OETL-ZT 80L*	18.28	OHB175J12	18.26	OHG95J10	15.93	OHZX6	18.17	OMSEA10PB	11.12
OETL-ZT100	18.28	OHB175J12	18.30	OHG95L10	15.30	OL40A1PB	11.3	OMSO21PB	11.6
OETL-ZT80A	18.94	OHB175J12	18.91	OHG95L10	15.93	OL40A2PB	11.3	OMSO22PB	11.6
OETL-ZT80A*	18.32	OHB175J12E16	18.40	OHY125J12	18.26	OL40A3PB	11.3	OMSO23PB	11.6
OETL-ZT80L	18.94	OHB175L10	15.93	OHY125J12	18.91	OL40A4PB	11.3	OMSO24PB	11.6
OETL-ZT80L*	18.32	OHB175L12	18.26	OHY145J12	18.26	OL40A5PB	11.3	OMSO31PB	11.6
OETL-ZW12	18.29	OHB175L12	18.30	OHY145J12	18.30	OL40A6PB	11.3	OMSO32PB	11.6
OETL-ZW12	18.33	OHB175L12	18.91	OHY145J12	18.34	OL40P12PB	11.10	OMSO33PB	11.6
OETL-ZW12	18.95	OHB1AH1	18.10	OHY145J12	18.91	OL40SDEPB	11.22	OMSO34PB	11.6
OETL-ZW13	18.29	OHB1PH	18.17	OHY145J12	18.96	OL40SDEPB	11.10	OMSO41PB	11.6
OETL-ZW13	18.33	OHB1RH	18.17	OHY145L12	18.26	OL40SO101PB	11.9	OMSO42PB	11.6
OETL-ZW13	18.95	OHB2AJ	5.5	OHY145L12	18.30	OL40SO111PB	11.9	OMSO43PB	11.6
OETL-ZW14	18.29	OHB2AJ	5.13	OHY145L12	18.91	OL40SO31PB	11.6	OMSO51PB	11.7
OETL-ZW14	18.95	OHB2AJ	5.17	OHY175J12	18.26	OL40SO61PB	11.7	OMSO52PB	11.7
OETL-ZW15	18.29	OHB2AJ	18.10	OHY175J12	18.30	OL40SO62PB	11.7	OMST301PB	11.10
OETL-ZW15	18.33	OHB2AJ	18.83	OHY175J12	18.91	OL40SO63PB	11.7	OMST31PB	11.6
OETL-ZW15	18.95	OHB2AJ1	18.10	OHY175L12	18.26	OL40SO71PB	11.8	OMST32PB	11.6
OETL-ZW16	18.13	OHB2AJ1	18.83	OHY175L12	18.30	OL40SO81PB	11.8	OMST33PB	11.6
OETL-ZW16	18.21	OHB2AJ1	18.9	OHY175L12	18.91	OL40SO91PB	11.8	OMST34PB	11.6
OETL-ZW16	18.89	OHB2AJ1	18.82	OHY1AH1	18.10	OL40ST101PB	11.9	OMST41PB	11.6
OETL-ZW24	18.14	OHB2AJ1	18.82	OHY1PH	18.17	OL40ST111PB	11.9	OMST42PB	11.6
OETL-ZW3	18.29	OHB2AJE011	18.16	OHY1RH	18.17	OL40ST121PB	11.9	OMST43PB	11.6
OETL-ZW3	18.95	OHB2PJ	18.17	OHY2AJ	5.5	OL40ST301PB	11.10	OMST51PB	11.7
OETL-ZW5	18.28	OHB2PJ	18.9	OHY2AJ	5.13	OL40ST61PB	11.7	OMST52PB	11.7
OETL-ZW5	18.32	OHB2RJ	18.17	OHY2AJ	5.17	OL40ST62PB	11.7	OMU1KB	11.5
OETL-ZW5	18.94	OHB3AH1	18.10	OHY2AJ	18.10	OL40ST63PB	11.7	OMU1PB	11.4
OETL-ZW9	18.29	OHB3PH	18.17	OHY2AJ	18.83	OL40ST71PB	11.8	OMU2PB	11.4
OETL-ZW9	18.33	OHB3RH	18.17	OHY2AJ1	18.10	OL40ST81PB	11.8	OMU3KB	11.5
OETL-ZW9	18.95	OHB4	18.87	OHY2AJ1	18.83	OL40ST91PB	11.8	OMU3PB	11.4
OETL-ZX108	18.28	OHB45J5	18.11	OHY2AJE011	18.16	OL40U1PB	11.4	OMU4PB	11.4
OETL-ZX108	18.32	OHB45J5	18.84	OHY2PJ	18.17	OL40U2PB	11.4	OMURR1PB	11.5
OETL-ZX108	18.94	OHB5	18.84	OHY2RJ	18.17	OL40U3PB	11.4	OMURR3PB	11.5
OETL-ZX114	18.31	OHB65J5	18.11	OHY3AH1	18.10	OL40U4PB	11.4	OMV30PB	11.11
OETL-ZX115	18.31	OHB65J5	18.15	OHY3PH	18.17	OL40URR1PB	11.5	OMV32PB	11.11
OETL-ZX119	18.31	OHB65J5	18.34	OHY3RH	18.17	OL40URR2PB	11.5	OMV3PB	11.11
OETL-ZX200A	18.36	OHB65J5	18.84	OHY45J5	18.11	OL40URR3PB	11.5	OMVN30PB	11.11
OETL-ZX58	18.13	OHB65J5	18.96	OHY45J5	18.84	OL40W3PB	11.10	OMVN3PB	11.11
OETL-ZX74	18.34	OHB65J5	18.9	OHY65J5	18.11	OL40WS1PB	11.5	OMWS1PB	11.5
OETL-ZX74	18.96	OHB65J5	18.9	OHY65J5	18.15	OL40WS2PB	11.5	OMWS2PB	11.5
OETL-ZX800A	18.27	OHB65J5	18.82	OHY65J5	18.34	OL40WS3PB	11.5	OMWS3PB	11.5
OETL-ZX94	18.27	OHB65J5E011	18.16	OHY65J5	18.84	OL40WS4PB	11.5	OMWS4PB	11.5
OETL-ZX95	18.21	OHB65J5T	18.84	OHY65J5	18.96	OLZ21	11.14	OMX99	11.13
OETL-ZX95	18.24	OHB65J6	18.15	OHY65J5E011	18.16	OLZ31	11.14	OMXB1	11.13
OETL-ZX95	18.28	OHB65J6	18.20	OHY65J5T	18.84	OMA01KB	11.4	OMXNB1	11.13
OETL-ZX95	18.32	OHB65J6	18.87	OHY65J6	15.26	OMA01PB	11.4	ONA01KB	11.4
OETL-ZX95	18.89	OHB65L5	18.11	OHY65J6	18.15	OMA02PB	11.4	ONA01M	11.4
OETL-ZX95	18.94	OHB65L5	18.15	OHY65J6	18.20	OMA03KB	11.4	ONA01PB	11.4
OEZNP1	18.21	OHB65L5	18.84	OHY65J6	18.87	OMA03PB	11.4	ONA02M	11.4
OFM240	18.107	OHB65L5E011	18.16	OHY65L5	18.11	OMA04PB	11.4	ONA02PB	11.4
OFM600	18.107	OHB80J6	18.15	OHY65L5	18.15	OMA05PB	11.4	ONA03KB	11.4
OFMZ2	18.107	OHB80J6	18.20	OHY65L5	18.84	OMA06PB	11.4	ONA03M	11.4
OFMZ4	18.107	OHB80J6	18.23	OHY65L5E011	18.16	OMA1KB	11.3	ONA03PB	11.4
OFS240	18.107	OHB80J6	18.34	OHY7	18.11	OMA1PB	11.3	ONA04PB	11.4
OFS600	18.107	OHB80J6	18.87	OHY80J6	18.15	OMA2PB	11.3	ONA05PB	11.4
OHB125J10	15.93	OHB80J6	18.96	OHY80J6	18.20	OMA3KB	11.3	ONA06M	11.4
OHB125J12	18.26	OHB80J6	18.82	OHY80J6	18.23	OMA3PB	11.3	ONA06PB	11.4
OHB125J12	18.91	OHB80J8	18.34	OHY80J6	18.34	OMA4PB	11.3	ONA1KB	11.3
OHB125L10	15.93	OHB80L6	18.15	OHY80J6	18.87	OMA5PB	11.3	ONA1M	11.3
OHB13	18.20	OHB80L6	18.20	OHY80J6	18.96	OMA6PB	11.3	ONA1PB	11.3
OHB145J12	18.26	OHB80L6	18.23	OHY80J8	18.34	OMAU31PB	11.12	ONA2EPB	11.22
OHB145J12	18.30	OHB80L6	18.87	OHY80L6	15.26	OMF101	11.13	ONA2EZB	11.22
OHB145J12	18.34	OHB95J10	15.30	OHY80L6	18.15	OMFB72	11.13	ONA2M	11.3
OHB145J12	18.91	OHB95J10	15.93	OHY80L6	18.20	OMFG72	11.13	ONA2PB	11.3

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ONA3EZB	11.22	ONST33PB	11.6	OPY2EN1	18.19	OS30AJS30	18.96	OSC32B4F1	18.101
ONA3KB	11.3	ONST34PB	11.6	OS100B01	18.104	OS32B12	18.104	OSC32F314	18.101
ONA3M	11.3	ONST51PB	11.7	OS100B11	18.104	OS32B12A1	18.104	OSC32F414	18.101
ONA3PB	11.3	ONST52PB	11.7	OS100B12	18.104	OS32B12A2	18.104	OSC35D302	18.101
ONA4EPB	11.22	ONST61PB	11.7	OS100B13	18.104	OS32B12F1	18.104	OSC35D402	18.101
ONA4EZB	11.22	ONST62PB	11.7	OS100F03	18.106	OS32B22A1F	18.104	OSC50F3	18.101
ONA4PB	11.3	ONST63PB	11.7	OS100F04F	18.106	OS32B22A1N1	18.104	OSC50F4	18.101
ONA5EPB	11.22	ONST71PB	11.8	OS100F04N1	18.106	OS32B22A2N1	18.104	OSC60J3	18.88
ONA5EZB	11.22	ONST81PB	11.8	OS100J03	18.87	OS32B22F1N1	18.104	OSC60J3	18.101
ONA5PB	11.3	ONST91PB	11.8	OS100J03	18.82	OS32B22N1	18.104	OSC60J4	18.88
ONA6EPB	11.22	ONU1EPB	11.22	OS100J03-FC	18.99	OS32D12	18.105	OSC60J4	18.101
ONA6EZB	11.22	ONU1KB	11.5	OS100J04F	18.87	OS32D22F	18.105	OSC63B3	18.101
ONA6M	11.3	ONU1M	11.4	OS100-J1T6	18.89	OS32D22N1	18.105	OSC63B4	18.101
ONA6PB	11.3	ONU1PB	11.4	OS100JF30	18.97	OS32F1214	18.106	OSC63D3	18.101
ONA8EPB	11.22	ONU2M	11.4	OS100JS30	18.96	OS32F2214F	18.106	OSC63D4	18.101
ONA8EZB	11.22	ONU2PB	11.4	OS125D01	18.105	OS32F2214N1	18.106	OSC63F3	18.101
ONA9EPB	11.22	ONU3KB	11.5	OS125D11	18.105	OS32M12	18.101	OSC63F4	18.101
ONA9EPB	11.22	ONU3M	11.4	OS125D12	18.105	OS32M22F	18.101	OSJ100B8-150	18.82
ONAU31M	11.12	ONU3PB	11.4	OS125D22F	18.105	OS32M22N1	18.101	OSJ100B8-150	18.82
ONAU31PB	11.12	ONU4M	11.4	OS125D22N1	18.105	OS32MS30	18.101	OSJ30B2A1-180	18.82
ONAU32PB	11.12	ONU4PB	11.4	OS125F03	18.106	OS32MS40F	18.101	OSJ30B2A1-180	18.82
ONF 101	11.13	ONUR139M	11.12	OS125F04F	18.106	OS32MS40N1	18.101	OSJ30B6-150	18.82
ONFB72	11.13	ONUR139PB	11.12	OS125F04N1	18.106	OS32RD12	18.103	OSJ30B6-150	18.82
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ONPB1	11.13	ONV30PB	11.11	OS160B13	18.104	OS60J12	18.87	OSJ600B6-150	18.82
ONPG1	11.13	ONV32PB	11.11	OS160D01	18.105	OS60J12	18.82	OSKJ200B8-290	18.82
ONSA2PB	11.12	ONV3M	11.11	OS160D11	18.105	OS60J12-FC	18.99	OSKJ200B8-290	18.82
ONSDPEB	11.10	ONV3PB	11.11	OS160D12	18.105	OS60J22F	18.87	OSL800B4-280	18.82
ONSDPEB	11.22	ONVN30M	11.11	OS160D22F	18.105	OS60JF30	18.97	OSL800B4-280	18.82
ONSE158M	11.10	ONVN30PB	11.11	OS160D22N1	18.105	OS60JS30	18.96	OSNF100-S	18.34
ONSE158PB	11.10	ONVN3M	11.11	OS160RD03	18.103	OS63B12	18.104	OSNF30-S	18.34
ONSE2PB	11.12	ONVN3PB	11.11	OS160RD0380	18.103	OS63B22N1	18.104	OSNF60-S	18.34
ONSEA10M	11.12	ONW3EPB	11.22	OS160RD04	18.103	OS63D12	18.105	OSS160T1	18.88
ONSEA10PB	11.12	ONW3PB	11.10	OS160RD0480	18.103	OS63D22F	18.105	OSS160T3	18.88
ONSEA1PB	11.12	ONWS1M	11.5	OS160RF0327	18.103	OS63D22N1	18.105	OSS160T3	18.98
ONSO101PB	11.9	ONWS1PB	11.5	OS160RF0427	18.103	OS63F12	18.106	OSS200G1L/3	18.88
ONSO111PB	11.9	ONWS2M	11.5	OS200J02	18.87	OS63F22F	18.106	OSS200G1L/4	18.88
ONSO21M	11.6	ONWS2PB	11.5	OS200J03	18.87	OS63RD12	18.103	OSS200G1S/3	18.88
ONSO21PB	11.6	ONWS3M	11.5	OS200J03	18.82	OS63RD22	18.103	OSS200G1S/4	18.88
ONSO22PB	11.6	ONWS3PB	11.5	OS200J03-FC	18.99	OS63RF1214	18.103	OSV200BK	18.87
ONSO23PB	11.6	ONWS4M	11.5	OS200J04	18.87	OS63RF2214	18.103	OSVY200BK	18.87
ONSO24PB	11.6	ONWS4PB	11.5	OS200J11	18.87	OS63X12	18.101	OSZ1	18.89
ONSO31M	11.6	ONX30	11.13	OS200J12	18.87	OS63X22F	18.101	OSZ2	18.89
ONSO31PB	11.6	ONX99	11.13	OS200J13	18.87	OS63X22N1	18.101	OSZ4	18.85
ONSO32PB	11.6	ONXB1	11.13	OS200J22	18.87	OS63XS30	18.101	OSZ4	18.98
ONSO33PB	11.6	ONZ10L2	11.13	OS20B12A1	18.104	OS63XS40F	18.101	OT100B2A1-180	18.8
ONSO34PB	11.6	ONZ10L4	11.13	OS20B22A1F	18.104	OS63XS40N1	18.101	OT100B2A1-180	18.9
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ONSO43PB	11.6	ONZ20RY	11.13	OS25F2210F	18.106	OSC25F310	18.101	OT100E3	18.10
ONSO51PB	11.7	ONZ74	11.14	OS25F2210N1	18.106	OSC25F410	18.101	OT100E3	18.9
ONSO52PB	11.7	OPB1	18.13	OS25RF1210	18.103	OSC30ACC3	18.101	OT100E3	18.9
ONSO61PB	11.7	OPB1	18.19	OS25RF2210	18.103	OSC30ACC4	18.101	OT100E3C	18.16
ONSO62PB	11.7	OPB1EN1	18.13	OS30ACC12	18.83	OSC30AJ3	18.101	OT100E3-F	18.35
ONSO63PB	11.7	OPB1EN1	18.19	OS30ACC12	18.82	OSC30AJ4	18.101	OT100E6	18.15
ONSO71PB	11.8	OPB2	18.13	OS30ACC12	18.82	OSC30B2A1-180	18.82	OT100ET3	18.17
ONSO81PB	11.8	OPB2	18.19	OS30ACC12-FC	18.99	OSC30B2A1-180	18.82	OT100ET3	18.9
ONSO91PB	11.8	OPB2EN1	18.13	OS30ACC22F	18.83	OSC30B6-150	18.82	OT100ET3	18.9
ONST101PB	11.9	OPB2EN1	18.19	OS30ACCF30	18.97	OSC30B6-150	18.82	OT100ET3P	18.8
ONST111PB	11.9	OPY1	18.13	OS30ACCS30	18.96	OSC32B3A1	18.101	OT100ET3P	18.9
ONST121PB	11.9	OPY1	18.19	OS30AJ12	18.83	OSC32B3A2	18.101	OT100ET3S	18.8
ONST301M	11.10	OPY1EN1	18.13	OS30AJ12	18.82	OSC32B3E1	18.101	OT100ET3S	18.9
ONST301PB	11.10	OPY1EN1	18.19	OS30AJ12	18.82	OSC32B3F1	18.101	OT1200B4-280	18.8
ONST31M	11.6	OPY2	18.13	OS30AJ12-FC	18.99	OSC32B4A1	18.101	OT1200B4-280	18.9

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OT160ET3	18.20	OT32ET3S	18.8	OTK400B4-280	18.8	OTZW10	18.90	OVR 65 440 s P	14.67
OT160ET3	18.9	OT32ET3S	18.9	OTK400B4-280	18.9	OTZW17	18.14	OVR 65 440 s P TS	14.67
OT160ET3P	18.8	OT400U011	18.26	OTPA116A2P1	5.4	OTZW17X	18.14	OVR 65 550 s	14.67
OT160ET3P	18.9	OT400U02	18.26	OTPA116L2P1	5.4	OTZW25	18.90	OVR 65 660 s	14.67
OT16B2A1-180	18.8	OT400U03	18.26	OTPA325A2P1	5.13	OTZW25X	18.90	OWC5DSH1	18.86
OT16B2A1-180	18.9	OT400U03	18.9	OTPA325B2P1	5.13	OTZW26	18.90	OWC5DSH1X	18.86
OT16B6-170	18.8	OT400U03-FC	18.37	OTPD125ED	18.18	OTZW6	18.14	OWC5DSH2	18.86
OT16B6-170	18.9	OT400U12	18.26	OTPD125EP	18.12	OTZW6X	18.14	OWC5DSH2X	18.86
OT16E3	18.10	OT400U13	18.26	OTPD32ED	18.18	OTZW8	18.14	OWM5DS1	18.86
OT16E3	18.9	OT400U22	18.26	OTPD32EP	18.12	OVR 100 275 s P	14.67	OWM5DS2	18.86
OT16E3	18.9	OT400U04	18.26	OTPD60EP	18.12	OVR 100 275 s P TS	14.67	OWP5DS1	18.86
OT16E3C	18.16	OT45B2A1-180	18.8	OTPD63ED	18.18	OVR 100 320 s P	14.67	OWP5DS2	18.86
OT16E6	18.15	OT45B2A1-180	18.9	OTPD63EP	18.12	OVR 100 320 s P TS	14.67	OXN250	18.24
OT16ET3	18.17	OT45B6-170	18.8	OTPE125ED	18.18	OVR 100 440 s	14.67	OXN250	18.89
OT16ET3	18.9	OT45B6-170	18.9	OTPE125EP	18.12	OVR 100 440 s P	14.67	OXN400	18.27
OT16ET3S	18.8	OT45E3	18.10	OTPE160EP	18.21	OVR 100 440 s P TS	14.67	OXN10X148	15.30
OT2000M8-325	18.8	OT45E3	18.9	OTPE32ED	18.18	OVR 15 150	14.67	OXN10X225	15.30
OT2000M8-325	18.9	OT45E3	18.9	OTPE32EP	18.12	OVR 15 150 s P	14.67	OXN10X500	15.30
OT200U02	18.23	OT45E3C	18.16	OTPE63ED	18.18	OVR 15 275	14.67	OXN10X220	18.92
OT200U03	18.23	OT45E6	18.15	OTPE63EP	18.12	OVR 15 275 P TS	14.67	OXN10X250	18.92
OT200U03	18.9	OT45ET3	18.17	OTPL125ED	18.18	OVR 15 320	14.67	OXN10X250	18.92
OT200U03-FC	18.37	OT45ET3	18.9	OTPL125EP	18.12	OVR 15 440	14.67	OXN10X280	18.26
OT200U04	18.23	OT45ET3S	18.8	OTPL32ED	18.18	OVR 15 440 P	14.67	OXN10X280	18.30
OT200U11	18.23	OT45ET3S	18.9	OTPL32EP	18.12	OVR 15 550	14.67	OXN10X280	18.40
OT200U12	18.23	OT600B4-280	18.8	OTPL63ED	18.18	OVR 15 660	14.67	OXN10X280	18.92
OT200U13	18.23	OT600B4-280	18.9	OTPL63EP	18.12	OVR 1N 15 150	14.68	OXN10X280	18.92
OT200U22	18.23	OT60B2A1-180	18.8	OTPN125ED	18.18	OVR 1N 15 150 s P TS	14.68	OXN10X280	18.9
OT25B2A1-180	18.8	OT60B2A1-180	18.9	OTPN125EP	18.12	OVR 1N 40 150 s P	14.68	OXN10X280	18.82
OT25B2A1-180	18.9	OT60B6-170	18.8	OTPN160EP	18.21	OVR 1N 40 150 s P TS	14.68	OXN10X280-45	18.26
OT25B6-170	18.8	OT60B6-170	18.9	OTPN32ED	18.18	OVR 1N 65 150 s P	14.68	OXN10X280-45	18.31
OT25B6-170	18.9	OT60E3	18.10	OTPN32EP	18.12	OVR 3L 15 275 P	14.68	OXN10X280-45	18.92
OT25E3	18.10	OT60E3	18.9	OTPN63ED	18.18	OVR 3L 40 275 s P	14.68	OXN10X280-45	18.92
OT25E3	18.9	OT60E3	18.9	OTPN63EP	18.12	OVR 3L 65 275 s P	14.68	OXN12X325	18.26
OT25E3	18.9	OT60E3C	18.16	OTPS125ED	18.18	OVR 3N 100 320 s P	14.68	OXN12X325	18.30
OT25E3C	18.16	OT60E3-F	18.35	OTPS125EP	18.12	OVR 3N 100 320 s P TS	14.68	OXN12X325	18.30
OT25E6	18.15	OT60E6	18.15	OTPS160EP	18.21	OVR 3N 15 150	14.68	OXN12X325	18.34
OT25ET3	18.17	OT60ET3	18.17	OTPS32ED	18.18	OVR 3N 15 275	14.68	OXN12X325	18.40
OT25ET3	18.9	OT60ET3	18.9	OTPS32EP	18.12	OVR 3N 15 320	14.68	OXN12X325	18.92
OT25ET3S	18.8	OT60ET3S	18.9	OTPS60EP	18.12	OVR 3N 40 150 s P TS	14.68	OXN12X325	18.92
OT25ET3S	18.9	OT60ET3P	18.8	OTPS63ED	18.18	OVR 3N 40 275 s P	14.68	OXN12X325	18.96
OT30B2A1-180	18.8	OT60ET3P	18.9	OTPS63EP	18.12	OVR 3N 40 320 P	14.68	OXN12X325	18.9
OT30B2A1-180	18.9	OT60ET3S	18.8	OTS125T1	18.13	OVR 3N 40 320 s P	14.68	OXN12X325-45	18.26
OT30B6-170	18.8	OT60ET3S	18.9	OTS125T1	18.19	OVR 3N 40 320 s P TS	14.68	OXN12X325-45	18.31
OT30B6-170	18.9	OT63B2A1-180	18.8	OTS125T3	18.13	OVR 3N 40 440 s P	14.68	OXN12X325-45	18.31
OT30E3	18.10	OT63B2A1-180	18.9	OTS125T3	18.19	OVR 3N 65 150 s P	14.68	OXN12X325-45	18.92
OT30E3	18.9	OT63B6-170	18.8	OTS125T3	18.36	OVR 3N 65 150 s P TS	14.68	OXN12X395	18.26
OT30E3	18.9	OT63B6-170	18.9	OTS250G1L/3	18.24	OVR 3N 65 275 s P	14.68	OXN12X395	18.30
OT30E3C	18.16	OT63E3	18.10	OTS250G1L/4	18.24	OVR 3N 65 320 s P	14.68	OXN12X395	18.30
OT30E3-F	18.35	OT63E3	18.9	OTS250G1S/3	18.24	OVR 3N 65 320 s P TS	14.68	OXN12X395	18.40
OT30E6	18.15	OT63E3	18.9	OTS250G1S/4	18.24	OVR 3N 65 440 s P	14.68	OXN12X395	18.92
OT30ET3	18.17	OT63E3C	18.16	OTS32T1	18.13	OVR 40 150 s P	14.67	OXN12X395	18.92
OT30ET3	18.9	OT63E6	18.15	OTS32T1	18.19	OVR 40 150 s P TS	14.67	OXN12X465	18.26
OT30ET3	18.9	OT63ET3	18.17	OTS32T3	18.13	OVR 40 275 P	14.67	OXN12X465	18.30
OT30ET3P	18.8	OT63ET3	18.9	OTS32T3	18.19	OVR 40 275 s P	14.67	OXN12X465	18.30
OT30ET3P	18.9	OT63ET3S	18.8	OTS400G1L/3	18.27	OVR 40 275 s P TS	14.67	OXN12X465	18.40
OT30ET3S	18.8	OT63ET3S	18.9	OTS400G1L/4	18.27	OVR 40 320 P	14.67	OXN12X465	18.92
OT30ET3S	18.9	OT800B4-280	18.8	OTS400G1S/3	18.27	OVR 40 320 s P	14.67	OXN12X465	18.92
OT3150M8-325	18.8	OT800B4-280	18.9	OTS400G1S/4	18.27	OVR 40 320 s P TS	14.67	OXN12X465-45	18.26
OT3150M8-325	18.9	OTC25M25	11.22	OTS63T1	18.13	OVR 40 440	14.67	OXN12X465-45	18.31
OT32B2A1-180	18.8	OTC26M25	11.22	OTS63T1	18.19	OVR 40 440 s P	14.67	OXN12X465-45	18.31
OT32B2A1-180	18.9	OTC35M25	11.22	OTS63T3	18.13	OVR 40 440 s P TS	14.67	OXN12X465-45	18.92
OT32B6-170	18.8	OTC36LM25	11.22	OTS63T3	18.19	OVR 40 550	14.67	OXN12X465-45	18.92

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OXF5X170	18.34	OXS5X120	18.16	OZXA-28/3P	18.38	P142L2-48M	6.5	P250DB1-60D	6.6
OXF5X170	18.84	OXS5X120	18.83	OZXA-30	18.27	P142L2-60M	6.5	P250DF1-48F	6.6
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OXF5X265	18.15	OXS5X180	5.13	OZXA-32	18.38	P175D1-48	6.5	P250L2-60M	6.5
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OXF6X130-45	18.20	OZXA-175/400	18.38	OZXX-2	18.39	P18D2-48M	6.5	P300LB1-48A	6.6
OXF6X130-45	18.23	OZXA-175/400	18.92	OZXX-2	18.93	P18D2-60M	6.5	P300LB1-60Z	6.6
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OXF6X150	18.20	OZXA-200	18.38	OZXX-3	18.31	P18DF1-48B	6.6	P30D1-48	6.5
OXF6X150	18.23	OZXA-200	18.88	OZXX-3	18.39	P18DF1-60B	6.6	P30D1-60	6.5
OXF6X150	18.87	OZXA-200	18.100	OZXX-3	18.93	P18L1-48	6.5	P30D2-48M	6.5
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OXF6X210	18.23	OZXA-200/3P	18.100	OZXX-4	18.93	P18LB1-48E	6.6	P30DF1-48C	6.6
OXF6X210	18.34	OZXA-206	18.24	OZXX-5	18.27	P18LB1-60E	6.6	P30DF1-60C	6.6
OXF6X210	18.87	OZXA-206	18.38	OZXX-5	18.31	P18LF1-48A	6.6	P30L1-48	6.5
OXF6X210	18.96	OZXA-206	18.88	OZXX-5	18.39	P18LF1-60A	6.6	P30L1-60	6.5
OXF6X210	18.9	OZXA-206	18.100	OZXX-5	18.93	P1-ES	8.42	P30L2-48M	6.5
OXF6X210-45	18.20	OZXA-24	18.34	OZXX-6	18.27	P1-HOA	8.42	P30L2-60M	6.5
OXF6X210-45	18.23	OZXA-24	18.88	OZXX-6	18.31	P2-1HOARL	8.42	P30LB1-48J	6.6
OXF6X210-45	18.87	OZXA-24	18.96	OZXX-6	18.39	P2-1OORL	8.42	P30LB1-60J	6.6
OXF6X290	18.15	OZXA-24	18.98	OZXX-6	18.93	P22D1-48	6.5	P30LF1-48B	6.6
OXF6X290	18.20	OZXA-24	18.100	P105D1-48	6.5	P22D1-60	6.5	P30LF1-60B	6.6
OXF6X290	18.23	OZXA-25	18.34	P105D1-60	6.5	P22D2-48M	6.5	P3-1ESHOARL	8.42
OXF6X290	18.87	OZXA-25	18.36	P105D2-48M	6.5	P22D2-60M	6.5	P3-1HOARLGL	8.42
OXF6X290	18.82	OZXA-25	18.96	P105D2-60M	6.5	P22DB1-48K	6.6	P3-1HOASRL	8.42
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OXF6X290-45	18.23	OZXA-26	18.34	P105DF1-60X	6.6	P22DF1-48B	6.6	P3-1SSRL	8.42
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OXF6X360	18.15	OZXA-26	18.96	P105DF1-60E	6.6	P22L1-48	6.5	P37D1-60	6.5
OXF6X360	18.20	OZXA-26	18.100	P105L1-48	6.5	P22L1-60	6.5	P37D2-48M	6.5
OXF6X360	18.23	OZXA-26/3P	18.92	P105L1-60	6.5	P22L2-48M	6.5	P37D2-60M	6.5
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P37LB1-60K	6.6	P60LB1-60N	6.6	PEB-300-24	6.59	PS3/12/16BP	14.19	PSS250/430-500F	6.4
P37LF1-48B	6.6	P60LF1-48C	6.6	PEB-300-48	6.59	PS3/18/16BP	14.19	PSS250/430-500F	6.4
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P4-1HOARLYLGL	8.43	P72D2-60M	6.5	PEB-400-24	6.59	PS3-2-0	5.13	PSS25-480B	6.3
P4-1HOASRLGL	8.43	P72DB1-48T	6.6	PEB-400-48	6.59	PS3-2-1	5.13	PSS25-600B	6.3
P4-1OORLYLGL	8.43	P72DB1-60T	6.6	PEB-400-48-1	6.60	PS3-2-2	5.13	PSS30/52-500F	6.4
P4-1SSRGL	8.43	P72DF1-48D	6.6	PEB-400-60	6.59	PS3-3-0	5.13	PSS30/52-500F	6.4
P44D1-48	6.5	P72DF1-60D	6.6	PEB-400-60-1	6.60	PS3-3-1	5.13	PSS30/52-690F	6.4
P44D1-60	6.5	P72L1-48	6.5	PEB-550-24	6.59	PS3-4-0	5.13	PSS30/52-690F	6.4
P44D2-48M	6.5	P72L1-60	6.5	PEB-550-24	6.59	PS3-4-1	5.13	PSS300/515-500F	6.4
P44D2-60M	6.5	P72L2-48M	6.5	PEB-550-48	6.59	PS3-4-2	5.13	PSS300/515-500F	6.4
P44DB1-48R	6.6	P72L2-60M	6.5	PEB-550-48-1	6.60	PS3-5-0	5.13	PSS300/515-690F	6.4
P44DB1-60R	6.6	P72LB1-48R	6.6	PEB-550-60	6.59	PS3-5-1	5.13	PSS37/64-500F	6.4
P44DF1-48C	6.6	P72LB1-60R	6.6	PEB-550-60-1	6.60	PS4/58/16NSP	14.20	PSS37/64-500F	6.4
P44DF1-60C	6.6	P72LF1-48C	6.6	PEB-800-24	6.59	PS4/60/16SP	14.19	PSS37/64-690F	6.4
P44L1-48	6.5	P72LF1-60C	6.6	PEB-800-24	6.59	PS4-2-0	5.16	PSS37/64-690F	6.4
P44L1-60	6.5	P85D1-48	6.5	PEB-800-48	6.59	PS4-2-2	5.16	PSS44/76-500F	6.4
P44L2-48M	6.5	P85D1-60	6.5	PEB-800-48-1	6.60	PS4-3-0	5.16	PSS44/76-500F	6.4
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P44LB1-60L	6.6	P85DB1-48V	6.6	PG16-1/2 NPT	5.13	PS4-4-2	5.16	PSS50/85-500F	6.4
P44LF1-48C	6.6	P85DB1-60X	6.6	PG16-1/2NPT	5.4	PSCT-100	6.8	PSS50/85-500F	6.4
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P484R10	20.15	P85L1-48	6.5	PR111/P-A-LSI	16.26	PSCT-200	6.8	PSS60/105-500F	6.4
P484R15	20.15	P85L1-60	6.5	PR111/P-A-LSIG	16.26	PSCT-250	6.8	PSS60/105-500F	6.4
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P484R20	20.15	P85L2-60M	6.5	PR111/P-LSI	16.26	PSCT-400	6.8	PSS60/105-690F	6.4
P484R21	20.15	P85LB1-48S	6.6	PR111/P-LSIG	16.26	PSCT-50	6.8	PSS72/124-500F	6.4
P484R22.5	20.15	P85LF1-48D	6.6	PR112/P-A-LSI	16.26	PSCT-60	6.8	PSS72/124-500F	6.4
P484R25	20.15	P85LF1-60D	6.6	PR112/P-A-LSIG	16.26	PSCT-60	6.8	PSS72/124-690F	6.4
P484R27	20.15	PEB-010-24	6.59	PR112/PD-A-LSI	16.26	PSCT-75	6.8	PSS72/124-690F	6.4
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P484R30	20.15	PEB-010-48	6.59	PR112/PD-LSI	16.26	PS-ENDSP	14.23	PSS85/147-500F	6.4
P484R4	20.15	PEB-010-48-1	6.60	PR112/PD-LSIG	16.26	PSLK-185	6.8	PSS85/147-690F	6.4
P484R5	20.15	PEB-010-60	6.59	PR112/P-LSI	16.26	PSLK-185	6.31	PSS85/147-690F	6.4
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P50LF1-48C	6.6	PEB-1000-60	6.59	PS1-3-0	5.5	PSS12-400B	6.3	PST44-600-70	6.25
P50LF1-60C	6.6	PEB-1000-60-1	6.60	PS1-3-1	5.5	PSS12-480B	6.3	PST44-600-70	6.25
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P60D1-60	6.5	PEB-100-24	6.59	PS1-4-0	5.5	PSS142/245-500F	6.4	PST50-600-70	6.25
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S3H225TW	15.67	S3LQ070TW	15.68	S4E-1	15.99	S500-H11	14.40	S501UC-B50	14.38
S3H225TW-2	15.67	S3LQ080TW	15.68	S4E-3R12	15.99	S500-H20	14.40	S501UC-B6	14.38
S3HQ015TW	15.68	S3LQ090TW	15.68	S4H100BW	15.71	S500-K1	14.22	S501UC-B63	14.38
S3HQ020TW	15.68	S3LQ100TW	15.68	S4H100BW-2	15.71	S500-K2	14.40	S501UC-K0.15	14.39
S3HQ025TW	15.68	S3LQ125TW	15.68	S4H100CW	15.71	S500-ME1	14.22	S501UC-K0.21	14.39
S3HQ030TW	15.68	S3LQ150TW	15.68	S4H100CW-2	15.71	S500-ME1	14.40	S501UC-K0.3	14.39
S3HQ035TW	15.68	S3LQ175TW	15.68	S4H100EW	15.71	S500-ME2	14.22	S501UC-K0.42	14.39
S3HQ040TW	15.68	S3LQ200TW	15.68	S4H100MW	15.73	S500-ME2	14.40	S501UC-K0.58	14.39
S3HQ050TW	15.68	S3LQ225TW	15.68	S4H100MW-2	15.73	S500-ME3	14.22	S501UC-K0.8	14.39
S3HQ060TW	15.68	S3-M3	5.13	S4H250BW	15.71	S500-ME3	14.40	S501UC-K1.1	14.39
S3HQ070TW	15.68	S3N003MW	15.69	S4H250BW-2	15.71	S500-RD3	14.40	S501UC-K1.5	14.39
S3HQ080TW	15.68	S3N005MW	15.69	S4H250CW	15.71	S500-S02	14.40	S501UC-K11	14.39
S3HQ090TW	15.68	S3N010MW	15.69	S4H250CW-2	15.71	S500-S11	14.40	S501UC-K15	14.39
S3HQ100TW	15.68	S3N015TW	15.67	S4H250DW	15.73	S500-S20	14.40	S501UC-K2.1	14.39
S3HQ125TW	15.68	S3N015TW-2	15.67	S4H250EW	15.71	S501-B10	14.36	S501UC-K20	14.39
S3HQ150TW	15.68	S3N020TW	15.67	S4H250MW	15.73	S501-B13	14.36	S501UC-K26	14.39
S3HQ175TW	15.68	S3N020TW-2	15.67	S4H250MW-2	15.73	S501-B16	14.36	S501UC-K3	14.39
S3HQ200TW	15.68	S3N025MW	15.69	S4HQ100BW	15.72	S501-B20	14.36	S501UC-K32	14.39
S3HQ225TW	15.68	S3N025TW	15.67	S4HQ100CW	15.72	S501-B25	14.36	S501UC-K37	14.39
S3L003MW	15.69	S3N025TW-2	15.67	S4HQ100EW	15.72	S501-B32	14.36	S501UC-K4.2	14.39
S3L005MW	15.69	S3N030TW	15.67	S4HQ250BW	15.72	S501-B40	14.36	S501UC-K41	14.39
S3L010MW	15.69	S3N030TW-2	15.67	S4HQ250CW	15.72	S501-B50	14.36	S501UC-K45	14.39
S3L015TW	15.67	S3N035TW	15.67	S4HQ250EW	15.72	S501-B6	14.36	S501UC-K5.8	14.39
S3L015TW-2	15.67	S3N035TW-2	15.67	S4L100BW	15.71	S501-B63	14.36	S501UC-K8	14.39
S3L020TW	15.67	S3N040TW	15.67	S4L100BW-2	15.71	S501-C10	14.36	S502-B10	14.36
S3L020TW-2	15.67	S3N040TW-2	15.67	S4L100CW	15.71	S501-C13	14.36	S502-B13	14.36
S3L025MW	15.69	S3N050MW	15.69	S4L100CW-2	15.71	S501-C16	14.36	S502-B16	14.36
S3L025TW	15.67	S3N050TW	15.67	S4L100EW	15.71	S501-C20	14.36	S502-B20	14.36
S3L025TW-2	15.67	S3N050TW-2	15.67	S4L100MW	15.73	S501-C25	14.36	S502-B25	14.36
S3L030TW	15.67	S3N060TW	15.67	S4L100MW-2	15.73	S501-C32	14.36	S502-B32	14.36
S3L030TW-2	15.67	S3N060TW-2	15.67	S4L250BW	15.71	S501-C40	14.36	S502-B40	14.36
S3L035TW	15.67	S3N070TW	15.67	S4L250BW-2	15.71	S501-C50	14.36	S502-B50	14.36
S3L035TW-2	15.67	S3N070TW-2	15.67	S4L250CW	15.71	S501-C6	14.36	S502-B6	14.36
S3L040TW	15.67	S3N080TW	15.67	S4L250CW-2	15.71	S501-C63	14.36	S502-B63	14.36
S3L040TW-2	15.67	S3N080TW-2	15.67	S4L250EW	15.71	S501-D13	14.36	S502-C10	14.36
S3L050MW	15.69	S3N090TW	15.67	S4L250MW	15.73	S501-D16	14.36	S502-C13	14.36
S3L050TW	15.67	S3N090TW-2	15.67	S4L250MW-2	15.73	S501-D20	14.36	S502-C16	14.36
S3L050TW-2	15.67	S3N100MW	15.69	S4LQ100BW	15.72	S501-D25	14.36	S502-C20	14.36
S3L060TW	15.67	S3N100TW	15.67	S4LQ100CW	15.72	S501-D32	14.36	S502-C25	14.36
S3L060TW-2	15.67	S3N100TW-2	15.67	S4LQ100EW	15.72	S501-D40	14.36	S502-C32	14.36
S3L070TW	15.67	S3N125MW	15.69	S4LQ250BW	15.72	S501-D50	14.36	S502-C40	14.36
S3L070TW-2	15.67	S3N125TW	15.67	S4LQ250CW	15.72	S501-D63	14.36	S502-C50	14.36
S3L080TW	15.67	S3N125TW-2	15.67	S4LQ250EW	15.72	S501-K0.15	14.37	S502-C6	14.36
S3L080TW-2	15.67	S3N150MW	15.69	S4-M1	5.16	S501-K0.21	14.37	S502-C63	14.36
S3L090TW	15.67	S3N150TW	15.67	S4N100BW	15.71	S501-K0.3	14.37	S502-D13	14.36
S3L090TW-2	15.67	S3N150TW-2	15.67	S4N100BW-2	15.71	S501-K0.42	14.37	S502-D16	14.36
S3L100MW	15.69	S3N175TW	15.67	S4N100CW	15.71	S501-K0.58	14.37	S502-D20	14.36
S3L100TW	15.67	S3N175TW-2	15.67	S4N100CW-2	15.71	S501-K0.8	14.37	S502-D25	14.36
S3L100TW-2	15.67	S3N200TW	15.67	S4N100EW	15.71	S501-K1.1	14.37	S502-D32	14.36
S3L125MW	15.69	S3N200TW-2	15.67	S4N100MW	15.73	S501-K1.5	14.37	S502-D40	14.36
S3L125TW	15.67	S3N225TW	15.67	S4N100MW-2	15.73	S501-K11	14.37	S502-D50	14.36
S3L125TW-2	15.67	S3N225TW-2	15.67	S4N250BW	15.71	S501-K15	14.37	S502-D63	14.36
S3L150MW	15.69	S3NK225	15.99	S4N250BW-2	15.71	S501-K2.1	14.37	S502-K0.15	14.37
S3L150TW	15.67	S3NQ015TW	15.68	S4N250CW	15.71	S501-K20	14.37	S502-K0.21	14.37
S3L150TW-2	15.67	S3NQ020TW	15.68	S4N250CW-2	15.71	S501-K26	14.37	S502-K0.3	14.37
S3L175TW	15.67	S3NQ025TW	15.68	S4N250EW	15.71	S501-K3	14.37	S502-K0.42	14.37

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S502-K0.8	14.37	S503-D25	14.36	S504UC-K0.42	14.39	S6H600BW-2	15.79	S6NQ800BW	15.80
S502-K1.1	14.37	S503-D32	14.36	S504UC-K0.58	14.39	S6H600CW	15.79	S6NQ800CW	15.80
S502-K1.5	14.37	S503-D40	14.36	S504UC-K0.8	14.39	S6H600CW-2	15.79	S6NQ800EW	15.80
S502-K11	14.37	S503-D50	14.36	S504UC-K1.1	14.39	S6H600DW	15.81	S7D1000W	15.85
S502-K15	14.37	S503-D63	14.36	S504UC-K1.5	14.39	S6H600EW	15.79	S7D1250W	15.85
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S502-K20	14.37	S503-K0.21	14.37	S504UC-K15	14.39	S6H600MW-2	15.81	S7E-3R12	15.99
S502-K26	14.37	S503-K0.3	14.37	S504UC-K2.1	14.39	S6H600TW	15.79	S7H1000BW	15.83
S502-K3	14.37	S503-K0.42	14.37	S504UC-K20	14.39	S6H600TW-2	15.79	S7H1000BW-2	15.83
S502-K32	14.37	S503-K0.58	14.37	S504UC-K26	14.39	S6H800BW	15.79	S7H1000CW	15.83
S502-K37	14.37	S503-K0.8	14.37	S504UC-K3	14.39	S6H800BW-2	15.79	S7H1000CW-2	15.83
S502-K4.2	14.37	S503-K1.1	14.37	S504UC-K32	14.39	S6H800CW	15.79	S7H1000DW	15.85
S502-K41	14.37	S503-K1.5	14.37	S504UC-K37	14.39	S6H800CW-2	15.79	S7H1000EW	15.83
S502-K45	14.37	S503-K11	14.37	S504UC-K4.2	14.39	S6H800DW	15.81	S7H1000MW	15.85
S502-K5.8	14.37	S503-K15	14.37	S504UC-K41	14.39	S6H800EW	15.79	S7H1000MW-2	15.85
S502-K8	14.37	S503-K2.1	14.37	S504UC-K45	14.39	S6H800MW	15.81	S7H1200BW	15.83
S502UC-B10	14.38	S503-K20	14.37	S504UC-K5.8	14.39	S6H800MW-2	15.81	S7H1200BW-2	15.83
S502UC-B13	14.38	S503-K26	14.37	S504UC-K8	14.39	S6H800TW	15.79	S7H1200CW	15.83
S502UC-B16	14.38	S503-K3	14.37	S5E-1	15.99	S6H800TW-2	15.79	S7H1200CW-2	15.83
S502UC-B20	14.38	S503-K32	14.37	S5E-3R12	15.99	S6HQ600BW	15.80	S7H1200DW	15.85
S502UC-B25	14.38	S503-K37	14.37	S5H300TW	15.75	S6HQ600CW	15.80	S7H1200EW	15.83
S502UC-B32	14.38	S503-K4.2	14.37	S5H300TW-2	15.75	S6HQ600EW	15.80	S7H1200MW	15.85
S502UC-B40	14.38	S503-K41	14.37	S5H400BW	15.75	S6HQ800BW	15.80	S7H1200MW-2	15.85
S502UC-B50	14.38	S503-K45	14.37	S5H400BW-2	15.75	S6HQ800CW	15.80	S7HQ1000BW	15.84
S502UC-B6	14.38	S503-K5.8	14.37	S5H400CW	15.75	S6HQ800EW	15.80	S7HQ1000CW	15.84
S502UC-B63	14.38	S503-K8	14.37	S5H400CW-2	15.75	S6L600BW	15.79	S7HQ1000EW	15.84
S502UC-K0.15	14.39	S503UC-B10	14.38	S5H400DW	15.77	S6L600BW-2	15.79	S7HQ1200BW	15.84
S502UC-K0.21	14.39	S503UC-B13	14.38	S5H400EW	15.75	S6L600CW	15.79	S7HQ1200CW	15.84
S502UC-K0.3	14.39	S503UC-B16	14.38	S5H400MW	15.77	S6L600CW-2	15.79	S7HQ1200EW	15.84
S502UC-K0.42	14.39	S503UC-B20	14.38	S5H400MW-2	15.77	S6L600EW	15.79	S7NK1200	15.99
S502UC-K0.58	14.39	S503UC-B25	14.38	S5H400TW	15.75	S6L600MW	15.81	S8ES250-1	15.99
S502UC-K0.8	14.39	S503UC-B32	14.38	S5H400TW-2	15.75	S6L600MW-2	15.81	S8ES250-3R12	15.99
S502UC-K1.1	14.39	S503UC-B40	14.38	S5HQ400BW	15.76	S6L600TW	15.79	S8V16CW	15.87
S502UC-K1.5	14.39	S503UC-B50	14.38	S5HQ400CW	15.76	S6L600TW-2	15.79	S8V16DW	15.87
S502UC-K11	14.39	S503UC-B6	14.38	S5HQ400EW	15.76	S6L800BW	15.79	S8V16EW	15.87
S502UC-K15	14.39	S503UC-B63	14.38	S5L300TW	15.75	S6L800BW-2	15.79	S8V16MW	15.87
S502UC-K2.1	14.39	S503UC-K0.15	14.39	S5L300TW-2	15.75	S6L800CW	15.79	S8V20CW	15.87
S502UC-K20	14.39	S503UC-K0.21	14.39	S5L400BW	15.75	S6L800CW-2	15.79	S8V20DW	15.87
S502UC-K26	14.39	S503UC-K0.3	14.39	S5L400BW-2	15.75	S6L800EW	15.79	S8V20EW	15.87
S502UC-K3	14.39	S503UC-K0.42	14.39	S5L400CW	15.75	S6L800MW	15.81	S8V20MW	15.87
S502UC-K32	14.39	S503UC-K0.58	14.39	S5L400CW-2	15.75	S6L800TW	15.79	S8V25CW	15.87
S502UC-K37	14.39	S503UC-K0.8	14.39	S5L400EW	15.75	S6L800TW-2	15.79	S8V25DW	15.87
S502UC-K4.2	14.39	S503UC-K1.1	14.39	S5L400MW	15.77	S6LQ600BW	15.80	S8V25EW	15.87
S502UC-K41	14.39	S503UC-K1.5	14.39	S5L400MW-2	15.77	S6LQ600CW	15.80	S8V25MW	15.87
S502UC-K45	14.39	S503UC-K11	14.39	S5L400TW	15.75	S6LQ600EW	15.80	S8VQ16CW	15.87
S502UC-K5.8	14.39	S503UC-K15	14.39	S5L400TW-2	15.75	S6LQ800BW	15.80	S8VQ16EW	15.87
S502UC-K8	14.39	S503UC-K2.1	14.39	S5LQ400BW	15.76	S6LQ800CW	15.80	S8VQ20CW	15.87
S503-B10	14.36	S503UC-K20	14.39	S5LQ400CW	15.76	S6LQ800EW	15.80	S8VQ20EW	15.87
S503-B13	14.36	S503UC-K26	14.39	S5LQ400EW	15.76	S6N600BW	15.79	SA1	14.22
S503-B16	14.36	S503UC-K3	14.39	S5N300TW	15.75	S6N600BW-2	15.79	SA2	14.22
S503-B20	14.36	S503UC-K32	14.39	S5N300TW-2	15.75	S6N600CW	15.79	SA450	5.17
S503-B25	14.36	S503UC-K37	14.39	S5N400BW	15.75	S6N600CW-2	15.79	SD-PZ1	14.23
S503-B32	14.36	S503UC-K4.2	14.39	S5N400BW-2	15.75	S6N600EW	15.79	SD-PZ2	14.23
S503-B40	14.36	S503UC-K41	14.39	S5N400CW	15.75	S6N600MW	15.81	SK 516 540-2	8.55
S503-B50	14.36	S503UC-K45	14.39	S5N400CW-2	15.75	S6N600MW-2	15.81	SK 615 502-B	8.45
S503-B6	14.36	S503UC-K5.8	14.39	S5N400EW	15.75	S6N600TW	15.79	SK 615 502-D	8.27
S503-B63	14.36	S503UC-K8	14.39	S5N400MW	15.77	S6N600TW-2	15.79	SK 615 512-1	8.25
S503-C10	14.36	S504UC-B10	14.38	S5N400MW-2	15.77	S6N800BW	15.79	SK 615 512-1	8.37
S503-C13	14.36	S504UC-B13	14.38	S5N400TW	15.75	S6N800BW-2	15.79	SK 615 516-1	8.45
S503-C16	14.36	S504UC-B16	14.38	S5N400TW-2	15.75	S6N800CW	15.79	SK 615 545-1	8.52
S503-C20	14.36	S504UC-B20	14.38	S5NK400	15.99	S6N800CW-2	15.79	SK 615 545-2	8.52
S503-C25	14.36	S504UC-B25	14.38	S5NQ400BW	15.76	S6N800EW	15.79	SK 615 545-3	8.52
S503-C32	14.36	S504UC-B32	14.38	S5NQ400CW	15.76	S6N800MW	15.81	SK 615 545-4	8.52
S503-C40	14.36	S504UC-B40	14.38	S5NQ400EW	15.76	S6N800MW-2	15.81	SK 615 545-5	8.52
S503-C50	14.36	S504UC-B50	14.38	S6D400W	15.81	S6N800TW	15.79	SK 615 546-1	8.52
S503-C6	14.36	S504UC-B6	14.38	S6D630W	15.81	S6N800TW-2	15.79	SK 615 546-13	8.52
S503-C63	14.36	S504UC-B63	14.38	S6D800W	15.81	S6NK800	15.99	SK 615 546-2	8.52
S503-D13	14.36	S504UC-K0.15	14.39	S6E-1	15.99	S6NQ600BW	15.80	SK 615 546-3	8.52
S503-D16	14.36	S504UC-K0.21	14.39	S6E-3R12	15.99	S6NQ600CW	15.80	SK 615 546-4	8.52

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SK 615 546-8	8.52	SSM-23600-E-S	6.53	T030L2-48M	6.26	T-10	13.6	T150L1-60	6.26
SK 615 550-29	8.53	SSM-33200-E	6.53	T030L2-60M	6.26	T1000D1-48M	6.27	T150L2-48M	6.26
SK 615 550-44	8.53	SSM-33200-E-S	6.53	T030LB1-48L	6.28	T1000D1-60M	6.27	T150L2-60M	6.26
SK 615 550-61	8.53	SSM-33400-E	6.53	T030LB1-60K	6.28	T1000D2-48M	6.27	T150LB1-48Y	6.28
SK 615 550-62	8.53	SSM-33400-E-S	6.53	T030LF1-48C	6.28	T1000D2-60M	6.27	T150LB1-60X	6.28
SK 615 550-63	8.53	SSM-33600-E	6.53	T030LF1-60B	6.28	T1000DB1-48LM	6.29	T150LF1-48E	6.28
SK 615 550-71	8.54	SSM-33600-E-S	6.53	T040D1-48	6.27	T1000DB1-60KM	6.29	T150LF1-60E	6.28
SK 615 550-75	8.54	SSM-41200-E	6.53	T040D1-60	6.27	T1000DF1-48KM	6.29	T1800D1-60M	6.27
SK 615 550-76	8.54	SSM-41200-E-S	6.53	T040D2-48M	6.27	T1000DF1-60KM	6.29	T1800D2-60M	6.27
SK 615 550-80	8.55	SSM-41400-E	6.53	T040D2-60M	6.27	T1000L1-60M	6.26	T1800DB1-60NM	6.29
SK 615 550-81	8.55	SSM-41400-E-S	6.53	T040DB1-48N	6.29	T1000L2-60M	6.26	T1800DF1-60NM	6.29
SK 615 552-13	8.53	SSM-41600-E	6.53	T040DB1-60L	6.29	T1000LB1-60KM	6.28	T1B015TL-1	15.8
SK 615 552-14	8.53	SSM-41600-E-S	6.53	T040DF1-48C	6.29	T1000LF1-60KB	6.28	T1B020TL-1	15.8
SK 615 552-15	8.53	SSM-66200-E	6.53	T040DF1-60C	6.29	T100D1-48	6.27	T1B025TL-1	15.8
SK 615 552-16	8.53	SSM-66200-E-S	6.53	T040L1-48	6.26	T100D1-60	6.27	T1B030TL-1	15.8
SK 615 552-17	8.53	SSM-66400-E	6.53	T040L1-60	6.26	T100D2-48M	6.27	T1B040TL-1	15.8
SK 615 552-18	8.53	SSM-66400-E-S	6.53	T040L2-48M	6.26	T100D2-60M	6.27	T1B050TL-1	15.8
SK 615 552-20	8.53	SSM-66600-E	6.53	T040L2-60M	6.26	T100DB1-48V	6.29	T1B060TL-1	15.8
SK 615 552-21	8.53	SSM-66600-E-S	6.53	T040LB1-48N	6.28	T100DB1-60T	6.29	T1B070TL-1	15.8
SK 615 552-22	8.53	ST-E	18.13	T040LB1-60L	6.28	T100DF1-48D	6.29	T1B080TL-1	15.8
SK 615 552-23	8.53	STL-ST	18.13	T040LF1-48C	6.28	T100DF1-60D	6.29	T1B090TL-1	15.8
SK 615 552-24	8.53	SZ-AST50I	14.23	T040LF1-60C	6.28	T100L1-48	6.26	T1B100TL-1	15.8
SK 615 552-25	8.53	SZ-AST50U	14.23	T050D1-48	6.27	T100L1-60	6.26	T1E-1	15.33
SK 615 552-27	8.53	SZ-AST55I	14.23	T050D1-60	6.27	T100L2-48M	6.26	T1E-3R12	15.33
SK 615 552-28	8.53	SZ-AST55U	14.23	T050D2-48M	6.27	T100L2-60M	6.26	T1N015TL	15.8
SK 615 552-29	8.53	SZ-AST55UPRT	14.23	T050D2-60M	6.27	T100LB1-48V	6.28	T1N020TL	15.8
SK 615 552-30	8.53	SZ-BSK	14.23	T050DB1-48R	6.29	T100LB1-60T	6.28	T1N025TL	15.8
SK 615 552-31	8.53	SZ-ESK2	14.23	T050DB1-60N	6.29	T100LF1-48D	6.28	T1N030TL	15.8
SK 615 552-32	8.53	T010L1-48	6.26	T050DF1-48C	6.29	T100LF1-60D	6.28	T1N040TL	15.8
SK 615 552-39	8.53	T010L2-48M	6.26	T050DF1-60C	6.29	T1200D1-48M	6.27	T1N050TL	15.8
SK 615 552-40	8.53	T010LB1-48E	6.28	T050L1-48	6.26	T1200D1-60M	6.27	T1N060TL	15.8
SK 615 552-52	8.54	T010LF1-48A	6.28	T050L1-60	6.26	T1200D2-48M	6.27	T1N070TL	15.8
SK 615 552-53	8.54	T015L1-60	6.26	T050L2-48M	6.26	T1200D2-60M	6.27	T1N080TL	15.8
SK 615 552-55	8.54	T015L2-60M	6.26	T050L2-60M	6.26	T1200DB1-48MM	6.29	T1N090TL	15.8
SK 615 552-60	8.55	T015LB1-60E	6.28	T050LB1-48R	6.28	T1200DB1-60LM	6.29	T1N100DL	15.8
SK 615 562-12	8.53	T015LF1-60A	6.28	T050LB1-60N	6.28	T1200DF1-48LM	6.29	T1N100TL	15.8
SK 615 562-18	8.53	T020D1-48	6.27	T050LF1-48C	6.28	T1200DF1-60KM	6.29	T1NQ015TL	15.8
SK 615 562-27	8.53	T020D2-48M	6.27	T050LF1-60C	6.28	T125D1-48	6.27	T1NQ020TL	15.8
SK 615 562-72	8.54	T020DB1-48J	6.29	T060D1-48	6.27	T125D1-60	6.27	T1NQ025TL	15.8
SK 615 562-82	8.55	T020DF1-48B	6.29	T060D1-60	6.27	T125D2-48M	6.27	T1NQ030TL	15.8
SK 615 562-83	8.55	T020L1-48	6.26	T060D2-48M	6.27	T125D2-60M	6.27	T1NQ040TL	15.8
SK 615 562-87	8.21	T020L2-48M	6.26	T060D2-60M	6.27	T125DB1-48X	6.29	T1NQ050TL	15.8
SK 615 562-88	8.21	T020LB1-48J	6.28	T060DB1-48S	6.29	T125DB1-60V	6.29	T1NQ060TL	15.8
SK 615 998-1	8.52	T020LF1-48B	6.28	T060DB1-60R	6.29	T125DF1-48E	6.29	T1NQ070TL	15.8
SK 615 998-2	8.52	T025D1-48	6.27	T060DF1-48D	6.29	T125DF1-60D	6.29	T1NQ080TL	15.8
SK 615 998-3	8.52	T025D1-60	6.27	T060DF1-60C	6.29	T125L1-48	6.26	T1NQ090TL	15.8
SK 615 998-4	8.52	T025D2-48M	6.27	T060L1-48	6.26	T125L1-60	6.26	T1NQ100TL	15.8
SK 615 998-5	8.52	T025D2-60M	6.27	T060L1-60	6.26	T125L2-48M	6.26	T-20	13.6
SK 616 016-2	8.25	T025DB1-48K	6.29	T060L2-48M	6.26	T125L2-60M	6.26	T200D1-48	6.27
SK 616 016-2	8.37	T025DB1-60J	6.29	T060L2-60M	6.26	T125LB1-48X	6.28	T200D1-60	6.27
SK 616 021-71	8.26	T025DF1-48B	6.29	T060LB1-48S	6.28	T125LB1-60V	6.28	T200D2-48M	6.27
SK 616 021-71	8.38	T025DF1-60B	6.29	T060LB1-60R	6.28	T125LF1-48E	6.28	T200D2-60M	6.27
SK 616 021-72	8.26	T025L1-48	6.26	T060LF1-48D	6.28	T125LF1-60D	6.28	T200DB1-48A	6.29
SK 616 021-73	8.26	T025L1-60	6.26	T060LF1-60C	6.28	T1500D1-48M	6.27	T200DB1-60Y	6.29
SK 616 502-B	8.27	T025L2-48M	6.26	T075D1-48	6.27	T1500D1-60M	6.27	T200DF1-48E	6.29
SK 616 541-2	8.55	T025L2-60M	6.26	T075D1-60	6.27	T1500D2-48M	6.27	T200DF1-60E	6.29
SK1-02	5.4	T025LB1-48K	6.28	T075D2-48M	6.27	T1500D2-60M	6.27	T200L1-48	6.26
SK1-11	5.4	T025LB1-60J	6.28	T075D2-60M	6.27	T1500DB1-48NM	6.29	T200L1-60	6.26
SK1-20	5.4	T025LF1-48B	6.28	T075DB1-48T	6.29	T1500DB1-60MM	6.29	T200L2-48M	6.26
SK4-11	5.17	T025LF1-60B	6.28	T075DB1-60S	6.29	T1500DF1-48NM	6.29	T200L2-60M	6.26
SMR-39	14.22	T030D1-48	6.27	T075DF1-48D	6.29	T1500DF1-60LM	6.29	T200LB1-48A	6.28
SSM-138300-E	6.53	T030D1-60	6.27	T075DF1-60D	6.29	T150D1-48	6.27	T200LB1-60Y	6.28
SSM-138300-E-S	6.53	T030D2-48M	6.27	T075L1-48	6.26	T150D1-60	6.27	T200LF1-48E	6.28
SSM-138600-E	6.53	T030D2-60M	6.27	T075L1-60	6.26	T150D2-48M	6.27	T200LF1-60E	6.28
SSM-138600-E-S	6.53	T030DB1-48L	6.29	T075L2-48M	6.26	T150D2-60M	6.27	T250D1-48	6.27
SSM-23200-E	6.53	T030DB1-60K	6.29	T075L2-60M	6.26	T150DB1-48Y	6.29	T250D1-60	6.27
SSM-23200-E-S	6.53	T030DF1-48C	6.29	T075LB1-48T	6.28	T150DB1-60X	6.29	T250D2-48M	6.27
SSM-23400-E	6.53	T030DF1-60B	6.29	T075LB1-60S	6.28	T150DF1-48E	6.29	T250D2-60M	6.27

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T250DB1-60Z	6.29	T2SQ025BW	15.11	T3S080TW	15.13	T4H150BW	15.16	T4LQ250CW	15.18
T250DF1-48F	6.29	T2SQ025TW	15.11	T3S090TW	15.13	T4H150CW	15.16	T4LQ250EW	15.18
T250DF1-60E	6.29	T2SQ030TW	15.11	T3S100MW	15.13	T4H150E5W	15.19	T4LQ250TW	15.19
T250L1-48	6.26	T2SQ040TW	15.11	T3S100TW	15.13	T4H150EW	15.16	T4N020TW	15.17
T250L1-60	6.26	T2SQ050TW	15.11	T3S125MW	15.13	T4H150TW	15.17	T4N030TW	15.17
T250L2-48M	6.26	T2SQ060BW	15.11	T3S125TW	15.13	T4H200TW	15.17	T4N040TW	15.17
T250L2-60M	6.26	T2SQ060TW	15.11	T3S150DW	15.13	T4H250BW	15.16	T4N050TW	15.17
T250LB1-48B	6.28	T2SQ070TW	15.11	T3S150MW	15.13	T4H250CW	15.16	T4N080TW	15.17
T250LB1-60Z	6.28	T2SQ080TW	15.11	T3S150TW	15.13	T4H250DW	15.17	T4N100BW	15.16
T250LF1-48F	6.28	T2SQ090TW	15.11	T3S175TW	15.13	T4H250E5W	15.19	T4N100CW	15.16
T250LF1-60E	6.28	T2SQ100BW	15.11	T3S200MW	15.13	T4H250EW	15.16	T4N100E5W	15.19
T2E-1	15.33	T2SQ100TW	15.11	T3S200TW	15.13	T4H250TW	15.17	T4N100EW	15.16
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T2H015TW	15.10	T300D1-48	6.27	T3S225TW	15.13	T4HQ030TW	15.19	T4N125TW	15.17
T2H020MW	15.10	T300D1-60	6.27	T3SQ060TW	15.14	T4HQ040TW	15.19	T4N150BW	15.16
T2H020TW	15.10	T300D2-48M	6.27	T3SQ070TW	15.14	T4HQ050TW	15.19	T4N150CW	15.16
T2H025BW	15.10	T300D2-60M	6.27	T3SQ080TW	15.14	T4HQ080TW	15.19	T4N150E5W	15.19
T2H025E5W	15.10	T300DB1-48D	6.29	T3SQ090TW	15.14	T4HQ100BW	15.18	T4N150EW	15.16
T2H025TW	15.10	T300DB1-60B	6.29	T3SQ100TW	15.14	T4HQ100CW	15.18	T4N150TW	15.17
T2H030TW	15.10	T300DF1-48F	6.29	T3SQ125TW	15.14	T4HQ100EW	15.18	T4N200TW	15.17
T2H040TW	15.10	T300DF1-60F	6.29	T3SQ150TW	15.14	T4HQ100TW	15.19	T4N250BW	15.16
T2H050MW	15.10	T300L1-48M	6.26	T3SQ175TW	15.14	T4HQ125TW	15.19	T4N250CW	15.16
T2H050TW	15.10	T300L1-60	6.26	T3SQ200TW	15.14	T4HQ150BW	15.18	T4N250E5W	15.19
T2H060BW	15.10	T300L2-48M	6.26	T3SQ225TW	15.14	T4HQ150CW	15.18	T4N250EW	15.16
T2H060E5W	15.10	T300L2-60M	6.26	T-40	13.6	T4HQ150EW	15.18	T4N250TW	15.17
T2H060TW	15.10	T300LB1-48DM	6.28	T400D1-48	6.27	T4HQ150TW	15.19	T4NK250	15.33
T2H070TW	15.10	T300LB1-60B	6.28	T400D1-60	6.27	T4HQ200TW	15.19	T4NQ020TW	15.19
T2H080TW	15.10	T300LF1-48FM	6.28	T400D2-48M	6.27	T4HQ250BW	15.18	T4NQ030TW	15.19
T2H090TW	15.10	T300LF1-60F	6.28	T400D2-60M	6.27	T4HQ250CW	15.18	T4NQ040TW	15.19
T2H100BW	15.10	T350D1-48	6.27	T400DB1-48F	6.29	T4HQ250EW	15.18	T4NQ050TW	15.19
T2H100E5W	15.10	T350D1-60	6.27	T400DB1-60D	6.29	T4HQ250TW	15.19	T4NQ080TW	15.19
T2H100MW	15.10	T350D2-48M	6.27	T400DF1-48G	6.29	T4L020TW	15.17	T4NQ100BW	15.18
T2H100TW	15.10	T350D2-60M	6.27	T400DF1-60F	6.29	T4L030TW	15.17	T4NQ100CW	15.18
T2HQ015TW	15.11	T350DB1-48E	6.29	T400L1-48M	6.26	T4L040TW	15.17	T4NQ100EW	15.18
T2HQ020TW	15.11	T350DB1-60C	6.29	T400L1-60M	6.26	T4L050TW	15.17	T4NQ100TW	15.19
T2HQ025BW	15.11	T350DF1-48F	6.29	T400L2-48M	6.26	T4L080TW	15.17	T4NQ125TW	15.19
T2HQ025TW	15.11	T350DF1-60F	6.29	T400L2-60M	6.26	T4L100BW	15.16	T4NQ150BW	15.18
T2HQ030TW	15.11	T350L1-48M	6.26	T400LB1-48FM	6.28	T4L100CW	15.16	T4NQ150CW	15.18
T2HQ040TW	15.11	T350L1-60M	6.26	T400LB1-60DM	6.28	T4L100E5W	15.19	T4NQ150EW	15.18
T2HQ050TW	15.11	T350L2-48M	6.26	T400LF1-48GM	6.28	T4L100EW	15.16	T4NQ150TW	15.19
T2HQ060BW	15.11	T350L2-60M	6.26	T400LF1-60FM	6.28	T4L100TW	15.17	T4NQ200TW	15.19
T2HQ060TW	15.11	T350LB1-48EM	6.28	T4045SF1	12.5	T4L125TW	15.17	T4NQ250BW	15.18
T2HQ070TW	15.11	T350LB1-60CM	6.28	T4050PSF1	12.5	T4L150BW	15.16	T4NQ250CW	15.18
T2HQ080TW	15.11	T350LF1-48FM	6.28	T4075PSF1	12.5	T4L150CW	15.16	T4NQ250EW	15.18
T2HQ090TW	15.11	T350LF1-60FM	6.28	T41.5K1	12.5	T4L150E5W	15.19	T4NQ250TW	15.19
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T2NK125	15.33	T3N060TW	15.13	T41K1	12.5	T4L200TW	15.17	T4S040TW	15.17
T2S015TW	15.10	T3N070TW	15.13	T4200PSF1	12.5	T4L250BW	15.16	T4S050TW	15.17
T2S020MW	15.10	T3N080TW	15.13	T4250PSF1	12.5	T4L250CW	15.16	T4S080TW	15.17
T2S020TW	15.10	T3N090TW	15.13	T42K1	12.5	T4L250DW	15.17	T4S100BW	15.16
T2S025BW	15.10	T3N100TW	15.13	T4300PSF1	12.5	T4L250E5W	15.19	T4S100CW	15.16
T2S025E5W	15.10	T3N125TW	15.13	T4350PSF1	12.5	T4L250EW	15.16	T4S100E5W	15.19
T2S025TW	15.10	T3N150TW	15.13	T43K1	12.5	T4L250TW	15.17	T4S100EW	15.16
T2S030TW	15.10	T3N175TW	15.13	T4500PSF1	12.5	T4LQ020TW	15.19	T4S100TW	15.17
T2S040TW	15.10	T3N200TW	15.13	T45K1	12.5	T4LQ030TW	15.19	T4S125TW	15.17
T2S050MW	15.10	T3N225TW	15.13	T4750PS1	12.5	T4LQ040TW	15.19	T4S150BW	15.16
T2S050TW	15.10	T3NK225	15.33	T4E-1	15.33	T4LQ050TW	15.19	T4S150CW	15.16
T2S060BW	15.10	T3NQ060TW	15.14	T4E-3R12	15.33	T4LQ080TW	15.19	T4S150E5W	15.19
T2S060E5W	15.10	T3NQ070TW	15.14	T4H020TW	15.17	T4LQ100BW	15.18	T4S150EW	15.16
T2S060TW	15.10	T3NQ080TW	15.14	T4H030TW	15.17	T4LQ100CW	15.18	T4S150TW	15.17
T2S070TW	15.10	T3NQ090TW	15.14	T4H040TW	15.17	T4LQ100EW	15.18	T4S200TW	15.17
T2S080TW	15.10	T3NQ100TW	15.14	T4H050TW	15.17	T4LQ100TW	15.19	T4S250BW	15.16
T2S090TW	15.10	T3NQ125TW	15.14	T4H080TW	15.17	T4LQ125TW	15.19	T4S250CW	15.16
T2S100BW	15.10	T3NQ150TW	15.14	T4H100BW	15.16	T4LQ150BW	15.18	T4S250E5W	15.19
T2S100E5W	15.10	T3NQ175TW	15.14	T4H100CW	15.16	T4LQ150CW	15.18	T4S250EW	15.16
T2S100MW	15.10	T3NQ200TW	15.14	T4H100E5W	15.19	T4LQ150EW	15.18	T4S250TW	15.17
T2S100TW	15.10	T3NQ225TW	15.14	T4H100EW	15.16	T4LQ150TW	15.19	T4SQ020TW	15.19
T2SQ015TW	15.11	T3S060TW	15.13	T4H100TW	15.17	T4LQ200TW	15.19	T4SQ030TW	15.19

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T4SQ050TW	15.19	T500LF1-60GM	6.28	T5NQ400CW	15.23	T62K1	12.6	TA200DU150	2.6
T4SQ080TW	15.19	T5E-1	15.33	T5NQ400EW	15.23	T6300PS1	12.6	TA200DU175	2.6
T4SQ100BW	15.18	T5E-3R12	15.33	T5NQ400TW	15.23	T6350PS1	12.6	TA200DU200	2.6
T4SQ100CW	15.18	T5H300BW	15.21	T5S300BW	15.21	T63K1	12.6	TA200DU90	2.6
T4SQ100EW	15.18	T5H300CW	15.21	T5S300CW	15.21	T6500PS1	12.6	TA25DU0.16	2.6
T4SQ100TW	15.19	T5H300E5W	15.24	T5S300E5W	15.24	T65K1	12.6	TA25DU0.16	2.6
T4SQ125TW	15.19	T5H300EW	15.21	T5S300EW	15.21	T6750PS1	12.6	TA25DU0.25	2.6
T4SQ150BW	15.18	T5H300TW	15.22	T5S300TW	15.22	T700D1-48M	6.27	TA25DU0.4	2.6
T4SQ150CW	15.18	T5H400BW	15.21	T5S400BW	15.21	T700D1-60M	6.27	TA25DU0.63	2.6
T4SQ150EW	15.18	T5H400CW	15.21	T5S400CW	15.21	T700D2-48M	6.27	TA25DU1.0	2.6
T4SQ150TW	15.19	T5H400DW	15.22	T5S400E5W	15.24	T700D2-60M	6.27	TA25DU1.4	2.6
T4SQ200TW	15.19	T5H400E5W	15.24	T5S400EW	15.21	T700DB1-48KM	6.29	TA25DU1.8	2.6
T4SQ250BW	15.18	T5H400EW	15.21	T5S400TW	15.22	T700DB1-60JM	6.29	TA25DU11	2.6
T4SQ250CW	15.18	T5H400TW	15.22	T5S600BW	15.21	T700DF1-48JM	6.29	TA25DU14	2.6
T4SQ250EW	15.18	T5H600BW	15.21	T5S600CW	15.21	T700DF1-60HM	6.29	TA25DU19	2.6
T4SQ250TW	15.19	T5H600CW	15.21	T5S600E5W	15.24	T700L1-48M	6.26	TA25DU2.4	2.6
T4V020TW	15.17	T5H600DW	15.22	T5S600EW	15.21	T700L1-60M	6.26	TA25DU25	2.6
T4V030TW	15.17	T5H600E5W	15.24	T5SQ300BW	15.23	T700L2-48M	6.26	TA25DU3.1	2.6
T4V040TW	15.17	T5H600EW	15.21	T5SQ300CW	15.23	T700L2-60M	6.26	TA25DU32	2.6
T4V050TW	15.17	T5HQ300BW	15.23	T5SQ300EW	15.23	T700LB1-48KM	6.28	TA25DU4.0	2.6
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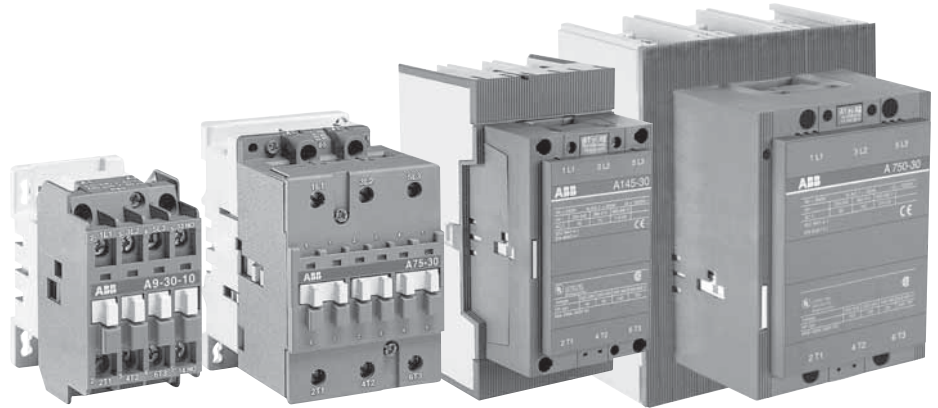
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A9 - A110

- Maximum UL/CSA horsepower ratings according to UL508 and CSA22.2 No. 14
- Includes NEMA sizes 00 - 3
- CE mark
- Compact space saving design
- Standard auxiliary contact configurations:
 - A9 - A40 1 NO or 1 NC
 - A50 - A110 1 NO & 1 NC
- Contactor sizes A50 - A110 can be supplied without auxiliaries
- Additional auxiliary contact blocks are available
- D.C. ratings & D.C. control operation available
- Fast, snap-on DIN rail mounting
- Double break contact design
- Snap-on front mounted accessories include mechanical latch, pneumatic timer, and 1 & 4 pole auxiliary contact blocks
- Contactors ensure positive safety between their auxiliary contact blocks.
- Easy coil change
- Captive terminal screws
- NEMA, UL, IEC, CSA, VDE and most other international standards
- Touch safe design: All connection terminals are protected against accidental touch
- Terminals supplied open for ease of wiring
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- Screwdriver guide holes
- UL File No: E39231 (A9 - A75); (AE9 - AE75); (AL9 - AL40); (AF50 - AF75)
- UL File No: E79416 (A95 - A110); (AE95 - AE110); (AF145 - AF750)
- CSA File No: LR56745 (A9 - A75); (AE9 - AE75); (AF50 - AF75)
- CSA File No: LR19700 (A95 - A110); (AE95 - AE110); (AF145 - AF750)
- CSA approved for elevator service

A145 - AF1650

- Maximum UL/CSA horsepower ratings according to UL508 and CSA22.2 No. 14
- Includes NEMA sizes 4 - 8
- CE mark
- 1 NO & 1 NC auxiliary contacts are standard and up to 6 additional auxiliary contacts may be added to provide a total of 8 (4 NO & 4 NC)
- Contactors ensure positive safety between their auxiliary contact blocks.
- D.C. ratings and D.C. control operation available
- Easy maintenance of main contacts and coil inspection
- Can be mounted in any position
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- NEMA, UL, IEC, CSA, VDE and most other international standards
- UL File No: E79416 (A/AF145 - AF750)
- UL File No: E73397 (AF1350 - AF1650)
- CSA File No: LR19700

General information

A9 - A300, AC operated

UL rated, 3 phase

Application

A-Line contactors are mainly used for controlling 3-phase motors and for controlling power circuits corresponding to their operating characteristics up to 690 and even 1000 VAC, and 440 VDC.

Description of 3 pole and 4 pole contactors A9 - A300

All A-Line contactors can be assembled side by side. The add-on or built-in auxiliary contacts are suitable for low level currents.

Control circuit types

- A-Line types: AC operated with laminated magnetic circuit.

Contactor types

- 3 pole contactors with NO or NC built in auxiliary contact for A9 - A40 contactors; factory assembled auxiliary contacts for A50 - A300 contactors
- 4 pole contactors: 4 NO or 2 NO & 2 NC without any auxiliary contacts. (A9 - A75)

Quick mounting on DIN rail: EN 50022 and EN 50023 standards:

35 x 7.5mm for A9 - A40

35 x 15mm for A9 - A75

75mm for A45 - A110

Location of side mounted accessories: on right or left hand side. Factory mounted on left hand side for CAL5 on A50 - A300

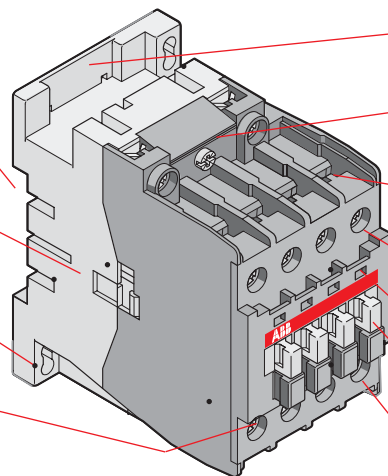
Holes for screw mounting (screws not supplied). Distance between holes according to EN 50003.

Terminals delivered in open position with captive screws (screws of unused terminals must be tightened).

Screwdriver guidance for all terminals makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 - Part. 100.

All A9 - A40 contactor terminals as well as A45 - A300 contactor auxiliary contact and coil terminals ensure IP20 degree of protection according to IEC 947-1.



A9 - A300

Location of surge suppressors.

Clear marking of coil voltages and frequencies.

Connecting point for control leads in top part of main terminals of A50 - A75 contactors. For A95 & A110 contactors these are additional power connections.

Terminal marking according to IEC 947-4-1, EN 50005, EN 50012 and NEMA standards.

Location of function marker.

Stops for attaching front mounted accessories.

Terminal screws:

- Posidrive (+,-) No 2 for all A9 - A75
- M8 hex threaded socket screw for A95 - A300 main terminals.

Catalog number explanation

A9-30-10-84

Frame size

Power pole

30 = 3 NO
40 = 4 NO
22 = 2 NO & 2 NC

Coil voltage

(see coil voltage selection chart)

Auxiliary contacts

10 = 1 NO & 0 NC
01 = 0 NO & 1 NC
11 = 1 NO & 1 NC
00 = No auxiliary provided
22 = 2 NO & 2 NC

Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

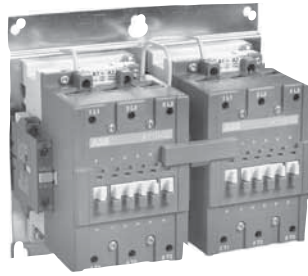
For other voltages, see page 1.26.

A9 - A300, AC operated Non-reversing, mechanically interlocked, reversing UL rated, 3 phase

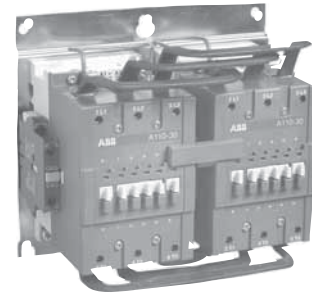
Across the line
1
contactors



A26-30-10-84



A110M-30-11-84



A110R-30-11-84

UL general purpose current	UL motor switching current	Maximum motor horsepower ratings				Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
AC1		UL rated											
21	9	2	2	5	7.5	1 0	0 1	A9-30-10-84 A9-30-01-84	\$ 78	A9M-30-10-84 A9M-30-01-84	\$ 255	A9R-30-10-84 A9R-30-01-84	\$ 315
25	11	3	3	7.5	10	1 0	0 1	A12-30-10-84 A12-30-01-84	84	A12M-30-10-84 A12M-30-01-84	315	A12R-30-10-84 A12R-30-01-84	375
30	17	5	5	10	15	1 0	0 1	A16-30-10-84 A16-30-01-84	102	A16M-30-10-84 A16M-30-01-84	345	A16R-30-10-84 A16R-30-01-84	413
40	28	7.5	10	20	25	1 0	0 1	A26-30-10-84 A26-30-01-84	183	A26M-30-10-84 A26M-30-01-84	405	A26R-30-10-84 A26R-30-01-84	480
50	34	10	10	25	30	1 0	0 1	A30-30-10-84 A30-30-01-84	252	A30M-30-10-84 A30M-30-01-84	548	A30R-30-10-84 A30R-30-01-84	623
60	42	10	15	30	40	1 0	0 1	A40-30-10-84 A40-30-01-84	297	A40M-30-10-84 A40M-30-01-84	639	A40R-30-10-84 A40R-30-01-84	750
80	54	15	20	40	50	1	1	A50-30-11-84	330	A50M-30-11-84	713	A50R-30-11-84	810
90	65	20	25	50	60	1	1	A63-30-11-84	372	A63M-30-11-84	870	A63R-30-11-84	1013
105	80	25	30	60	75	1	1	A75-30-11-84	413	A75M-30-11-84	1155	A75R-30-11-84	1298
125	95	30	30	60	75	1	1	A95-30-11-84	450	A95M-30-11-84	1230	A95R-30-11-84	1425
140	110	30	40	75	100	1	1	A110-30-11-84	480	A110M-30-11-84	1365	A110R-30-11-84	1628
230	130	40	50	100	125	1	1	A145-30-11-84	825	A145M-30-11-84	2235	A145R-30-11-84	2250
250	156	50	60	125	150	1	1	A185-30-11-84	1290	A185M-30-11-84	3360	A185R-30-11-84	3375
300	192	60	75	150	200	1	1	A210-30-11-84	1635	A210M-30-11-84	4035	A210R-30-11-84	4050
350	248	75	100	200	250	1	1	A260-30-11-84	1815	A260M-30-11-84	4485	A260R-30-11-84	4500
400	302	100	100	250	300	1	1	A300-30-11-84	1875	A300M-30-11-84	5460	A300R-30-11-84	5475
550	414	125	150	350	400	1	1						
650	480	150	200	400	500	1	1						
750	602	200	250	500	600	1	1						
900	810	250	300	600	700	1	1						
1350	960	—	400	800	900	1	1						
1650	1080	—	450	900	1000	1	1						

See Type AF contactors, page 1.9

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A75-30-11-80

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations. Only side-mounted blocks are allowed to be factory installed. If auxiliary contacts are not required for A50 - A300, subtract \$ 40 from list price and change catalog number to "00" instead of "11."

Mechanical interlock

Mechanically interlocked contactors are designed for reversing, 2 speed, reduced voltage, etc. type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A300 — mounted on common baseplate

Power wiring is not included. The NC electrical interlock is provided with the mechanical interlock for A9 - A110 contactors.

Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Reversing

Reversing contactors are designed for reversing type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A300 — mounted on common baseplate

The NC electrical interlock is provided with the mechanical interlock for A9 - A110 contactors.

General information

AE9 - AE110, DC operated

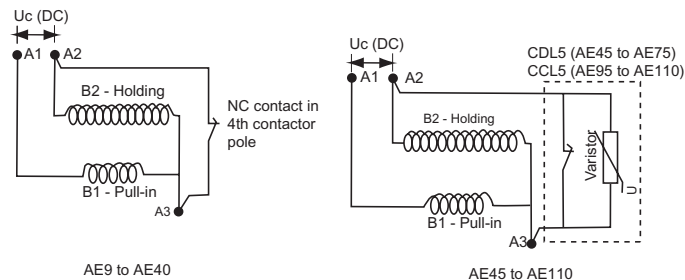
UL rated, 3 phase

Application

A-Line contactors are mainly used for controlling 3-phase motors and for controlling power circuits corresponding to their operating characteristics up to 690 and even 1000 VAC. and 440 VDC.

Control circuit types

AE types: with laminated magnetic circuit and double-winding coil fed from DC supply via a CDL5 insertion contact mounted on the device. The CDL5 has an NC lagging contact for insertion of the second winding. (See schematic.)



Quick mounting on DIN rail: EN 50022 and EN 50023 standards:

35 x 7.5mm for AE9 - AE40

35 x 15mm for AE9 - AE75

75mm for AE45 - AE110

Location of side mounted accessories: on right or left hand side. Factory mounted on left hand side for CAL5 on A50 - A300

- right hand side for CDL5/CCL5 on AE45 - AE110

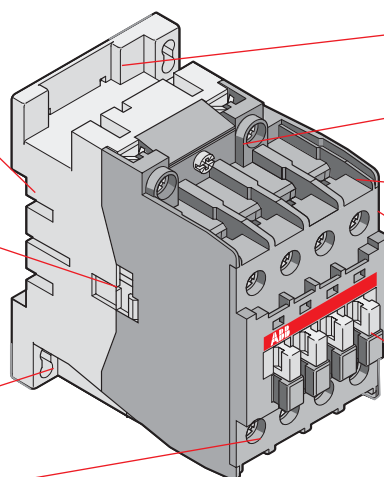
Holes for screw mounting (screws not supplied). Distance between holes according to EN 50003.

Terminals delivered in open position with captive screws (unused terminal screws must be tightened).

Screwdriver guidance for all terminals makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 - Part. 100.

All AE9 - AE40 contactor terminals as well as AE45 - AE110 contactor auxiliary contact and coil terminals ensure IP20 degree of protection according to IEC 947-1.



AE9 - AE110

Location of surge suppressors.

Clear marking of coil voltages and frequencies.

Connecting point for control leads in top part of main terminals of AE50 - AE75 contactors. For AE95 & AE110 contactors these are additional power connections.

Terminal marking according to IEC 947-4-1, EN 50005, EN 50012 and NEMA standards.

Location of function marker.

Stops for attaching front mounted accessories.

Terminal screws:

- Posidrive (+,-) No° 2 for all AE9 - AE75
- M8 hex threaded socket screw for AE95 & AE110

Catalog number explanation

AE9-30-00-81

Frame size

Power pole

30 = 3 NO
40 = 4 NO
22 = 2 NO & 2 NC

Coil voltage

(see coil voltage selection chart)

Auxiliary contacts

00 = No auxiliary provided
11 = 1 NO & 1 NC

Coil voltage selection chart

Hz	Contr. type	Volts						
		12	24	48	110	125	220	240
DC	AE	80	81	83	86	87	88	89

For other voltages, see page 1.26.

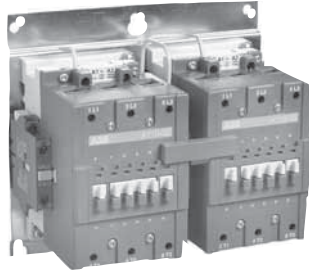
AE9 - AE110

Non-reversing, mechanically interlocked, reversing
DC operated, UL rated, 3 phase

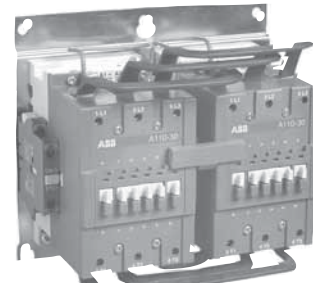
Across the line
1
contactors



AE26-30-11-81



AE110M-30-11-81



AE110R-30-11-81

General purpose current	UL motor switching current	Maximum motor horsepower ratings				Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
AC1		UL rated											
21	9	2	2	5	7.5	1	1	AE9-30-11-81	\$ 118	AE9M-30-11-81	\$ 335	AE9R-30-11-81	\$ 395
25	11	3	3	7.5	10	1	1	AE12-30-11-81	124	AE12M-30-11-81	395	AE12R-30-11-81	455
30	17	5	5	10	15	1	1	AE16-30-11-81	142	AE16M-30-11-81	425	AE16R-30-11-81	493
40	28	7.5	10	20	25	1	1	AE26-30-11-81	223	AE26M-30-11-81	485	AE26R-30-11-81	560
50	34	10	10	25	30	1	1	AE30-30-11-81	292	AE30M-30-11-81	628	AE30R-30-11-81	703
60	42	10	15	30	40	1	1	AE40-30-11-81	337	AE40M-30-11-81	720	AE40R-30-11-81	830
80	54	15	20	40	50	1	1	AE50-30-11-81	375	AE50M-30-11-81	803	AE50R-30-11-81	930
90	65	20	25	50	60	1	1	AE63-30-11-81	477	AE63M-30-11-81	1080	AE63R-30-11-81	1208
105	80	25	30	60	75	1	1	AE75-30-11-81	518	AE75M-30-11-81	1365	AE75R-30-11-81	1493
125	95	30	30	60	75	1	1	AE95-30-11-81	555	AE95M-30-11-81	1440	AE95R-30-11-81	1635
140	110	30	40	75	100	1	1	AE110-30-11-81	690	AE110M-30-11-81	1785	AE110R-30-11-81	2048
230	130	40	50	100	125	1	1						
250	156	50	60	125	150	1	1						
300	192	60	75	150	200	1	1						
350	248	75	100	200	250	1	1						
400	302	100	100	250	300	1	1						
550	414	125	150	350	400	1	1						
650	480	150	200	400	500	1	1						
750	602	200	250	500	600	1	1						
900	810	250	300	600	700	1	1						
1350	960	—	400	800	900	1	1						
1650	1080	—	450	900	1000	1	1						

See AF contactors, page 1.9

Coil voltage selection

All DC operated catalog numbers include a 24VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 110V coil is required for an AE75 contactor: AE75-30-11-86

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.4. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations.

Mechanical interlock

Mechanically interlocked contactors are designed for reversing, 2 speed, reduced voltage, etc. type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- AE9 - AE16 — mounted on 35mm DIN rail
- AE26 - AE110 — mounted on common baseplate

Power wiring is not included.

The NC electrical interlock is provided with the mechanical interlock.

Coil voltage selection chart

Hz	Contr. type	Volts							
		12	24	48	110	125	220	240	
DC	AE	80	81	83	86	87	88	89	

For other voltages, see page 1.26.

Reversing

Reversing contactors are designed for reversing type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- AE9 - AE16 — mounted on 35mm DIN rail
- AE26 - AE110 — mounted on common baseplate

The NC electrical interlock is provided with the mechanical interlock.

General information

AL9 - AL40, DC operated

UL rated, 3 phase

Application

AL and AL...Z contactors are mainly used for controlling 3-phase motors and for controlling power circuits corresponding to their operating characteristics up to 690 and even 1000 VAC, and 440 VDC.

Control circuit types

AL9 - AL40: DC coil with low power consumption of 3W to 3.5W

AL9Z - AL16Z: DC coil with low power consumption of 2.4W. Designed to be directly controlled by PLC.

Quick mounting on DIN rail: EN 50022 and EN 50023 standards:

35 x 7.5mm for AL9 - AL40
35 x 15mm for AL9 - AL40

Location of side mounted accessories: on right or left hand side.

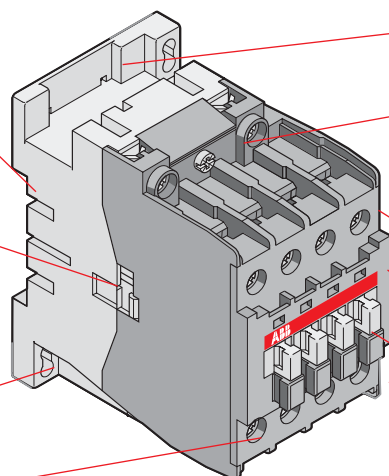
Holes for screw mounting (screws not supplied). Distance between holes according to EN 50003.

Terminals delivered in open position with captive screws (unused terminal screws must be tightened).

Screwdriver guidance for all terminals makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 - Part. 100.

All AL9 - AL40 contactor terminals as well as contactor auxiliary contacts and coil terminals ensure IP20 degree of protection according to IEC 60947-1.



AL9 - AL40

Location of surge suppressors.

Clear marking of coil voltages and frequencies.

Terminal marking according to IEC 60947-4-1, EN 50005, EN 50012 and NEMA standards.

Location of function marker.

Stops for attaching front mounted accessories.

Terminal screws:

- Posidrive (+,-) No° 2 for all AL contactors

Catalog number explanation

AL9 - 30 - 10 - 81

Frame size

Power pole

30 = 3 NO

Coil voltage

(see coil voltage selection chart)

Auxiliary contacts

10 = 1 NO & 0 NC

01 = 0 NO & 1 NC

Coil voltage selection

Hz	Contr. type	Volts						
		12	24	48	110	125	220	240
DC	AL	80	81	83	86	87	88	89
DC	AL...Z		15	28				

For other voltages, see page 1.26.

AL9 - AL40, AL9Z - AL16Z

Non-reversing, mechanically interlocked, reversing DC operated, UL rated, 3 phase

Across the line
1
contactors



AL9-30-10-81



AL26-30-10-81



AL40-30-10-81

AL Contactors — 3W and 3.5W consumption

General purpose current	UL motor switching current	Maximum motor horsepower ratings				Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
AC1		UL rated											
21	9	2	2	5	7.5	1 0	0 1	AL9-30-10-81 AL9-30-01-81	\$ 110	AL9M-30-10-81 AL9M-30-01-81	\$ 319	AL9R-30-10-81 AL9R-30-01-81	\$ 379
25	11	3	3	7.5	10	1 0	0 1	AL12-30-10-81 AL12-30-01-81	135	AL12M-30-10-81 AL12M-30-01-81	417	AL12R-30-10-81 AL12R-30-01-81	477
30	17	5	5	10	15	1 0	0 1	AL16-30-10-81 AL16-30-01-81	150	AL16M-30-10-81 AL16M-30-01-81	441	AL16R-30-10-81 AL16R-30-01-81	501
40	28	7.5	10	20	25	1 0	0 1	AL26-30-10-81 AL26-30-01-81	190	AL26M-30-10-81 AL26M-30-01-81	473	AL26R-30-10-81 AL26R-30-01-81	533
50	34	10	10	20	30	1 0	0 1	AL30-30-10-81 AL30-30-01-81	260	AL30M-30-10-81 AL30M-30-01-81	618	AL30R-30-10-81 AL30R-30-01-81	678
60	42	10	15	30	40	1 0	0 1	AL40-30-10-81 AL40-30-01-81	300	AL40M-30-10-81 AL40M-30-01-81	715	AL40R-30-10-81 AL40R-30-01-81	775

ALZ Contactors — 2.4W consumption

General purpose current	UL motor switching current	Maximum motor horsepower ratings				Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
AC1		UL rated											
21	9	2	2	5	7.5	1 0	0 1	AL9Z-30-10-15 AL9Z-30-01-15	\$ 110	AL9ZM-30-10-15 AL9ZM-30-01-15	\$ 319	AL9ZR-30-10-15 AL9ZR-30-01-15	\$ 379
25	11	3	3	7.5	10	1 0	0 1	AL12Z-30-10-15 AL12Z-30-01-15	135	AL12ZM-30-10-15 AL12ZM-30-01-15	417	AL12ZR-30-10-15 AL12ZR-30-01-15	477
30	17	5	5	10	15	1 0	0 1	AL16Z-30-10-15 AL16Z-30-01-15	150	AL16ZM-30-10-15 AL16ZM-30-01-15	441	AL16ZR-30-10-15 AL16ZR-30-01-15	501

Coil voltage selection

All DC operated catalog numbers include a 24VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 48V coil is required for an AL30 contactor: AL30-30-10-83

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.6. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations.

Coil voltage selection

Hz	Contr. type	Volts							
		12	24	48	110	125	220	240	
DC	AL	80	81	83	86	87	88	89	
DC	AL...Z		15	28					

For other voltages, see page 1.26.

Mechanical interlock

Mechanically interlocked contactors are designed for reversing, 2 speed, reduced voltage, etc. type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- AL9 & AL16 — mounted on 35mm DIN rail
- AL26 & AL40 — mounted on common baseplate

Power wiring is not included.

The NC electrical interlock is provided

Reversing

Reversing contactors are designed for reversing type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted with line and load terminals.

① Only coil voltages available for AL9Z – AL16Z.

General information

AF50 - AF1650, AC & DC operated

UL rated, 3 phase

Application

A-Line contactors are mainly used for controlling 3-phase motors and for controlling power circuits corresponding to their operating characteristics up to 690 and even 1000 VAC. and 440 VDC.

Description of 3 pole contactors AF50 - AF1650

All AF contactors can be assembled side by side. The add-on auxiliary contacts are suitable for low level currents.

Quick mounting on DIN rail: EN 50022 and EN 50023 standards:

35 x 15mm for AF50 - AF75

75mm for AF50 - AF110

Location of side mounted accessories: on right or left hand side. Factory mounted on left hand side for CAL5 on AF50 - AF1650

Holes for screw mounting (screws not supplied). Distance between holes according to EN 50003.

Terminals delivered in open position with captive screws (screws of unused terminals must be tightened).

Screwdriver guidance for all terminals makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 - Part. 100.

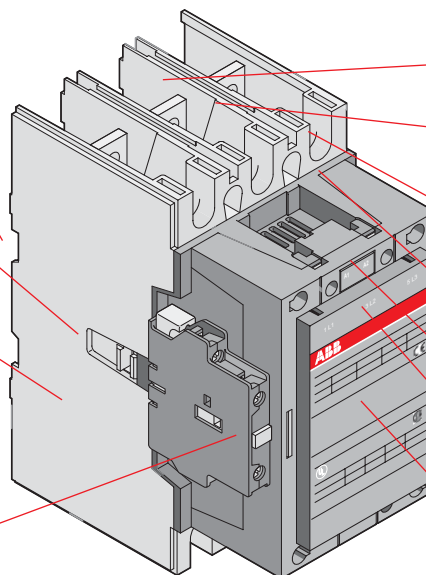
All AF50- AF110 contactor terminals as well as AF50 - AF1650 contactor auxiliary contact and coil terminals ensure IP20 degree of protection according to IEC 947-1.

Control circuit types

- AF types: AC/DC operated with laminated magnetic circuit.

Contact or types

- 3 pole contactors with 1 NO or 1 NC factory assembled auxiliary contacts for AF50 - AF1650 contactors



AF50 - AF1650

Surge suppressors built in as standard on the printed circuit board.

Clear marking of coil voltages and frequencies.

Connecting point for control leads in top part of main terminals of AF50 - AF75 contactors. For AF95 & AF110 contactors these are additional power connections.

Terminal marking according to IEC 947-4-1, EN 50005, EN 50012 and NEMA standards.

Location of function marker.

Stops for attaching front mounted accessories.

Terminal screws:

- Posidrive (+,-) No 2 for all AF50 - AF75
- M8 hex threaded socket screw for AF95 - AF1650 main terminals.

Catalog number explanation

AF50 - 30 - 11 - 70

Frame size

Power pole

30 = 3 NO
40 = 4 NO
22 = 2 NO & 2 NC

Coil voltage

(see coil voltage selection chart)

Auxiliary contacts

11 = 1 NO & 1 NC
00 = No auxiliary provided
22 = 2 NO & 2 NC

Coil voltage selection – AF50 to AF1650

AC/DC VOLTS, 40 - 60 Hz				
24 - 60 DC	20 - 60 DC	48 - 130 AC/DC	100 - 250 AC/DC	250 - 500 AC//DC
68 ①	72 ②	69	70 ③	71 ④

① AF400 - AF750, DC only.

② AF50 - AF300, DC only.

③ Only option for AF1350 / AF1650.

④ AF400 - AF750 only.

AF50 - AF1650

Non-reversing, mechanically interlocked, reversing
AC & DC operated, UL rated, 3 phase

Across the line
1
contactors



AF63-30-11-70



AF95-30-11-70



AF400-30-11-70



AF750-30-11-70

3 Pole

General purpose current	UL motor switching current	Maximum UL Listed motor horsepower ratings				Standard auxiliary contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
80	54	15	20	40	50	1	1	AF50-30-11-70	\$ 450	AF50M-30-11-70	\$ 953	AF50R-30-11-70	\$ 1050
90	65	20	25	50	60	1	1	AF63-30-11-70	495	AF63M-30-11-70	1116	AF63R-30-11-70	1259
105	80	25	30	60	75	1	1	AF75-30-11-70	535	AF75M-30-11-70	1399	AF75R-30-11-70	1542
125	95	30	30	60	75	1	1	AF95-30-11-70	570	AF95M-30-11-70	1470	AF95R-30-11-70	1665
140	110	30	40	75	100	1	1	AF110-30-11-70	600	AF110M-30-11-70	1605	AF110R-30-11-70	1868
230	130	40	50	100	125	1	1	AF145-30-11-70	1110	AF145M-30-11-70	2655	AF145R-30-11-70	2670
250	156	50	60	125	150	1	1	AF185-30-11-70	1635	AF185M-30-11-70	3870	AF185R-30-11-70	3885
300	192	60	75	150	200	1	1	AF210-30-11-70	1980	AF210M-30-11-70	4545	AF210R-30-11-70	4560
350	248	75	100	200	250	1	1	AF260-30-11-70	2235	AF260M-30-11-70	5055	AF260R-30-11-70	5070
400	302	100	100	250	300	1	1	AF300-30-11-70	2385	AF300M-30-11-70	6030	AF300R-30-11-70	6045
550	414	125	150	350	400	1	1	AF400-30-11-70	3120	AF400M-30-11-70	6705	AF400R-30-11-70	6720
650	480	150	200	400	500	1	1	AF460-30-11-70	4425	AF460M-30-11-70	13,275	AF460R-30-11-70	13,290
750	602	200	250	500	600	1	1	AF580-30-11-70	6900	AF580M-30-11-70	18,375	AF580R-30-11-70	18,390
900	810	250	300	600	700	1	1	AF750-30-11-70	7200	AF750M-30-11-70	19,725	AF750R-30-11-70	19,740
1350	960	—	400	800	900	1	1	AF1350-30-11-70	8490	—	—	—	—
1650	1080	—	450	900	1000	1	1	AF1650-30-11-70	10,230	—	—	—	—

Coil voltage selection – wide range AC/DC coils

All catalog numbers include a 100-250V AC/DC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 24V coil is required for a AF110 contactor: AF110-30-11-72

Coil voltage selection – AF50 to AF1650

AC/DC VOLTS, 40 - 60 Hz				
24 - 60 DC	20 - 60 DC	48 - 130 AC/DC	100 - 250 AC/DC	250 - 500 AC/DC
68 ①	72 ②	69	70 ③	71 ④

① AF400 – AF750, DC only.

② AF50 – AF300, DC only.

③ Only option for AF1350 / AF1650.

④ AF400 - AF750 only.

Contactors for ring tongue termination

A/AE9 - A/AE110, AC & DC operated

UL rated, 3 phase

UL general purpose current AC1	UL Motor switching current	UL/CSA horsepower ratings			Auxiliary contacts		AC operated		DC operated	
		240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price
21	9	2	5	7.5	1 0	0 1	A93010RT-84 A93001RT-84	\$ 81	AE93000RT-81 —	\$ 91 —
25	11	3	7.5	10	1 0	0 1	A123010RT-84 A123001RT-84	87	AE123000RT-81 —	97 —
30	17	5	10	15	1 0	0 1	A163010RT-84 A163001RT-84	106	AE163000RT-81 —	116 —
40	28	10	20	25	1 0	0 1	A263010RT-84 A263001RT-84	189	AE263000RT-81 —	199 —
80	54	20	40	50	0	0	A503000RT-84	311	AE503000RT-81	356
90	65	25	50	60	0	0	A633000RT-84	354	AE633000RT-81	459
105	80	30	60	75	0	0	A753000RT-84	396	AE753000RT-81	501
125	95	30	60	75	0	0	A953000RT-84	466	AE953000RT-81	571
140	110	40	75	100	0	0	A1103000RT-84	543	AE1103000RT-81	753

Coil voltage selection – AC coils

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the AC coils Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A753000RT-80

Coil voltage selection – DC coils

All DC operated catalog numbers include a 24VDC coil. To select other coil voltages, substitute the code from the DC coils Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 110V coil is required for an AE75 contactor: AE753000RT-86

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations. Only side-mounted blocks are allowed to be factory installed.

Auxiliary contact block with ring tongue termination

Positioning	Maximum number of contact blocks	Contact description	Catalog number	List price
Front mounting (C4-pole)	1 block A/AE9 – A/AE110	2 NO & 2 NC 3 NO & 1 NC 4 NO	CA5-22ERT CA5-31ERT CA5-40ERT	\$ 35

Coil voltage selection chart – AC coils

Hz	Cntr. type	Volts																
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600	
60	A		81	83	84	84		34	36	80	42							
50	A		81	83	84				80				85	86				55

For other voltages, see page 1.26.

Coil voltage selection chart – DC coils

Hz	Cntr. type	Volts					
		24	48	110	125	220	240
DC	AE	81	83	86	87	88	89

For other voltages, see page 1.26.

A9 – AF1650

Non-reversing, mechanically interlocked, reversing
NEMA rated, AC operated, 3 phase

Across the line
1



A26N1-30-10-84



A145N4-30-11-84



AF400N6-30-11-70

NEMA size	Continuous current	Maximum motor horsepower ratings			Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		200V	230V	460/575V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
NEMA rated												
00	9	1.5	1.5	2	1	0	A9N00-30-10-84	\$ 78	A9N00M-10-84	\$ 255	A9N00R-10-84	\$ 315
0	18	3	3	5	1	0	A16N0-30-10-84	102	A16N0M-10-84	345	A16N0R-10-84	413
1	27	7.5	7.5	10	1	0	A26N1-30-10-84	183	A26N1M-10-84	405	A26N1R-10-84	480
2	45	10	15	25	1	1	A50N2-30-11-84	330	A50N2M-11-84	713	A50N2R-11-84	810
3	90	25	30	50	1	1	A75N3-30-11-84	413	A75N3M-11-84	1155	A75N3R-11-84	1298
4	135	40	50	100	1	1	A145N4-30-11-84	825	A145N4M-11-84	2235	A145N4R-11-84	2250
5	270	75	100	200	1	1	A260N5-30-11-84	2235	A260N5M-11-84	5055	A260N5R-11-84	5070
6	540	150	200	400	1	1	AF460N6-3011-70	4425	AF460N6M-11-70	13,275	AF460N6R-11-70	13,290
7	810	—	300	600	1	1	AF750N7-3011-70	7200	AF750N7M-11-70	19,725	AF750N7R-11-70	19,740
8	1215	—	450	900	1	1	AF1650N83011-70	10,230	—	—	—	—

Coil voltage selection – A contactors

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A75N3-30-11-80

Coil voltage selection – wide range AC/DC coils

The NEMA size 6,7 and 8 contactors are provided with a wide range coil voltage. They are shown with the standard 100-250V AC/DC coil. To select other ranges substitute the code from the coil voltage selection chart for the two digits after the last dash in the catalog number.

Ex.: A 24V coil is required for the AF460N6 contactor: AF460N6-3011-68

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations.

Mechanical interlock

Mechanically interlocked contactors are designed for reversing, 2 speed, reduced voltage, etc. type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A750 — mounted on common baseplate

Power wiring is not included.

For A9 - A110 contactors the NC electrical interlock is provided with the mechanical interlock.

Reversing

Reversing contactors are designed for reversing type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A750 — mounted on common baseplate

For A9 - A750 contactors the NC electrical interlock is provided with the mechanical interlock.

Coil voltage selection – A contactors

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – AF460N6 to AF1650N8

AC/DC VOLTS, 40 - 60 HZ			
24 - 60 DC	48 - 130 AC/DC	100 - 250 AC/DC	250-500 AC/DC
68 ①	69	70 ③	71 ②

① AF400 – AF750, DC only.

② AF400 - AF750 only.

③ Only option for AF1650.

AE9 – AF1650, AL9 – AL26

Non-reversing, mechanically interlocked, reversing
NEMA rated, DC operated, 3 phase



AE26N1-30-11-81



AF145N4-30-11-68



AF460N6R-11-68

AE & AF Contactors

NEMA size	Continuous current	Maximum motor horsepower ratings			Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		200V	230V	460/575V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
NEMA rated												
00	9	1.5	1.5	2	1	0	AE9N00-30-11-81	\$ 118	AE9N00M-11-81	\$ 335	AE9N00R-11-81	\$ 395
0	18	3	3	5	1	0	AE16N0-30-11-81	142	AE16N0M-11-81	425	AE16N0R-11-81	493
1	27	7.5	7.5	10	1	0	AE26N1-30-11-81	223	AE26N1M-11-81	485	AE26N1R-11-81	560
2	45	10	15	25	1	1	AE50N2-30-11-81	375	AE50N2M-11-81	803	AE50N2R-11-81	930
3	90	25	30	50	1	1	AE75N3-30-11-81	518	AE75N3M-11-81	1365	AE75N3R-11-81	1493
4	135	40	50	100	1	1	AF145N4-3011-70	1110	AF145N4M-11-70	2655	AF145N4R-11-70	2670
5	270	75	100	200	1	1	AF260N5-3011-70	2235	AF260N5M-11-70	5055	AF260N5R-11-70	5070
6	540	150	200	400	1	1	AF460N6-3011-70	4425	AF460N6M-11-70	13,275	AF460N6R-11-70	13,290
7	810	—	300	600	1	1	AF750N7-3011-70	7200	AF750N7M-11-70	19,725	AF750N7R-11-70	19,740
8	1215	—	450	900	1	1	AF1650N83011-70	10,230	—	—	—	—

AL Contactors

NEMA size	Continuous current	Maximum motor horsepower ratings			Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	460/575V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
NEMA rated												
00	9	1.5	1.5	2	1	0	AL9N00-30-10-81	\$ 110	AL9N00M-10-81	\$ 319	AL9N00R-10-81	\$ 379
0	18	3	3	5	1	0	AL16N0-30-10-81	150	AL16N0M-10-81	441	AL16N0R-10-81	501
1	27	7.5	7.5	10	1	0	AL26N1-30-10-81	190	AL26N1M-10-81	473	AL26N1R-10-81	533

Coil voltage selection – AE contactors

All DC operated catalog numbers include a 24VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 125V coil is required for an AE75 contactor: AE75N3-30-11-87

Coil voltage selection – AF wide range AC/DC coils

All catalog numbers include a 100-250V AC/DC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 24V coil is required for a AF145 contactor: AF145N4-30-11-72

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations.

Mechanical interlock

Mechanically interlocked contactors are designed for reversing, 2 speed, reduced voltage, etc. type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- AE9 - AE16 — mounted on 35mm DIN rail
- AE26 - AE75 — mounted on common baseplate

Power wiring is not included.

For AE9 - AE75 contactors the NC electrical interlock is provided with the mechanical interlock.

Reversing

Reversing contactors are designed for reversing type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- AE9 - AE16 — mounted on 35mm DIN rail
- AE26 - AE75 — mounted on common baseplate

For AE9 - AE75 contactors the NC electrical interlock is provided with the mechanical interlock.

Coil voltage selection – AF50 to AF1650

AC/DC VOLTS, 40 - 60 Hz				
24 - 60 DC	20 - 60 DC	48 - 130 AC/DC	100 - 250 AC/DC	250 - 500 AC/DC
68 ①	72 ②	69	70 ④	71 ③

Coil voltage selection – AE & AL contactors

Hz	Contactor type	Volts						
		12	24	48	110	125	220	240
DC	AE, AL	—	81	83	86	87	88	89

① AF400 – AF750, DC only.
② AF50 – AF300, DC only.

③ AF400 - AF750 only.
④ Only option for AF1650.

A9 – A/AE75 , EK110 – EK1000, AL9 – AL26

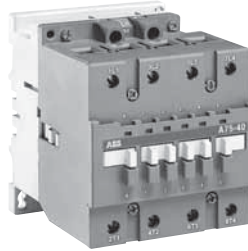
AC & DC operated

UL rated, 4 pole

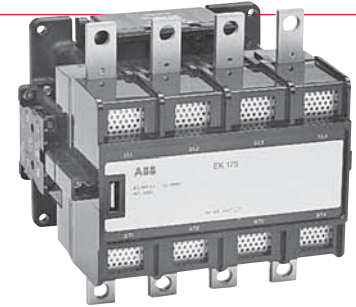
Across the line
1
contactors



A9-40-00



A75-40-00



EK175C4P-PL

4 Pole – 4 NO power poles

UL general purpose current		AC operated		DC operated	
AC operated	DC operated	Catalog number	List price	Catalog number	List price
21	21	A9-40-00-84	\$ 120	AL9-40-00-81	\$ 133
30	30	A16-40-00-84	165	AL16-40-00-81	172
40	40	A26-40-00-84	228	AL26-40-00-81	224
65	65	A45-40-00-84	360	AE45-40-00-86	420
80	80	A50-40-00-84	413	AE50-40-00-86	473
105	105	A75-40-00-84	525	AE75-40-00-86	570
150	150	EK110C4P-1L	743	EK110C4P-PL	953
200	200	EK150C4P-1L	1013	EK150C4P-PL	1238
250	250	EK175C4P-1L	1763	EK175C4P-PL	1988
300	300	EK210C4P-1L	2025	EK210C4P-PL	2280
400	400	EK370C4P-1L	4650	EK370C4P-PL	5010
600	600	EK550C4P-1L	6510	EK550C4P-PL	7005
1000 ①	1000 ①	EK1000C4P-1L	9000	EK1000C4P-PL	9700

4 Pole – 4 NC power poles

UL general purpose current	AC operated	List price
AC operated	Catalog number	
30	A16-04-00-84	\$ 165

4 Pole – 2 NO & 2 NC power poles

UL general purpose current		AC operated		DC operated	
AC operated	DC operated	Catalog number	List price	Catalog number	List price
21	21	A9-22-00-84	\$ 120	AL9-22-00-81	\$ 133
30	21	A16-22-00-84	165	AL16-22-00-81	172
40	30	A26-22-00-84	228	AL26-22-00-81	224
65	65	A45-22-00-84	360	AE45-22-00-86	420
105	105	A75-22-00-84	525	AE75-22-00-86	570

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. All DC operated catalog numbers include a 110VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A75-30-00-80

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations.

Accessories for EK

Please consult factory.

Coil voltage selection – A contactors

Hz	Cntr. type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84			80					85	86			55

For other voltages, see page 1.26.

Coil voltage selection – EK contactors

Hz	Contr. type	Volts														
		24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	EK	F	G		1		B		2	C	Z		3	4		6
50	EK	N		1			J			3	M				5	
DC	EK	Y	W	P		Q		R					T			

• For other voltages, consult factory.

• 24 & 48VAC coils are not available for sizes EK550. For these applications, use an interposing control relay.

Coil voltage selection – AE & AL contactors

Hz	Contr. type	Volts						
		12	24	48	110	125	220	240
DC	AE, AL	-	81	83	86	87	88	89

For other voltages, see page 1.26.

① Not UL Listed. IEC value AC1 for 40°C.

AF45 - AF75

AC & DC operated

UL rated, 4 pole

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.8. Add \$ 20 to the list price for each additional auxiliary and see page 1.18 for available combinations. If auxiliary contacts are required for AF50 – AF750 contactors, add \$ 40 to the list price and change the 8th & 9th digits in the catalog number from "00" to "11".

4 Pole — 4 NO power poles

General purpose	Auxiliary contacts		Catalog number	List price
	NO	NC		
AC1				
65	0	0	AF45-40-00-70	\$ 385
80	0	0	AF50-40-00-70	435
105	0	0	AF75-40-00-70	645

4 Pole — 2 NO - 2 NC power poles

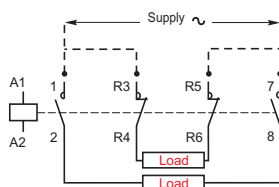
General purpose	Auxiliary contacts		Catalog number	List price
	NO	NC		
AC1				
65	0	0	AF45-22-00-70	\$ 385
105	0	0	AF75-22-00-70	645

These contactors (2 NO & 2 NC power poles) can be used for controlling either 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with 1 single supply (see diagrams below).

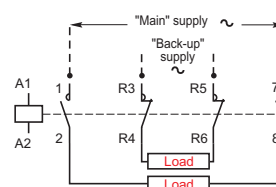
When the contactor operates, there is no mechanical overlapping between the NO main poles and NC main poles: Break before Make.

These contactors (2 NO & 2 NC power poles) are not suitable for a reversing starter or a wye-delta starter or for controlling a single load from 2 separate supplies.

1 single supply and 2 separate loads



2 separate supplies and 2 separate loads



Coil voltage selection – wide range AC/DC coils

All catalog numbers include a 100-250V AC/DC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 24V coil is required for a AF45 contactor: AF45-22-00-72

Coil voltage selection – AF50 to AF75

AC/DC VOLTS, 40 - 60 HZ			
24 - 60 DC	20 - 60 DC	48 - 130 AC/DC	100 - 250 AC/DC
68 ①	72 ②	69	70

① AF400 – AF750, DC only.
② AF50 – AF300, DC only.

UA26 – UA110 for 3 phase capacitor switching, 3 phase AC operated

Across the line
contactors

1



UA75-30-00-84



UA95-30-00-84

240V	Max kvar switching capacity		Standard auxiliary contacts		Catalog number	List price
	480V	575/600V	NO	NC		
12.5	25	30	1	0	UA26-30-10-84	\$ 225
16	32	40	1	0	UA30-30-10-84	338
20	40	50	0	0	UA50-30-00-84	345
			1	1	UA50-30-11-84	375
27.5	55	70	0	0	UA75-30-00-84	450
			1	1	UA75-30-11-84	480
35	70	75	0	0	UA95-30-00-84	465
			1	1	UA95-30-11-84	495
40	80	85	0	0	UA110-30-00-84	525
			1	1	UA110-30-11-84	570

For 3 phase capacitors carrying out single bank or stepped bank compensation.
Max. peak current \hat{I} : 100 times the capacitor nominal r.m.s. current at $U_e \leq 500V$ or 90 times for $U_e > 500V$
Electrical durability: 100,000 operating cycles.

Power in kvar

Contactor	208V	240V	480V	600V	Max amps
UA26	3.5	4.0	8.0	10.0	10
UA30	7.0	8.0	16.5	20.5	20
UA50	10.5	12.5	25.0	31.0	30
UA75	21.5	25.0	50.0	62.0	60
UA95	25.0	29.0	58.0	72.0	70
UA110	28.5	33.0	66.0	83.0	80
A145	43	50	100	125	120
A185	57	66	133	166	160
A210	66	77	153	192	185
A260	75	87	174	218	210
A300	88	101	203	254	245
AF400	119	137	274	343	330
AF460	142	164	329	410	396
AF580	178	205	411	514	495
AF750	214	247	495	618	595

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$20 to list price for each additional auxiliary, and see page 1.18 for available combinations.

Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80			85	86			55	

For other voltages, see page 1.26.

Accessories for A/AF/AL & AE contactors



CAL5-11



CA5-10

Auxiliary contact blocks – Standard

Positioning	Maximum number of contact blocks	Contact Description	Catalog number	List price
Front mounting (single pole)	4 blocks: A9 – A26 AE9 – AE26 AL9 – AL26	1 N.O. 1 N.C.	CA5-10 CA5-01	\$ 15
	5 blocks: A30, A40, AE30, AE40, AL30, AL40 6 blocks: A45 – A110 AE45 – AE110 AF45 – AF110		1 N.O. Early make 1 N.C. Late break	
Front mounting (4 pole)	1 block: A9 – A26-40-00 A30 – A110 AE9 – AE110	4 N.O. 3 N.O. & 1 N.C. 2 N.O. & 2 N.C. 4 N.C. 2 N.O./2 N.C.Ⓢ	CA5-40E CA5-31E CA5-22E CA5-04E CA5-11/11E	30
	1 block: A9 – A40-30-10 AL9 – AL40-30-10		3 N.O. & 1 N.C. 2 N.O. & 2 N.C. 1 N.O. & 3 N.C. 4 N.C. 4 N.O. 2 N.O./2 N.C.Ⓢ	
Side mounting (2 pole)	2 blocks: A9 – A75, AE9-AE45 1 block: AE50 – AE75, AL9 – AL40	1 N.O. & 1 N.C.	CAL5-11	
	1 block: A/AE/AF95 - A/AE/AF110		CAL18-11	
	2 blocks: A145 – A300, AF145-AF1650 2 blocks: A145 – A300, AF145-AF1650		1 N.O. & 1 N.C. (inside L or R) 1 N.O. & 1 N.C. (outside, L or R)	CAL18-11 CAL18-11B

Auxiliary contact blocks – Front mounting, switching low voltage and low current

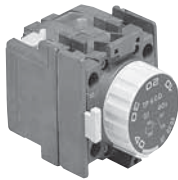
Positioning	Maximum number of contact blocks	Contact Description	Degree of protection	Catalog number	List price
Front mounting (single pole)	4 blocks: A9 – A26 AE9 – AE26 AL9 – AL26	1 N.O. 1 N.C. 1 N.O. 1 N.C.	IP40 IP40 IP40 IP40	CE5-10D0.1 CE5-01D0.1 CE5-10D2 CE5-01D2	\$ 38
	5 blocks: A30, A40, AE30, AE40, AL30, AL40 6 blocks: A45 – A110 AE45 – AE110 AF45 – AF110			1 N.O. 1 N.C. 1 N.O. 1 N.C.	IP67 IP67 IP67 IP67

Ⓢ Includes 1 N.O. & 1 N.C. overlapping

Accessories for A/AF/AL & AE contactors

Across the line
contactors

1



TP40DA



VE5-1



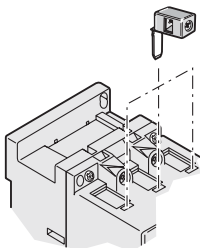
VM300H



LK75-A

LK75-A1

LK110



Pneumatic timers

Mounting on	Timing range	Contacts		Catalog number	List price
		N.O.	N.C.		
A9 – A75	On delay 0.1 – 40 s	1	1	TP40DA	\$ 108
AE9 – AE75	On delay 10 – 180 s	1	1	TP180DA	
AL9 – AL40	Off delay 0.1 – 40 s	1	1	TP40IA	
	Off delay 10 – 180 s	1	1	TP180IA	

Interlocks for two horizontally mounted contactors – A9 - A110

Feature	Mounting on	Contacts		Catalog number	List price
		N.O.	N.C.		
Mechanical/electrical	A/AE/AL9 – A/AE/AL40	—	2	VE5-1	\$ 45
Mechanical/electrical	A45 – A110	—	2	VE5-2 [Ⓢ]	45
Mechanical	A/AE/AL9 – A/AE/AL40	—	—	VM5-1	21

Interlocks for two horizontally mounted contactors – A95 - AF750 contactors

Feature	Left contactors	Right contactors	Catalog number	List price
Mechanical	A95 – A300	A145 – A300	VM300H	\$ 110
Mechanical	A210 – A300	AF400 – AF460	VM300/460H	130
Mechanical	AF400 – AF750	AF400 – AF750	VM750H	150

Interlocks for two vertically mounted contactors – A95 - AF750 contactors

Feature	Top contactor	Bottom Contactor	Catalog number	List price
Mechanical	A95 – A300	A145 – A300	VM300V	\$ 205
Mechanical	A210 – A300	AF400 – AF460	VM300/460V	250
Mechanical	AF400 – AF750	AF400 – AF750	VM750V	270

Interlocks for two horizontally mounted contactors – AF1350 - AF1650 contactors

Feature	Left contactor	Right Contactor	Catalog number	List price
Mechanical	AF1350 – AF1650	AF1350 – AF1650	VM1650H	\$ 665

Auxiliary lead terminals (Set of 2)

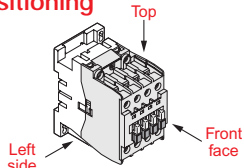
Connections	Mounting on	Catalog number	List price
Connects from side	A50 – A75	LK75-A	\$ 15
Connects from top	A50 – A75	LK75-A1	15
Connects from side	A95 – A110	LK110	23

[Ⓢ] Use type VE 5-2 for mechanical and electrical interlocking between A30/A40 and A50 - A75 contactors.

Accessories

Possible accessory combinations for A contactors

Positioning



Accessories — Front face mounting

Auxiliary contacts		Pneumatic timers
1 - pole	4 - pole	
CA5-10 or CA5-01	CA5-40 or CA5-22 or CA5-31	TP - D or TP - I

Accessories — Side mounting

Auxiliary contacts	Electrical or mechanical interlock ^①	
CAL 5-11 CAL18-11 CAL18-11B	VE5-1 or VM 5-1	VE 5-2 VM300H VM300/460H VM750H

Configurations of accessories are different depending on whether front or side mounted.

N Contactor relays A and AE Contactors

Type Main poles Built-in auxiliary contacts



A9 - A26	- 3 0 - 1 0
A9 - A26	- 3 0 - 0 1 ^①
A9 - A26	- 4 0 - 0 0
A9 - A26	- 2 2 - 0 0 ^①
AE9 - AE26	- 3 0 - 0 0

AL9 - AL26	- 3 0 - 1 0
AL9 - AL26	- 3 0 - 0 1

AL9 - AL16	- 4 0 - 0 0
AL9 - AL16	- 2 2 - 0 0
AL26	- 4 0 - 0 0
AL26	- 2 2 - 0 0

A9 - A16	- 3 0 - 2 2
A9 - A26	- 3 0 - 3 2

A30, A40	- 3 0 - 1 0
A30, A40	- 3 0 - 0 1
AE30, AE40	- 3 0 - 1 0
AE30, AE40	- 3 0 - 0 1

AE30, AE40	- 3 0 - 1 0
AE30, AE40	- 3 0 - 0 1

A30, A40	- 3 0 - 3 2
----------	-------------

A50 - A75	- 3 0 - 0 0
A45 - A75	- 4 0 - 0 0
A45, A75	- 2 2 - 0 0 ^②
A95, A110	- 3 0 - 0 0

A50 - A75	- 3 0 - 2 2
A95, A110	- 3 0 - 2 2

AE50 - AE75	- 3 0 - 0 0
AE45 - AE75	- 4 0 - 0 0
AE45, AE75	- 2 2 - 0 0 ^②
AE95, AE110	- 3 0 - 0 0

A50 - A75	- 3 0 - 1 1
AE50, AE75	- 3 0 - 1 1
A95, A110	- 3 0 - 1 1
AE95, AE110	- 3 0 - 1 1

A145 - AF1650	- 3 0 - 0 0
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Accessories — Front mounting

Auxiliary contact blocks
1-pole CA5-



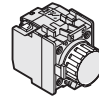
1 to 4 CA5-
1-pole blocks

4-pole CA5-



OR 1 CA5-
4-pole block

TP - A Pneumatic timer block



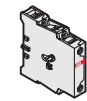
OR 1 TP - A block

Accessories — Side mounting

Auxiliary contact Blocks
2-pole CAL5-11,
CAL18-11



+ 1 to 2
CAL5-11 blocks



OR 1 VM/E 5-1 block
+ 1 CAL5-11 block

1 to 4 CA5-
1-pole blocks

OR 1 CA5-
4-pole block

OR —

OR 1 CAL5-11 block

OR 1 VM/E 5-1 block
+ 1 CAL5-11 block

1 to 4 CA5-
1-pole blocks

OR 1 CA5-
4-pole block

OR —

OR 1 CAL5-11 block

OR 1 VM/E 5-1 block
+ 1 CAL5-11 block

—

—

—

+ 1 to 2
CAL5-11 blocks

OR 1 VM/E 5-1 block
+ 1 CAL5-11 block

1 to 5 CA5-
1-pole blocks

OR 1 CA5- 4-pole block
+ 1 CA5- 1-pole block

OR 1 TP - A block
+ 1 CA5- 1-pole block

+ 1 to 2
CAL5-11 blocks

OR 1 VM/E 5-1 block
+ 1 CAL5-11 block

1 to 5 CA5-
1-pole blocks

OR 1 CA5- 4-pole block
+ 1 CA5- 1-pole block

OR —

OR 1
CAL5-11 block

OR 1 VM/E 5-1 block
+ 1 CAL5-11 block

1 CA5-
1-pole block

—

—

+ 1 to 2
CAL5-11 blocks

OR 1 VM/E 5-1 block
+ 1 CAL5-11 block

1 to 6 CA5-
1-pole blocks

OR 1 CA5- 4-pole block
+ 2 CA5- 1-pole blocks

OR 1 TP - A block
+ 2 CA5-
1-pole blocks

+ 1 to 2
CAL5-11 blocks
2 CAL18-11 blocks

OR 1 VE5-2 block
+ 1 CAL5-11 block
1 VE5-2 + CAL5-11

2 CA5-
1-pole blocks

—

—

+ 1 to 2
CAL5-11 blocks

OR 1 VE5-2 block
+ 1 CAL5-11 block

1 to 6 CA5-
1-pole blocks

OR 1 CA5- 4-pole block
+ 2 CA5- 1-pole blocks

OR 1 TP - A block
+ 2 CA5-
1-pole blocks

+ 1 CAL5-11 block
1 CAL5-11 block
1 CAL5-11 block
1 CAL18-11 block

OR 1 VE5-2 block

1 to 6 CA5-
1-pole blocks

OR 1 CA5- 4-pole block
+ 2 CA5- 1-pole blocks

OR 1 TP - A block
+ 2 CA5-
1-pole blocks

+ 1 CAL5-11 block
+ 1 CAL18-11 block

OR 1 VE5-2 block

—

—

—

1 to 2
CAL18-11 blocks
+ 1 to 2
CAL18-11B blocks

OR 1 CAL18-11 block
+ 1 CAL18-11B block
+ VM300H or VM300/460H
or VM750H interlock

Contactor mounting configurations (standard from factory)

Auxiliary contacts are mounted on the contactor in the following order:

- Left - 1st
- Right - 2nd
- Top - 3rd (L to R)

^① In mounting position 5 (see page 1.36), there should be no more than 2 "N.C." front-mounted auxiliary contacts - The CAL 5-11 side-mounted blocks offer additional "N.C." contacts.

^② Whatever the mounting position (see page 1.36), there should be no more than 2 "N.C." front-mounted auxiliary contacts - The CAL 5-11 side-mounted blocks offer additional "N.C." contacts.

Accessories

Auxiliary contact block technical data

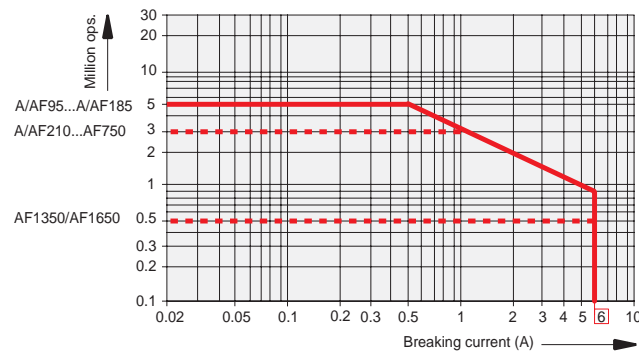
CA5/CAL5-11/CAL18-11/CC5

Across the line
contactors

1

Types	1-pole CA5, 4-pole CA5 2-pole CAL5-11 and 1-pole CC5		CAL18-11 CAL18-11B
Standards	IEC 947-5-1 and EN 60947-5-1		
Rated insulation voltage U_i according to IEC 947-5-1	V	690	690
according to UL/CSA	V	600	690
Rated operational voltage U_e	~ V	24 to 690	
Conventional thermal current I_{th}	A	16	
Rated operational current I_e in AC-15 acc. to IEC 947-5-1	24 to 127 V 220 to 240 V 380 to 440 V 500 to 690 V	A A A A	6 4 3 2
in DC-13 acc. to IEC 947-5-1	24 V 48 V 72 V 125 V 250 V	A A A A A	6 2.8 1 0.55 0.3
Connecting terminals (delivered in open position. Screws of unused terminals should be tightened).	M 3.5 (+,-) pozidriv 2 screw with cable clamp		
Connecting capacity			
• Rigid solid	1 or 2 x mm ²	1 to 4	
• Flexible with cable end	1 x mm ² 2 x mm ²	0.75 to 2.5 0.75 to 2.5	
Mechanical durability	cycles	10 million, A9 - A75;	5 million, A/AF95 - A/AF185; 3 million, A/AF210 - AF750; 0.5 million, AF1350 & AF1650
Max. switching frequency	cycles/h	3600	
Electrical durability		See curve below	
Max. switching frequency	cycles/h	1200	
Rated making capacity Rated breaking capacity		10 x I_e AC-15 10 x I_e AC-15	
Rated short-time withstand current I_{cw} q = 40°C	1 s 0.1 s	A A	100 140
Min. switching capacity		17 V / 1 mA	24V / 50 mA
Short-circuit protection - gG (gl) fuses	A	10	
Power loss per pole at 6 A	W	0.15	
Degree of protection according to IEC 529, IEC 144, DIN 40 050 and NFC 20-010		IP 20	

CAL18



Electrical durability

AC-15 according to IEC 947-5-1

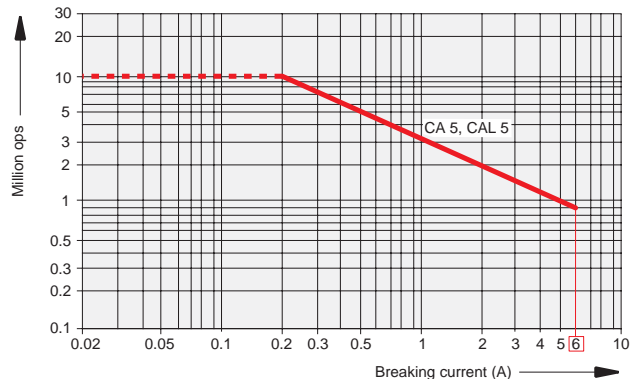
making current: 10 x I_e where $\cos \varphi = 0.7$ and U_e

breaking current: I_e where $\cos \varphi = 0.4$ and U_e

The curves opposite show the electrical durability of the auxiliary contact blocks according to breaking current I_c .

These curves have been plotted for resistive and inductive loads up to 690 V, 40 to 60 Hz.

CA5, CAL5



Accessories

Auxiliary contact block technical data

CE5

Auxiliary contact blocks for switching low level voltage and current

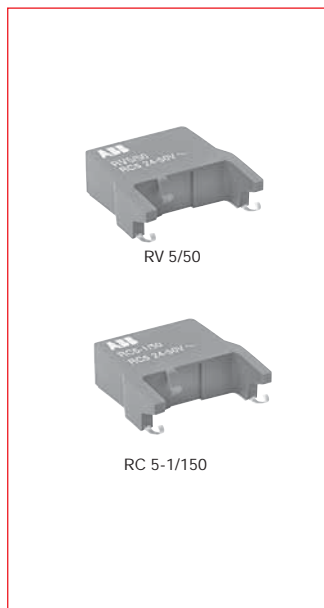
Types		CE5-10D0.1 CE5-01D0.1 CE5-10W0.1 CE5-01W0.1 Version 100 mA	CE5-10DZ CE5-01DZ CE5-10WZ CE5-01WZ Version 2 A
Standards		IEC 947-5-1 and EN 60947-5-1	
Approvals		UL / CSA	
Rated insulation voltage U_i			
according to IEC 947-5-1	V	250	250
according to UL/CSA	V	125	250
Rated operational voltage U_e		V	250
Rated operational current I_e			
in AC-15 or AC-14 acc. to IEC 947-5-1	A	0.1	2
in DC-12 acc. to IEC 947-5-1	A	0.1	2
24 V	A	0.1	0.5
60 V	A	0.1	0.2
110 V	A	0.1	0.1
220 V	A	0.1	0.1
Minimal switching		3 V / 1 mA	17 V / 1 mA
Reliability for the minimal switching		10 ⁻⁸	
Connecting terminals		M3.5 (+,-) posidriv 2 screw with cable clamp	
Connecting capacity			
• Rigid solid		1 ou 2 (1...4) mm ²	
• Flexible with cable end		1 ou 2 (0.75... 2.5) mm ²	
Short circuit protection		100 mA	10 A
Degree of protection			
according to IEC529, IEC 144, DIN 40 050, NFC 20-010	IP 20		
Mounting		Front mounting on contactors: A, AE, TAE9...110, AL, AF, GA, N, NE	
Dimensions		Identical to those of CA5 single pole	

Accessories

Surge suppressors for A/AE/AL/EK contactors

Across the line
contactors


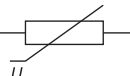
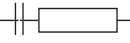
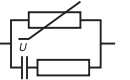
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Surge suppression device

Mounting on	Voltage range	Catalog number	List price
AE9 to AE110 AL9 to AL40	12 – 32 VDC 25 – 65 VDC 50 – 90 VDC 77 – 150 VDC 150 – 264 VDC	RT5/32 RT5/65 RT5/90 RT5/150 RT5/264	\$ 30
A9 to A110; AE9 to AE110 AL9 to AL40	24 – 50 VAC/VDC 50 – 133 VAC/VDC 110 – 250 VAC/VDC 250 – 440 VAC/VDC	RV5/50 RV5/133 RV5/250 RV5/440	
A9 to A40	24 – 50 VAC 50 – 133 VAC 110 – 250 VAC 250 – 440 VAC	RC5-1/50 RC5-1/133 RC5-1/250 RC5-1/440	
A45 to A300	24 – 50 VAC 50 – 133 VAC 110 – 250 VAC 250 – 440 VAC	RC5-2/50 RC5-2/133 RC5-2/250 RC5-2/440	26
EK110 to EK210	24 – 48 VAC 110 – 415 VAC	RC-EH250/48 RC-EH250/415	
EK370 to EK550	48 – 110VAC	RC-EH800/110	
EK110 to EK550 EK370 to EK550	24 – 125VDC 220 – 600VAC	RC-EH800/110 RC-EH800/600	

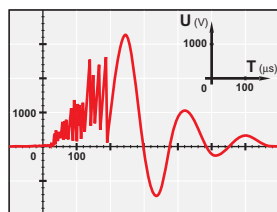
Technical data

Type	Control circuit	Opening time growth factor	Residual overvoltage or clipping voltage	Remarks
RT 5 /... transil diode 	32 DC 65 DC 90 DC 150 DC 264 DC	2.5 to 3	50 V 100 V 150 V 210 V 390 V	Advantages <ul style="list-style-type: none"> • Good energy absorption • Unpolarized system Drawback <ul style="list-style-type: none"> • Simple, reliable system • A certain delay on drop out which does not however reduce contactor breaking capacity.
Varistor 	RV 5/... 50 AC/DC 133 AC/DC 250 AC/DC 440 AC/DC	1.1 to 1.5	132 V 270 V 480 V 825 V	Advantages <ul style="list-style-type: none"> • High energy absorption; good damping • Unpolarized system Drawback <ul style="list-style-type: none"> • Clipping as from U_{vdr}, thus voltage front up to this point
RC 5-1/... or RC 5-2/... RC-EH 300/... 	see table above AC	1.2 to 3	2 to 3 x U_c	Advantages <ul style="list-style-type: none"> • Very fast clipping • Attenuation of steep fronts and thus of high frequencies • No operating delays
Varistor + RC 	RC-EH ... 800/110 AC/DC 800/600 AC	1.1 to 1.5	205 V 1100 V	Advantages <ul style="list-style-type: none"> • High energy absorption: good damping • Unpolarized system • The RC system damps the voltage front under the U_{vdr}* threshold.

* U_{vdr} = Varistor operating voltage (voltage dependent resistor), tolerance $\pm 10\%$

Accessories

Surge suppressors for A/AE/AL/EK contactors General information



General

The operation of inductive circuits causes overvoltages, in particular on opening of the contactor coil.

The electromagnetic energy stored by the coil during contactor closing is restored on opening in the form of surges, the slope and amplitude of which may rise to several kilovolts. A number of drawbacks are observed ranging from interference on the electronic devices to breakdown of insulators and even destruction of certain sensitive components.

The graph opposite reproduces the oscillogram showing voltage discharges at the terminals of a 42V/50Hz coil without peak clipping. The coil was switched by 8 series-connected poles of a contactor relay.

Following a burst of discharges with a very steep slope a damped oscillation emerges with a peak value of 3500V.

Overvoltage factor

The overvoltage factor k is defined as the ratio of the maximum overvoltage peak value \hat{U}_s to the peak value \hat{U}_c of the coil rated control voltage U_c :

$$k = \frac{\hat{U}_s \text{ max.}}{\hat{U}_c}$$

in DC:

$$k = \frac{\hat{U}_s \text{ max.}}{U_c}$$

or in AC:

$$k = \frac{\hat{U}_s \text{ max.}}{U_c \sqrt{2}}$$

For example the following is obtained for the above graph: $k = \frac{3500}{42 \sqrt{2}} \approx 60$

Surge suppressors

To guard against the harmful effects of these overvoltages, ABB has developed a range of surge suppressors designed to reduce the k factor defined above and to limit or even completely eliminate the high pre-damping voltage frequencies.

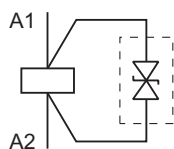
Each case is different, but the technical data tolerances and the generous sizing of parts have enabled us to reduce the number of variants.

We have chosen the following solutions: transil diodes, varistors and RC blocks.

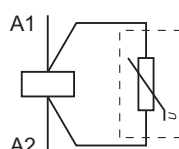
Note: A varistor is a resistor whose value increases to a very large extent when a certain voltage is applied at its terminals.

Wiring diagrams

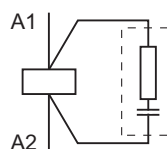
Transil diode



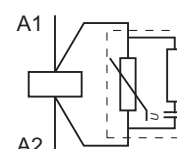
Varistor (only)



RC type



Varistor + RC



General technical data

The housings and impregnation resins of the surge suppressors are made of flame-resistant materials in accordance with the UL 94 standard.

These systems are not polarized, i.e. d.c. operated devices do not have to be connected in a specific direction.

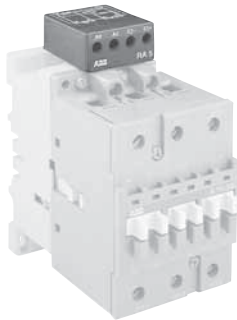
- Operating temperature: -20 to +70 °C
- Connection to the coil terminals (parallel mounting)
 - For **RT 5**, **RV 5**, **RC 5-1** and **RC 5-2**: clip-on for both fixing and connection.
- Mounting:
 - **RT 5**, **RV 5** and **RC 5**: clipped onto the top part of the contactor base. This mounting method prevents any projections and change in contactor dimensions.
 - **RC-EH**: glued to the top part of the contactor base.

Accessories

Interface relays for A contactors

Across the line
contactors

1



A30-30-10 + RA 5



RA 5

Interface relays

Mounting on contactor types	Coil voltages	Catalog number	List price
N, A9 – A110	24 – 250V, 50, 60 Hz	RA5	\$ 75

Description

RA5 interface relays are designed to receive 24 VDC signals delivered by PLCs or other sources with a low output power and to restore them with sufficient power to operate the coils of the relevant contactors

Types

- RA5 for combination with A9 – A110 contactors and N contactor relays.

Description

RA5 interface relays are made up of a miniature electromechanical relay equipped with a N.O. contact and with a low consumption 24 VDC coil.

The interface relay coil is controlled by the PLC while the N.O. contact ensures switching of the power contactor.

Coil switching gives rise to overvoltages which have adverse effects on the electronic devices, insulators and, more generally, on component lifetime. The RA 5 is equipped with surge suppressors:

- on the 24 VDC relay coil via a diode
- on the power contactor coil via a varistor.

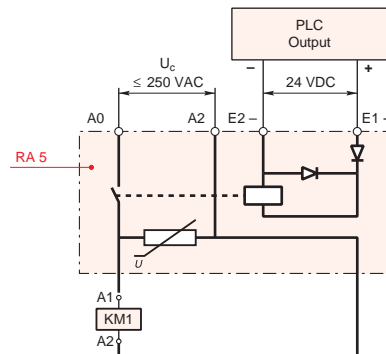
Furthermore, the RA5 are protected against relay pole reversal by a diode inserted between the E1 and E2 input terminals.

Connection

The “E1+” and “E2-” input terminals must be connected, according to their polarity, to the PLC output.

- The RA 5 is equipped with two terminal pads for connection to the A1 and A2 terminals of the contactor coil. This coil is supplied between the A0 and A2 terminals of the RA 5.

RA 5 interface relay for the A 9 – A 110 contactors and N control relays



Mounting

- RA5: terminal pads clamped inside the contactor coil terminals.

Accessories

Interface relay technical data

General technical data

Standards		IEC 255-5
Rated insulation voltage U_i acc. to IEC 947-4-1 and VDE 0110	VAC	250
Permissible ambient temperature		
• For free air operation:		
– at $U_e = 24\text{VDC}$ (between E1 & E2)	°C	-25 to +70
– from 0.85 to 1.1 U_e	°C	-25 to +55
• For storage	°C	-40 to +70
Climatic withstand		Complies with that of associated contactors
Mounting position		No limitation
Operating height	meters	3000
Mounting		Using the contactor A1 and A2 terminal connecting points Cable clamps and M 3.5 (+, -) pozidriv screws (2)
Connecting terminals (open on delivery)		
Cable cross-sectional area:		
• Rigid solid	2 x mm ²	1 to 4
• Flexible	2 x mm ²	0.75 to 2.5
Degree of protection		Protection against direct contact acc. to VDE 0106, Part 100

Construction data

Surge suppression:		
• For contactor coil		Varistor
• For interface relay coil		Diode
Protection against polarity reversal between terminals E1 and E2		Diode
Use on contactors with coils:		
• 24 to 250V/50, 60 Hz	types	N, A9 – A110
Interface relay operating time	ms	
Total operating time, interface relay + contactor		
• Between energization and:		
– NO contact opening	ms	19 to 36
– NC contact opening	ms	16 to 32
• Between de-energization and:		
– NO contact opening	ms	15 to 25
– NC contact opening	ms	18 to 28

Electrical input data

Control voltage (E1 and E2 terminals) U_c :		
• Rated value	VDC	24
• Maximum range	VDC	17 to 30
Max. consumption for $U_c = 24\text{ VDC}$, $\varnothing=20^\circ\text{C}$	W	0.3
"0" status (relay open)		
• For U_c	VDC	≤ 2.4
• For I_c	mA	≤ 1
"1" status (relay closed) for U_c	VDC	≥ 17
Max. short supply interruption immunity time	ms	4
Electrical output data		
Switching voltage (A0 and A2 terminals)	VAC VDC	≤ 250 –
Electrical lifetime	millions of operations	4 (600 ops./h) on A9 – A40 2 (600 ops./h) on A45 – A110

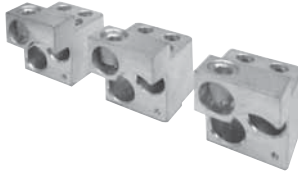
Accessories for A/AE/AL/AF contactors

Across the line
contactors

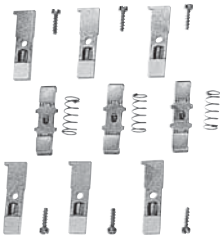
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ATK185



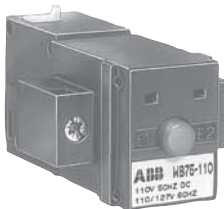
ATK750/3



ZL75



ZL145



WB75A-04



BA5-50

Terminal lug kits (Set of 3)

Wire range	For contactor	Catalog number	List price
6 – 250 MCM	A145 – A185	ATK185	\$ 45
4 – 400 MCM	A210 – A300	ATK300	68
(2) 4-500 MCM	A210 – A300	ATK300/2	110
(2) 2/0 – 500 MCM	AF400 – AF580	ATK580/2	150
(3) 2/0 – 500 MCM	AF580 – AF750	ATK750/3	225
(4) 4/0 – 500 MCM	AF1350	ATK1350/4	235
(4) 1/0 – 750 MCM	AF1350 – AF1650	ATK1650/4	335
(6) 1/0 – 750 MCM	AF1350 – AF1650	ATK1650/6	560

Contact kits

For contactors	Catalog number	List price
3 Pole		
A/AE/AF50	ZL50	\$ 113
A/AE/AF63	ZL63	135
A/AE/AF75	ZL75	158
A/AE/AF95	ZL95	225
A/AE/AF110	ZL110	255
A/AF145	ZL145	300
A/AF185	ZL185	420
A/AF210	ZL210	525
A/AF260	ZL260	855
A/AF300	ZL300	1020
AF400	ZL400	1716
AF460	ZL460	2434
AF580	ZL580	3795
AF750	ZL750	3960
AF1350	ZL1350	4255
AF1650	ZL1650	4890
4 Pole		
A/AE45	ZLT45	150
A/AE50	ZLT50	150
A/AE75	ZLT75	210
3 Pole		
UA50	ZLU50	150
UA75	ZLU75	215
UA95	ZLU95	306
UA110	ZLU110	347

Mechanical latches

For contactors	Catalog number	List price
A9 - A75, AE45 - AE75, & AL9 - AL40	WB75A-★	\$ 84

★ - Coil voltage suffix. Refer to Coil Voltage Selection chart and substitute the desired coil voltage suffix for the ★.

Coil voltage selection chart — mechanical latches for A, AE & AL contactors

50 Hz (AC/DC)	60 Hz (AC)	Voltage code	50 Hz (DC)	60 Hz (AC)	Voltage code
24	24 – 28	01	220 – 230	220 – 255	06
42	42 – 48	02	230 – 240	230 – 277	05
48	48 – 55	03	380 – 415	380 – 440	07
110	110 – 127	04	415 – 440	440 – 480	08

Range: WB75A for contactors A9 – A75, AL9 – AL40, AE45 – AE75 and control relays N and NL.

Description: WB75A block: contains a mechanical latching device with electromagnetic impulse unlatching (AC or DC) or manual unlatching. Captive screw type connecting terminals, built-in cable clamps, M 3.5 (=, -) posidrive 1 screw with screwdriver guidance, delivered untightened and protected against accidental direct contact.

Operation: After closing, the contactor continues to be held in the closed position by the latching mechanism should the supply voltage fail at the contact coil terminals.

Contact opening can be controlled:

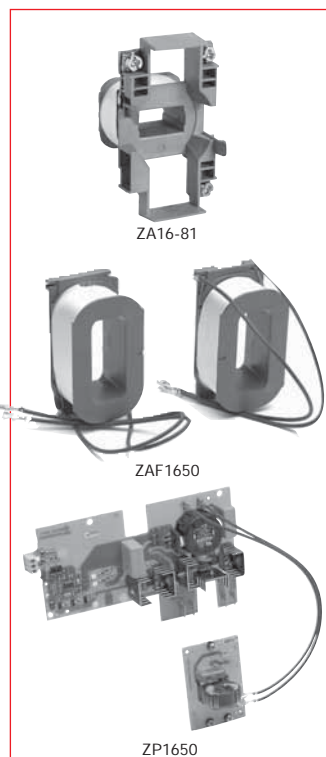
- Electrically by an impulse* (AC or DC) on the WB75A block coil. The coil is not designed to permanently energized.
- Manually by pressing the pushbutton on the front face of the WB75A block.

Mounting: WB75A is clipped onto the front face of the contactor.

Identification markers

Mounting on	Coil voltage	Catalog number	List price
A/AE/AL/AF9 – A/AE/AL/AF110	Pack of 50	BA5-50	\$ 15

Accessories for A/AE/AL/AF contactors Coils & coil voltage codes



Coils — AC operated

For contactors	Catalog number	List price
A9 – A16	ZAI16-★	\$ 24
A26 – A40	ZAI40-★	30
A45 – A75	ZAI75-★	57
A95 – A110	ZAI110-★	60
A145 – A185	ZAI185-★	150
A210 – A300	ZAI300-★	180

Coils — DC operated

AE9 – AE16	ZAE16-★	24
AE26 – AE40	ZAE40-★	30
AE45 – AE75	ZAE75-★	57
AE95 – AE110	ZAE110-★	90
Auxiliary including an insertion contact and a varistor for DC operated contactors	CCL18-01	45
AE95 – AE110		

Coils — AC/DC operated (coil and printed circuit board except ZAF1650)

AF45 – AF75	ZAF75-★	120
AF95, AF110	ZAF110-★	165
AF145 – AF185	ZAF185-★	200
AF210 – AF300	ZAF300-★	240
AF400, AF460	ZAF460-★	450
AF580, AF750	ZAF750-★	525
AF1350, AF1650 (Set of 2 coils only)	ZAF1650-★	920

Printed circuit board — AC/DC operated

AF1350 – AF1650	ZP1650	1620
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★ – Coil voltage suffix. Refer to Coil Voltage Selection charts below and substitute the desired coil voltage code for the ★.

Coil voltage selection — AC operated for A9 – A300; UA26 – UA110

VAC (50Hz)	VAC (60Hz)	Voltage Code
24	24	81
26	28	16
28	32	17
42	42	82
48	48	83
60	60	73
100	100 – 110	74 ②
110	110 – 120	84
110 – 115	115 – 127	89 ③
120	140	29
125 – 127	150	30
175	208	34
190	220	36
200	200 – 220	75 ②
220 – 230	230 – 240	80
230 – 240	240 – 260	88
230 – 240	277	42
230/400	—	62 ①
—	230/400	63 ①
380 – 400	400 – 415	85
400 – 415	415 – 440	86
—	480	51
440	500	53
500	600	55
550	—	56
660 – 690	—	58

Coil voltage selection — DC operated for AE contactors

VDC	Voltage code AE contactors
12	80
24	81
42	82
48	83
50	21
60	84
75	85
110	86
125	87
220	88
240	89
250	38

Coil voltage selection — AC/DC operated for AF50 – AF1650

VAC & VDC 40-60 Hz	Suffix Code
24 – 60 VDC	68 ④
20 – 60 VDC	72 ⑤
48 – 130 VAC/VDC	69
100 – 250 VAC/VDC	70 ⑦
250 – 500 VAC/DC	71 ⑥

- ① Only for A9 – A16.
- ② Not for A145 – A300
- ③ A145 – A300 at 60 Hz, 115V only
- ④ AF400 – AF750, DC only
- ⑤ AF45 – AF300
- ⑥ AF400 - AF750 only
- ⑦ Only option for AF1350 - AF1650

Accessories for EK contactors Coils & coil voltage codes

Across the line
contactors

1

Coils — AC & DC operated

Contactor size	AC Coils		DC Coils	
	Catalog number	List price	Catalog number	List price
EK110, EK150	KH210-★	\$ 200	KH210-★	\$ 260
EK175, EK210	KH300-★	240	KH300-★	320
EK370, EK550	KH800-★	580	KH800-★	700

★ – Coil voltage suffix. Refer to the Coil Voltage Selection chart and substitute the desired coil voltage suffix for the ★. AC and DC operated contactors DO NOT have the same magnet structure. Therefore, DC coils will not fit on an AC magnet structure and vice versa.

Coil voltage selection — AC operated for EK110 – EK550

VAC (50Hz)	VAC (60Hz)	Voltage Code
–	24	F
24	–	N
–	48	G
110	120	1
–	208	B
–	240	2
220 – 230	–	J
–	380	Z
380 – 400	440	3
400 – 415	–	M
–	480	4
500	–	5
–	600	6

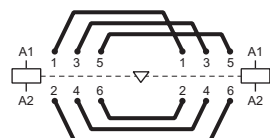
Consult factory if other voltages are required.

Coil voltage selection — DC operated for EK110 – EK550

VDC	Voltage Code
24	Y
48	W
110	P
125	Q
220	R
440	T

Consult factory if other voltages are required.

Accessories for A/AE/AL/AF contactors



BEM circuit diagram



BES110 connection diagram



BED...

Connection kits for reversing

Mounting on 3 pole contactors	Catalog number	List price
A/AE/AL9 – A/AE/AL16	BEM16-30	\$ 23
A/AE/AL26	BEM26-30	30
A/AE/AL30, A/AE/AL40	BEM40-30	45
A/AE/AF50 – A/AE/AF75	BEM75-30	165
A/AE/AF95, A/AE/AF110	BEM110-30	180
A/AF145 – A/AF185	BEM185-30	260
A/AF210 – A/AF300	BEMA300-30	470
AF400 – AF460	BEM460-30	850
AF580 – AF750	BEM750-30	1200

Application

Connections between the main poles of **two 3 pole contactors** mounted side by side so that they operate as reversing contactors.

Description

The connection kits for reversing contactors are made up of three reversing connections and three phase to phase connections.

- BEM16-30 — Insulated, solid, rigid copper wires
- BEM26 and 40-30 — Insulated, stranded, rigid copper wires
- BEM75 and 110-30 — Insulated, solid copper bars

Connection kits for phase to phase

Mounting on 3 pole contactors	Catalog number	List price
A/AE/AF50, A/AE/AF75	BES75-30	\$ 75
A/AE/AF95, A/AE/AF110	BES110-30	90
A/AF145 – A/AF185	BES185-30	130
A/AF210 – A/AF300	BESA300-30	200
AF400 – AF460	BES460-30	425
AF580 – AF750	BES750-30	650

The connection kit for phase to phase contactors is made up of three phase to phase bus bars.

Connection kits for wye-delta starters

Mounting on contactors		Catalog number	List price
Line and delta contactor	Wye contactor		
A30 A40	A26 A26	BED40U	\$ 53
A50 A63	A30 A40	BED50U	165
A75 A95 A110 A145 A185 A210	A50 A75 A95 A110 A145 A185	BED75U BED95U BED110U BED145U BED185U BED210U	180 195 225 250 290 375
A260/A300	A210	BED300U	500
AF400/AF460	A260/A300	BED400U	850
AF460	AF400	BED460U	900
AF580	AF400/AF460	BED580U	1250
AF750	AF580	BED750U	1450

Application

Connections between the main poles of a wye-delta starter.

Description

The connection kits for wye-delta starters are made up of:

- Three line contactor/wye contactor connections — line side.
- Three wye contactor/delta contactor connections — load side.
- The shorting connection for the "S" contactor.

BED40U – Insulated, stranded, rigid copper wires.

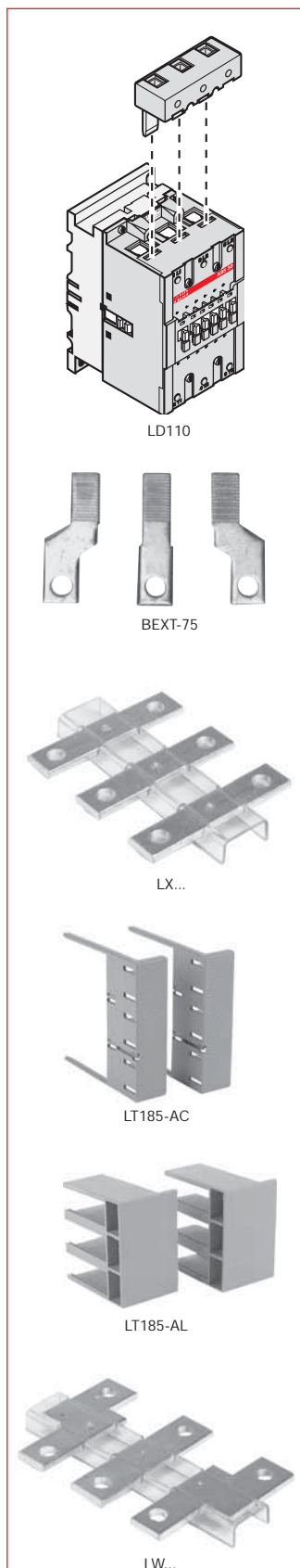
BED50U thru BED750U — Insulated, solid copper bars.

The above connection sets allow a mechanical interlock unit to be mounted between the wye and delta contactors if required.

Accessories for A/AE/AL/AF contactors

Across the line
contactors

1



Additional terminal blocks

Mounting on 3 pole contactors	Wire range	Catalog number	List price
A/AE/AL9 – A/AE/AL16 (set of 2)	16 – 6	LD-16	\$ 20
A/AE/AL26 (set of 2)	14 – 6	LD-26	22
A/AE/AL30 – A/AE/AL40	12 – 4	LD-40	26
A/AE/AF50 – A/AE/AF75	10 – 2	LD-75	28
A/AE/AF95 – A/AE/AF110	8 – 1	LD-110	30

Utilization – The LD series terminal block is designed to increase the connection capacity of the contactor on which it is mounted. The LD 75 and LD110 terminal blocks are mounted in the three independent apertures located above the built-in connectors.

Terminal extensions

Mounting on contactors	Catalog number	List price
A/AE/AF50 – A/AE/AF75	BEXT-75	\$ 15
A/AE/AF95, A/AE/AF110	LW-110	15
A/AF145 – A/AF185	LX185	90
A/AF210 – A/AF300	LX300	140
AF400 – AF460	LX460	195
AF580 – AF750	LX750	225

Application

They are designed to increase the width of the contactor terminal pads to allow larger connectors to be mounted.

Description

Terminal extension sets contain 3 bars.

Terminal shrouds — two pieces

For contactor	Catalog number	List price
A/AF145 – A/AF185 for flush mount	LT185-AC	\$ 10
A/AF145 – A/AF185 for extended mount	LT185-AL	
A/AF145 – A/AF185 for shorting bar LY...between A(F)145 / A(F)185 & TA200DU	LT185-AY	
A/AF210 – A/AF300 for flush mount	LT300-AC	
A/AF210 – A/AF300 for extended mount	LT300-AL	
A/AF210 – A/AF300 for shorting bar LY300	LT300-AY	20
AF400 – AF460 for flush mount	LT460-AC	
AF400 – AF460 for extended mount	LT460-AL	
AF580 – AF750 for flush mount	LT750-AC	
AF580 – AF750 for extended mount	LT750-AL	

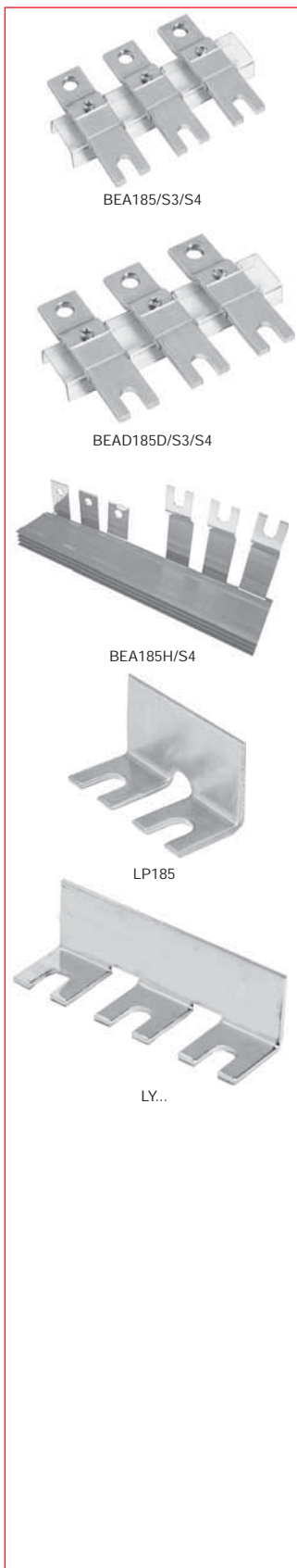
Terminal enlargements

For contactor	Catalog number	List price
A/AF95 – A/AF110	LW110	\$ 95
A/AF145 – A/AF185	LW185	120
A/AF210 – A/AF300	LW300	130
AF400 – AF460	LW460	295
AF580 – AF750	LW750	355

Arc chutes

For contactor	Catalog number	List price
A/AF145 – A/AF185	ZW185	\$ 130
A/AF210 – A/AF300	ZW300	180
A/AF400 – A/AF460	ZW460	190
A/AF580 – A/AF750	ZW750	230
AF1350 – AF1650	ZW1650	315

Accessories for A/AE/AF contactors



Vertical connection bars between contactor and MCCB — three bars

MCCB	For contactor	Catalog number	List price
T1	A/AE/AF50 – A/AE/AF75	BEA75/T1	\$ 85
T3	A/AE/AF95 – A/AE/AF110	BEA110/T3	95
T3	A/AF145 – A/AF185	BEA185/T3	60
S3, S4	A/AF145 – A/AF185	BEA185/S3/S4	60
S4	A/AF210 – A/AF300	BEA210/S4	70
S5	A/AF210 – A/AF300	BEA300/S5	75
S5 ^①	AF400 – AF460	BEA400/S5	95
S6	AF400 – AF750	BEA750/S6	115

Vertical connection bars between contactor and MCCB — three bars

MCCB	For contactor	Catalog number	List price
S3, S4	A/AF145 – A/AF185	BEA185D/S3/S4	\$ 70
S4	A/AF210 – A/AF300	BEA210D/S4	80
S5	A/AF210 – A/AF300	BEA300D/S5	85
S5	AF400 – AF460	BEA400D/S5	105
S6	AF400 – AF750	BEA750D/S6	125

To be used when power take off is needed (IP00) or with other bus bars. (EX: Reversing, IP20)

Horizontal connection busbars between contactor and MCCB — three bars

MCCB	For contactor	Catalog number	List price
S3, S4	A/AF145 – A/AF185	BEA185H/S4	\$ 150
S4	A/AF210 – A/AF300	BEA210H/S4	220
S5	A/AF210 – A/AF300	BEA300H/S5	220
S5	AF400 – AF460	BEA400H/S5	435
S6	AF400 – AF460	BEA460H/S6	660
S6	AF580 – AF750	BEA750H/S6	670

Shorting bars, 2 pole

For contactor	Catalog number	List price
A/AF145 – A/AF185	LP185	\$ 35
A/AF210 – A/AF300	LP300	50
AF400 – AF460	LP460	50
AF580 – AF750	LP750	50

Shorting bars, 3 pole

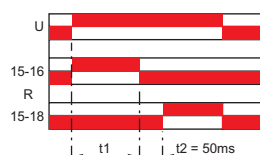
For contactor	Catalog number	List price
A/AE45 – A/AE/AF75	LF75	\$ 40
A/AE/AF95 – A/AE/AF110	LY110	40
A/AE/AF145 – A/AE/AF185	LY185	40
A/AE/AF210 – A/AE/AF300	LYA300	60
AF400 – AF460	LY460	60
AF580 – AF750	LY750	60

① Not for use with flange handles.

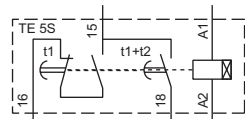
Accessories for A contactors TE5S electronic timer for wye-delta starters



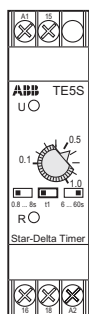
TE5S-*



Chart



Equivalent diagram



Front face

Electronic timer

For contactors	Rated control voltage U_c V	Packing piece	Unit weight kg	Catalog number	List price
A9 – AF750	24 AC/DC	1	0.080	TE5S-24	\$ 120
	110 – 120 AC	1	0.080	TE5S-120	
	220 – 240 AC	1	0.080	TE5S-240	
	380 – 440 AC	1	0.080	TE5S-440	

Application

Utilization

When used in wye-delta starters, the TE5S lags the wye connection and provides a lapse of 50 ms before the switchover to the delta connection.

Description

According to the type of device chosen, the electronic circuit has a 24 VAC/VDC, 110 – 120 VAC or 220 – 230 VAC supply. An output relay with reversing contact ensures high current switching. A two-position switch allows selection of one of the two time delay ranges: 0.8 to 8 s or 6 to 60 s. The 0.1 to 1.0 adjustable knob allows an initial setting without steps within the previously selected range which can then be adjusted using a stopwatch.

Note: We recommend that you allow for temperature drift for the final adjustment of the time delay setting. Drift: -0.2% per $^{\circ}\text{C}$. For example, a setting made at 20°C will yield a time delay shorter by 7% at 55°C in an enclosure. (-0.2% per $^{\circ}\text{C}$ i.e. $-0.2 \times 35 = -7\%$).

The TE5S, which is not affected by these settings, establishes a fixed "lapse" of 50 ms between the opening of contact 15 – 16 and the closing of contact 15 – 18. It is this time delay that prevents from arc short-circuit during wye to delta switching.

Operation

On energization, the green U indicator light (voltage applied) comes on. Contact 15 – 16 then immediately moves to the closed position.

Count-down of the programmed time immediately commences.

When the time delay has elapsed, contact 15 – 16 opens and at the same time the 50 ms lapse, t_2 , begins after which contact 15 – 18 moves to the closed position. The yellow R indicator light comes on.

On de-energization, the U and R indicator lights go out and, after the 250 ms resetting time, the device is ready for a new cycle.

Mounting

Mounts on 35mm DIN rail.

Accessories for A contactors TE5S electronic timer for wye-delta starters, technical data

Technical Data

Types	TE5S-24	TE5S-120	TE5S-240	TE5S-440
Compliance with standards	IEC 60947-5-1, EN 60947-5-1			
Rated insulation voltage U_i according to IEC 60947-5-1	V	440		
Rated operational voltage U_e according to IEC 60947-5-1	V d.c. V a.c.	24 24 ... 240		– 440
Conventional free air thermal current I_{th}	A	10		
Rated operational current I_e acc. to IEC 60947-5-1				
AC-15	24-120 V a.c. 220-240 V a.c. 380-440 V a.c.	A A A	5 4 –	– – 3
DC-13	24 V d.c.	A	4	–
Short-circuit protection - gG type fuses	A	10		
Rated supply voltage U_c	V d.c. V a.c.	24 24	– 110 ... 120	– 220 ... 240 380 ... 440
– Rated frequency limits	Hz	48 ... 63		
– Supply voltage range		0.85 ... 1.1 U_c		
– Overvoltage protection		Built-in varistor		
– Load factor	%	100		
– Average consumption	– in d.c. W – in a.c. VA	0.7 1.5	– 3.5	– 6.5 12.5
Time delay range (t_1) selected by switch	s	0.8 ... 8 and 6 ... 60		
– Temperature drift	% per °C	–0.2		
– Mechanical setting accuracy		±15 % of the setting range		
– On-load reiteration accuracy under constant conditions		±2 % after 1 million operating cycles		
Minimum time lapse (t_2)	ms	50		
Min. time lapse after 1 million operating cycles	ms	40		
Resetting time (maximum)	ms	250		
Front panel display:		Energization		Output relay activated
– green indicator light				
– yellow indicator light				
Permissible air temperature				
– for operation	°C	–25 ... +60		
– for storage	°C	–40 ... +85		
Vibration withstand acc. to IEC 60068-2-6, EN 60068-2-6		3 g from 10 to 300 Hz in the 3 directions		
Shock withstand acc. to IEC 60068-2-27, EN 60068-2-27		20 g / 11 ms in directions A and C 15 g / 11 ms in direction B		
Electrical durability	in millions of op. cycles	1		
Mechanical durability	in millions of op. cycles	5		
On-load maximum switching frequency	cycles/h	720		600
Fixing on mounting rail acc. to IEC/EN 60715		35 x 7.5 or 35 x 15		
Connecting terminals		(+, -) pozidriv 1 screw		
Connecting capacity				
– rigid solid	1 or 2 x mm ²	1 ... 2.5		
– flexible with cable end	1 or 2 x mm ²	0.75 ... 2.5		
Tightening torque	Nm	0.6 ... 0.8 max.		
Degree of protection according to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Terminals	IP 20		

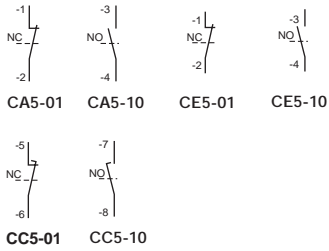
Accessories

Terminal markings

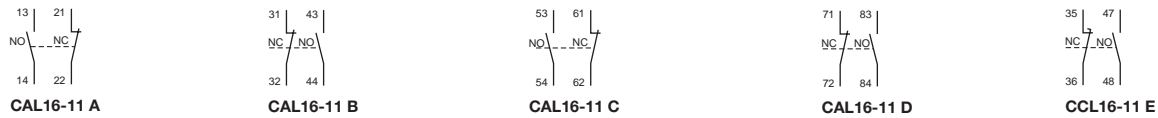
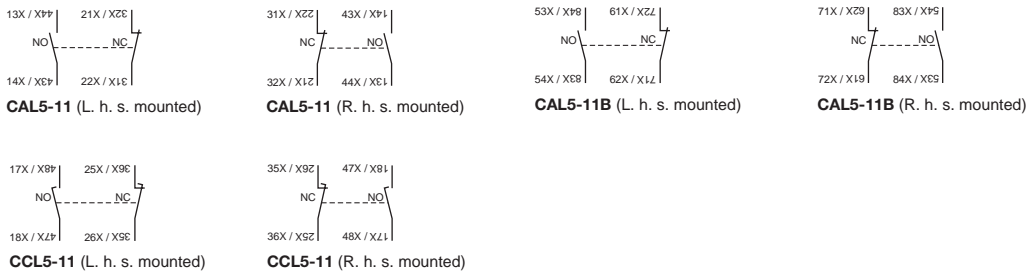
CA/CC/CAL/CCL auxiliary contacts

Across the line
1

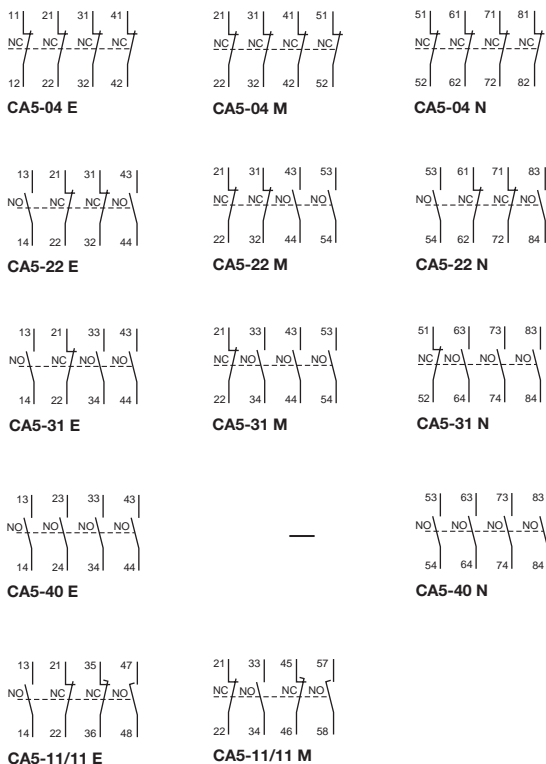
One pole auxiliary contacts



Two pole auxiliary contacts



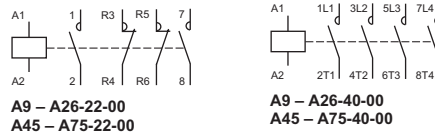
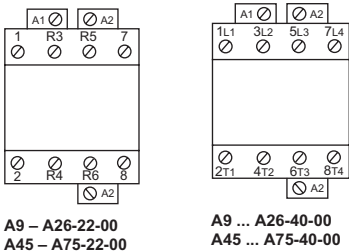
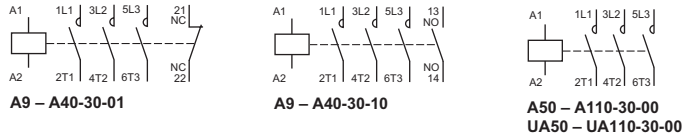
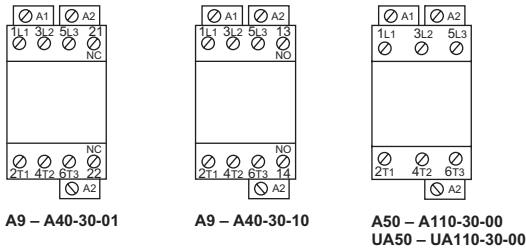
Four pole auxiliary contacts



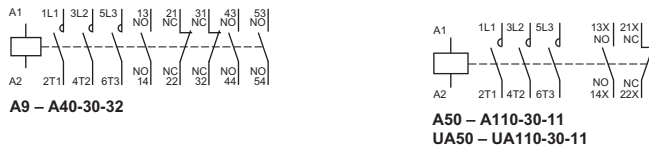
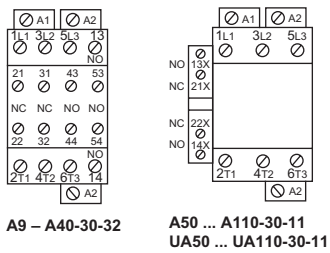
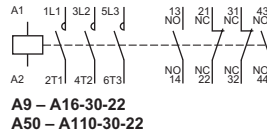
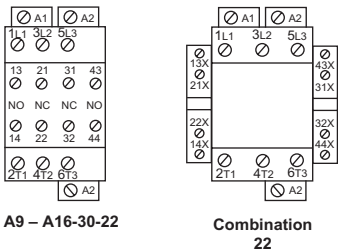
Accessories

Terminal markings & positioning for A/UA contactors

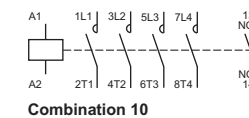
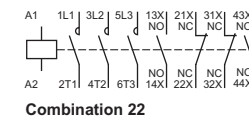
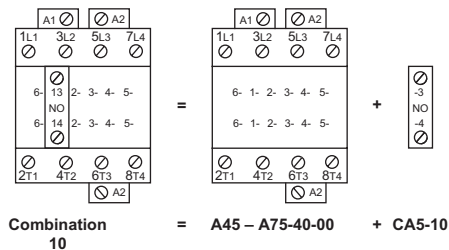
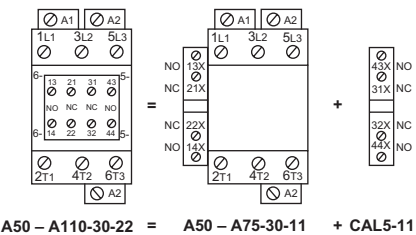
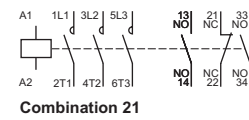
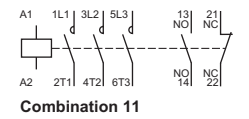
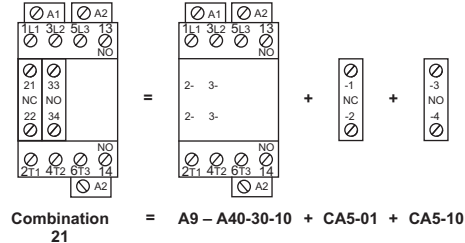
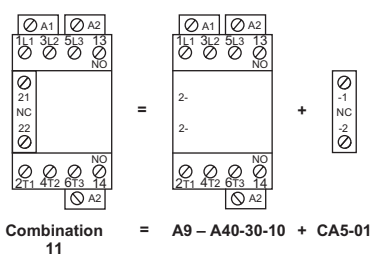
Standard devices without addition of auxiliary contacts



Standard 3 pole devices with factory mounted auxiliary contacts



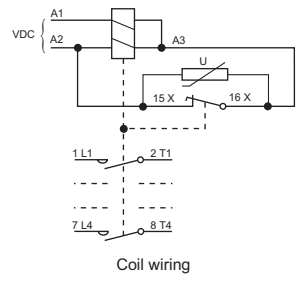
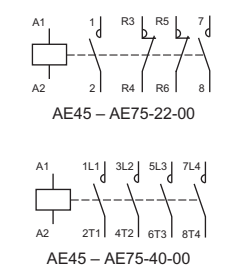
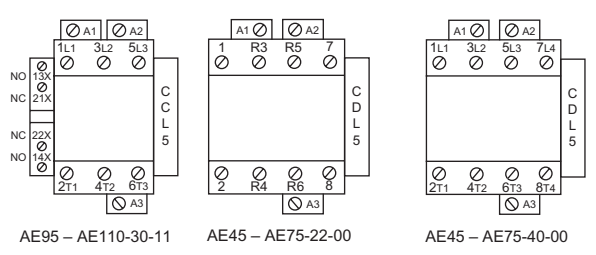
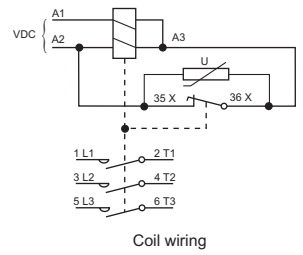
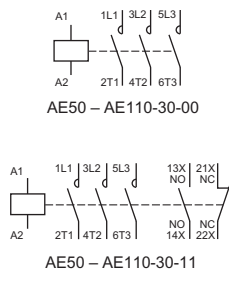
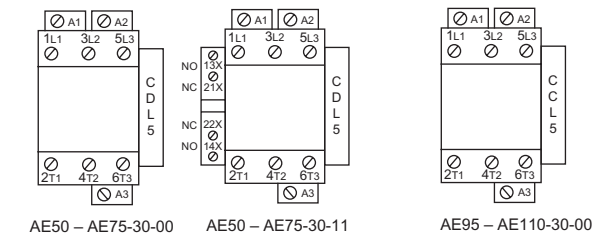
Other possible contact combinations with auxiliary contacts added by the user



Accessories

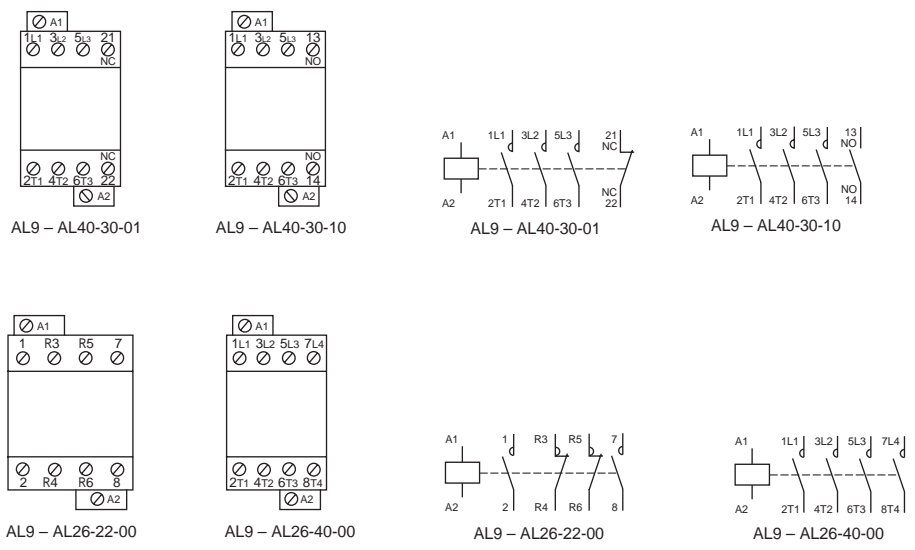
Terminal marking and positioning for AE/AL contactors

AE Contactors — D.C. operated

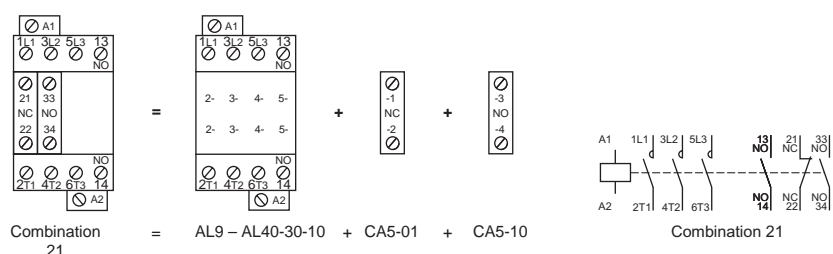


AL Contactors — D.C. operated

Standard devices without addition of auxiliary contacts



Other possible contact combinations with auxiliary contacts added by the user



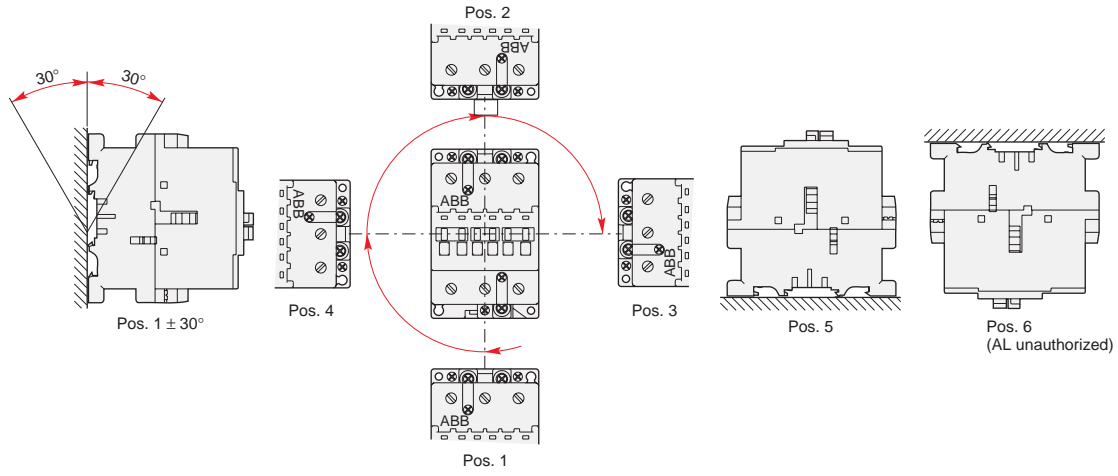
UL & CSA Technical data

A/AE9 – A/AE/AF110, AL9 – AL40

AC & DC operated

ABB contactor frame size		A/AE/AL 9	A/AE/AL 12	A/AE/AL 16	A/AE/AL 26	A/AE/AL 30	A/AE/AL 40	A/AE/AF 45	A/AE/AF 50	A/AE/AF 63	A/AE/AF 75	A/AE/AF 95	A/AE/AF 110
NEMA size		00	—	0	1	1P	—	—	2	—	3	—	—
Number of poles		3 OR 4	3	3 OR 4	3 OR 4	3	3	4	3 OR 4	3	3 OR 4	3	3
AC rating information													
NEMA cont. amp rating thermal current		9	—	18	27	36	—	—	45	—	90	—	—
NEMA maximum H.P. ratings 1 phase													
115 VAC		1/3	—	1	2	3	—	—	3	—	—	—	—
230 VAC		1	—	2	3	5	—	—	7.5	—	—	—	—
NEMA maximum H.P. ratings 3 phase													
200 VAC		1.5	—	3	7.5	—	—	—	10	—	25	—	—
230 VAC		1.5	—	3	7.5	—	—	—	15	—	30	—	—
460/575 VAC		2	—	5	10	—	—	—	25	—	50	—	—
U.L. general purpose current 40°C		21	25	30	40	50	60	65	80	90	105	125	140
Max. 3 Ph Switching motor loads A		9	11	17	28	34	42	—	54	65	80	95	110
U.L. maximum H.P. ratings 1 phase													
115 VAC		1/2	3/4	1.5	2	3	3	—	3	5	7.5	7.5	10
230 VAC		2	2	3	5	7.5	7.5	—	7.5	10	15	20	25
U.L. maximum H.P. ratings 3 phase													
200-208 VAC		2	3	5	7.5	10	10	—	15	20	25	30	30
220-240 VAC		2	3	5	10	10	15	—	20	25	30	30	40
440-480 VAC		5	7.5	10	20	25	30	—	40	50	60	60	75
550-600 VAC		7.5	10	15	25	30	40	—	50	60	75	75	100
U.L. maximum H.P. ratings VDC													
120 VDC		1	1.5	2	3	3	5	—	7.5	10	10	—	—
240 VDC		2	3	3	5	7.5	10	—	15	20	25	—	—
Lighting — ballast and incandescent 600VAC		15	15	20 ①	35	50	60	65	65	85	105	120	—
Resistive heating applications 600VAC		15	15	20	35	50	60	65	65	85	105	—	—
CSA Elevator ratings													
220 – 240VAC 3 phase		—	—	5	—	—	10	—	15	—	20	20	—
440 – 480VAC 3 phase		—	—	10	—	—	20	—	30	—	30	40	—
550 – 600VAC 3 phase		—	—	10	—	—	20	—	30	—	40	50	—
230VAC 1 phase		—	—	2	—	—	5	—	7.5	—	10	10	—
Auxiliary contacts													
NEMA rating AC		A600	A600	A600	A600	A600	A600	—	A600	A600	A600	A600	A600
AC rated voltage VAC		600	600	600	600	600	600	—	600	600	600	600	600
AC thermal rated current A		10	10	10	10	10	10	—	10	10	10	10	10
AC maximum volt-ampere making VA		7200	7200	7200	7200	7200	7200	—	7200	7200	7200	7200	7200
AC maximum volt-ampere breaking VA		720	720	720	720	720	720	—	720	720	720	720	720
NEMA rating DC		P600	P600	P600	P600	P600	P600	—	P600	P600	P600	P600	P600
DC rated voltage VDC		600	600	600	600	600	600	—	600	600	600	600	600
DC thermal rated current A		5	5	5	5	5	5	—	5	5	5	5	5
DC Maximum make-break A		0.2	0.2	0.2	0.2	0.2	0.2	—	0.2	0.2	0.2	0.2	0.2
Approximate weight													
Contactor lbs.		0.7	0.7	0.7	1.01	1.2	2.25	2.25	2.25	2.25	2.25	3.5	5
Starter lbs.		1.04	1.04	1.04	1.35	1.54	3	3	3	3	3	6	7
Terminal wire range													
Number of wires per phase AWG		18-10	18-10	18-10	12-8	8-4	8-4	8-1	8-1	8-1	8-1	6-2/0	6-2/0
		2	2	2	2	2	2	1	1	1	1	1	1
Maximum short circuit ratings													
MCCB,MCP, Amps/kA 480VAC		50/35	50/35	50/35	100/35	150/65	150/65	—	150/85	250/85	250/85	250/85	250/85
MCCB,MCP, Amps/kA 600VAC		10/35	10/35	10/35	100/35	150/25	150/25	—	—	—	—	250/35	250/35
Fuse,Amps — type/kA 600VAC		30J/200	30J/200	30J/200	60J/200	60J/200	100J/200	—	100J/200	200J/200	200J/200	200J/200	200J/200

Mounting positions



① 30A Ballast

UL & CSA Technical data

A/AF145 – AF750

AC & DC operated

Across the line
contactors

1

ABB contactor frame size		A/AF 145	A/AF 185	A/AF 210	A/AF 260	A/AF 300	AF 400	AF 460	AF 580	AF 750
NEMA size		4	—	—	5	—	—	6	—	7
Number of poles		3	3	3	3	3	3	3	3	3
AC rating information										
NEMA maximum H.P. ratings										
200	3 phase VAC	40	—	—	75	—	—	150	—	—
230	VAC	50	—	—	100	—	—	200	—	300
460/575	V	100	—	—	200	—	—	400	—	600
U.L. general purpose current		40°C	230	250	300	350	400	550	650	750
Max. 3 Ph switching motor loads		Amps	130	156	192	248	302	414	480	590
U.L. maximum H.P. ratings		1 phase								
115	VAC	10	15	—	—	—	—	—	—	—
230	VAC	25	30	40	50	—	—	—	—	—
U.L. maximum H.P. ratings		3 phase								
200—208	VAC	40	50	60	75	100	125	150	200	250
220—240	VAC	50	60	75	100	100	150	200	250	300
440—480	VAC	100	125	150	200	250	350	400	500	600
550—600	VAC	125	150	200	250	300	400	500	600	700
Lighting – ballast and incandescent	600VAC	200	—	300	—	400	—	—	—	—
CSA Elevator ratings										
220 – 240VAC	3 phase			40	50	60	—	—	—	—
240 – 480VAC	3 phase	Consult factory	Consult factory	75	100	125	—	—	—	—
550 - 600VAC	3 phase	factory	factory	100	125	150	—	—	—	—
230VAC	1 phase			—	—	—	—	—	—	—
Auxiliary contacts										
NEMA rating		AC	A600	A600	A600	A600	A600	A600	A600	A600
AC rated voltage		VAC	600	600	600	600	600	600	600	600
AC thermal rated current		A	10	10	10	10	10	10	10	10
AC maximum volt—ampere making		VA	7200	7200	7200	7200	7200	7200	7200	7200
AC maximum volt—ampere breaking		VA	720	720	720	720	720	720	720	720
NEMA rating		DC	P600	P600	P600	P600	P600	P600	P600	P600
DC rated voltage		VDC	600	600	600	600	600	600	600	600
DC thermal rated current		A	5	5	5	5	5	5	5	5
DC Maximum make—break		A	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Approximate weight										
Contactor		lbs.	7.1	7.1	13	13	26	26	33	33
Starter		lbs.	9.11	9.11	17.67	17.67	35	35	45	45
Terminal wire range										
Number of wires per phase		AWG	6-250MCM 1	6-250MCM 1	4-400MCM 1	4-400MCM 1	4-500MCM 2	250-500MCM 2	250-500MCM 2	2/0-500MCM 2
Maximum short circuit ratings										
MCCB,MCP,amps/kA		480VAC	400/85	400/85	800/85	800/85	800/85	800/80	800/80	1200/42
MCCB,MCP,amps/kA		600VAC	400/35	400/35	800/35	800/35	800/35	800/42	800/42	—
Fuse, amps—Type/kA		600VAC	400J/200	400J/200	600J/200	600J/200	600J/200	1000L/80	1000L/80	1200L/80

UL & CSA Technical data

AF1350 – AF1650

AC & DC operated

ABB contactor frame size		AF 1350	AF 1650
NEMA size		—	8
Number of poles		3	3
AC rating information			
NEMA maximum H.P. ratings	3 phase		
200	VAC	—	—
230	VAC	—	450
460/575	V	—	900
U.L. general purpose current			
	40°C	1350	1650
Max. 3 Ph switching motor loads	Amps	960	1080
U.L. maximum H.P. ratings			
1 phase			
115	VAC	—	—
230	VAC	—	—
3 phase			
U.L. maximum H.P. ratings			
200—208	VAC	—	—
220—240	VAC	400	450
440—480	VAC	800	900
550—600	VAC	900	1000
Auxiliary contacts			
NEMA rating	AC	A600	A600
AC rated voltage	VAC	600	600
AC thermal rated current	A	10	10
AC maximum volt—ampere making	VA	7200	7200
AC maximum volt—ampere breaking	VA	720	720
NEMA rating	DC	P600	P600
DC rated voltage	VDC	600	600
DC thermal rated current	A	5	5
DC Maximum make—break	A	0.2	0.2
Approximate weight			
Contactor	lbs.	75	75
Starter	lbs.	—	—
Terminal wire range			
	AWG	1/0-750 MCM	1/0-750 MCM
Number of wires per phase		4	6
Maximum short circuit ratings			
MCCB,MCP,amps/kA	480VAC	2000/42	2000/42
MCCB,MCP,amps/kA	600VAC	—	—
Fuse, amps—Type/kA	600VAC	1600L/82	2000L/82

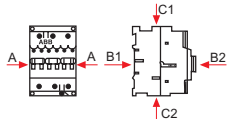
UL/CSA & IEC Technical data

A/AE9 – A/AE/AF/TAE110

Across the line
contactors

1

Contactor types: A..., AE... AF..., TAE...	9	12	16	26	30	40	45	50	63	75	95	110	
	-	-	-	-	-	-	45	50	63	75	95	110	
Rated insulation voltage U_i according to IEC 60947-4-1							1000						
according to UL/CSA							600						
Rated impulse withstand voltage U_{imp}							8						
Standards	Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1												
Air temperature close to contactor – fitted with thermal O/L relay	°C	see "Conditions for use" page 1.50, for control voltage limits and authorized mounting positions											
– without thermal O/L relay	°C	-25 to +55											
– for storage	°C	-40 to +70 (55 max. for TAE... contactors)											
		-60 to +80										-40 to +70	
Climatic withstand 30		acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II										acc. to IEC 68-2-	
Operating altitude	m	≤ 3000											
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27 Mounting position 1 (see page 1.50)		1/2 sinusoidal shock for 11 ms: no change in contact position											
		Shock direction	Making position		Breaking position								
		A	20 g		20 g								
		B1	10 g		5 g ①								
		B2	15 g ②		15 g ②								
		C1	20 g		20 g								
		C2	20 g		20 g								
												Not valid for DIN-rail mounting	

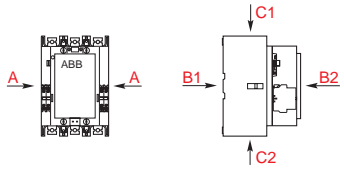


① 3 g for AF 45-22, AE 45-22, AF 75-22 and AE 75-22.
② 10 g for AF 45-22, AE 45-22, AF 75-22 and AE 75-22.

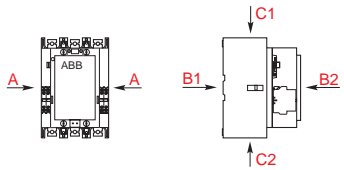
UL/CSA & IEC Technical data

A/AF145 – AF1650

A/AF145 – AF750

Contactor types:	A...	145	185	210	260	300	-	-	-	-	
	AF...	145	185	210	260	300	400	460	580	750	
Rated insulation voltage U_i according to IEC 60947-4-1 according to UL/CSA	V	1000 V600									
Rated impulse withstand voltage U_{imp} . Standards	kV	8 Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1									
Air temperature close to contactor – fitted with thermal O/L relay	°C	see "Conditions for use" page 1.51 , for control voltage limits and authorized mounting positions									
– without thermal O/L relay	°C	-25 to +55									
– for storage	°C	-40 to +70									
Climatic withstand		acc. to IEC 60068-2-30									
Operating altitude	m	≤ 3000									
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27 Mounting position 1 (see page 1.51)		1/2 sinusoidal shock for 30 ms: no change in contact position 5 g in all directions (A, B1, B2, C1, C2)									
											

AF1350 – AF1650

Contactor types:	AF...	1350	1650
Rated insulation voltage U_i according to IEC 60947-4-1 according to UL/CSA	V	1000 600	
Rated impulse withstand voltage U_{imp} . Standards	kV	8 Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1	
Air temperature close to contactor – fitted with thermal O/L relay		see "Conditions for use" page 1.51 , for control voltage limits and authorized mounting positions	
– without thermal O/L relay		°C-25 to +55	
– for storage		°C-40 to +70	
Climatic withstand		acc. to IEC 60068-2-30	
Operating altitude	m	≤ 3000	
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27 Mounting position 1 (See page 1.51)		1/2 sinusoidal shock for 30 ms: no change in contact position 5 g in all directions (A, B1, B2, C1, C2)	
			

IEC Technical data

DC circuit switching

A/AE9 – GAE75

Across the line
contactors

1

General

The arc switching on d.c. is more difficult than on a.c.

- For selecting a contactor it is essential to determine the current, the voltage and the L/R time constant of the controlled load.
- For information, typical time constant values are quoted hereafter: non inductive loads such as resistance furnaces ($L/R \geq 1$ ms), inductive loads such as shunt motors ($L/R \geq 2$ ms) or series motors ($L/R \geq 7.5$ ms).
- The addition of a resistor in parallel with an inductive winding helps in the elimination of the arcs.
- All the poles required for breaking must be connected in series between the load and the source polarity not linked to earth (or chassis).

a.c. operated contactors		A9	A12	A16	A26	A30	A40	A45	A50	A63	A75	GA75	
a.c. / d.c. operated (electronic coil interface)		-	-	-	-	-	-	AF45	AF50	AF63	AF75	-	
d.c. operated contactors		AE9	AE12	AE16	AE26	AE30	AE40	AE45	AE50	AE63	AE75	GAE75	
Utilization category DC-1, $L/R \leq 1$ ms													
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	120
	110 V	A	10	15	20	-	-	-	-	-	-	-	120
	220 V	A	-	-	-	-	-	-	-	-	-	-	120
	440 V	A	-	-	-	-	-	-	-	-	-	-	100
	600 V	A	-	-	-	-	-	-	-	-	-	-	75
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	-
	110 V	A	25	27	30	45	55	60	70	100	110	120	-
	220 V	A	10	15	20	-	-	-	-	-	-	-	-
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	-
	110 V	A	25	27	30	45	55	60	70	100	110	120	-
	220 V	A	25	27	30	45	55	60	70	100	110	120	-
	≤ 72 V	A	25	27	30	45	-	-	70	100	-	120	-
	110 V	A	25	27	30	45	-	-	70	100	-	120	-
	220 V	A	25	27	30	45	-	-	70	100	-	120	-
	440 V	A	10	15	20	-	-	-	-	-	-	-	-
Utilization category DC-3, $L/R \leq 2$ ms													
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	120
	110 V	A	6	7	8	-	-	-	-	-	-	-	120
	220 V	A	-	-	-	-	-	-	-	-	-	-	100
	440 V	A	-	-	-	-	-	-	-	-	-	-	85
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	-
	110 V	A	25	27	30	45	55	60	70	100	110	120	-
	220 V	A	6	7	8	-	-	-	-	-	-	-	-
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	-
	110 V	A	25	27	30	45	55	60	70	100	110	120	-
	220 V	A	25	27	30	45	55	60	70	100	110	120	-
	≤ 72 V	A	25	27	30	45	-	-	70	100	-	120	-
	110 V	A	25	27	30	45	-	-	70	100	-	120	-
	220 V	A	25	27	30	45	-	-	70	100	-	120	-
	440 V	A	6	7	8	-	-	-	-	-	-	-	-
Utilization category DC-5, $L/R \leq 7.5$ ms													
	≤ 72 V	A	9	12	16	25	30	40	50	50	63	75	85
	110 V	A	4	4	4	-	-	-	-	-	-	-	85
	220 V	A	-	-	-	-	-	-	-	-	-	-	85
	440 V	A	-	-	-	-	-	-	-	-	-	-	35
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	-
	110 V	A	10	15	20	30	45	50	70	80	90	100	-
	220 V	A	4	4	4	-	-	-	-	-	-	-	-
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	-
	110 V	A	25	27	30	45	55	60	70	100	110	120	-
	220 V	A	9	12	16	25	30	40	50	50	63	75	-
	≤ 72 V	A	25	27	30	45	-	-	70	100	-	120	-
	110 V	A	25	27	30	45	-	-	70	100	-	120	-
	220 V	A	10	15	20	30	-	-	70	70	-	100	-
	440 V	A	4	4	4	-	-	-	-	-	-	-	-

IEC Technical data










DC circuit switching

A/AF/AE95 – AF750

Technical Data

- The tables indicate for the standard contactors the I_b max. operating currents depending on: the utilization category (i.e. L/R) DC-1, DC-3, DC-5 as defined in the IEC 60947-4-1 publication, the operating voltage U_b and the pole coupling details. See page 1.81.
Ampere values quoted in the tables below are valid for a $-25 \dots +70$ °C temperature close to the contactors, as long as the AC-1 Ampere values (see pages 1.45 - 146) for the corresponding ambient temperature are not exceeded.
- Max. switching frequency: 300 ops/h.
- For switching higher d.c. ratings, we recommend the use of bar mounted contactors, R series (63 ... 2000 A).

The selection table for AE 50 ... AE 110 contactors can be used for the TAE 50 ... TAE 110 types.

a.c. operated contactors a.c. / d.c. operated (electronic coil interface) d.c. operated contactors			A95 AF95 AE95	A110 AF110 AE110	A145 AF145 -	A185 AF185 -	A210 AF210 -	A260 AF260 -	A300 AF300 -	- AF400 -	- AF460 -	- AF580 -	- AF750 -
Utilization category DC-1, L/R ≤ 1 ms													
	≤ 110 V	A	-	-	-	-	-	-	-	600	700	800	1050
	≤ 110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	-	-	-	-	-	-	-	600	700	800	1050
	≤ 110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	145	160	250	275	350	400	450	600	700	800	1050
	440 V	A	-	-	-	-	-	-	-	600	700	800	1050
	600 V	A	-	-	-	-	-	-	-	600	700	800	1050
Utilization category DC-3, L/R ≤ 2.5 ms													
	≤ 110 V	A	-	-	-	-	-	-	-	600	700	800	1050
	≤ 110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	-	-	-	-	-	-	-	600	700	800	1050
	≤ 110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	145	160	250	275	350	400	450	600	700	800	1050
	440 V	A	-	-	-	-	-	-	-	600	700	800	1050
	600 V	A	-	-	-	-	-	-	-	600	700	800	1050
Utilization category DC-5, L/R ≤ 15 ms													
	≤ 110 V	A	-	-	-	-	-	-	-	600	700	800	1050
	≤ 110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	-	-	-	-	-	-	-	600	700	800	1050
	≤ 110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	145	160	250	275	350	400	450	600	700	800	1050
	440 V	A	-	-	-	-	-	-	-	600	700	800	1050
	600 V	A	-	-	-	-	-	-	-	600	700	800	1050

IEC Technical data

DC circuit switching

AL9 — AL40

General

The arc switching on d.c. is more difficult than on a.c.

- For selecting a contactor it is essential to determine the current, the voltage and the L/R time constant of the controlled load.
- For information, typical time constant values are quoted hereafter: non inductive loads such as resistance furnaces ($L/R \geq 1$ ms), inductive loads such as shunt motors ($L/R \geq 2$ ms) or series motors ($L/R \geq 7.5$ ms).
- The addition of a resistor in parallel with an inductive winding helps in the elimination of the arcs.
- All the poles required for breaking must be connected in series between the load and the source polarity not linked to earth (or chassis).

A.C. operated contactors		AL9	AL12	AL16	AL26	AL30	AL40	
Utilization category DC-1, $L/R \leq 1$ ms								
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	10	15	20	-	-	-
	220 V	A	-	-	-	-	-	-
	440 V	A	-	-	-	-	-	-
	600 V	A	-	-	-	-	-	-
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	25	27	30	45	55	60
	220 V	A	10	15	20	-	-	-
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	25	27	30	45	55	60
	220 V	A	25	27	30	45	55	60
	≤ 72 V	A	25	27	30	45	-	-
	110 V	A	25	27	30	45	-	-
	220 V	A	25	27	30	45	-	-
	440 V	A	10	15	20	-	-	-
Utilization category DC-3, $L/R \leq 2$ ms								
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	6	7	8	-	-	-
	220 V	A	-	-	-	-	-	-
	440 V	A	-	-	-	-	-	-
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	25	27	30	45	55	60
	220 V	A	6	7	8	-	-	-
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	25	27	30	45	55	60
	220 V	A	25	27	30	45	55	60
	≤ 72 V	A	25	27	30	45	-	-
	110 V	A	25	27	30	45	-	-
	220 V	A	25	27	30	45	-	-
	440 V	A	6	7	8	-	-	-
Utilization category DC-5, $L/R \leq 7.5$ ms								
	≤ 72 V	A	9	12	16	25	30	40
	110 V	A	4	4	4	-	-	-
	220 V	A	-	-	-	-	-	-
	440 V	A	-	-	-	-	-	-
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	10	15	20	30	45	50
	220 V	A	4	4	4	-	-	-
	≤ 72 V	A	25	27	30	45	55	60
	110 V	A	25	27	30	45	55	60
	220 V	A	9	12	16	25	30	40
	≤ 72 V	A	25	27	30	45	-	-
	110 V	A	25	27	30	45	-	-
	220 V	A	10	15	20	30	-	-
	440 V	A	4	4	4	-	-	-

IEC Technical data

DC circuit switching

EK110 — EK1000

General








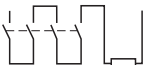



The arc switching on d.c. is more difficult than on a.c.

- For selecting a contactor it is essential to determine the current, the voltage and the L/R time constant of the controlled load.
- For information, typical time constant values are quoted hereafter: non inductive loads such as resistance furnaces ($L/R \leq 1$ ms), inductive loads such as shunt motors ($L/R \leq 2$ ms) or series motors ($L/R \leq 7.5$ ms).
- The addition of a resistor in parallel with an inductive winding helps in the elimination of the arcs.
- All the poles required for breaking must be connected in series between the load and the source polarity not linked to earth (or chassis).

Technical Data

- The tables indicate for the standard contactors the I_b max. operating currents depending on: the utilization category (i.e. L/R) DC-1, DC-3, DC-5 as defined in the IEC 60947-4-1 publication (see page 1.75 for more details), the operating voltage U_b and the pole coupling details. Ampere values quoted in the tables below are valid for a $-25 \dots +70$ °C temperature close to the contactors, as long as the AC-1 Ampere values (see page 1.61) for the corresponding ambient temperature are not exceeded.
- Max. switching frequency: 300 ops/h.
- For switching higher d.c. ratings, we recommend the use of bar mounted contactors, R series (63 ... 2000 A).

Selection Table

a.c. / d.c. operated contactors			EK110	EK150	EK175	EK210	EK370	EK550	EK1000
Utilization category DC-1, $L/R \leq 1$ ms									
	≤ 72 V	A	120	145	210	210	370	550	-
	110 V	A	120	145	210	210	370	550	-
	≤ 72 V	A	200	200	300	300	550	800	-
	110 V	A	200	200	300	300	550	800	-
	220 V	A	200	200	300	300	550	800	-
	≤ 72 V	A	200	200	300	300	550	800	-
	110 V	A	200	200	300	300	550	800	-
	220 V	A	200	200	300	300	550	800	-
	440 V	A	-	-	210	210	450	650	-
	600 V	A	-	-	-	-	450	650	-
	≤ 72 V	A	200	200	300	300	550	800	-
	110 V	A	200	200	300	300	550	800	-
	220 V	A	200	200	300	300	550	800	-
	440 V	A	200	200	260	300	450	650	-
	600 V	A	-	-	260	300	450	650	-
Utilization category DC-3, $L/R \leq 2$ ms									
	≤ 72 V	A	120	145	210	210	370	550	-
	≤ 72 V	A	135	145	210	210	450	650	-
	110 V	A	135	135	210	210	450	650	-
	220 V	A	135	135	210	210	450	650	-
	≤ 72 V	A	135	145	210	210	450	650	-
	110 V	A	135	135	210	210	450	650	-
	220 V	A	135	135	210	210	450	650	-
	440 V	A	-	-	210	210	450	650	-
	600 V	A	-	-	-	-	450	650	-
	≤ 72 V	A	135	145	210	210	450	650	-
	110 V	A	135	135	210	210	450	650	-
	220 V	A	135	135	210	210	450	650	-
	440 V	A	135	135	210	210	450	650	-
	600 V	A	-	-	170	210	450	650	-
Utilization category DC-5, $L/R \leq 7.5$ ms									
	≤ 72 V	A	135	145	210	210	450	650	-
	110 V	A	135	135	210	210	450	650	-
	220 V	A	135	135	210	210	450	650	-
	≤ 72 V	A	135	145	210	210	450	650	-
	110 V	A	135	135	210	210	450	650	-
	220 V	A	135	135	210	210	450	650	-
	440 V	A	-	-	210	210	450	650	-
	600 V	A	-	-	-	-	450	650	-
	≤ 72 V	A	135	145	210	210	450	650	-
	110 V	A	135	135	210	210	450	650	-
	220 V	A	135	135	210	210	450	650	-
	440 V	A	135	135	210	210	450	650	-
	600 V	A	-	-	170	210	450	650	-

IEC Technical data

A/AE9 — A/AE/AF/TAE110

Across the line
contactors

1

Main Pole - Utilization Characteristics

Contactor types:	A..., AE...	9	12	16	26	30	40	45	50	63	75	95	110	
	AF..., TAE...	-	-	-	-	-	-	45	50	63	75	95	110	
Rated operational voltage U_e max.	V	690						1000 (690 for AF... contactors)						
Rated frequency limits	Hz	25-400												
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1, open contactors $\varnothing \leq 40^\circ\text{C}$	A	26	28	30	45	65	65	100	100	125	125	145	160	
with conductor cross-sectional area mm^2	4	4	4	6	16	16	35	35	50	50	70	70		
Rated operational current I_e / AC-1 for air temperature close to contactor	A	25	27	30	45	55	60	70	100	115	125	145	160	
U_e max. 690 V	$\varnothing \leq 40^\circ\text{C}$	A	22	25	27	40	55	60	60	85	95	105	135	145
	$\varnothing \leq 55^\circ\text{C}$	A	18	20	23	32	39	42	50	70	80	85	115	130
	$\varnothing \leq 70^\circ\text{C}$ ③	A	2.5	4	4	6	10	16	25	35	50	50	50	70
with conductor cross-sectional area mm^2		2.5	4	4	6	10	16	25	35	50	50	50	70	
Utilization categorie AC-3														
for air temperature close to contactor $\leq 55^\circ\text{C}$														
Rated operational current I_e AC-3 ①														
3-phase motors	220-230-240 V	A	9	12	17	26	33	40	40	53	65	75	96	110
	380-400 V	A	9	12	17	26	32	37	37	50	65	75	96	110
	415 V	A	9	12	17	26	32	37	37	50	65	72	96	110
	440 V	A	9	12	16	26	32	37	37	45	65	70	93	100
	500 V	A	9	12	14	22	28	33	33	45	55	65	80	100
	690 V	A	7	9	10	17	21	25	25	35	43	46	65	82
	1000 V	A	-	-	-	-	-	-	-	23 ②	25 ②	28 ②	30 ②	30 ②
Rated operational power AC-3 ①														
1500 r.p.m. 50 Hz 1800 r.p.m. 60 Hz 3-phase motors	220-230-240 V	kW	2.2	3	4	6.5	9	11	11	15	18.5	22	25	30
	380-400 V	kW	4	5.5	7.5	11	15	18.5	18.5	22	30	37	45	55
	415 V	kW	4	5.5	9	11	15	18.5	18.5	25	37	40	55	59
	440 V	kW	4	5.5	9	15	18.5	22	22	25	37	40	55	59
	500 V	kW	5.5	7.5	9	15	18.5	22	22	30	37	45	55	59
	690 V	kW	5.5	7.5	9	15	18.5	22	22	30	37	40	55	75
	1000 V	kW	-	-	-	-	-	-	-	30 ②	33 ②	37 ②	40 ②	40 ②
Rated making capacity AC-3 according to IEC 60947-4-1														
10 x I_e AC-3														
Rated breaking capacity AC-3 according to IEC 60947-4-1														
8 x I_e AC-3														
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded														
$U_e \leq 500$ V a.c. - gG type fuse	A	25	32	32	50	63	80	100	125	160	160	200		
Rated short-time withstand current I_{cw} at 40°C ambient temp., in free air, from a cold state														
1 s	A	250	280	300	400	600	1000					1320	1320	
10 s	A	100	120	140	210	400	650					800	800	
30 s	A	60	70	80	110	225	370					500	500	
1 min	A	50	55	60	90	150	250					350	350	
15 min	A	26	28	30	45	65	110	110	135	135	160	160	175	
Maximum breaking capacity $\cos \varnothing = 0.45$ ($\cos \varnothing = 0.35$ for $I_e > 100$ A)														
at 440 V	A	250			420	820	900	1300				1160		
at 690 V	A	90			170	340	490	630				800		
Heat dissipation per pole														
I_e / AC-1	W	0.8	1	1.2	1.8	2.5	3	2.5	5	6.5	7	6.5	7.5	
I_e / AC-3	W	0.1	0.2	0.35	0.6	0.9	1.3	0.65	1.3	1.5	2	2.7	3.6	
Max. electrical switching frequency														
- for AC-1	cycles/h	600						600 (300 for AF..., AE... TAE...)					300	
- for AC-3	cycles/h	1200 (600 for AE...)						600 (300 for AF..., AE... TAE...)					300	
- for AC-2, AC-4	cycles/h	300						150					150	
Electrical durability														
see pages 1.70 - 1.73														
Mechanical durability														
- millions of operating cycles		10 (5 for AE... and TAE... contactors)												
- max. mechanical switching frequency	cycles/h	3600 (300 for AF... contactors)												



① For the corresponding hp/A values of 1500 r.p.m., 50Hz, 3-phase motors, see page 1.76.

② AF... contactors excluded

③ Unauthorized for TAE... contactors.

IEC Technical data
A/AF145 – AF750

Main Pole - Utilization Characteristics

Contactor types:	A...	145	185	210	260	300	-	-	-	-			
	AF...	145	185	210	260	300	400	460	580	750			
Rated operational voltage U_e max.	V	690											
Rated frequency limits	Hz	25 ... 400											
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1, open contactors $\varnothing \leq 40^\circ\text{C}$													
with conductor cross-sectional area ①	mm ²	250	275	350	400	500	600	700	800	1050			
		120	150	185	240	300 ③	2 x 185	2 x 240	2 x 240	2 x 80 x 5 ②			
Rated operational current I_e / AC-1 for air temperature close to contactor													
U_e max. 690 V	with conductor cross-sectional area	mm ²	$\varnothing \leq 40^\circ\text{C}$	A	250	275	350	400	500	600	700	800	1050
			$\varnothing \leq 55^\circ\text{C}$	A	230	250	300	350	400	500	600	700	800
			$\varnothing \leq 70^\circ\text{C}$	A	180	180	240	290	325	400	480	580	720
			120	150	185	240	300 ③	2 x 185	2 x 240	2 x 240	2 x 80 x 5 ②		
Utilization categorie AC-3 for air temperature close to contactor $\leq 55^\circ\text{C}$													
Rated operational current I_e AC-3													
3-phase motors 	220-230-240 V	A	145	185	210	260	305	400	460	580	750		
	380-400 V	A	145	185	210	260	305	400	460	580	750		
	415 V	A	145	185	210	260	300	400	460	580	750		
	440 V	A	145	185	210	240	280	400	460	580	750		
	500 V	A	145	170	210	240	280	400	460	580	750		
	690 V	A	120	170	210	220	280	350	400	500	650		
	1000 V	A	-	-	-	-	-	-	-	-	-		
Rated operational power AC-3													
1500 r.p.m. 50 Hz 1800 r.p.m. 60 Hz 3-phase motors 	220-230-240 V	kW	45	55	59	80	90	110	132	160	220		
	380-400 V	kW	75	90	110	140	160	200	250	315	400		
	415 V	kW	75	90	110	140	160	220	250	355	425		
	440 V	kW	75	90	110	140	160	220	250	355	450		
	500 V	kW	90	110	132	180	200	250	315	400	520		
	690 V	kW	110	132	160	200	250	315	355	500	600		
	1000 V	kW	-	-	-	-	-	-	-	-	-		
Rated making capacity AC-3 according to IEC 60947-4-1													
			10 x I_e AC-3										
Rated breaking capacity AC-3 according to IEC 60947-4-1													
			8 x I_e AC-3										
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded $U_e \leq 500$ V a.c. - gG type fuse													
	A	315	355	400	500	630	800	1000					
Rated short-time withstand current I_{cw} at 40°C ambient temp., in free air, from a cold state													
	1 s	A	1800	2000	2500	3500	4600	7000					
	10 s	A	1200	1500	1700	2400	4400	6400					
	30 s	A	800	1000	1200	1500	3100	4500					
	1 min	A	600	800	1000	1100	2500	3500					
	15 min	A	280	320	400	500	840	1300					
Maximum breaking capacity $\cos \varnothing = 0.45$ ($\cos \varnothing = 0.35$ for $I_e > 100$ A)													
	at 440 V	A	1500	2000	2300	2600	3000	4000	5000	6000	7500		
	at 690 V	A	1200	1600	2000	2400	2500	3500	4500	5000	7000		
Heat dissipation per pole													
	I_e / AC-1	W	13	16	18	25	32	30	42	32	50		
	I_e / AC-3	W	5	8	9	14	18	16	21	17	28		
Max. electrical switching frequency													
- for AC-1	cycles/h	300		300			300		300				
- for AC-3	cycles/h	300		300			300		300				
- for AC-2, AC-4	cycles/h	150		150			60		60				
Electrical durability													
			see pages 1.65 ... 1.69					-	-	-	-		
Mechanical durability													
- millions of operating cycles			5					3					
- max. mechanical switching frequency	cycles/h		3600 (300 for AF... contactors)					300					

① Conductors with preparation.



② Dimensions of the bars (in mm).

③ For currents above 450A, use terminal extension / enlargement pieces LX 300 / LW 300 see page 1.31).

IEC Technical data

AF1350 – AF1650

Main Pole - Utilization Characteristics

Contactor types: AF...		1350	1650
Rated operational voltage U_e max.	V	1000	1000
Rated frequency limits	Hz	25-400	25-400
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1, open contactors $\varnothing \leq 40^\circ\text{C}$	A	1350	1650
with conductor cross-sectional area ^①	mm ²	2/100x5	3/100x5
Rated operational current I_e / AC-1 for air temperature close to contactor			
U_e max. 690 V	$\varnothing \leq 40^\circ\text{C}$ A	1350	1650
	$\varnothing \leq 55^\circ\text{C}$ A	1150	1450
	$\varnothing \leq 70^\circ\text{C}$ A	1000	1270
with conductor cross-sectional area	mm ²	2 x 80 x 5 ^①	2 x 80 x 5 ^①
Utilization categorie AC-3 for air temperature close to contactor $\leq 55^\circ\text{C}$			
Rated operational current I_e AC-3			
	220-230-240 V A	860	1050
3-phase motors	380-400 V A	860	1050
	415 V A	860	1050
	440 V A	860	1050
	500 V A	—	—
	690 V A	—	—
	1000 V A	—	—
			
Rated operational power AC-3			
	220-230-240 V kW	257	315
	380-400 V kW	475	560
	415 V kW	500	600
	440 V kW	560	670
	500 V kW	—	—
	690 V kW	—	—
	1000 V kW	—	—
			
Rated making capacity AC-3 according to IEC 60947-4-1		10 x I_e , AC-3	
Rated breaking capacity AC-3 according to IEC 60947-4-1		8 x I_e , AC-3	
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded $U_e \leq 500$ V a.c. - gG type fuse		Product coordination with ABB circuit breaker Consult factory	
Rated short-time withstand current I_{cw} at 40°C ambient temp., in free air, from a cold state			
	1 s A	10,000	12,000
	10 s A	8000	10,000
	30 s A	6000	7500
	1 min A	4500	5500
	15 min A	1600	2200
Maximum breaking capacity $\cos \varnothing = 0.45$ ($\cos \varnothing = 0.35$ for $I_e > 100$ A)			
	at 440 V A	10,000	12,000
	at 690 V A	—	—
Max. electrical switching frequency			
– for AC-1	cycles/h	60	60
– for AC-3	cycles/h		
– for AC-2, AC-4	cycles/h		
Electrical durability		50,000	50,000
Mechanical durability			
– millions of operating cycles		500,000	500,000
– max. mechanical switching frequency	cycles/h	60	60

① Dimensions of the bars (in mm).

IEC Technical data

A/AF9 — AF110

Magnet System Characteristics for A... Contactors

Contactor types:	A...	9	12	16	26	30	40	45	50	63	75	95	110					
Rated control circuit voltage U_c																		
– at 50 Hz	V	20 ... 690																
– at 60 Hz	V	24 ... 600																
Coil operating limits according to IEC 60947-4-1		$\vartheta \leq 55^\circ\text{C}$						$\vartheta \leq 70^\circ\text{C}$										
		0.85 ... 1.1 x U_c																
Drop-out voltage in % of U_c		roughly 40 ... 65 %																
Coil consumption																		
Average pull-in value	50 Hz	VA	70				120				180				350			
	60 Hz	VA	80				140				210				450			
	50/60 Hz	VA/VA	74/70				125/120				190/180				410/365			
Average holding value	50 Hz	VA/W	8/2				12/3				18/5.5				22/6.5			
	60 Hz	VA/W	8/2				12/3				18/5.5				26/8			
	50/60 Hz	VA/W	8/2				12/3				18/5.5				27/7.5			
Operating time																		
between coil energization and:																		
– N.O. contact closing	ms	10 ... 26				8 ... 21				8 ... 27				10 ... 25				
– N.C. contact opening	ms	7 ... 21				6 ... 18				7 ... 22				7 ... 22				
between coil de-energization and:																		
– N.O. contact opening	ms	4 ... 11				4 ... 11				4 ... 11				7 ... 15				
– N.C. contact closing	ms	9 ... 16				7 ... 14				7 ... 14				10 ... 18				

Magnet System Characteristics for AF... Contactors

Contactor types:	AF...	-	-	-	-	-	-	45	50	63	75	95	110					
Rated control circuit voltage U_c																		
– at 50 Hz	V	48 ... 250																
– at 60 Hz	V	48 ... 250																
– d.c.	V	20 ... 250																
Coil operating limits according to IEC 60947-4-1		$\vartheta \leq 70^\circ\text{C}$																
		0.85 ... 1.1 x U_c																
Drop-out voltage in % of U_c		55 %																
Coil consumption																		
Average pull-in value	50 Hz	VA	210												350			
	60 Hz	VA	210												350			
	d.c.	W	190												400			
Average holding value	50 Hz	VA/W	7/2.8												7/3.5			
	60 Hz	VA/W	7/2.8												7/3.5			
	d.c.	W	2.8												2			
Operating time																		
between coil energization and:																		
– N.O. contact closing	ms	30 ... 100				30 ... 80				30 ... 80								
– N.C. contact opening	ms	27 ... 95				27 ... 77				27 ... 77								
between coil de-energization and:																		
– N.O. contact opening	ms	30 ... 110				55 ... 125				55 ... 125								
– N.C. contact closing	ms	35 ... 115				60 ... 130				60 ... 130								

Ⓢ 50/60 Hz coils: voltage codes 8 0 to 8 8. see page 1.28.

IEC Technical data

A145 — AF750

Across the line
contactors

1

Magnet System Characteristics for A... Contactors

Contactor types:	A...	145	185	210	260	300	-	-	-	-
Rated control circuit voltage U_c										
- at 50 Hz	V	24 ... 690								
- at 60 Hz	V	24 ... 690								
Coil operating limits according to IEC 60947-4-1		$\vartheta \leq 70 \text{ }^\circ\text{C}$ 0.85 ... 1.1 x U_c								
Drop-out voltage in % of U_c		roughly 25 ... 65 %								
Coil consumption										
Average pull-in value	50 Hz	VA	550		1350					
	60 Hz	VA	600		1550					
	50/60 Hz ①	VA/VA	700/650		1700/1550					
Average holding value	50 Hz	VA/W	35/11		60/16					
	60 Hz	VA/W	40/12		65/19					
	50/60 Hz ①	VA/W	44/13		80/21					
Operating time										
between coil energization and:										
- N.O. contact closing	ms		13 ... 27		17 ... 35					
- N.C. contact opening	ms		8 ... 22		12 ... 30					
between coil de-energization and:										
- N.O. contact opening	ms		5 ... 10		7 ... 13					
- N.C. contact closing	ms		9 ... 13		10 ... 16					

Magnet System Characteristics for AF... Contactors

Contactor types:	AF...	145	185	210	260	300	400	460	580	750
Rated control circuit voltage U_c										
- at 50 Hz	V	48 ... 250								
- at 60 Hz	V	48 ... 250								
- d.c.	V	24 ... 250								
Coil operating limits according to IEC 60947-4-1		$\vartheta \leq 70 \text{ }^\circ\text{C}$ 0.85 ... 1.1 x U_c								
Drop-out voltage in % of U_c		55 %								
Coil consumption										
Average pull-in value	50 Hz	VA	430		470		890		850	
	60 Hz	VA	430		470		890		850	
	d.c.	W	500		520		990		950	
Average holding value	50 Hz	VA/W	12/3.5		10/2.5		12/4		12/4.5	
	60 Hz	VA/W	12/3.5		10/2.5		12/4		12/4.5	
	d.c.	W	2		2		4		4.5	
Operating time										
between coil energization and:										
- N.O. contact closing	ms		30 ... 115				50 ... 120			
- N.C. contact opening	ms		30 ... 115				50 ... 120			
between coil de-energization and:										
- N.O. contact opening	ms		25 ... 80				40 ... 70			
- N.C. contact closing	ms		25 ... 80				40 ... 70			

① 50/60 Hz coils: voltage codes 8 0 to 8 8. see page 1.28.

IEC Technical data

AF1350 — AF1650

Magnet System Characteristics for AF... Contactors

Contactor types:	AF...	1350	1650
Rated control circuit voltage U_c			
– at 50 Hz	V	100 - 250	
– at 60 Hz	V	100 - 250	
– d.c.	V	100 - 250	
Coil operating limits according to IEC 60947-4-1		$\vartheta \leq 70\text{ °C}$ 0.85 ... 1.1 x U_c	
Drop-out voltage in % of U_c		55 %	
Coil consumption			
Average pull-in value			
50 Hz	VA	1900	
60 Hz	VA	1900	
d.c.	W	1700	
Average holding value			
50 Hz	VA/W	48/17	
60 Hz	VA/W	48/17	
d.c.	W	16	
Operating time			
between coil energization and:			
– N.O. contact closing	ms	50 - 80	
– N.C. contact opening		ms	50 - 80
between coil de-energization and			
– N.O. contact opening		ms	35 - 55
– N.C. contact closing	ms	35 - 55	
With PLC			
between coil energization and			
– N.O. contact opening		ms	40 - 65
– N.C. contact closing	ms	40 - 65	
between coil de-energization and			
– N.O. contact opening		ms	10 - 30
– N.C. contact closing	ms	10 - 30	

① 50/60 Hz coils: voltage codes 8 0 to 8 8. see page 1.28.

IEC Technical data

AE9 — AE110

TAE45 — TAE110

Across the line
contactors

1

Magnet System Characteristics for AE... Contactors

Contactor types:	AE...	9	12	16	26	30	40	45	50	63	75	95	110
Rated control circuit voltage U_c	V d.c.	12 ... 250											
Coil operating limits according to IEC 60947-4-1		$\theta \leq 55^\circ\text{C}$ 0.85 ... 1.1 x U_c										$\theta \leq 70^\circ\text{C}$	
Drop-out voltage in % of U_c		roughly 10 ... 30 %						roughly 15 ... 40 %					
Coil consumption - Average values													
- pull-in value	W	90			110			200			400		
- holding value	W	2			2.5			4			2.4		
Coil time constant													
- open	L/R	ms 2			3			3			6		
- closed	L/R	ms 9			16			15			30 ... 40		
Operating time													
between coil energization and:													
- N.O. contact closing	ms	10 ... 16			13 ... 21			13 ... 30			15 ... 25		
- N.C. contact opening	ms	8 ... 12			11 ... 16			10 ... 27			12 ... 22		
between coil de-energization and													
- N.O. contact opening	ms	5 ... 14 ①			6 ... 12 ①			5 ... 15 ①			15 ... 20 ①		
- N.C. contact closing	ms	11 ... 17 ①			8 ... 16 ①			8 ... 18 ①			18 ... 23 ①		

Magnet System Characteristics for TAE... Contactors

Contactor types:	TAE...	-	-	-	-	-	-	45	50	-	75	95	110
Rated control circuit voltage U_c	V d.c.	17 ... 264											
Coil operating limits according to IEC 60947-4-1		$\theta \leq 55^\circ\text{C}$ $U_c \text{ min. ... } U_c \text{ max.}$											
Drop-out voltage in % of $U_c \text{ max.}$		roughly 20 ... 35 %											
Coil consumption values for $U_c \text{ min. ... } U_c \text{ max.}$													
- pull-in value	W							120 ... 250			300 ... 1000		
- holding value	W							1.7 ... 6.5			2 ... 7		
Coil time constant													
- open	L/R	ms						3			6		
- closed	L/R	ms						15			40		
Operating time													
between coil energization and:													
- N.O. contact closing	ms							13 ... 30			15 ... 25		
- N.C. contact opening	ms							10 ... 27			12 ... 22		
between coil de-energization and													
- N.O. contact opening	ms							5 ... 15 ②			15 ... 20 ②		
- N.C. contact closing	ms							8 ... 18 ②			18 ... 23 ②		

① The use of surge suppressors increases the opening time on a scale of 1.1 to 1.5 for a varistor suppressor and on a scale of 4 to 8 for a diode suppressor. AE 9 ... AE 40 contactors and $U_c \geq 110 \text{ V}$: table values for contactors with RV 5 surge suppressor (factory mounted).

② The use of surge suppressors increases the opening time on a scale of 1.1 to 1.5 for a varistor suppressor and on a scale of 4 to 8 for a diode suppressor.

IEC Technical data

A9 — A110

Built-in Auxiliary Contacts - Utilization Characteristics

Contactor types: A...		9	12	16	26	30	40	45	50	63	75	95	110
Rated operational voltage U_e max.	V	690						-	-	-	-	-	-
Conventional free air thermal current I_{th} - $\theta \leq 40$ °C	A	16						-	-	-	-	-	-
Rated frequency limits	Hz	25 ... 400						-	-	-	-	-	-
Rated operational current I_e / AC-15 according to IEC 60947-5-1													
24-127 V 50/60 Hz	A	6						-	-	-	-	-	-
220-240 V 50/60 Hz	A	4						-	-	-	-	-	-
380-440 V 50/60 Hz	A	3						-	-	-	-	-	-
500 V 50/60 Hz	A	2						-	-	-	-	-	-
690 V 50/60 Hz	A	2						-	-	-	-	-	-
Rated operational current I_e / DC-13 according to IEC 60947-5-1													
24 V d.c.	A / W	6 / 144						-	-	-	-	-	-
48 V d.c.	A / W	2.8 / 134						-	-	-	-	-	-
72 V d.c.	A / W	2 / 144						-	-	-	-	-	-
125 V d.c.	A / W	1.1 / 138						-	-	-	-	-	-
250 V d.c.	A / W	0.55 / 138						-	-	-	-	-	-
Rated making capacity acc. to IEC 60947-5-1		10 x I_e / AC-15						-	-	-	-	-	-
Rated breaking capacity acc. to IEC 60947-5-1		10 x I_e / AC-15						-	-	-	-	-	-
Short-circuit protection gG type fuse	A	10						-	-	-	-	-	-
Rated short-time withstand current I_{cw} for 1.0 s	A	100						-	-	-	-	-	-
for 0.1 s	A	140						-	-	-	-	-	-
Minimum switching capacity	V / mA	17 / 5						-	-	-	-	-	-
Non-overlapping time between N.O. and N.C. contacts	ms	≥ 2						-	-	-	-	-	-
Insulating resistance at 500 V d.c. after durability test	MOhm	5						-	-	-	-	-	-
Heat dissipation per pole at 6 A	W	0.10						-	-	-	-	-	-

IEC Technical data

A/AE9 — AF/TAE110

Mounting characteristics

Contactor types:	A..., AE...	9	12	16	26	30	40	45	50	63	75	95	110
	AF..., TAE...	-	-	-	-	-	-	45	50	63	75	95	110
Mounting positions	see "Conditions for use"												
Mounting distances	The contactors can be assembled side by side												
Mounting													
on DIN rail	35 x 7.5 mm				35 x 15 mm				35 x 15 mm				75 x 25 mm
according to IEC 715 and EN 50022 / EN 50023	35 x 15 mm				75 x 25 mm								75 x 25 mm
by screws (not supplied)	2 x M4				2 x M6								

Conditions for Use

Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Contactors	Mounting position	Ambient temperature	Control voltage
A 9 ... A 110, AE 9 ... AE 110	1, 1 ± 30°, 2, 3, 4, 5	≤ 55 °C 55 ... 70 °C	0.85 ... 1.1 x U _c U _c
	6	≤ 55 °C > 55 °C unauthorized	0.95 ... 1.1 x U _c -
AF 45 ... AF 110	1, 1 ± 30°, 2, 3, 4, 5	≤ 70 °C	0.85 U _c min. ... 1.1 x U _c max.
	6 unauthorized	-	-
TAE 45 ... TAE 110	1, 1 ± 30°, 2, 3, 4, 5	≤ 55 °C > 55 °C unauthorized	U _c min. ... U _c max. -
	6 unauthorized	-	-

Notes for 4-pole contactors

Whatever the coil voltage: Pos. 5 unauthorized for A 45-22-00, AE 45-22-00, A 75-22-00, AE 75-22-00 contactors.

For 60 Hz coil voltage: (only for devices fitted with CA 5-.. and CAL 5-11 auxiliary contacts or TP timer)

- A 45-40-00, A 50-40-00 and A 75-40-00 contactors

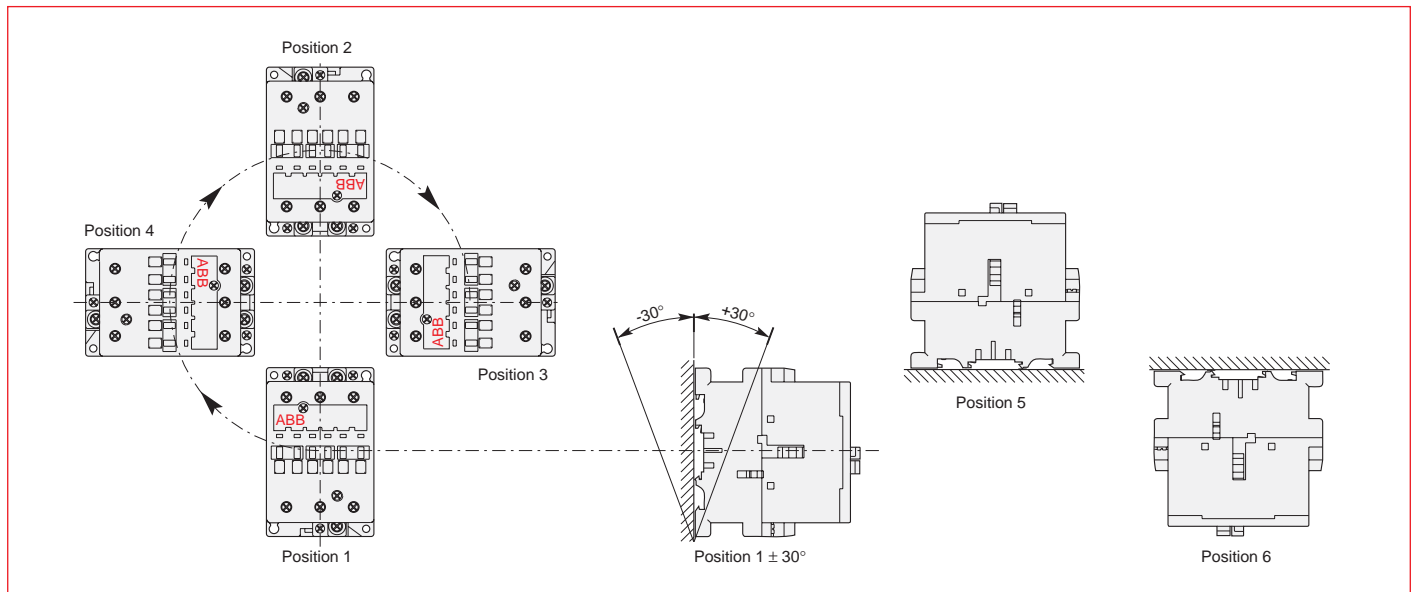
Mounting positions 1 to 5 and ambient temperature ≤ 55 °C: tolerance reduced to 0.9 ... 1.1 U_c (instead of 0.85 ... 1.1 U_c) for coil voltage codes 7 □ and 8 □.

- A 45-22-00 and A 75-22-00 contactors

Mounting positions 1 to 4 (pos. 5 unauthorized) and ambient temperature ≤ 55 °C: tolerance reduced to 0.9 ... 1.1 U_c (instead of 0.85 ... 1.1 U_c) for coil voltage codes 7 □ and 8 □.

For mounting position 6 or ambient temperature of 55 to 70 °C the information given on this page remains applicable.

Mounting Positions (see the above table for authorized positions)



IEC Technical data

A/AF145 — AF1650

Mounting Characteristics — A/AF145 — AF750

Contactor types:	A...	145	185	210	260	300	–	–	–	–
	AF...	145	185	210	260	300	400	460	580	750
Mounting positions	see "Condition for use"									
Mounting distances	The contactors can be assembled side by side									
Fixing										
on DIN rail according to IEC 715 and EN 50022 / EN 50023	–	–	–	–	–	–	–	–	–	–
by screws (not supplied)	4 x M5								4 x M6	

Mounting Characteristics — AF1350 — AF1650

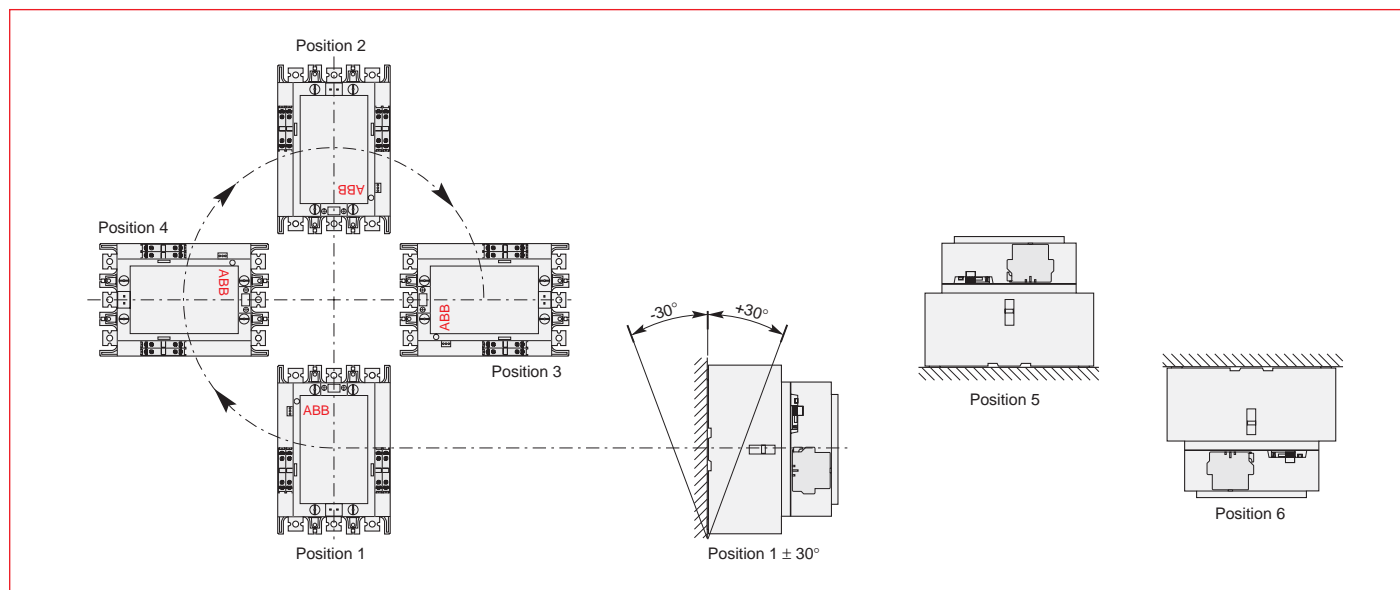
Contactor types:	AF	1350	1650
Mounting positions	see "Condition for use"		
Mounting distances	The contactors can be assembled side by side		
Fixing			
on DIN rail according to IEC 715 and EN 50022 / EN 50023	–	–	–
by screws (not supplied)	4 x M8		

Conditions for Use

Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Contactors	Mounting position	Ambient temperature	Control voltage
A 145 ... A 300	1, 1 ± 30°, 2, 3, 4, 5	≤ 70 °C	0.85 ... 1.1 x U _c
	6 unauthorized	–	–
AF 145 ... AF 750	1, 1 ± 30°, 2, 3, 4, 5	≤ 70 °C	0.85 x U _c min. ... 1.1 x U _c max.
	6 unauthorized	–	–

Mounting Positions (see the above table for authorized positions)

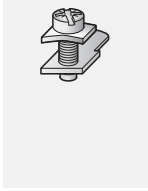
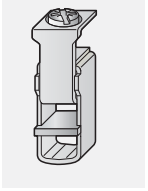
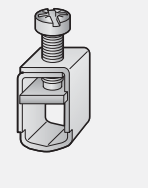
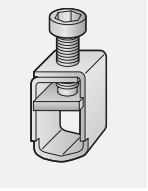


















IEC Technical data

A/AE9 — AF/TAE110

Across the line
1

Connecting Characteristics

Contactor types:	A..., AE...	9	12	16	26	30	40	45	50	63	75	95	110		
	AF..., TAE...	-	-	-	-	-	-	45	50	63	75	95	110		
Main terminals															
															
	with cable clamp					with double connector 2 x (5.6 x 6.5 mm)		with single connector (13 x 10 mm)				with single connector (14 x 14 mm)			
Connecting capacity (min. ... max.)															
Main conductors (poles)															
Rigid: solid ($\leq 4 \text{ mm}^2$)		1 ... 4				1.5 ... 6		2.5 ... 16				6 ... 50		10 ... 95	
stranded ($\geq 6 \text{ mm}^2$)		1 ... 4				1.5 ... 6		2.5 ... 16				6 ... 16		6 ... 35	
Rigid with connector		-				-		-				-		-	
single for Cu cable		-				-		-				-		-	
single for Al/Cu cable		-				-		-				-		-	
double for Al/Cu cable		-				-		-				-		-	
Flexible with cable end		0.75 ... 2.5				0.75 ... 4		2.5 ... 10				6 ... 35		10 ... 70	
		0.75 ... 2.5				0.75 ... 4		2.5 ... 10				6 ... 25		6 ... 35	
Bars or lugs		8				10		-				-		30 ②	
		3.7				4.2		-				-		6	
Auxiliary conductors															
(built-in auxiliary terminals + coil terminals)															
Rigid solid		1 ... 4								0.75 ... 2.5					
		1 ... 4								0.75 ... 2.5					
Flexible with cable end		0.75 ... 2.5								1 ... 2.5				0.75 ... 2.5	
		0.75 ... 2.5													
Lugs		8				① 10		8							
		3.7				① 4.2		3.7							
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529															
Protection against direct contact acc. to VDE 0106 - Part. 100															
- Main terminals	IP 20							IP 10							
- Coil terminals	IP 20														
- Built-in auxiliary terminals	IP 20														
Screw terminals															
(delivered in open position, screws of unused terminals must be tightened)															
Main terminals	(+,-) pozidriv 2 screws										hexagon socket				
	M3.5			M4		M5		M6			M8 (s = 4 mm)				
Coil terminals	M3.5 (+,-) pozidriv 2 screws with cable clamp														
Built-in auxiliary terminals	(+,-) pozidriv 2 screws with cable clamp														
	M3.5			M4		M5		-			-				
Tightening torque															
Main pole terminals															
- recommended	Nm / lb.in	1.00 / 9				1.7 / 15		2.30 / 20		4.00 / 35				6.00 / 53	
- max.	Nm	1.20				2.20		2.60		4.50				6.50	
Coil terminals															
- recommended	Nm / lb.in	1.00 / 9													
- max.	Nm	1.20													
Built-in auxiliary terminals															
- recommended	Nm / lb.in	1.00 / 9				1.7 / 15		1.00 / 9		-				-	
- max.	Nm	1.20				2.20		1.20		-				-	
Terminal marking and positioning															
see pages 1.34															

① $L \leq 8$ and $l > 3.7$ for coil terminal - $L \leq 10$ and $l > 4.2$ for built-in auxiliary terminals.
② With LW 110 enlargement piece. See page 1.31.

IEC Technical data

A/AF145 — AF750














Connecting Characteristics

Contactor types:	A...	145	185	210	260	300	-	-	-	-
AF...	145	185	210	260	300	400	460	580	750	
Main terminals										
Flat type										
Connecting capacity (min. ... max.)										
Main conductors (poles)										
Rigid:		1 x mm ²	-	-	-	-	-	-	-	-
		2 x mm ²	-	-	-	-	-	-	-	-
Rigid with connector										
single for Cu cable		mm ²	6 ... 185		16 ... 240		240		300	
single for Al/Cu cable		mm ²	25 ... 150		120 ... 240		240		300	
double for Al/Cu cable		mm ²	-		2 x 95 ... 120		2 x 240		3 x 185	
Flexible										
		1 x mm ²	-	-	-	-	-	-	-	-
		2 x mm ²	-	-	-	-	-	-	-	-
Bars or lugs		L mm ≤	24		32		47 / 45		52 / 50	
		Ø mm >	8		10		10		12	
Auxiliary conductors (coil terminals)										
Rigid solid										
		1 x mm ²	1 ... 4							
		2 x mm ²	1 ... 4							
Flexible with cable end										
		1 x mm ²	0.75 ... 2.5							
		2 x mm ²	0.75 ... 2.5							
Lugs		L mm ≤	8							
		l mm >	3.7							
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Protection against direct contact acc. to VDE 0106 - part 100									
- Main terminals	IP 00									
- Coil terminals	IP 20									
- Built-in auxiliary terminals	-									
Screw terminals										
Main terminals	Screws and bolts									
			M8	M10	M10	M12				
Coil terminals (delivered in open position)	M3.5 (+, -) pozidriv 2 screws with cable clamp									
Built-in auxiliary terminals	-									
Tightening torque										
Main pole terminals										
- recommended	Nm / lb.in	18 / 160		28 / 240		40 / 354		45 / 443		
- max.	Nm	20		30		44		49		
Coil terminals										
- recommended	Nm / lb.in	1.00 / 9								
- max.	Nm	1.20								
Built-in auxiliary terminals										
- recommended	Nm / lb.in	-	-	-	-	-	-	-	-	-
- max.	Nm	-	-	-	-	-	-	-	-	-
Terminal marking and positioning	see pages 1.36 & 1.37									

IEC Technical data

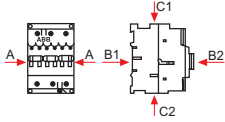
AF1350 — AF1650

Connecting Characteristics

Contactor types: AF...		1350	1650
Main terminals Flat type			
Connecting capacity (min. ... max.) Main conductors (poles)			
Rigid:	 1 x mm ²	—	—
	 2 x mm ²	—	—
Rigid with connector			
single for Cu cable	 mm ²	—	—
single for Al/Cu cable	 mm ²	—	—
double for Al/Cu cable	 mm ²	—	—
Flexible	 1 x mm ²	—	—
	 2 x mm ²	—	—
Bars or lugs	 L mm ≤ Ø mm >	100 12	100 12
Auxiliary conductors (coil terminals)			
Rigid solid	 1 x mm ²	1...4	1...4
	 2 x mm ²	1...4	1...4
Flexible with cable end	 1 x mm ²	0.75...2.5	0.75...2.5
	 2 x mm ²	0.75...2.5	0.75...2.5
Lugs	 L mm ≤ l mm >	8 3.7	8 3.7
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529			
– Main terminals		IP 00	IP 00
– Coil terminals		IP 20	IP 20
– Built-in auxiliary terminals			
Screw terminals Main terminals		Screw and bolts M12	
Coil terminals (delivered in open position)		M3.5 (+,-) pozidriv 2 screws with cable clamp	
Built-in auxiliary terminals		—	—
Tightening torque			
Main pole terminals			
– recommended	Nm / lb.in	45/443	45/443
– max.	Nm	49	49
Coil terminals			
– recommended	Nm / lb.in	1.00 / 9	1.00 / 9
– max.	Nm	1.20	1.20
Built-in auxiliary terminals			
– recommended	Nm / lb.in	—	—
– max.	Nm	—	—

UL/CSA & IEC Technical data

AL9 — AL40

Contactor types:	AL	AL9	AL12	AL16	AL26	AL30	AL40
Rated insulation voltage U_i according to IEC 60947-4-1	V				1000		
according to UL/CSA	V				600		
Rated impulse withstand voltage U_{imp}	kV				8		
Standards		Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1					
Air temperature close to contactor		see "Conditions for use" page 1.50, for control voltage limits and authorized mounting positions					
– fitted with thermal O/L relay	°C	-25 to +55					
– without thermal O/L relay	°C	-40 to +70 (55 max. for TAE... contactors)					
– for storage	°C	-60 to +80					
Climatic withstand		acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II					
Operating altitude	m	≤ 3000					
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27		1/2 sinusoidal shock for 11 ms: no change in contact position					
Mounting position 1 (see page 1.50)		Shock direction	Making position	Breaking position			
		A	20 g	20 g			
		B1	10 g	5 g			
		B2	15 g	15 g			
		C1	20 g	20 g			
		C2	20 g	20 g			

IEC Technical data

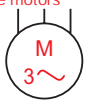
AL9 — AL40

Across the line
contactors

1

Main Pole - Utilization Characteristics

Contactor types:	AL	AL9	AL12	AL16	AL26	AL30	AL40	
Rated operational voltage U_e max.	V	690						
Rated frequency limits	Hz	25-400						
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1,								
open contactors $\varnothing \leq 40$ °C	A	26	28	30	45	65	65	
with conductor cross-sectional area mm^2	4	4	4	6	16	16	35	
Rated operational current I_e / AC-1 for air temperature close to contactor								
U_e max. 690 V	$\varnothing \leq 40$ °C	A	25	27	30	45	55	60
	$\varnothing \leq 55$ °C	A	22	25	27	40	55	60
	$\varnothing \leq 70$ °C ^③	A	18	20	23	32	39	42
with conductor cross-sectional area mm^2		2.5	4	4	6	10	16	
Utilization categorie AC-3 for air temperature close to contactor ≤ 55 °C								
Rated operational current I_e AC-3 ^①								
3-phase motors	220-230-240 V	A	9	12	17	26	33	40
	380-400 V	A	9	12	17	26	32	37
	415 V	A	9	12	17	26	32	37
	440 V	A	9	12	16	26	32	37
	500 V	A	9	12	14	22	28	33
	690 V	A	7	9	10	17	21	25
	1000 V	A	—	—	—	—	—	—
Rated operational power AC-3 ^①								
1500 r.p.m. 50 Hz 1800 r.p.m. 60 Hz 3-phase motors	220-230-240 V	kW	2.2	3	4	6.5	9	11
	380-400 V	kW	4	5.5	7.5	11	15	18.5
	415 V	kW	4	5.5	9	11	15	18.5
	440 V	kW	4	5.5	9	15	18.5	22
	500 V	kW	5.5	7.5	9	15	18.5	22
	690 V	kW	5.5	7.5	9	15	18.5	22
	1000 V	kW	—	—	—	—	—	—
Rated making capacity AC-3 according to IEC 60947-4-1								
		10 x I_e AC-3						
Rated breaking capacity AC-3 according to IEC 60947-4-1								
		8 x I_e AC-3						
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded								
$U_e \leq 500$ V a.c. - gG type fuse	A	25	32	32	50	63		
Rated short-time withstand current I_{cw} at 40 °C ambient temp., in free air, from a cold state								
1 s	A	250	280	300	400	600		
10 s	A	100	120	140	210	400		
30 s	A	60	70	80	110	225		
1 min	A	50	55	60	90	150		
15 min	A	26	28	30	45	65		
Maximum breaking capacity $\cos \varnothing = 0.45$ ($\cos \varnothing = 0.35$ for $I_e > 100$ A)								
at 440 V	A	250	—	—	420	820		
at 690 V	A	90	—	—	170	340		
Heat dissipation per pole								
I_e / AC-1	W	0.8	1	1.2	1.8	2.5		
I_e / AC-3	W	0.1	0.2	0.35	0.6	0.9		
Max. electrical switching frequency								
- for AC-1	cycles/h	600						
- for AC-3	cycles/h	1200						
- for AC-2, AC-4	cycles/h	300						
Mechanical durability								
- millions of operating cycles		10						
- max. mechanical switching frequency	cycles/h	3600						



IEC Technical data

AL9 — AL40, TAL9 – TAL40

Magnet system characteristics for AL contactors

Contactor types:	AL	AL9	AL12	16	26	30	40
Rated control circuit voltage U_c	V d.c.	12 ... 240 (24V & 48V for AL...Z)					
Coil operating limits according to IEC 60947-4-1		$\theta \leq 55^\circ\text{C}$ 0.85 ... 1.1 x U_c					
Drop-out voltage in % of U_c		roughly 15 ... 30 %					
Coil consumption - Average values							
- pull-in value	W	3 (2.4 for AL9Z - AL16Z)			3.5		
- holding value	W	3 (2.4 for AL9Z - AL16Z)			3.5		
Coil time constant							
- open	L/R	ms	40				
- closed	L/R	ms	90				
Operating time between coil energization and:							
- N.O. contact closing		ms	50 ... 75				
- N.C. contact opening		ms	45 ... 70				
Operating time between coil de-energization and:							
- N.O. contact opening		ms	15 ... 30				
- N.C. contact closing		ms	17 ... 32				

Magnet System Characteristics for TAL... Contactors

Contactor types:	TAL	TAL9	TAL12	TAL16	TAL26	TAL30	TAL40
Rated control circuit voltage U_c	V d.c.	9 ... 264					
Coil operating limits according to IEC 60947-4-1		$\theta \leq 55^\circ\text{C}$ 0.85 ... 1.1 x U_c					
Drop-out voltage in % of U_c max.		roughly 20... 35 %					
Coil consumption values for U_c max. and 20 °C							
- U_c max. DC	W	8.5			9		
- U_c min. DC	W	2.5			2.7		
- U_c DC	W	5			5.4		
Operating time between coil energization and:							
- N.O. contact closing		ms	50 ... 100		55 ... 110		
- N.C. contact opening		ms	20 ... 70		25 ... 75		
Operating time between coil de-energization and:							
- N.O. contact opening		ms	10 ... 17 ①		12 ... 18 ①		
- N.C. contact closing		ms	16 ... 27 ①		18 ... 28 ①		

① The use of surge suppressors increases the opening time on a scale of 1.1 to 1.5 for a varistor suppressor and on a scale of 4 to 8 for a diode suppressor.

IEC Technical data

AL9 — AL40

Across the line
contactors

1

Built-in Auxiliary Contacts - Utilization Characteristics

Contactor types: AL	AL9	AL12	AL16	AL26	AL30	AL40
Rated operational voltage U_e max. V	690					
Conventional free air thermal current I_{th} - $\vartheta \leq 40$ °C A	16					
Rated frequency limits Hz	25 ... 400					
Rated operational current I_e / AC-15 according to IEC 60947-5-1						
24-127 V 50/60 Hz A	6					
220-240 V 50/60 Hz A	4					
380-440 V 50/60 Hz A	3					
500 V 50/60 Hz A	2					
690 V 50/60 Hz A	2					
Rated operational current I_e / DC-13 according to IEC 60947-5-1						
24 V d.c. A / W	6 / 144					
48 V d.c. A / W	2.8 / 134					
72 V d.c. A / W	2 / 144					
125 V d.c. A / W	1.1 / 138					
250 V d.c. A / W	0.55 / 138					
Rated making capacity acc. to IEC 60947-5-1	10 x I_e / AC-15					
Rated breaking capacity acc. to IEC 60947-5-1	10 x I_e / AC-15					
Short-circuit protection gG type fuse A	10					
Rated short-time withstand current I_{cw}						
for 1.0 s A	100					
for 0.1 s A	140					
Minimum switching capacity V / mA	17 / 5					
Non-overlapping time between N.O. and N.C. contacts ms	≥ 2					
Insulating resistance at 500 V d.c. after durability test MOhm	5					
Heat dissipation per pole at 6 A W	0.10					

IEC Technical data

AL9 — AL40

Mounting characteristics

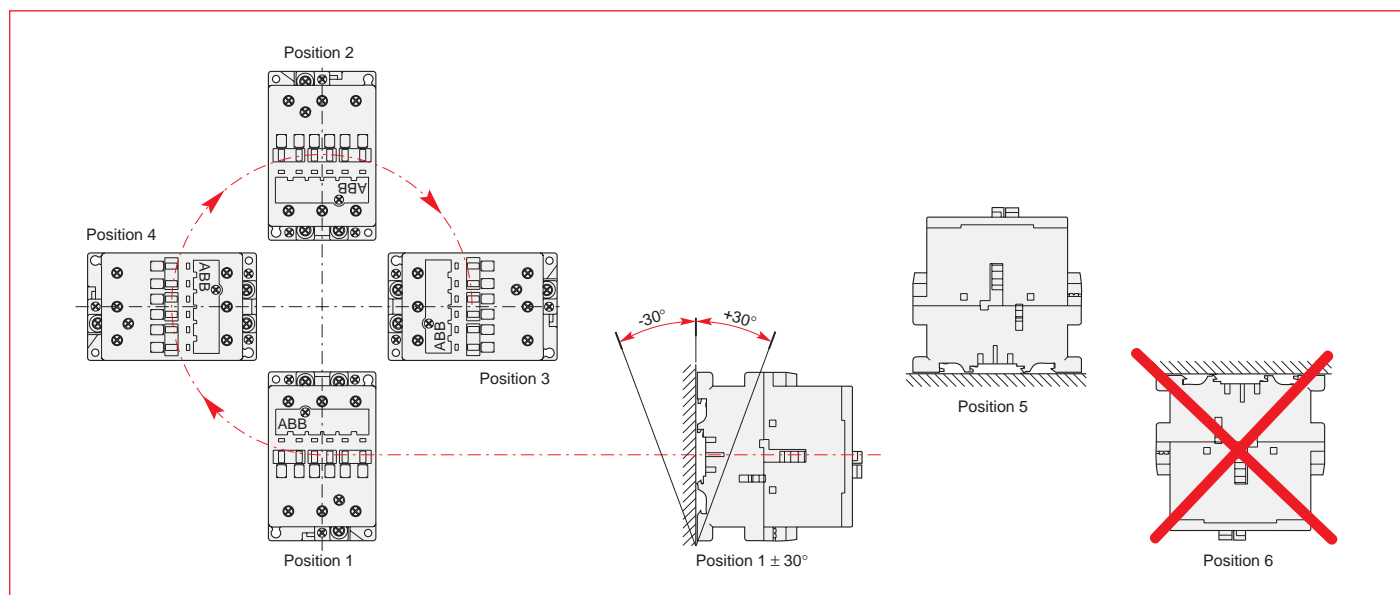
Contactor types:	AL	AL9	AL12	AL16	AL26	AL30	AL40
Mounting positions	see "Conditions for use"						
Mounting distances	The contactors can be assembled side by side						
Mounting	on DIN rail						
	according to IEC 715 and EN 50022 / EN 50023						
	by screws (not supplied)						
	35 x 7.5 mm		35 x 15 mm		2 x M4		

Conditions for Use

Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Mounting position	Ambient temperature	Control voltage
1, 1 ± 30°, 2, 3, 4, 5	≤ 55 °C	0.85 ... 1.1 x U _c
6 (Unauthorized)	55 ... 70 °C	U _c

Mounting Positions (see the above table for authorized positions)



IEC Technical data

AL9 — AL40

Connecting Characteristics

Contactor types: **AL** AL9 AL12 AL16 AL26 AL30 AL40

Main terminals



Connecting capacity (min. ... max.)

Main conductors (poles)

Rigid: solid ($\leq 4 \text{ mm}^2$)		1 ... 4			1.5 ... 6	2.5 ... 16
stranded ($\geq 6 \text{ mm}^2$)		1 ... 4			1.5 ... 6	2.5 ... 16
Rigid with connector						
single for Cu cable		mm^2	-	-	-	-
single for Al/Cu cable		mm^2	-	-	-	-
double for Al/Cu cable		mm^2	-	-	-	-
Flexible with cable end		1 x mm^2	0.75 ... 2.5		0.75 ... 4	2.5 ... 10
		2 x mm^2	0.75 ... 2.5		0.75 ... 4	2.5 ... 10
Bars or lugs		L mm \leq	8		10	-
		l mm $>$	3.7		4.2	-

Auxiliary conductors

(built-in auxiliary terminals + coil terminals)

Rigid solid		1 x mm^2	1 ... 4			
		2 x mm^2	1 ... 4			
Flexible with cable end		1 x mm^2	0.75 ... 2.5			
		2 x mm^2	0.75 ... 2.5			
Lugs		L mm \leq	8	①	8	
		l mm $>$	3.7	①	3.7	

Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529

Protection against direct contact acc. to VDE 0106 - Part. 100

- Main terminals
- Coil terminals
- Built-in auxiliary terminals

IP 20
IP 20
IP 20

Screw terminals

(delivered in open position, screws of unused terminals must be tightened)

Main terminals						
Coil terminals						
Built-in auxiliary terminals						

Tightening torque

Main pole terminals						
- recommended	Nm / lb.in	1.00 / 9			1.7 / 15	2.30 / 20
- max.	Nm	1.20			2.20	2.60
Coil terminals						
- recommended	Nm / lb.in	1.00 / 9				
- max.	Nm	1.20				
Built-in auxiliary terminals						
- recommended	Nm / lb.in	1.00 / 9			1.7 / 15	1.00 / 9
- max.	Nm	1.20			2.20	1.20

Terminal marking and positioning see pages 1.35

① L \leq 8 and l $>$ 3.7 for coil terminal - L \leq 10 and l $>$ 4.2 for built-in auxiliary terminals.

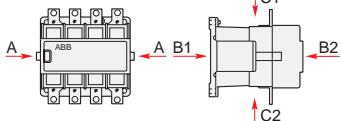
② With LW 110 enlargement piece. See page 1.31.

IEC Technical data

EK110 — EK1000

General Technical Data

Contactor types:	EK...	110	150	175	210	370	550	1000
Rated insulation voltage U_i according to IEC 60947-4-1	V	1000						
according to UL/CSA	V	600						
Rated impulse withstand voltage U_{imp}	kV	8						
Standards		Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1						
Air temperature close to contactor		see "Conditions for use" page 1.63, for control voltage limits and authorized mounting positions						
– fitted with thermal O/L relay	°C	-25 to +55						
– without thermal O/L relay	°C	-40 to +70						
– for storage	°C	-50 to +70						
Climatic withstand		acc. to IEC 60068-2-30						
Operating altitude	m	≤ 3000						
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27								
Mounting position 1 (see page 1.63)		1/2 sinusoidal shock for 15 ms: no change in contact position Contactor in making or breaking position						
		Shock direction: A, C1, C2: 10 g B1: 10 g B2: 10 g						





IEC Technical data

EK110 — EK1000

Across the line
contactors

1

Main Pole - Utilization Characteristics

Contactor types:	EK...	110	150	175	210	370	550	1000	
Rated operational voltage U_e max.	V	1000						690	
Rated frequency limits	Hz	25 ... 400							
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1, open contactors $\vartheta \leq 40^\circ\text{C}$	A	200	250	300	350	550	800	1000	
with conductor cross-sectional area	mm ²	95	150	185	240	2 x 185	2 x 240	2 x 300	
Rated operational current I_e / AC-1 for air temperature close to contactor									
U_e max. 690 V	$\vartheta \leq 40^\circ\text{C}$	A	200	250	300	350	550	800	1000
	$\vartheta \leq 55^\circ\text{C}$	A	180	230	270	310	470	650	800
	$\vartheta \leq 70^\circ\text{C}$	A	155	200	215	250	400	575	720
with conductor cross-sectional area	mm ²	95	150	185	240	2 x 185	2 x 240	2 x 300	
Utilization categorie AC-3									
for air temperature close to contactor $\leq 55^\circ\text{C}$									
Rated operational current I_e AC-3									
3-phase motors 	220-230-240 V	A	120	145	210	400	550	—	
	380-400 V	A	120	145	210	400	550	—	
	415 V	A	120	145	210	400	550	—	
	440 V	A	120	145	210	370	550	—	
	500 V	A	120	145	210	370	550	—	
	690 V	A	120	120	210	370	550	—	
	1000 V	A	64	80	113	155	175	—	
Rated operational power AC-3									
1500 r.p.m. 50 Hz	220-230-240 V	kW	30	45	59	110	160	—	
1800 r.p.m. 60 Hz	380-400 V	kW	55	75	110	200	280	—	
3-phase motors 	415 V	kW	55	75	110	220	315	—	
	440 V	kW	59	75	110	220	315	—	
	500 V	kW	75	90	132	250	400	—	
	690 V	kW	110	110	160	355	500	—	
	1000 V	kW	90	110	160	220	250	—	
Rated making capacity AC-3 according to IEC 60947-4-1									
			10 x I_e AC-3					—	
Rated breaking capacity AC-3 according to IEC 60947-4-1									
			8 x I_e AC-3					—	
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded									
$U_e \leq 500$ V a.c. - gG type fuse	A	250		355		630	800	1000	
Rated short-time withstand current I_{cw} at 40 °C ambient temp., in free air, from a cold state									
1 s	A	1700	1800	2300		5500		6800	
10 s	A	900	1200	1680		5300		6400	
30 s	A	600	700	1000		3700		4400	
1 min	A	450	550	800		3000		3400	
15 min	A	210	250	320		1000		1200	
Maximum breaking capacity $\cos \varphi = 0.45$ ($\cos \varphi = 0.35$ for $I_e > 100$ A)									
at 440 V	A	1400	1500	2000		5000	5400	—	
at 690 V	A	1100	1200	1700		5000	5400	—	
Heat dissipation per pole									
I_e / AC-1	W	10	13	18		40	60	80	
I_e / AC-3	W	3	5	9		15	25	—	
Max. electrical switching frequency									
- for AC-1	cycles/h	300						300	
- for AC-3	cycles/h	300						—	
- for AC-2, AC-4	cycles/h	150				120		—	
Electrical durability									
		see pages 1.75							
Mechanical durability									
- millions of operating cycles		10					5		
- max. mechanical switching frequency	cycles/h	3600				3600			

IEC Technical data

EK110 — EK1000

Magnet System Characteristics for EK... Contactors - a.c. Operated

Contactor types:	EK...	110	150	175	210	370	550	1000
Rated control circuit voltage U_c								
- at 50 Hz	V	24 ... 500				48 ... 500		
- at 60 Hz	V	24 ... 600				110 ... 600		
Coil operating limits according to IEC 60947-4-1		$\vartheta \leq 70^\circ\text{C}$ 0.85 ... 1.1 x U_c						
Drop-out voltage in % of U_c		roughly 45 ... 65 %						
Coil consumption								
Average pull-in value	50 Hz ^① VA	800		1100		3500		
	60 Hz ^① VA	900		1200		4000		
	50/60 Hz ^② VA/VA	500/500		630/630		3800/3400		
Average holding value	50 Hz ^① VA/W	44/15		52/18		125/50		
	60 Hz ^① VA/W	52/18		65/22		140/60		
	50/60 Hz ^② VA/W	2.5/2.5		2.5/2.5		140/60		
Operating time								
between coil energization and:								
- N.O. contact closing	ms	20 ... 40 ^① / 30 ... 50 ^②				30 ... 60		
- N.C. contact opening	ms	15 ... 35 ^① / 25 ... 45 ^②				25 ... 55		
between coil de-energization and:								
- N.O. contact opening	ms	7.5 ... 15 ^① / 95 ... 120 ^②				10 ... 20		
- N.C. contact closing	ms	10 ... 18 ^① / 100 ... 125 ^②				13 ... 23		

Magnet System Characteristics for EK... Contactors - d.c. Operated

Contactor types:	EK...	110	150	175	210	370	550	1000
Rated control circuit voltage U_c	V d.c.	12 ... 220				24 ... 220		
Coil operating limits according to IEC 60947-4-1		$\vartheta \leq 70^\circ\text{C}$ 0.85 ... 1.1 x U_c						
Drop-out voltage in % of U_c		roughly 15 ... 50 %						
Coil consumption - Average values								
- pull-in value	W	500		630		1100		
- holding value	W	2.5		2.5		20		
Coil time constant								
- open	L/R	ms	8			12		
- closed	L/R	ms	50			60		
Operating time								
between coil energization and:								
- N.O. contact closing	ms	30 ... 50				60 ... 80		
- N.C. contact opening	ms	27 ... 47				55 ... 75		
between coil de-energization and:								
- N.O. contact opening	ms	10 ... 35						
- N.C. contact closing	ms	13 ... 38						

① "A" coil voltage codes see page 1.29.

② 50/60 Hz "E" coil voltage codes see page 1.29.

IEC Technical data

EK110 — EK1000

Mounting Characteristics

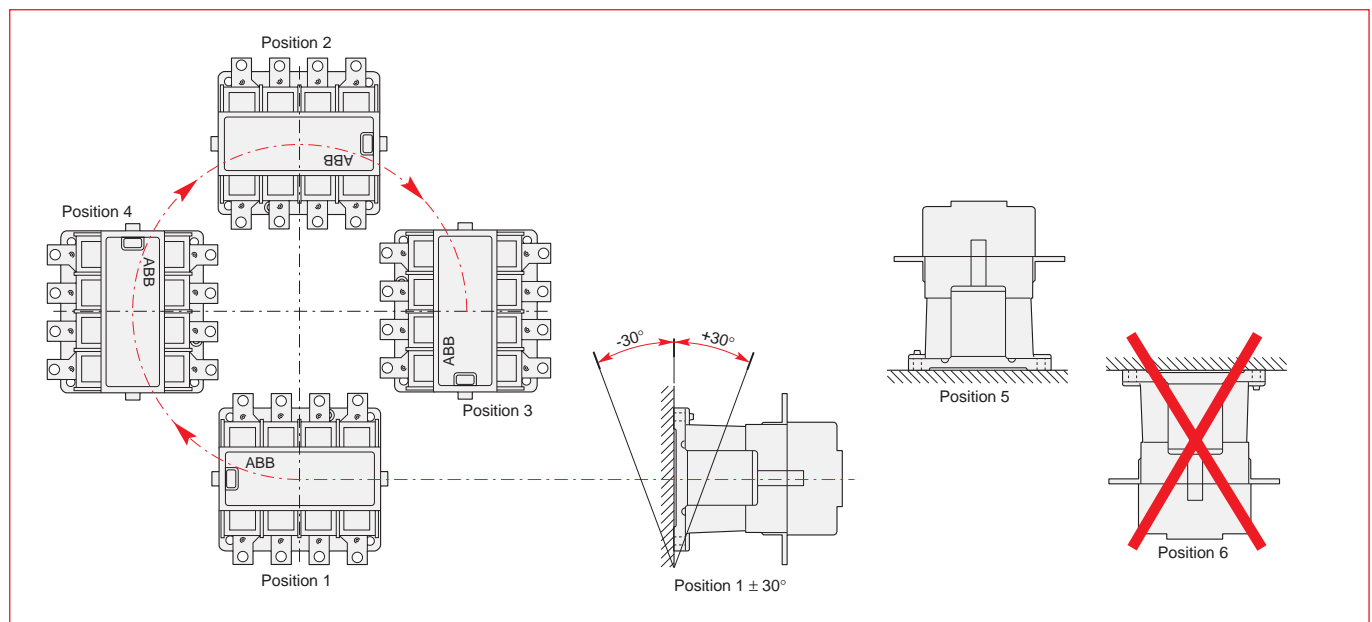
Contactor types: EK...	110	150	175	210	370	550	1000
Mounting positions	see "Conditions for use"						
Fixing by screws (supplied)	4 x M6			4 x M6 (1)			

Conditions for Use

Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Contactors	Mounting position	Ambient temperature	Control voltage
E110 ... EK210	1, 1 ± 30°, 3, 4, 5 2, 6 unauthorized	≤ 70 °C	0.85 ... 1.1 x U _c
E370 ... EK1000	1, 1 ± 30°, 2, 3, 4, 5 6 unauthorized	≤ 70 °C	0.85 ... 1.1 x U _c

Mounting Positions (see the above table for authorized positions)

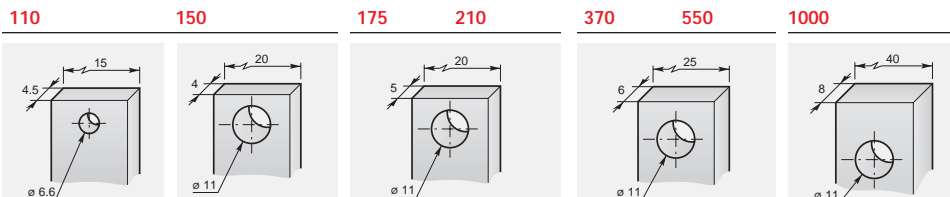


① Damping elements are supplied

IEC Technical data
EK110 — EK1000

Connecting Characteristics

Contactor types: EK...

Main terminals
Flat type

Connecting capacity (min. ... max.)

Main conductors (poles)

	110	150	175	210	370	550	1000
Rigid:							
1 x mm ²	-	-	-	-	-	-	-
2 x mm ²	-	-	-	-	-	-	-
Rigid with connector							
single for Cu cable mm ²	25 ... 120	25 ... 185	70 ... 300	70 ... 300	70 ... 300	70 ... 300	95 ... 300
single for Al/Cu cable mm ²	10 ... 70	35 ... 120	-	-	2 x 35 ... 185	2 x 35 ... 185	2 x 95 ... 300
double for Al/Cu cable mm ²	-	-	-	-	-	-	-
Flexible							
1 x mm ²	-	-	-	-	-	-	-
2 x mm ²	-	-	-	-	-	-	-
Bars or lugs							
L mm ≤	30	30	33	33	55	55	55
Ø mm >	6	10	10	10	10	10	10
Auxiliary conductors (coil terminals)							
Rigid solid							
1 x mm ²	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5
2 x mm ²	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5
Flexible with cable end							
1 x mm ²	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5
2 x mm ²	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5
Lugs							
L mm ≤	8	8	8	8	8	8	8
l mm >	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Protection against direct contact acc. to VDE 0106 - Part. 100						
- Main terminals	IP 00						
- Coil terminals	IP 20						
Screw terminals	Screws and bolts						
Main terminals	M6 M10						
Coil terminals (delivered in open position)	M3.5 (+,-) pozidriv 2 screws with cable clamp						
Tightening torque							
Main pole terminals							
- recommended	Nm / lb.in	5 / 44	18 / 160	18 / 160	18 / 160	18 / 160	18 / 160
- max.	Nm	6	22	22	22	22	22
Coil terminals							
- recommended	Nm / lb.in	1.00 / 9	1.00 / 9	1.00 / 9	1.00 / 9	1.00 / 9	1.00 / 9
- max.	Nm	1.20	1.20	1.20	1.20	1.20	1.20

IEC Technical data

Contactor electrical durability and Utilization categories

General

Utilization categories determine the current making and breaking conditions relating to the characteristics of the loads to be controlled by the contactors. International standard IEC 60947-4-1 and European standard EN 60947-4-1 are the standards to be referred to.

If I_c is the current to be broken by the contactor and I_e the rated operational current normally drawn by the load, then:

- Categories AC-1 and AC-3: $I_c = I_e$
- Category AC-2: $I_c = 2.5 \times I_e$
- Category AC-4: $I_c = 6 \times I_e$

Generally speaking $I_c = m \times I_e$ where m is a multiple of the load operational current.

On pages 1.66 - 1.71, the curves corresponding to categories AC-1, AC-2, AC-3 and AC-4 represent the electrical durability variation of standard contactors in relation to the breaking current I_c .

Electrical durability is expressed in millions of operating cycles.

These curves have been plotted for 400 V - 50 Hz 3-phase currents but remain valid up to 690 V - 40 ... 60 Hz provided that a check is carried out to make sure that at the operational voltage U_e , the current I_e normally drawn by the load does not exceed the value of the contactor rated operational current: $I_e / AC-1$ for category AC-1 and $I_e / AC-3$ for categories AC-3 and AC-4. The values are given for each type of contactor in pages 1.44, 1.45, 1.54, and 1.61 (Technical Data).

Curve Utilization Mode

Electrical durability forecast and contactor selection for categories AC-1, AC-2, AC-3 or AC-4

- Note the characteristics of the load to be controlled:
 - Operational voltage U_e
 - Current normally drawn I_e (U_e / I_e / kW relation for motors, + page 0/0).
 - Utilization category AC-1, AC-2, AC-3 or AC-4
 - Breaking current $I_c = I_e$ for AC-1 and for AC-3 ; $I_c = 2.5 \times I_e$ for AC-2 ; $I_c = 6 \times I_e$ for AC-4
- Define the number of operating cycles N required.
- On the diagram corresponding to the operational category, select the contactor with the curve immediately above the intersection point (I_c ; N).

Electrical durability forecast and contactor selection for mixed duty motor control: AC-3 ($I_c = I_e$) type switching off while "motor running" and, occasionally, AC-4 ($I_c = 6 \times I_e$) type switching off while "motor accelerating".

- Note the characteristics of the motor to be controlled:
 - Operational voltage U_e
 - Current normally drawn while "motor running" I_e (U_e / I_e / kW relation for motors, + 0/0).
 - Breaking current for AC-3 $I_c = I_e$
 - Breaking current for AC-4 while "motor accelerating" $I_c = 6 \times I_e$
 - Percentage of AC-4 operations K (on the basis of the total number of operating cycles)
- Define the total number of operating cycles N required.
- Note the smallest contactor rating compatible for AC-3 (U_e / I_e) on pages 2/62, 2/63, 2/73, and 2/79.
- For the selected contactor make a note of the following in relation to the voltage using diagram AC-3 page 2/85 and AC-4 page 2/86 or 2/87:
 - The number of operating cycles A for $I_c = I_e$ (AC-3)
 - The number of operating cycles B for $I_c = 6 \times I_e$ (AC-4)

- Calculate the estimated number of cycles N' (N' is always below A)

$$N' = \frac{A}{1 + 0.01 K (A/B - 1)}$$

- If N' is too low in relation to the target N , calculate the estimated number of cycles for a higher contactor rating.

Case of uninterrupted duty.

Among the different utilization categories, the uninterrupted duty implies the following remark. The combined effect of environmental conditions and the proper temperature of the product may require some disposals. As a matter of fact, for this duty, the use duration prevails over the number of operating cycles.

For long term service, some verifications of preventing maintenance are needed to check the functionality of the concerned product (consult us).

Over a duration of five years, in these conditions the contactor might present high internal resistance. We recommend to change the contactor or change the contacts.

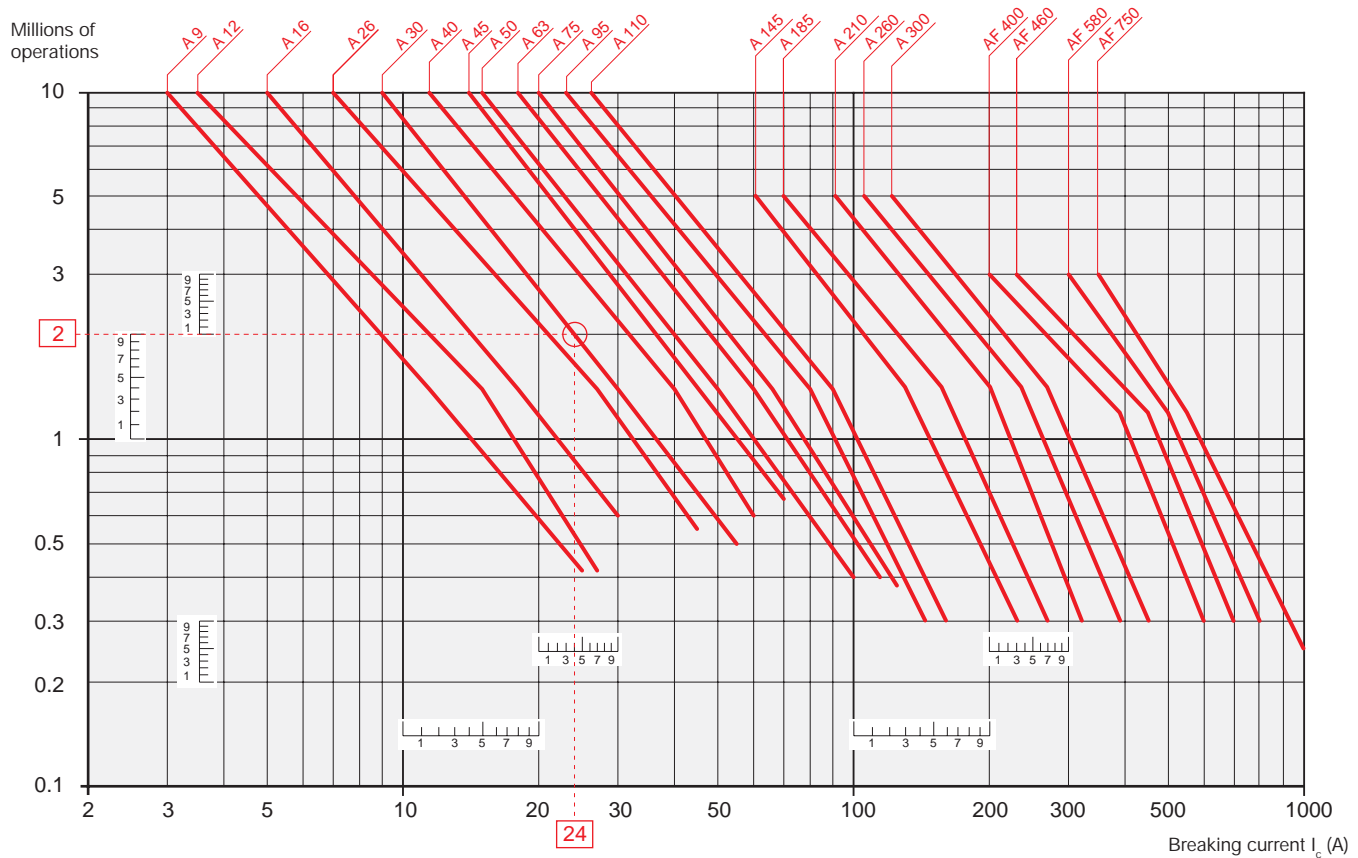
IEC Technical data

A9 — AF750

Electrical durability

Electrical Durability for AC-1 Utilization Category. Ambient Temperature $\leq 55\text{ }^{\circ}\text{C}$

Switching non-inductive or slightly inductive loads. The breaking current I_c for AC-1 is equal to the rated operational current of the load.



Example:

$I_c / \text{AC-1} = 24\text{ A}$ – Electrical durability required = 2 million operations.

Using the AC-1 curves above select the A 30 contactor at intersection "O" (24 A / 2 million operations).

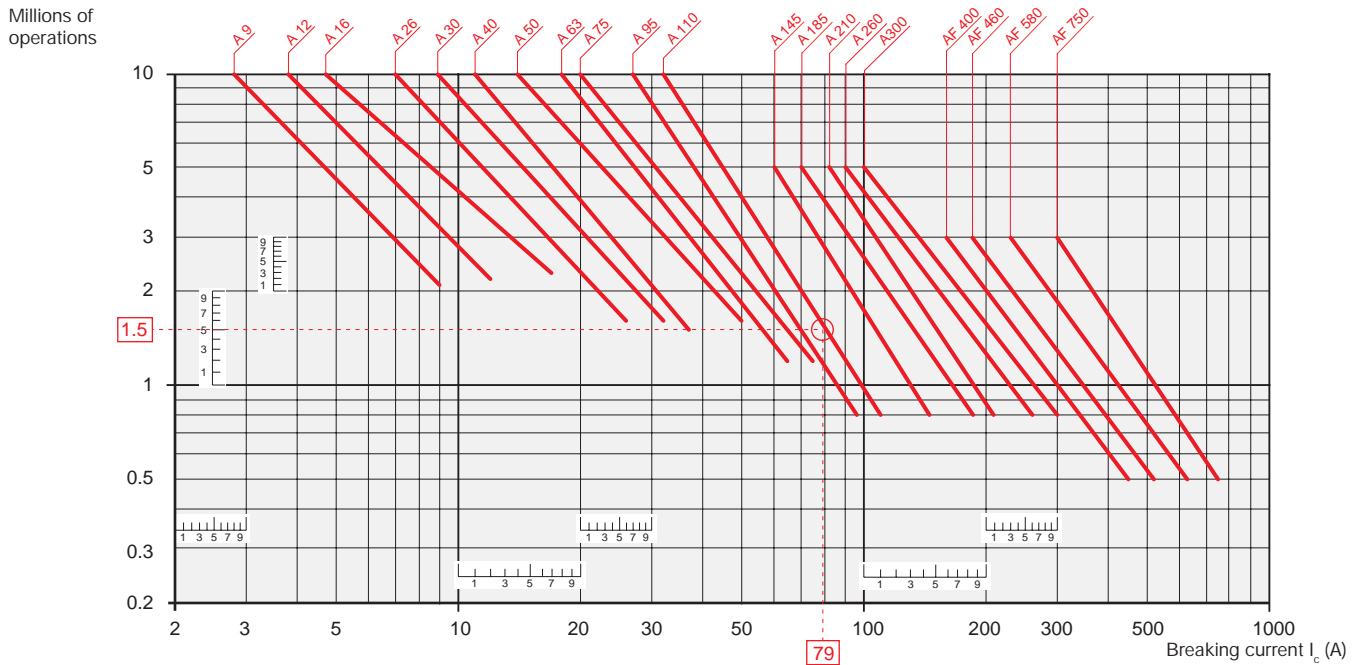
IEC Technical data

A9 — AF750

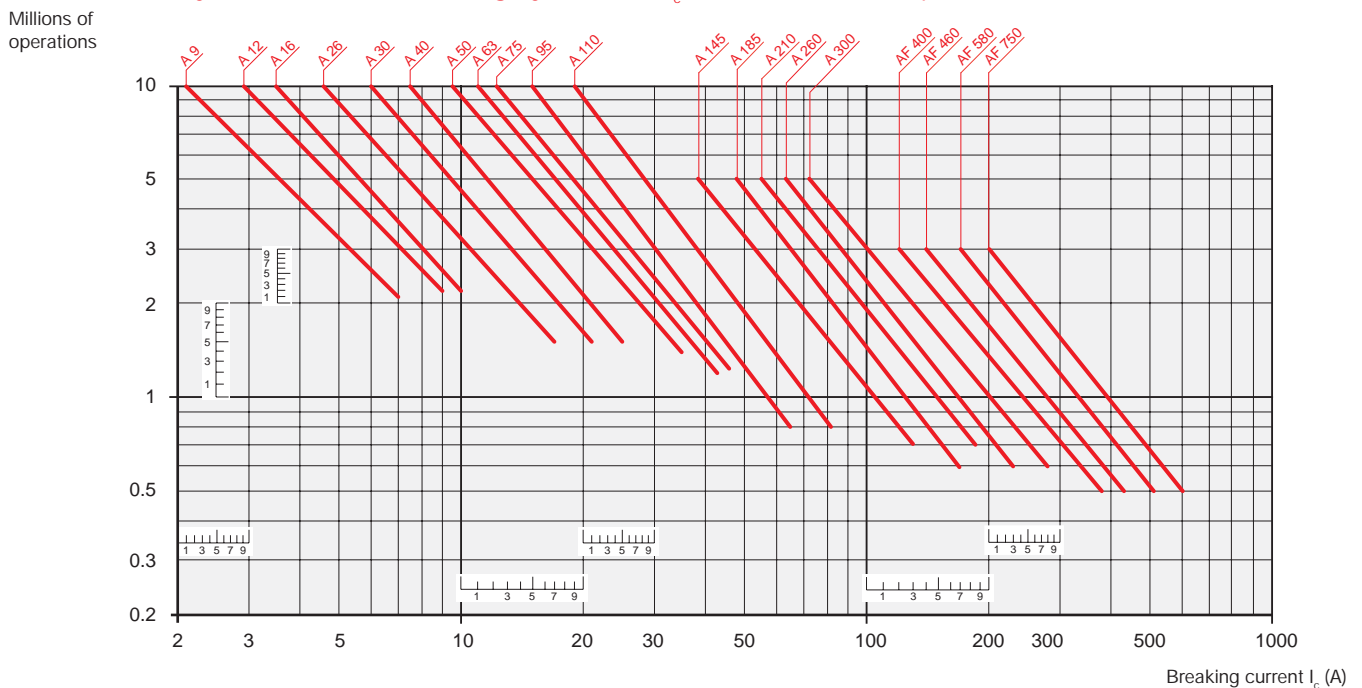
Electrical durability

Switching cage motors: starting and switching off running motors. The breaking current I_c for AC-3 is equal to the rated operational current I_e (I_e = motor full load current).

Electrical Durability for AC-3 Utilization Category - $U_e \leq 440$ V. Ambient Temperature ≤ 55 °C



Electrical Durability for AC-3 Utilization Category - 440 V < $U_e \leq 690$ V. Ambient Temperature ≤ 55 °C



Example:

Motor power 40 kW for AC-3 - $U_e = 400$ V utilization – Electrical durability required = 1.5 million operations.
40 kW, 400 V corresponds to $I_e = 79$ A. For AC-3: $I_c = I_e$. Select the A 110 contactor at intersection "O" (79 A / 1.5 million operations) on the curves (AC-3 - $U_e \leq 440$ V).

IEC Technical data

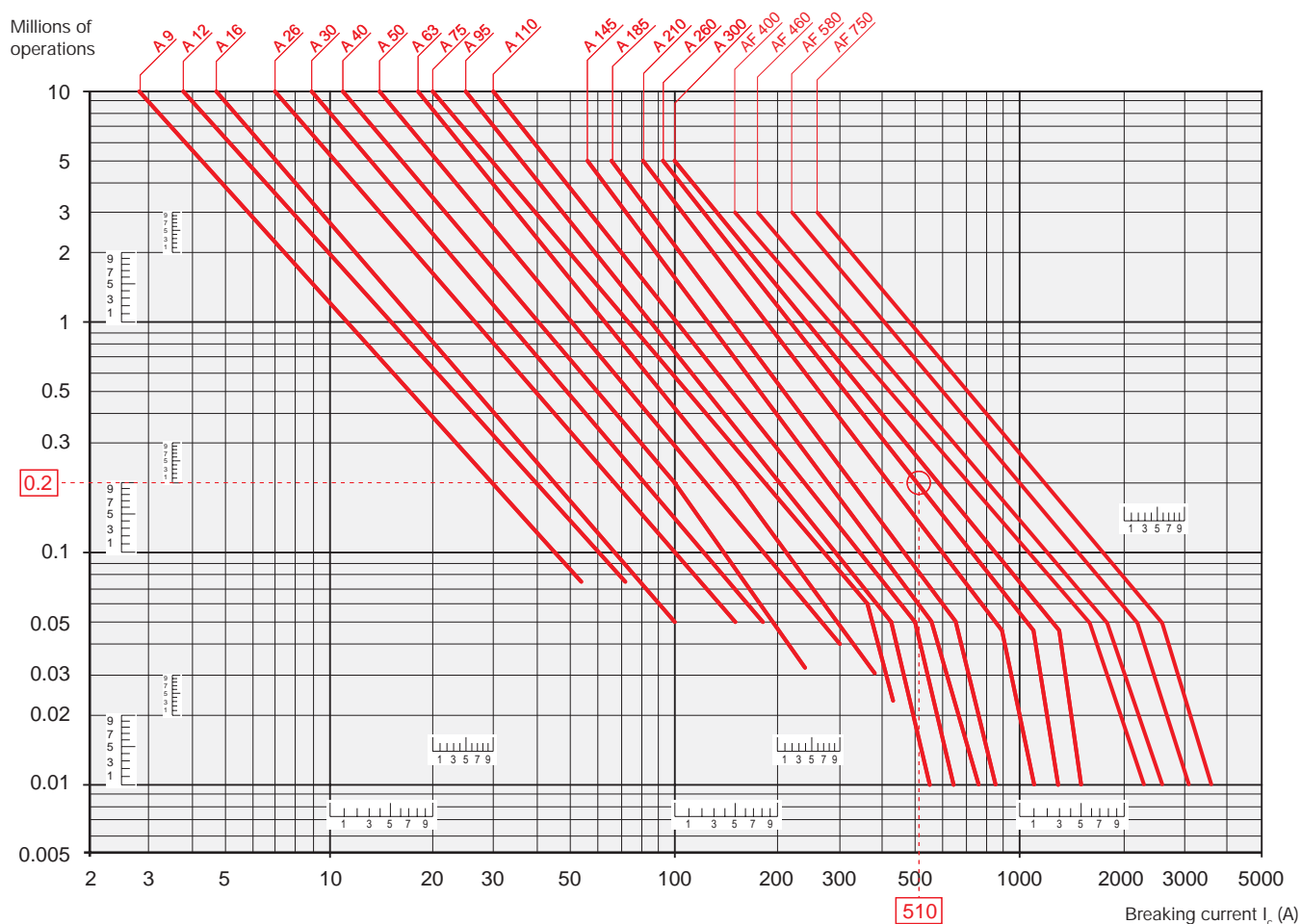
A9 — AF750

Electrical durability

Electrical Durability for AC-2 or AC-4 Utilization Category - $U_e \leq 440$ V. Ambient Temperature ≤ 55 °C

Maximum number of AC-2 or AC-4 operations: 300 per hour for A 9 ... A 40 contactors,
150 per hour for A 50 ... A 300 contactors.

Switching cage motors: starting, reverse operation and step-by-step operation. The breaking current I_c is equal to $2.5 \times I_e$ for AC-2 and $6 \times I_e$ for AC-4, keeping in mind that I_e is the motor rated operational current (I_e = motor full-load current).



Example:

Motor power 45 kW for AC-4 - $U_e = 400$ V utilization – Electrical durability required = 0.2 million operations.

45 kW, 400 V corresponds to $I_e = 85$ A.

For AC-4: $I_c = 6 \times I_e = 510$ A - Select the A 260 contactor at intersection "O" (510 A / 0.2 million operations) on the curves (AC-4 - $U_e \leq 440$ V).

IEC Technical data

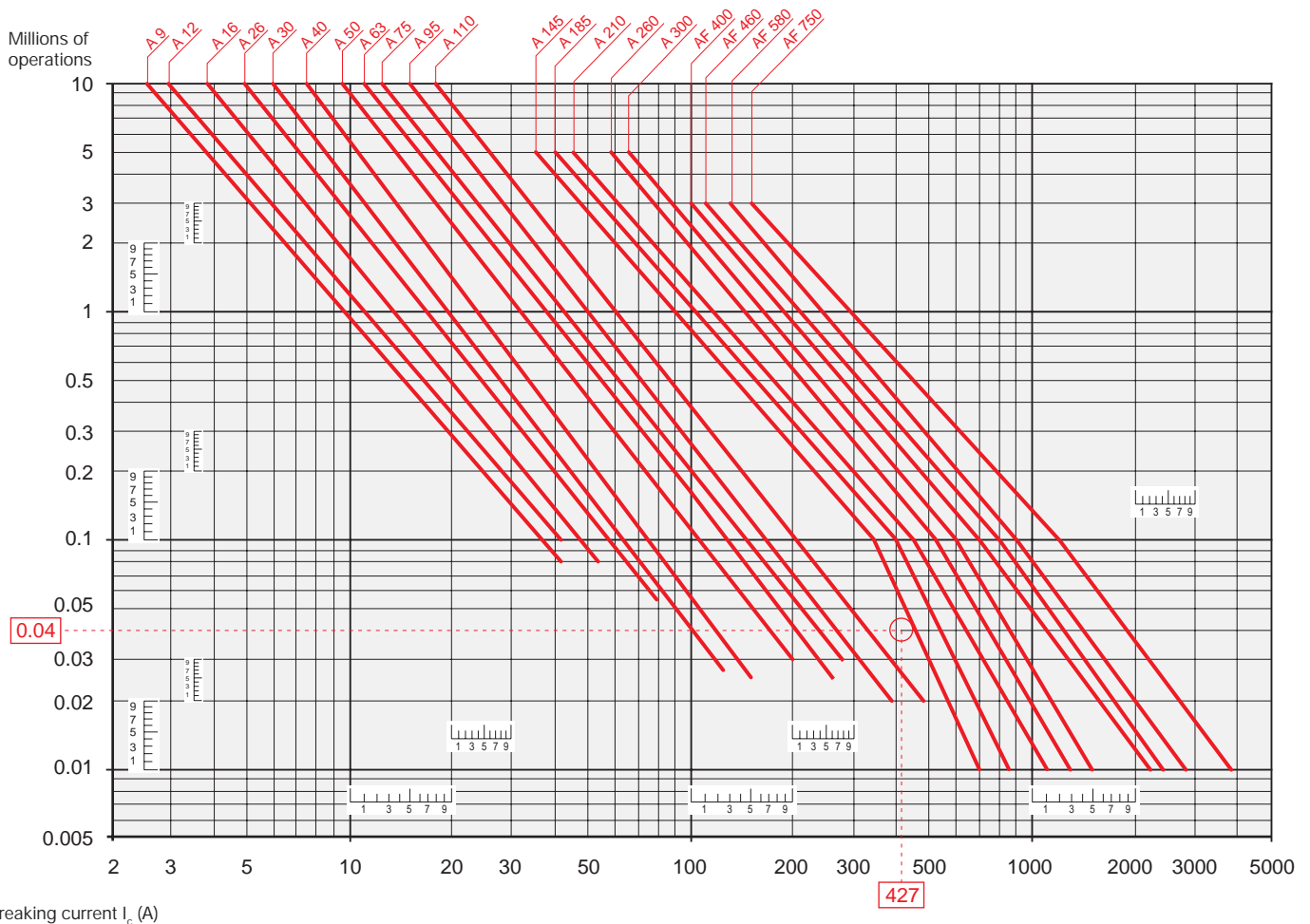
A9 — AF750

Electrical durability

Electrical Durability for AC-2 or AC-4 Utilization Category - $440\text{ V} < U_e \leq 690\text{ V}$. Ambient Temperature $\leq 55\text{ }^\circ\text{C}$

Maximum number of AC-2 or AC-4 operations: 300 per hour for A 9 ... A 40 contactors,
150 per hour for A 50 ... A 300 contactors.

Switching cage motors: starting, reverse operation and step-by-step operation. The breaking current I_c is equal to $2.5 \times I_e$ for AC-2 and $6 \times I_e$ for AC-4, keeping in mind that I_e is the motor rated operational current (I_e = motor full-load current).



Breaking current I_c (A)

Example:

Motor power 59 kW for AC-4 - $U_e = 600\text{ V}$ utilization – Electrical durability required = 0.04 million operations.

As stated on page 0/0: 59 kW, 600 V corresponds to $I_e = 71.1\text{ A}$.

For AC-4: $I_c = 6 \times I_e = 426.6\text{ A}$ - Select the A 145 contactor at intersection "O" (427 A / 0.04 million operations) on the curves

(AC-4 - $440\text{ V} < U_e \leq 690\text{ V}$).

IEC Technical data

AL9 — AL40

Electrical durability

Consult
factory

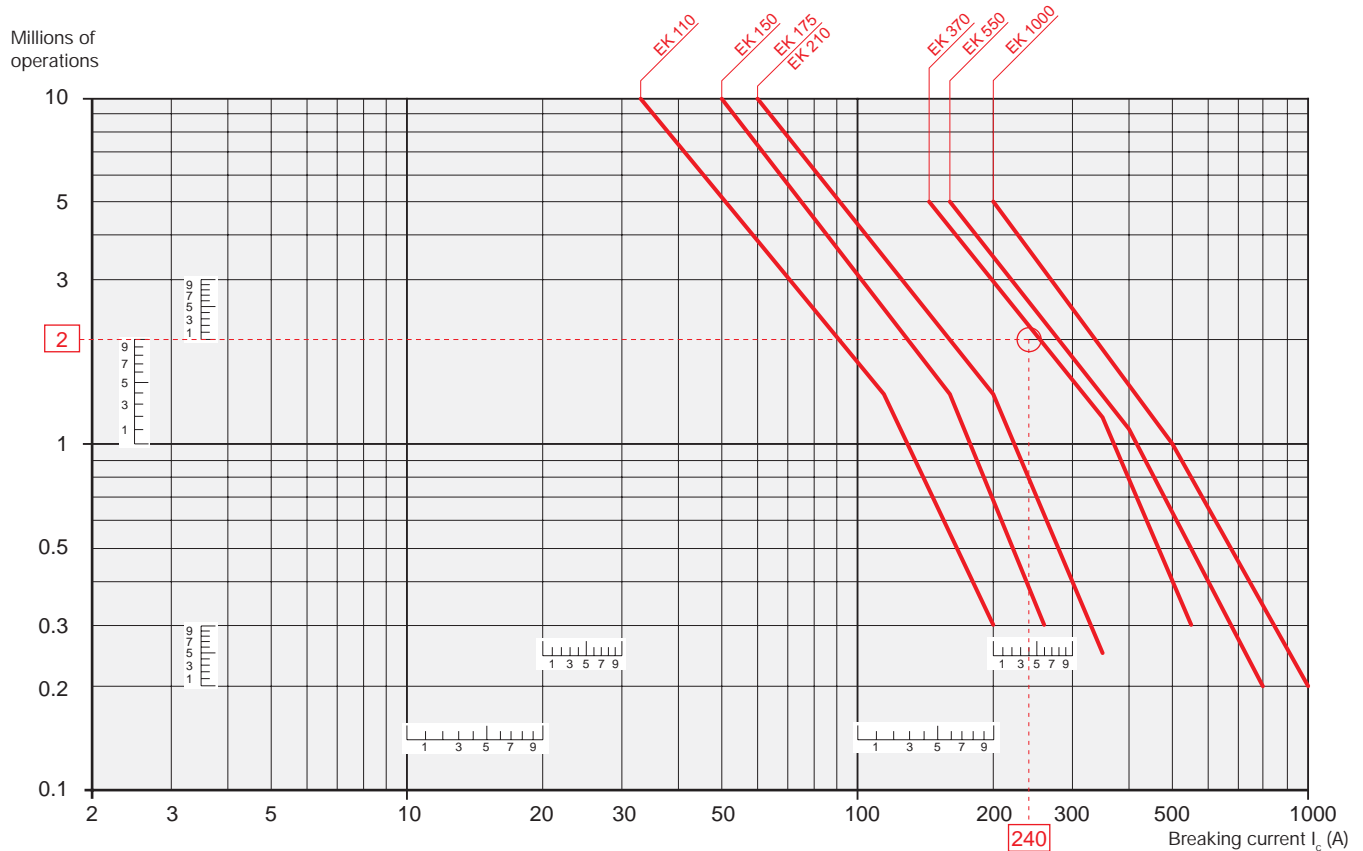
IEC Technical data

EK110 — EK1000

Electrical durability

Electrical Durability for AC-1 Utilization Category. Ambient Temperature $\leq 55\text{ }^{\circ}\text{C}$

Switching non-inductive or slightly inductive loads. The breaking current I_c for AC-1 is equal to the rated operational current of the load.



Example:

$I_c / \text{AC-1} = 240\text{ A}$ – Electrical durability required = 2 million operations.

Using the AC-1 curves above select the EK 370 contactor at intersection "O" (240 A / 2 million operations).

IEC Technical data

Influence of the length of conductors used in contactor control circuits



A 50-30-00



AF 460-30-11

Under certain conditions the excessive length of the control circuit conductors may prevent the contactor from carrying out closing and opening orders.

- no closing: due to excessive voltage drop (in a.c. or d.c.).
- no opening: due to excessive capacitance (in a.c.).

Contactor Closing (contactor with a.c. or d.c. fed control circuit)

The voltage drop is due to the pull-in current (pull-in power) and to the resistance of the control circuit conductors.

The table and graph below can be used to determine the single length of line feeders (distance between the control device and the contactor coil) in relation to:

- I the coil pull-in consumption.
- I the supply voltage.
- I the connecting wire cross-sectional area.

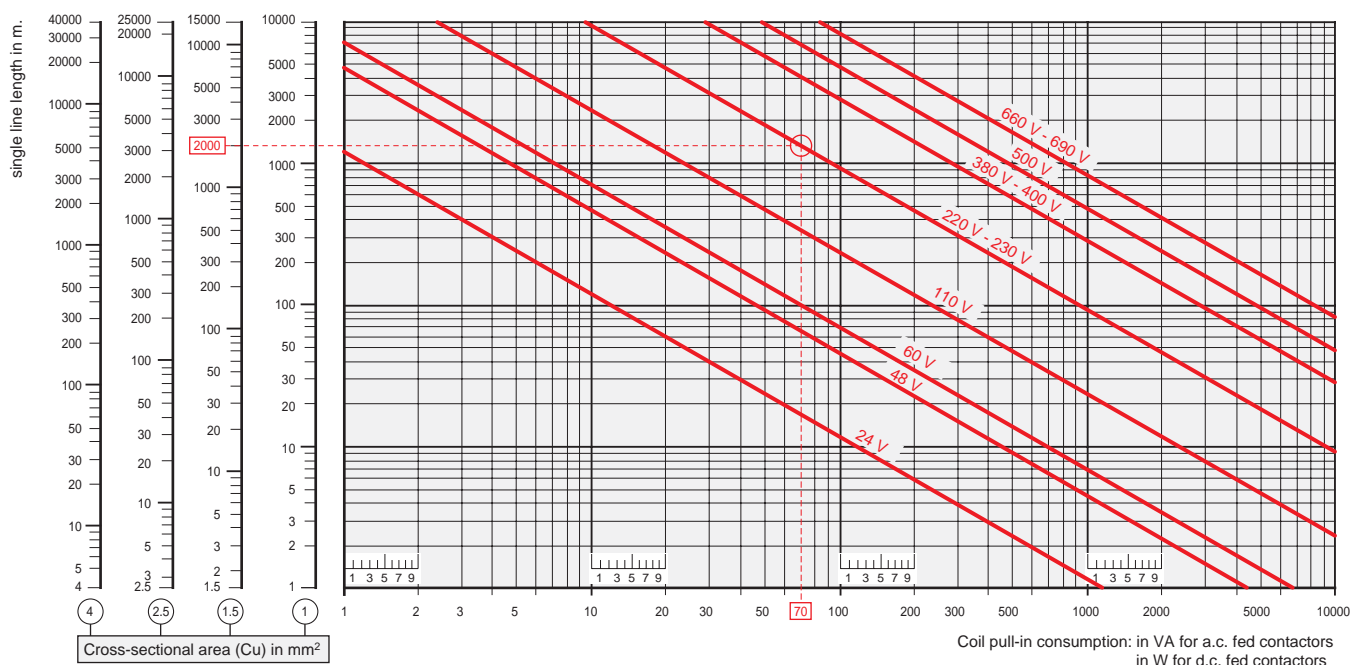
The graph has been drawn for a max. line voltage drop of 5 %.

Coil pull-in consumption (average value)

Contactors	a.c. control circuit 50 Hz	Contactors	d.c. control circuit
A 9, 12, 16	70 VA	AE 9, 12, 16	90 W
A 26, 30, 40	120 VA	AE 26, 30, 40	110 W
A 45, 50, 63, 75	180 VA	AE 45, 50, 63, 75	200 W
A 95, 110	450 VA	AE 95, 110	400 W
A 145, 185	700 VA	BC 9, 16, 18, 25, 30	7 W
A 210, 260, 300	1700 VA		
AF 45, 50, 63, 75	210 VA	AF 45, 50, 63, 75	190 W
AF 95, 110	350 VA	AF 95, 110	400 W
AF 145, 185	430 VA	AF 145, 185	500 W
AF 210, 260, 300	470 VA	AF 210, 260, 300	520 W
AF 400, 460	890 VA	AF 400, 460	990 W
AF 580, 750	850 VA	AF 580, 750	950 W

Permissible single length for the control circuit conductors on contactor closing:

Depending on the coil pull-in power consumption on the supply voltage and on the control circuit conductor cross-sectional area.



Example:

A 9 contactor

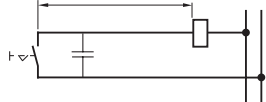
Coil voltage: 230 V 50 Hz, contactor coil pull-in power consumption: 70 VA, control circuit conductor cross-sectional area: Cu 1.5 mm².

Max. permissible length: 2000 m.

IEC Technical data

Influence of the length of conductors used in contactor control circuits

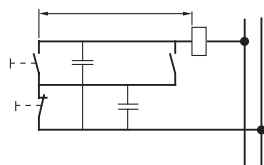
Single control line length



Wiring diagram A

Via maintained pushbutton and 2-core cable (with a capacity of 0.2 μF/km, for example).

Single control line length



Wiring diagram B

Via momentary pushbutton plus hold-in contact and 3-core cable (with a capacity of 2 x 0.2 = 0.4 μF/km, for example).

Contactor Opening (contactor with a.c. fed control circuit)

Under certain conditions, an a.c. operated contactor does not open when the control circuit is de-energized.

This is due to a critical capacity of the excessively long control circuit line and the type of contactor coil control layout (see diagrams A and B opposite).

This may be caused by the following factors:

- high control voltage.
- low coil holding consumption.
- low contactor drop-out voltage (according to IEC 60947-4-1: 0.2 to 0.75 x U_c).

If lines longer than those indicated are required, the following measures must be taken:

- select a contactor with a higher rating.
- select a lower control voltage.
- connect "R_p" impedances in parallel with the contactor coil:

$$\text{sizing of parallel resistor: } R_p = \frac{10^3}{C} \quad (\text{with } C \text{ in } \mu\text{F})$$

The table and graph below can be used to determine the single length of line feeders (distance between the control device and the contactor coil) in relation to:

- the coil holding consumption VA.
- the supply voltage.
- the capacity in μF/km (depending on the control layout).

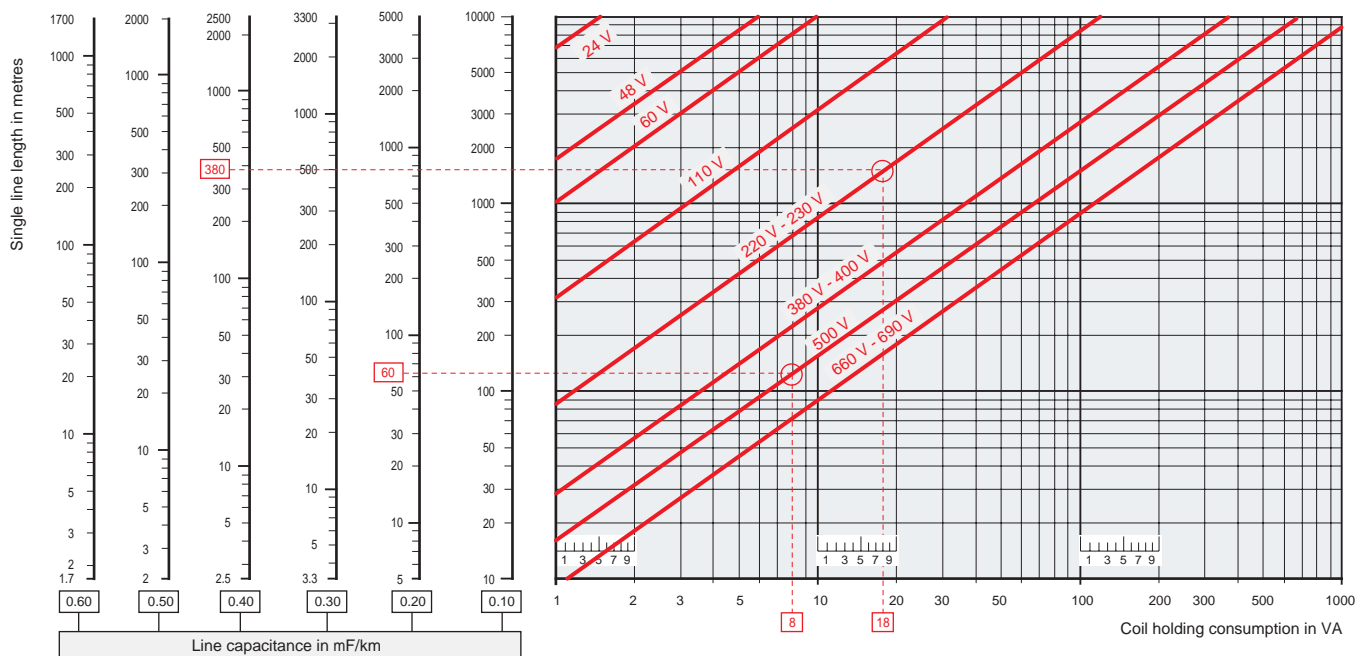
Wiring diagrams A and B opposite show two supply and coil control wiring examples.

Coil holding consumption (average value)

Contactors	a.c. control circuit 50 Hz	Contactors	a.c. control circuit 50 Hz
A 9, 12, 16	8 VA	AF 45, 50, 63, 75	7 VA
A 26, 30, 40	12 VA	AF 95, 110,	7 VA
A 45, 50, 63, 75	18 VA	AF 145, 185,	12 VA
A 95, 110	22 VA	AF 210, 260, 300	10 VA
A 145, 185	35 VA	AF 400, 460	12 VA
A 210, 260, 300	60 VA	AF 580, 750	12 VA

Permissible single length for the control circuit conductors on contactor opening:

Depending on the coil holding power consumption, on the supply voltage and on the control circuit conductor capacity.



Examples:

A 16 contactor

Coil voltage U_c = 500 V, 50 Hz, 8 VA contactor coil holding consumption, control type: diagram A, via maintained pushbutton, and 2-core cable with a capacity of 0.2 μF/km.

Max. permissible length: 60 m.

A 50 contactor

Coil voltage U_c = 230 V, 50 Hz, 18 VA contactor coil holding consumption, control type: diagram B via momentary pushbutton, hold-in contact and 3-core cable with a capacity of 2 x 0.2 μF/km = 0.4 μF/km.

Max. permissible length: 380 m.

IEC Technical data

Parallel connection of main poles

Parallel Connection of Main Poles

Purpose: Increasing the a.c. resistive load.

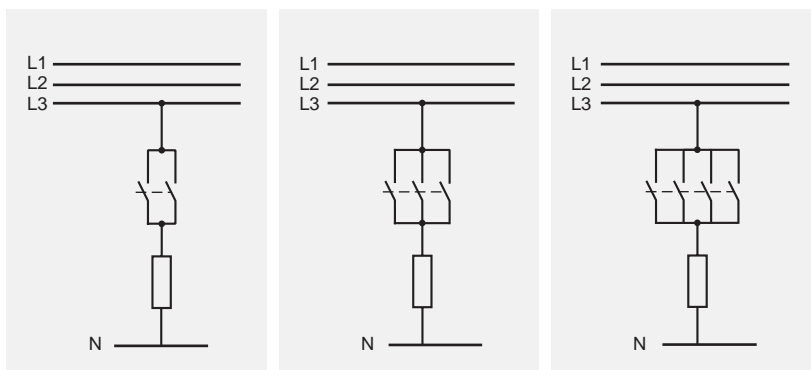
Remarks:

- Parallel connection of main poles to increase the d.c. resistive load is not acceptable.
- Parallel connection of main poles does'nt increase the breaking capacity.

Means: The poles can be connected in parallel via shorting bars. See page 1.30.

- LP and LH for parallel connection of 2 poles,
- LY and LF for parallel connection of 3 poles,

The table below shows the uprating factor for $I_g / AC-1$ max. in relation to the number of poles in parallel and for a max. switching frequency.



2 poles in //

3 poles in //

4 poles in //

Contactors			Factor to be applied to the rated operational current $I_g / AC-1$ to obtain the permissible current $I_g / AC-1$ with "n" poles in parallel.						
a.c. Operated	d.c. Operated	Cycles / h							
3-pole contactors									
A 9 ... A 75	AF 50 ... AF 75								
AF 50 ... AF 75	AE..., TAE...	600	1.6	2.2					
	AL...	A 95 ... A 300	AF 145 ... AF 750	300		1.6	2.2		
AF 145 ... AF 750									
4-pole contactors									
A 9 ... A 75	AF 45 ... AF 75								
AF 45 ... AF 75	AE..., TAE...	600	1.6	2.2		2.6			
	AL...	EK...	EK...	300		1.6	2.2	2.8	

IEC Technical data

Temporary or intermittent duty

Across the line
contactors

1

Utilization of Contactors for Temporary / Intermittent Duty

The table below shows the factor to be applied to the rated operational current $I_e / AC-1$ to obtain the permissible operational current $I_e / AC-1$ in relation to the switching frequency and the current flow time per cycle.

Operating cycles per hour	120	60	20	6	2	1
Current flow time per cycle in seconds.	Factor to be applied to the rated operational current $I_e / AC-1$ max. to obtain the permissible current $I_e / AC-1$ for temporary / intermittent duty.					
5	2.8	3.4	4	4.7	5	5.2
10	2.2	2.6	3	3.4	3.7	3.8
20	1.6	2	2.4	2.6	2.7	2.8
30	-	1.7	2.1	2.2	2.3	2.4
40	-	1.5	1.9	2.0	2.1	2.2
60	-	-	1.7	1.8	1.8	1.9

Example:

A 9 contactor (intermittent duty, resistive load)

Rated operational current $I_e / AC-1$ at 55 °C (see page 1.42)

Switching frequency

Current flow time per cycle

Factor to be applied to the current $I_e / AC-1$

Permissible current: $2.7 \times 22 =$

22 A

2 operations/h

20 s

2.7

59 A

Technical data

Technical terms and definitions

Altitude

Refers to the height of the site where the equipment is located, expressed in meters above the sea level.

Ambient temperature

Temperature of the air surrounding the unit.

Circuits

• Auxiliary circuit

All the conducting parts of a contactor, intended to be included in a circuit different from the main circuit and the control circuit of the contactor e.g. signalization, interlocking circuits etc ...

• Control circuit

All the conducting parts of a contactor (other than the main circuit) included in a circuit used for the closing operation, or opening operation, or both, of the contactor.

• Main circuit

All the conducting parts of a contactor included in the circuit which it is designed to close or open.

Coil operating range

Expressed as a multiple of the rated control circuit voltage U_c for the lower and upper limits.

Cycle duration

Total time of the on-load + off-load period.

Endurance / durability

• Electrical endurance

Number of on-load operating cycles (i.e. with current on the main contacts) a contactor can achieve, varies depending on the utilization category.

• Mechanical endurance

Number of off-load operating cycles (i.e. without current on the main contacts) a contactor can achieve.

Inching

Energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

Insulation class according to the VDE 0110 and NFC 20-040

Characterizes contactors suitability in accordance with environment and utilization conditions. A contactor can be classified depending on its own clearance and creepage distances in the insulation classes A, B, C, D which correspond to different insulation voltage values.

The insulation class C is applicable to most of the industrial applications. Equipment described in this catalogue correspond to insulation class C.

Intermittent duty

Duty in which the main contacts of a contactor remain closed for periods of time insufficient to allow the contactor to reach thermal equilibrium, the current-carrying periods being separated by off-load periods of sufficient duration to restore equality of temperature with the cooling medium.

Mounting positions

Stated by the manufacturer. Please note restrictions when applicable.

On-load factor

Ratio of the current flow time to the total time of the cycle x 100.

Plugging

Stopping or reversing a motor quickly by interchanging two supply leads whilst the motor is running.

Rated breaking capacity; Rated making capacity

Value of r.m.s current a contactor can break or make at a fixed voltage value, within the conditions specified by the standards, depending on the utilization category.

Rated control circuit voltage U_c

Control voltage value for which the control circuit of the unit is sized.

Rated insulation voltage U_i

Voltage value which designates the unit and to which dielectric tests, clearance and creepage distances are referred.

Rated impulse withstand voltage U_{imp}

The highest peak value of an impulse voltage of prescribed form 1.2/50, which does not cause breakdown under specified conditions of test.

Rated operating current I_e

Current value stated by the manufacturer and taking into account the rated operating voltage U_e , the rated frequency, the rated duty, the utilization category, the electrical contact life and the type of the protective enclosure.

Rated operating voltage U_e

Voltage value to which utilization characteristics of the contactor are referred, i.e. phase to phase voltage in 3 phase circuits.

Conventional thermal current I_{th}

Value of current the contactor can withstand with poles in closed position, in free air for an eight hour duty, without the temperature rise of its various parts exceeding the limits specified by the standards.

Resistance to shocks

Requirements applicable for instance to vehicles, crane operation or switchgear slide-in module systems.

At the quoted permissible «g» values, contactors must not undergo a change in switching state and O/L relays must not trip.

Resistance to vibrations

Requirements applicable to all the vehicles, vessels and other similar transport systems. At the quoted amplitude and vibration frequency values, the unit must be capable to achieve the required duty.

Short-circuit protection co-ordination

Achieved by using back-up protection devices such as circuit-breakers, H.R.C. fuses or standard fuses.

Co-ordination types a, b, c are defined in IEC 292-1 publication, VDE 0660, NFC 63-650 standards. Co-ordination types "1" and "2" are defined in IEC 947-4-1.

• Type 1 co-ordination

There has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable.

• Type 2 co-ordination

No damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated.

Switching frequency

Number of operating cycles per hour.

Time

• Closing time

Time between energization of the coil until the moment the contacts of the first current path to be closed actually close.

• Opening time

Time from the beginning of state causing breaking until the moment when the contacts of the last current path to be opened are open.

• Minimal operation time

Shortest control duration to ensure complete closing or opening of a contactor.

• Short time current permissible

Value of current which the contactor can withstand in closed position for a short time period and within specified conditions.

• Time constant

Ratio of inductance to the resistance : $L/R = \text{mH}/\text{Ohm} = \text{ms}$.

Standards

- IEC standards 158-1: "Contactors" and series IEC 292 :

"Motor-starters" have been revised and replaced by the new IEC 947-4-1 (1990-05): "Contactors and Motor-starters" referring to IEC 947-1 (1988): "General rules"
The new standards will constitute the basis of the future European and National standards, not yet revised.

Therefore the ratings indicated in this catalog are established according to the former and the future standards.

- Main changes and additions in the new standards are:
- Revision and extension of the utilization categories (see hereafter)
- Replacement of the coordination classes types a, b, c by new types: "1" (approximately equivalent to former class "a") and "2" (approximately equivalent to former class "c") with additional requirements.
- Classification of the thermal overload relays in tripping classes: 10 A; 10; 20 and 30 depending on their tripping times, at 1.5 and 7.2 times their setting current, in order to cover motor applications depending on their starting times. Class 10 A is adapted for motors according to IEC 34-1.
- Introduction of tests to verify the connecting capability and the mechanical strength of terminals.

Utilization categories

A contactor duty is characterized by the utilization category plus indication of the rated operating voltage and the rated operating current (see at Rated ...), or the motor characteristics.

Utilization categories for contactors according to IEC 947-4-1

Alternating current:	AC-1	Non-inductive or slightly inductive loads, resistance furnaces. Power factor 0.7 - 0.8 (slightly inductive).
	AC-2	Slip-ring motors: starting, switching-off.
	AC-3	Squirrel-cage motors: starting, switching-off motors during running. Power factor 0.4 - 0.5 (AC-3).
	AC-4	Squirrel-cage motors: starting, plugging, inching.
	AC-5a	Switching of electric discharge lamp controls.
	AC-5b	Switching of incandescent lamps.
	AC-6a	Switching of transformers.
	AC-6b	Switching of capacitor banks
	AC-8a AC-8b	Hermetic refrigerant compressor motor control with manual resetting of overload releases Hermetic refrigerant compressor motor control with automatic resetting of overload releases.
Direct current:	DC-1	Non-inductive or slightly inductive loads, resistance furnaces.
	DC-3	Shunt motors: starting, plugging, inching. Dynamic breaking of d.c. motors.
	DC-5	Series motors: starting, plugging, inching. Dynamic breaking of d.c. motors.
	DC-6	Switching of incandescent lamps

Utilization categories for contactor relays according to IEC 947-5-1

Alternating current:	AC-12	Control of resistive loads and solid state loads with isolation by opto couplers.
	AC-13	Control of solid state loads with transformer isolation.
	AC-14	Control of small electromagnetic loads (≤ 72 VA).
	AC-15	Control of electromagnetic loads (> 72 VA).
Direct current:	DC-12	Control of resistive loads and solid state loads with isolation by opto couplers.
	DC-13	Control of electromagnets.
	DC-14	Control of electromagnetic loads having economy resistors in circuit.

Utilization categories AC-1, AC-2, AC-3, AC-4 and DC-1, DC-3, DC-5 are maintained with slightly more severe tests.

Other categories have been added in order to standardize specific applications. In fact some contactor applications and the specific criteria characterizing the types of load controlled can modify the recommended utilization characteristics. These major applications are, for example :

Switching of capacitor banks

This application is characterized by high current peaks when switching-on the contactor and presence of harmonic currents on uninterrupted duty. For this application, IEC 947-4-1 has defined an utilization category AC-6b. Practical ratings have to be defined according to tests or, in absence of tests, by a calculation indicated in IEC 947-4-1.

Switching of transformers

This application is characterized by high current peaks on contactor closing due to magnetization phenomena. The corresponding utilization category according to IEC 947-4-1 is AC-6a. Ratings are derived from test-values for AC-3 or AC-4 according to formula given in IEC 947-4-1.

Switching of lighting circuits

The current peaks on contactor closing and power factor vary depending on the type of lamps, the switching method used and if compensation systems are fitted or not.

IEC 947-4-1 contains two standard utilization categories

- AC-5a for switching of the electric discharge lamps.
- AC-5b for switching of incandescent lamp.

UL/CSA Technical data

Motor data

Ampere ratings of 3 phase, AC induction motors

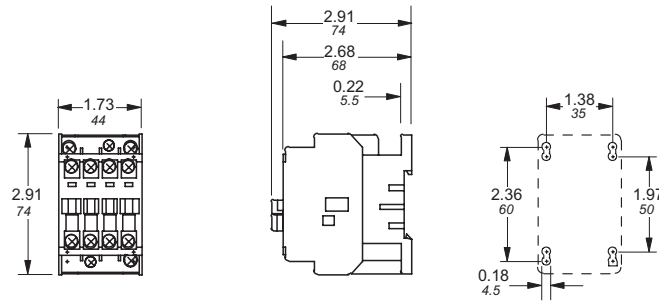
Horse power	110 – 120V			200 – 208V			220 – 240V			380 – 415V ^①		440 – 480V			550 – 600V		
	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase	Single phase	Three phase	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase
1/10	3.0	—	—	1.65	—	—	1.5	—	—	1.0	—	—	—	—	—	—	—
1/8	3.8	—	—	2.1	—	—	1.9	—	—	1.2	—	—	—	—	—	—	—
1/6	4.4	—	—	2.4	—	—	2.2	—	—	1.4	—	—	—	—	—	—	—
1/4	5.8	—	—	3.2	—	—	2.9	—	—	1.8	—	—	—	—	—	—	—
1/3	7.2	—	—	4.0	—	—	3.6	—	—	2.3	—	—	—	—	—	—	—
1/2	9.8	4.0	4.4	5.4	2.2	2.4	4.9	2.0	2.2	3.2	1.3	2.5	1.0	1.1	2.0	0.8	0.9
3/4	13.8	4.8	6.4	7.6	2.6	3.5	6.9	2.4	3.2	4.5	1.8	3.5	1.2	1.6	2.8	1.0	1.3
1	16.0	6.4	8.4	8.8	3.6	4.6	8.0	3.2	4.2	5.1	2.3	4.0	1.6	2.1	3.2	1.3	1.7
1 1/2	20.0	9.0	12.0	11.0	5.0	6.6	10.0	4.5	6.0	6.4	3.3	5.0	2.3	3.0	4.0	1.8	2.4
2	24.0	11.8	13.6	13.2	6.5	7.5	12.0	5.9	6.8	7.7	4.3	6.0	3.0	3.4	4.8	2.4	2.7
3	34.0	16.6	19.2	18.7	9.2	10.6	17.0	8.3	9.6	10.9	6.1	8.5	4.2	4.8	6.8	3.3	3.9
5	56.0	26.4	30.4	30.8	14.5	16.8	28.0	13.2	15.2	17.9	9.7	14.0	6.6	7.6	11.2	5.3	6.1
7 1/2	80.0	38.0	44.0	44.0	21.0	24.2	40.0	19.0	22.0	27.0	14.0	21.0	9.0	11.0	16.0	8.0	9.0
10	100.0	48.0	56.0	55.0	26.4	30.8	50.0	24.0	28.0	33.0	18.0	26.0	12.0	14.0	20.0	10.0	11.0
15	135.0	72.0	84.0	75.0	39.6	46.2	68.0	36.0	42.0	44.0	27.0	34.0	18.0	21.0	27.0	14.0	17.0
20	—	94.0	108.0	96.8	52.0	60.0	88.0	47.0	54.0	56.0	34.0	44.0	23.0	27.0	35.0	19.0	22.0
25	—	118.0	136.0	121.0	65.0	75.0	110.0	59.0	68.0	70.0	44.0	55.0	29.0	34.0	44.0	24.0	27.0
30	—	138.0	160.0	150.0	76.0	88.0	136.0	69.0	80.0	87.0	51.0	68.0	35.0	40.0	54.0	28.0	32.0
40	—	180.0	208.0	194.0	100.0	115.0	176.0	90.0	104.0	112.0	66.0	88.0	45.0	52.0	70.0	36.0	41.0
50	—	226.0	260.0	238.0	125.0	143.0	216.0	113.0	130.0	139.0	83.0	108.0	56.0	65.0	86.0	45.0	52.0
60	—	—	—	—	147.0	160.0	—	133.0	154.0	—	103.0	—	67.0	77.0	—	53.0	62.0
75	—	—	—	—	183.0	212.0	—	166.0	192.0	—	128.0	—	83.0	96.0	—	66.0	77.0
100	—	—	—	—	240.0	273.0	—	218.0	248.0	—	165.0	—	109.0	124.0	—	87.0	99.0
125	—	—	—	—	—	344.0	—	—	312.0	—	208.0	—	135.0	156.0	—	108.0	125.0
150	—	—	—	—	—	396.0	—	—	360.0	—	240.0	—	156.0	180.0	—	125.0	144.0
200	—	—	—	—	—	528.0	—	—	480.0	—	320.0	—	208.0	240.0	—	167.0	192.0
250	—	—	—	—	—	663.0	—	—	602.0	—	403.0	—	—	302.0	—	—	242.0
300	—	—	—	—	—	—	—	—	—	—	482.0	—	—	361.0	—	—	289.0
350	—	—	—	—	—	—	—	—	—	—	560.0	—	—	414.0	—	—	336.0
400	—	—	—	—	—	—	—	—	—	—	636.0	—	—	477.0	—	—	382.0
500	—	—	—	—	—	—	—	—	—	—	786.0	—	—	590.0	—	—	472.0

① To obtain full load currents for 265V and 277V motors, decrease corresponding 220 – 240V ratings by 13 percent and 17 percent.

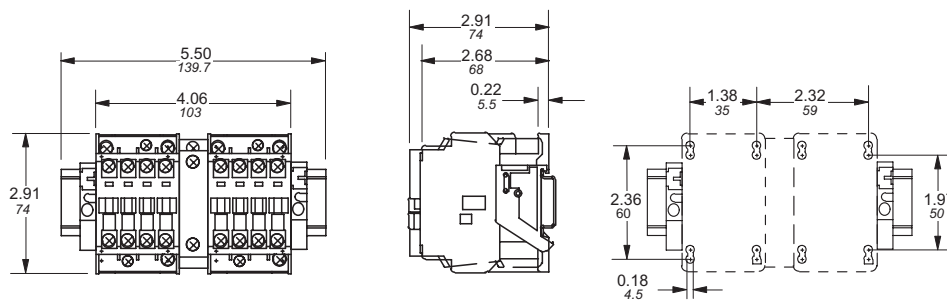
Approximate dimensions 3 pole contactors, A/AE9 – A/AE26

00.00 Inches
00.00 [Millimeters]

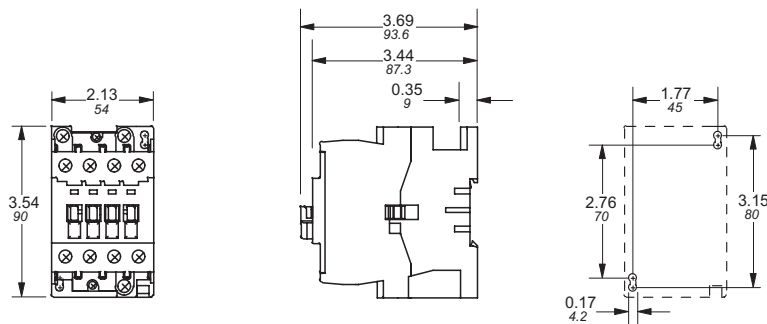
A/AE9 – A/AE16 — Contactor, 3 pole



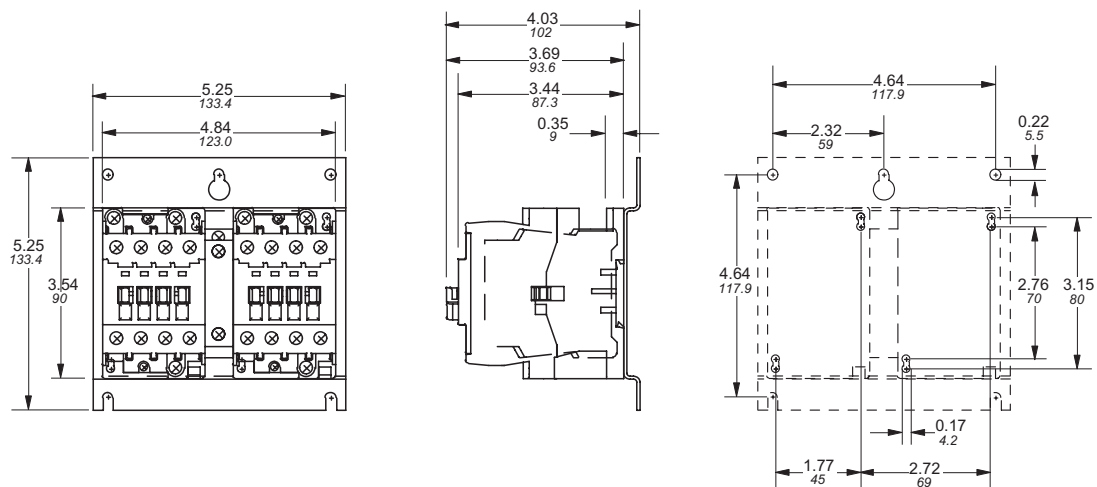
A/AE9 – A/AE16 + VM5 or VE5 — Mechanically interlocked contactor, 3 pole



A/AE26 — Contactor, 3 pole



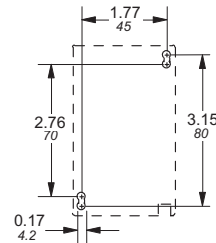
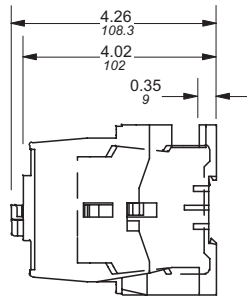
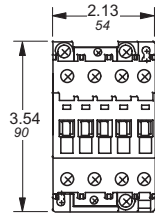
A/AE26 + VM5 or VE5 — Mechanically interlocked contactor, 3 pole



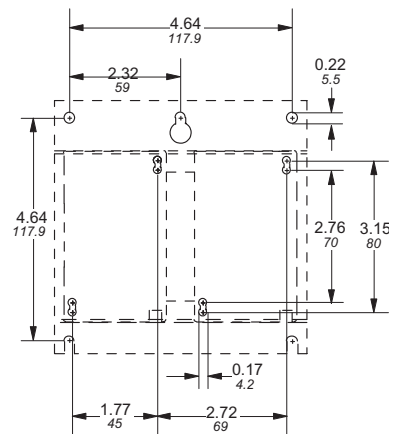
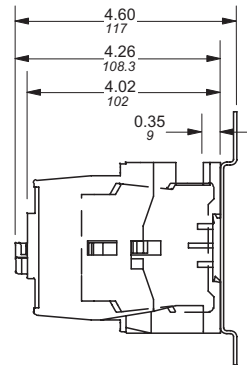
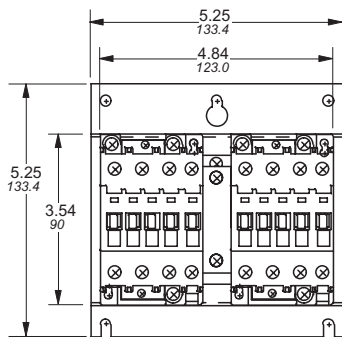
Approximate dimensions 3 pole , A/AE30 – A/AE/AF75

← 00.00 → Inches
00.00 → [Millimeters]

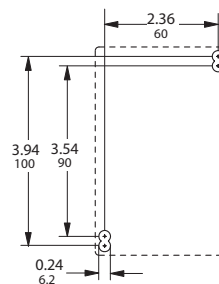
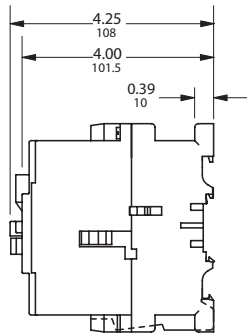
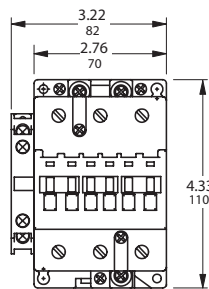
A/AE30 & A/AE40 — Contactor, 3 pole



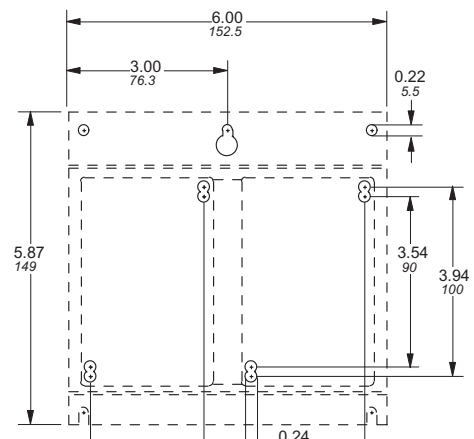
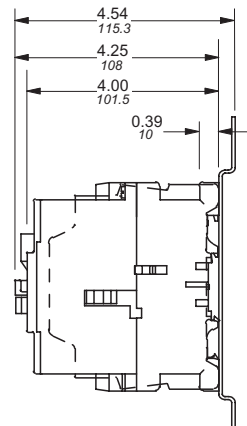
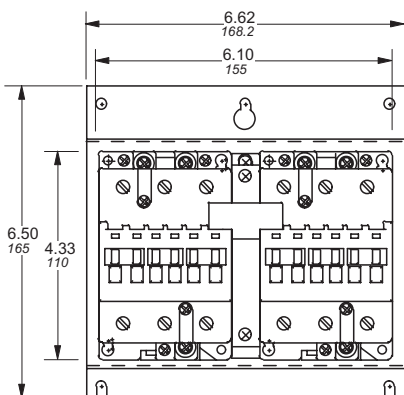
A/AE30 & A/AE40 + VM5 or VE5 — Mechanically interlocked contactor, 3 pole



A/AE/AF50 – A/AE/AF75 — Contactor, 3 pole



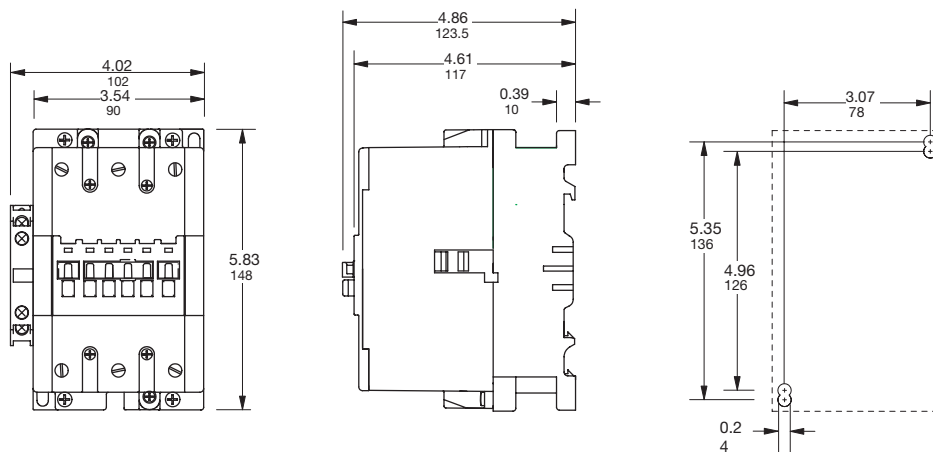
A/AE/AF50 – A/AE/AF75 + VM5 or VE5 — Mechanically interlocked contactor, 3 pole



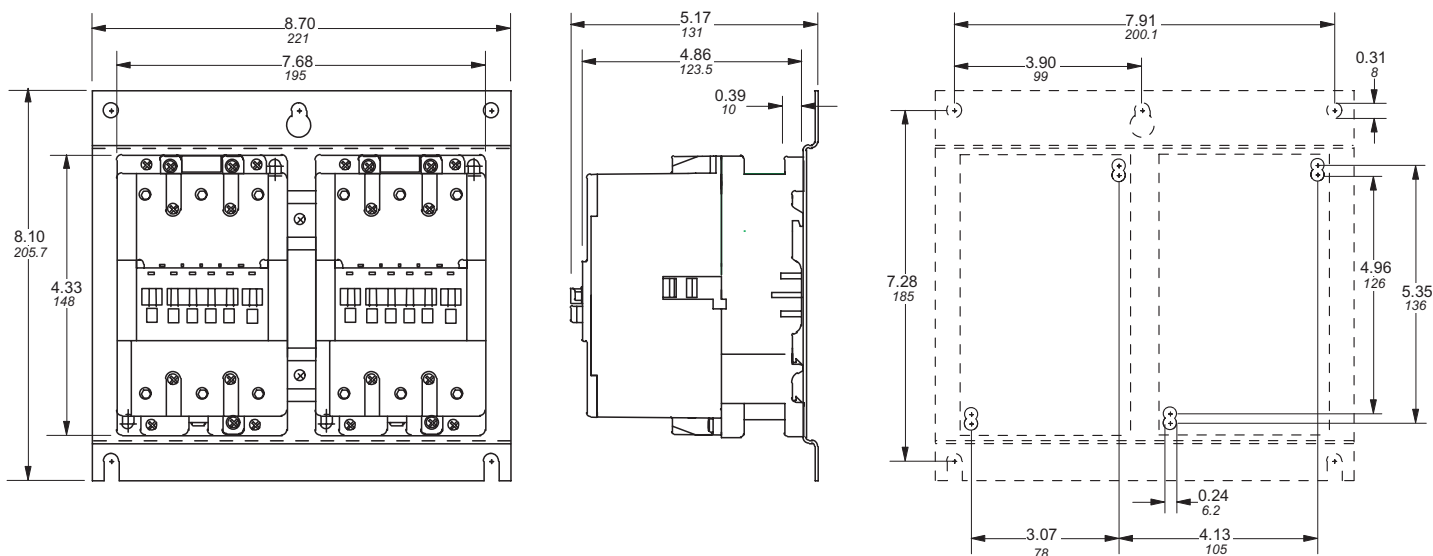
Approximate dimensions 3 pole, A/AE/AF95 & A/AE/AF110

00.00 — Inches
00.00 — [Millimeters]

A/AE/AF95 & A/AE/AF110 — Contactor, 3 pole



A/AE/AF95 & A/AE/AF110 + VE5 — Mechanically interlocked contactor, 3 pole

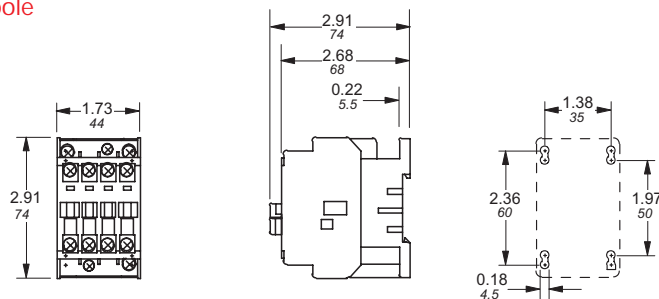


Approximate dimensions

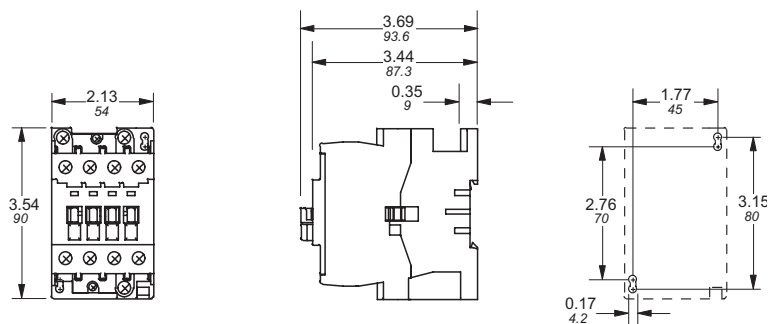
4 pole contactors, A/AE9 – A/AE/AF75

← 00.00 → Inches
00.00 [Millimeters]

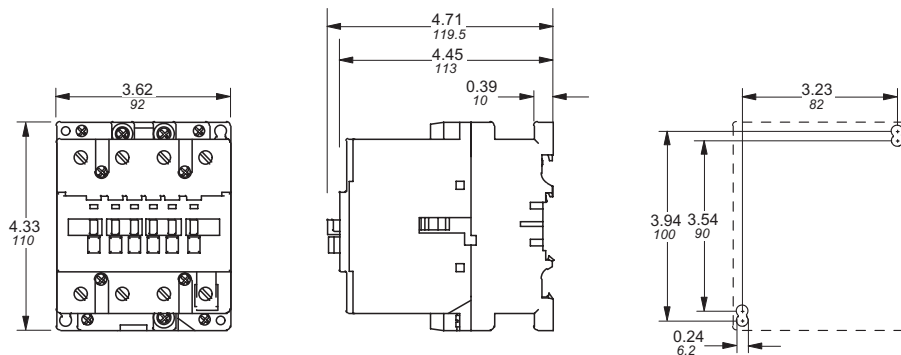
A/AE9 – A/AE16 — Contactor, 4 pole



A/AE26 — Contactor, 4 pole



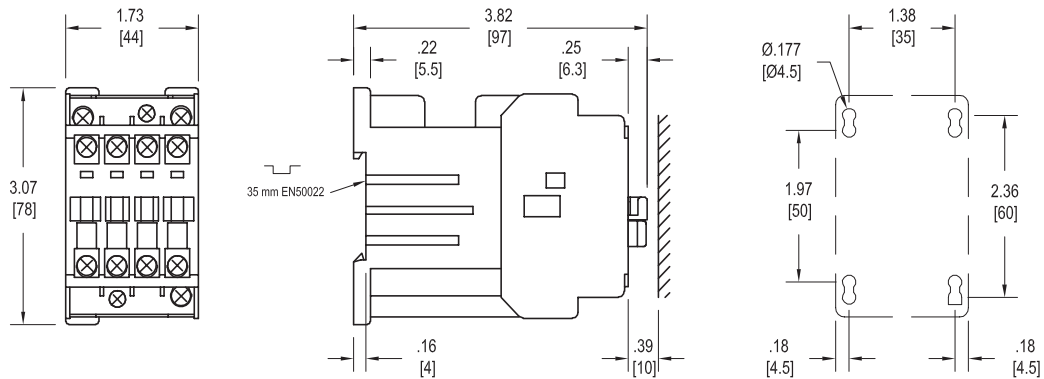
A/AE/AF45 – A/AE/AF75 — Contactor, 4 pole



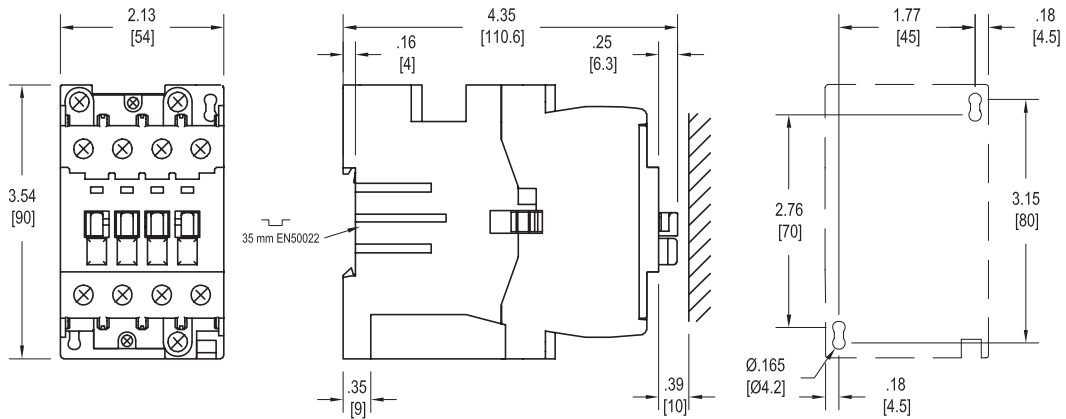
Approximate dimensions 3 & 4 pole contactors, AL9 – AL40

00.00 — Inches
00.00 — [Millimeters]

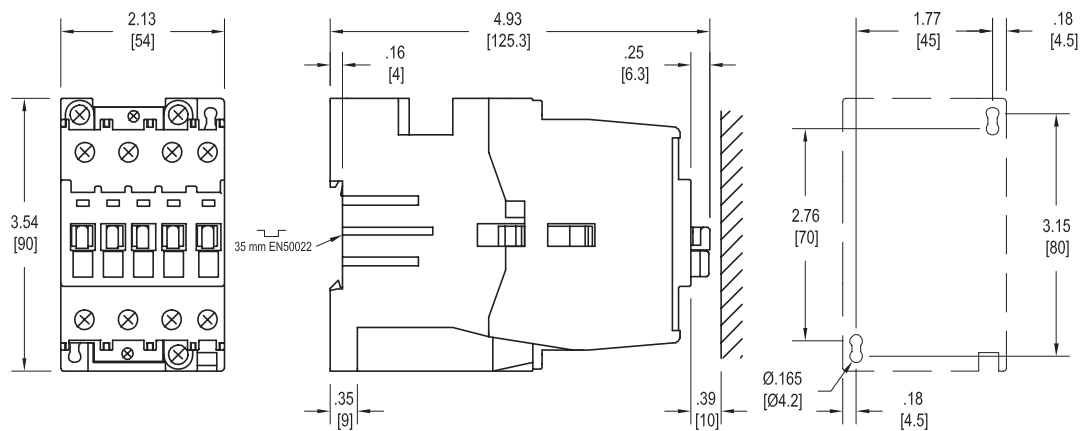
AL9, AL12,, AL16 — Contactor, 3 & 4 pole



AL26 — Contactor, 3 & 4 pole



AL30, AL40 — Contactor, 3 pole

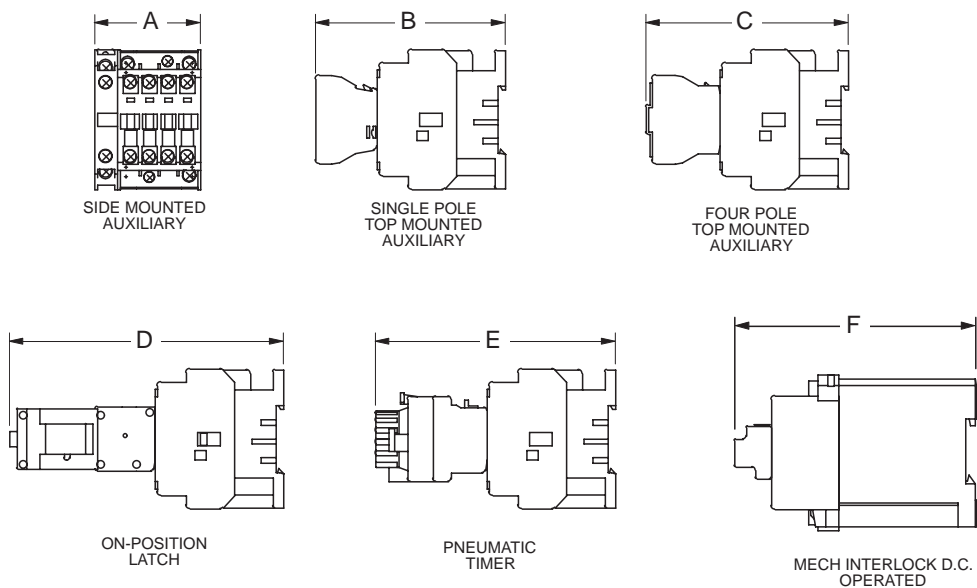


Approximate dimensions

Accessories for A/AE9 – A/AE/AF110

← 00.00 → Inches
00.00 [Millimeters]

A/AE9 – A/AE40
A/AE/AF50 – A/AE/AF110

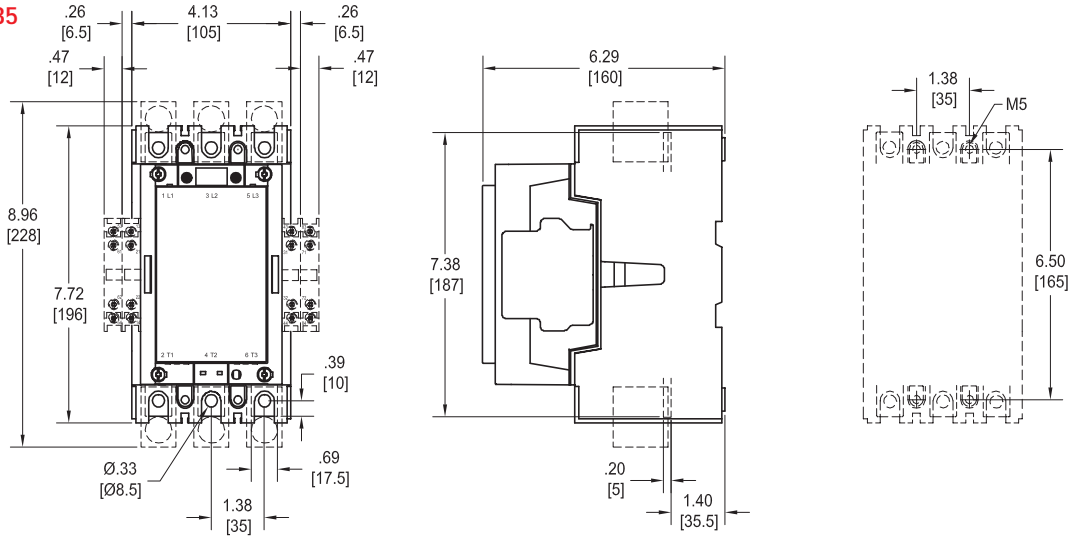


TYPE		A	B	C	D	E	F
A/AE9-16	IN	2.20	3.96	4.21	5.71	5.00	–
	MM	56	100.5	107	145	127	–
A/AE26	IN	2.20	4.72	4.97	6.47	5.76	–
	MM	56	119.8	126.3	164.3	146.3	–
A/AE30-40	IN	2.20	5.30	5.55	7.05	6.34	–
	MM	56	134.5	141	179	161	–
A/AE/AF50-75	IN	3.23	5.27	5.52	7.03	6.32	–
	MM	82	133.9	140.3	178.5	160.4	–
A/AE/AF45	IN	4.09	5.73	5.98	7.48	6.77	–
	MM	104	145.5	152	190	172	–
A/AE/AF95-110	IN	4.02	5.91	6.16	–	–	–
	MM	102	150	156.5	–	–	–

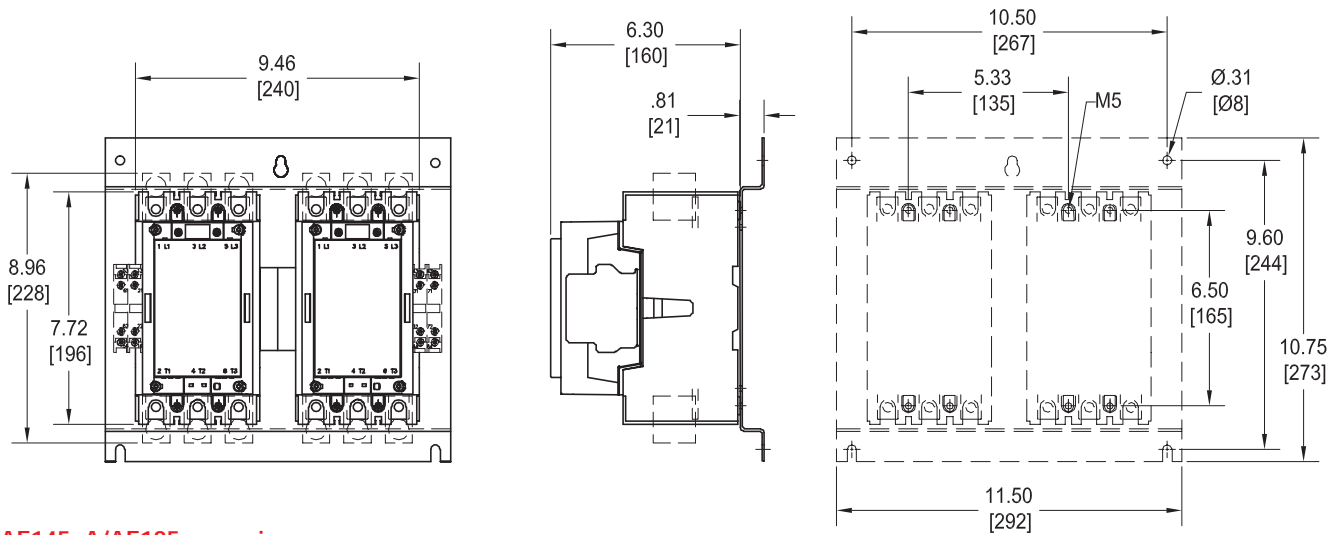
Approximate dimensions A/AF145 – A/AF185

00.00 Inches
00.00 [Millimeters]

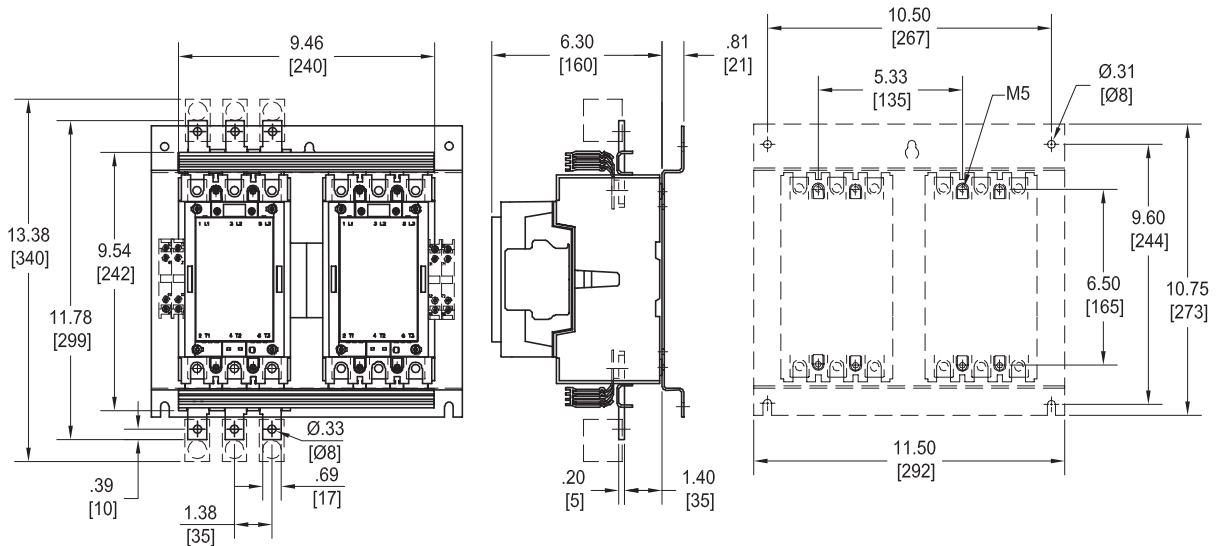
A/AF145 & A/AF185



A/AF145, A/AF185 with mechanical interlock



A/AF145, A/AF185 reversing

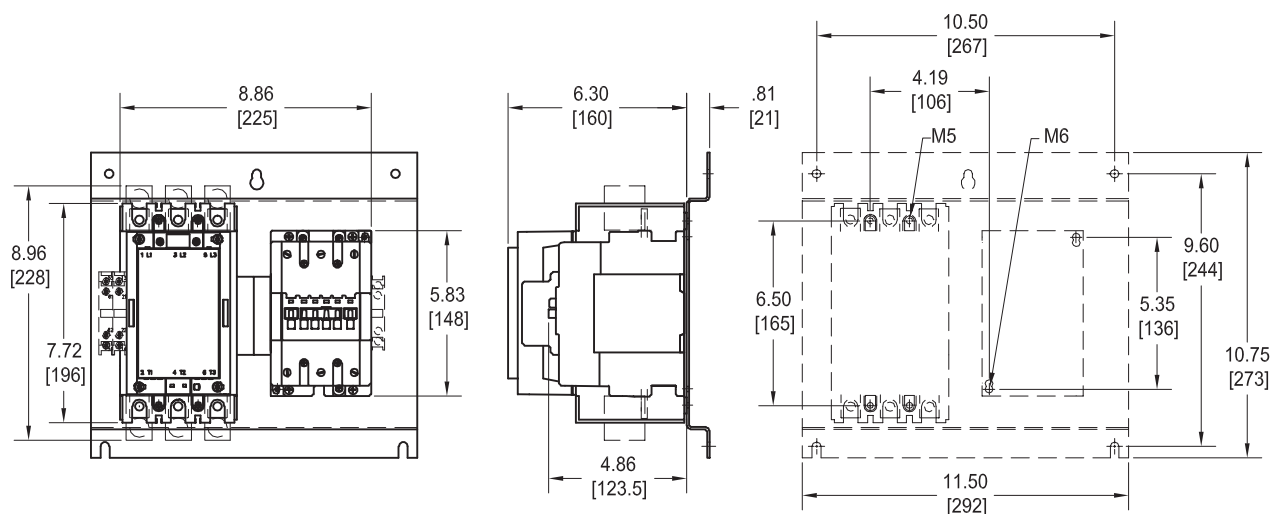


Approximate dimensions

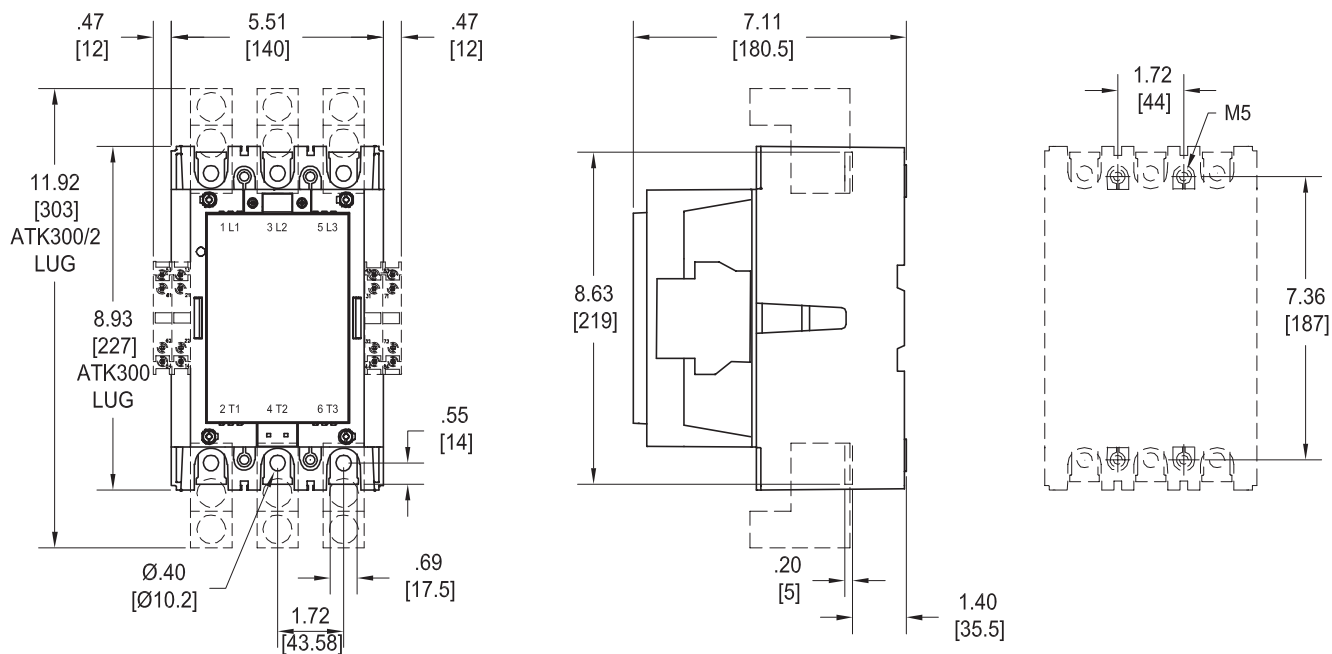
A/AF145 – A/AF300

← 00.00 → Inches
00.00 → [Millimeters]

A/AF145 – A/AE/AF95-110 mechanically interlocked



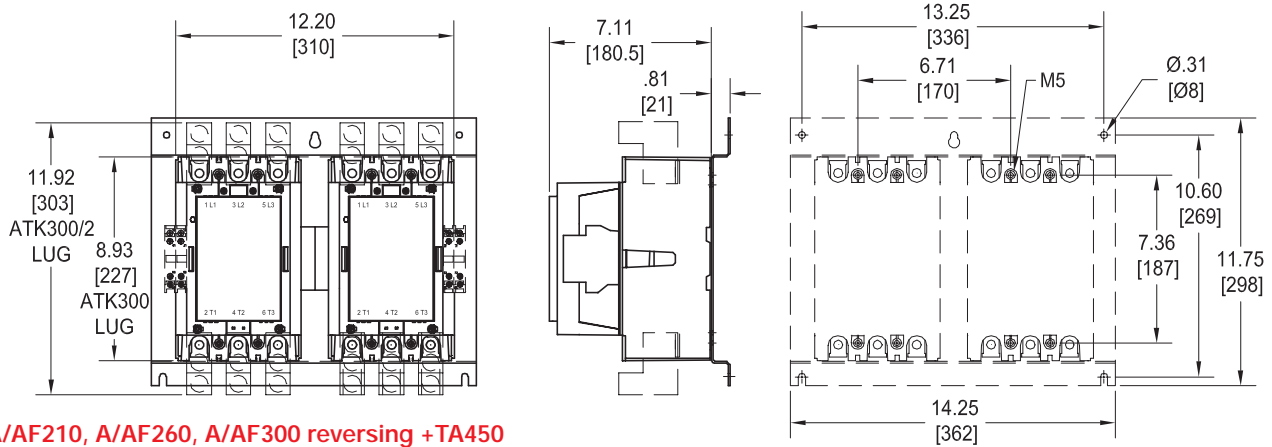
A/AF210, A/AF260, A/AF300



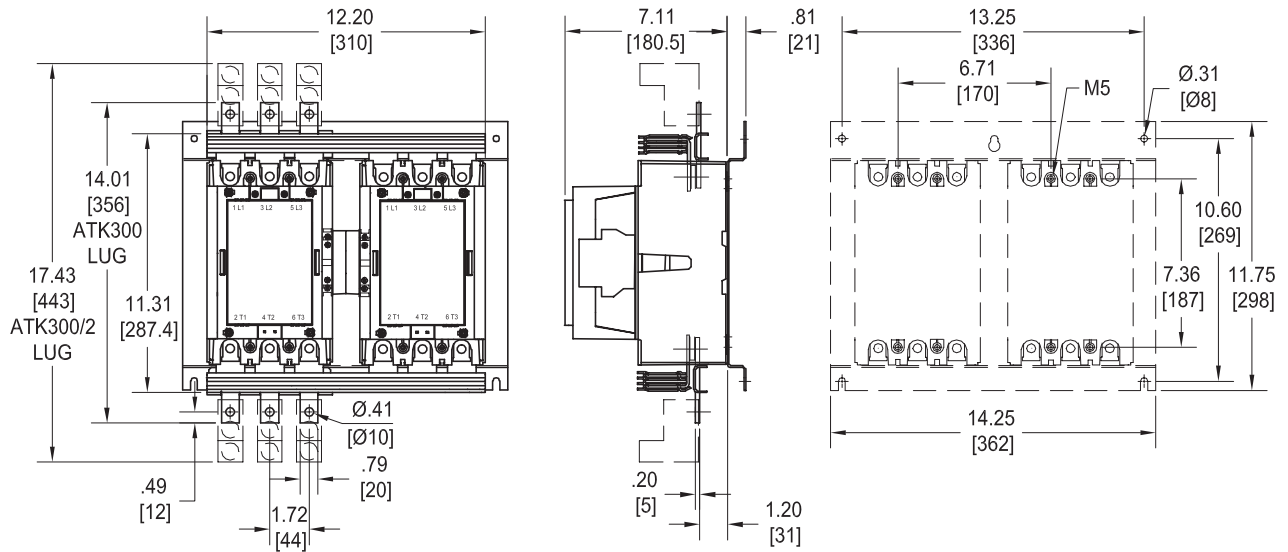
Approximate dimensions A/AF210 – A/AF300

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00.00 — [Millimeters]

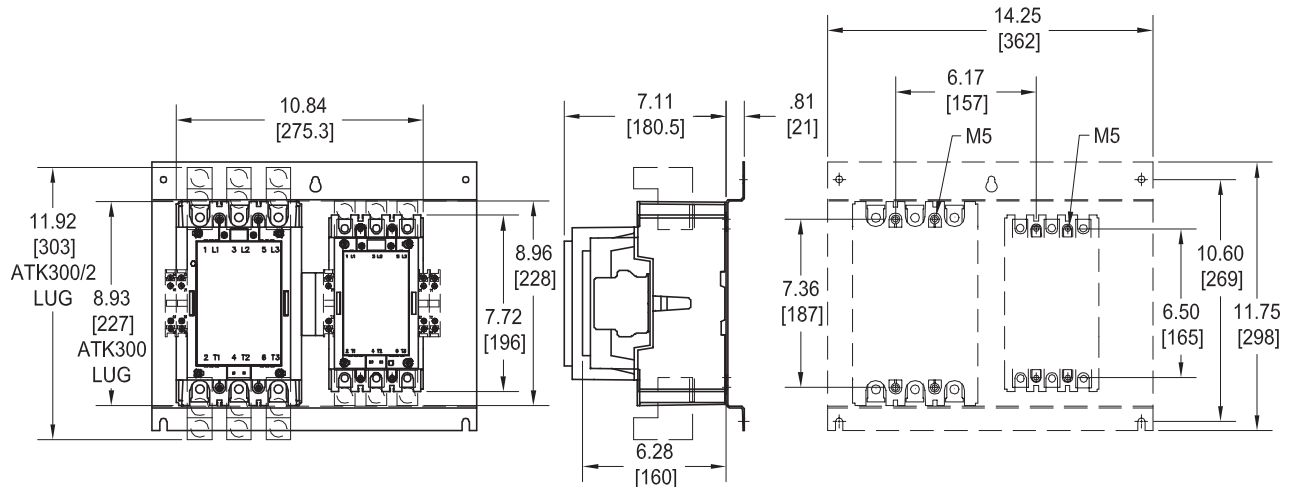
A/AF210, A/AF260, A/AF300 with mechanical interlock



A/AF210, A/AF260, A/AF300 reversing +TA450



A/AF210, A/AF145 with mechanical interlock

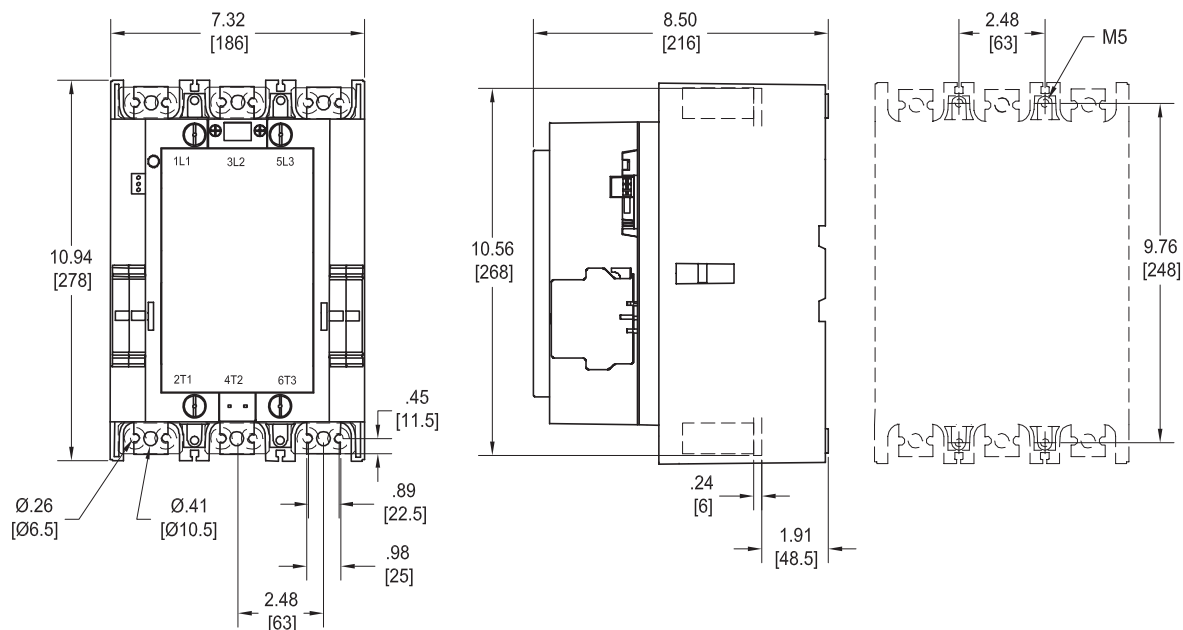


Approximate dimensions

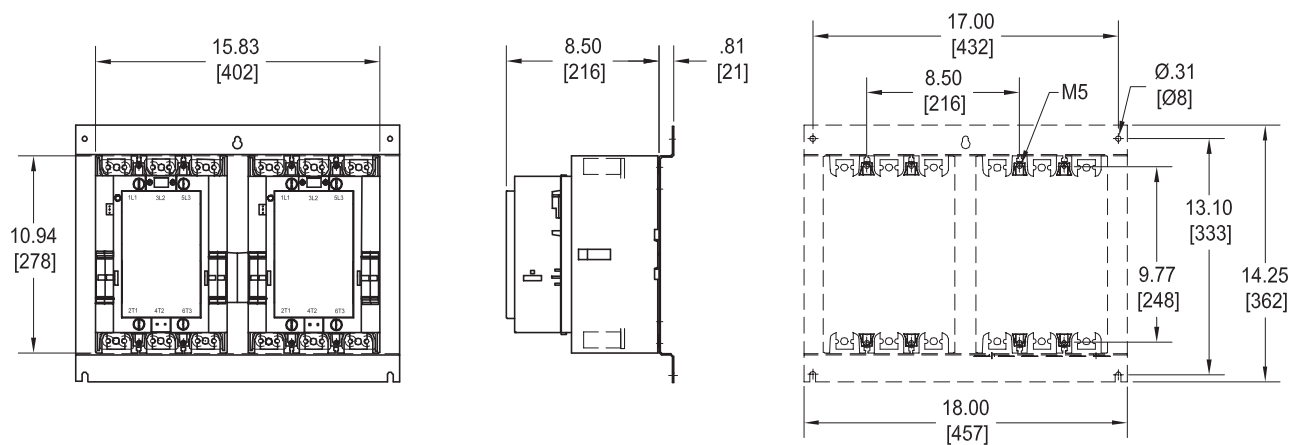
AF400 – AF460

← 00.00 → Inches
00.00 → [Millimeters]

AF400, AF460



AF400, AF460 with mechanical interlock

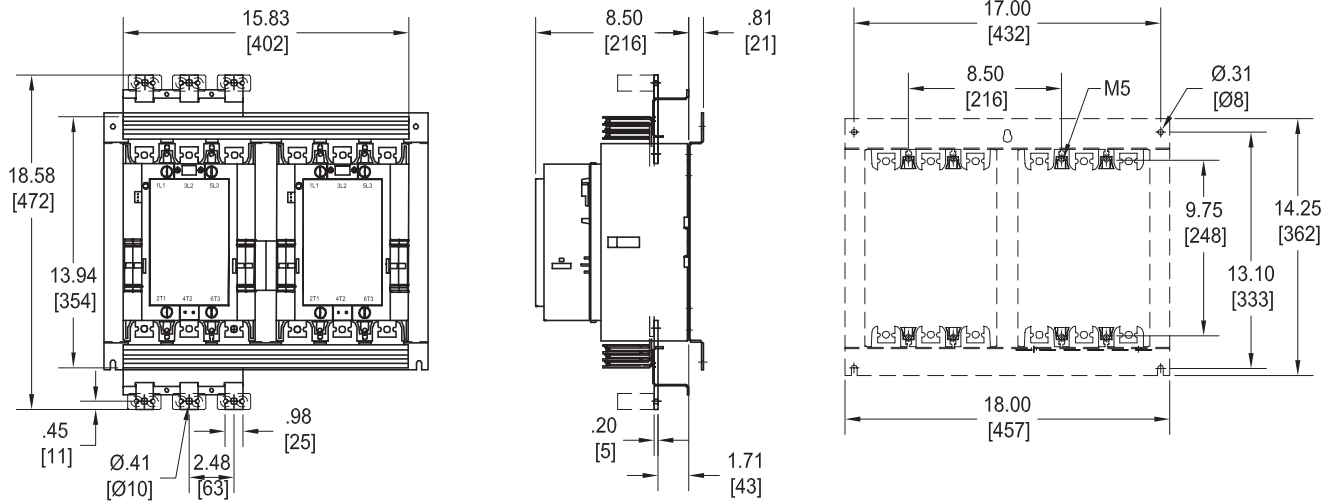


Approximate dimensions AF400 – AF750

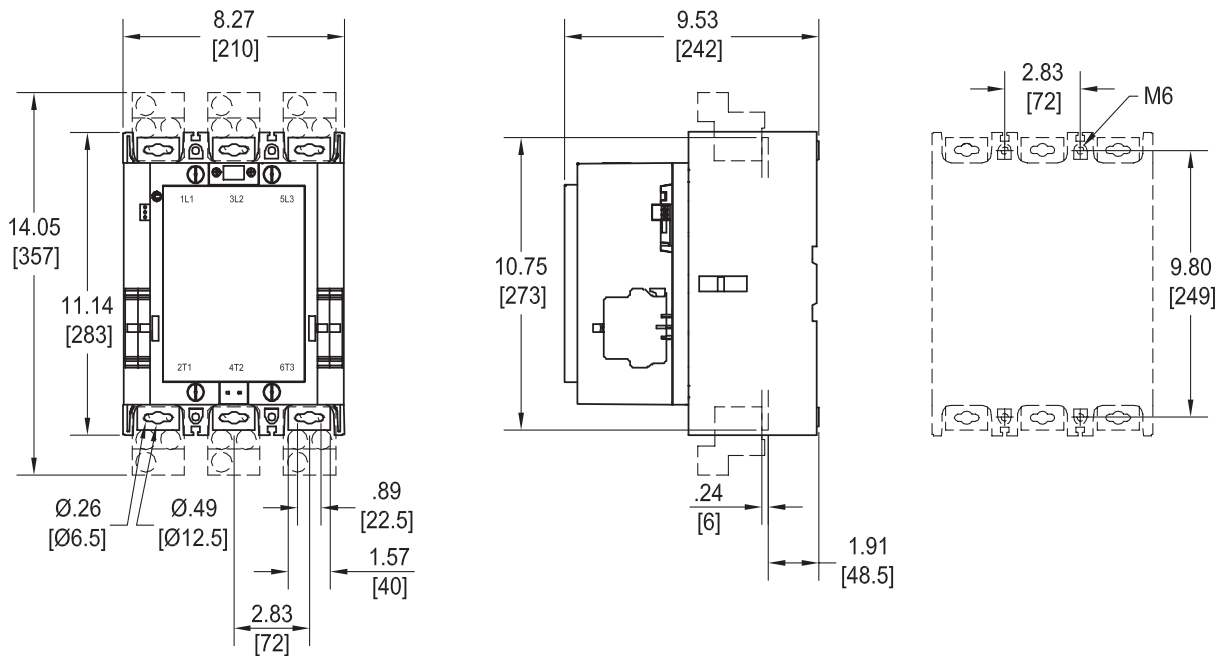
Across the line
1

00.00 Inches
00.00 [Millimeters]

AF400, AF460 reversing



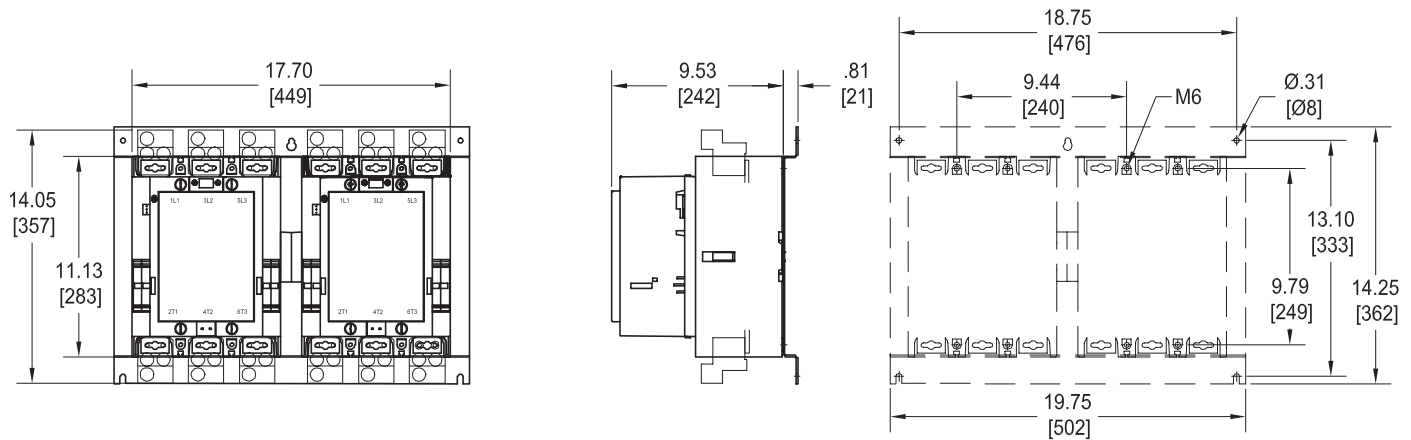
AF580 – AF750



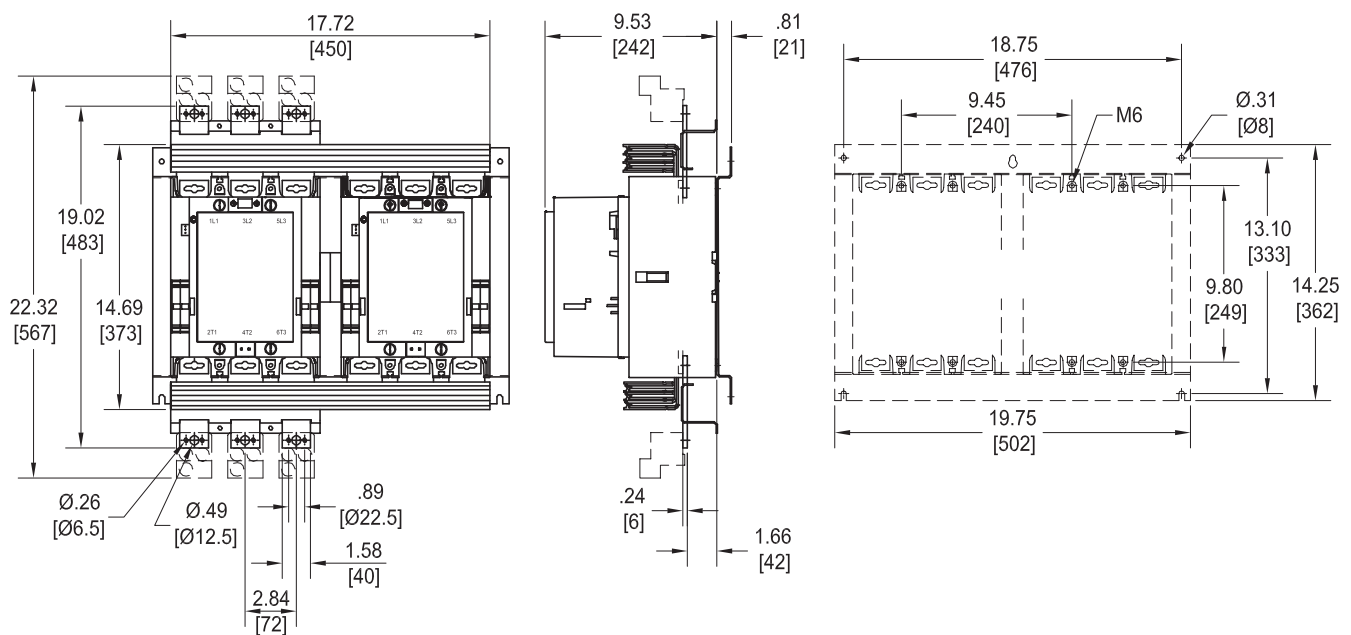
Approximate dimensions AF580 – AF750

← 00.00 → Inches
00.00 → [Millimeters]

AF580 – AF750 with mechanical interlock



AF580 – AF750 reversing



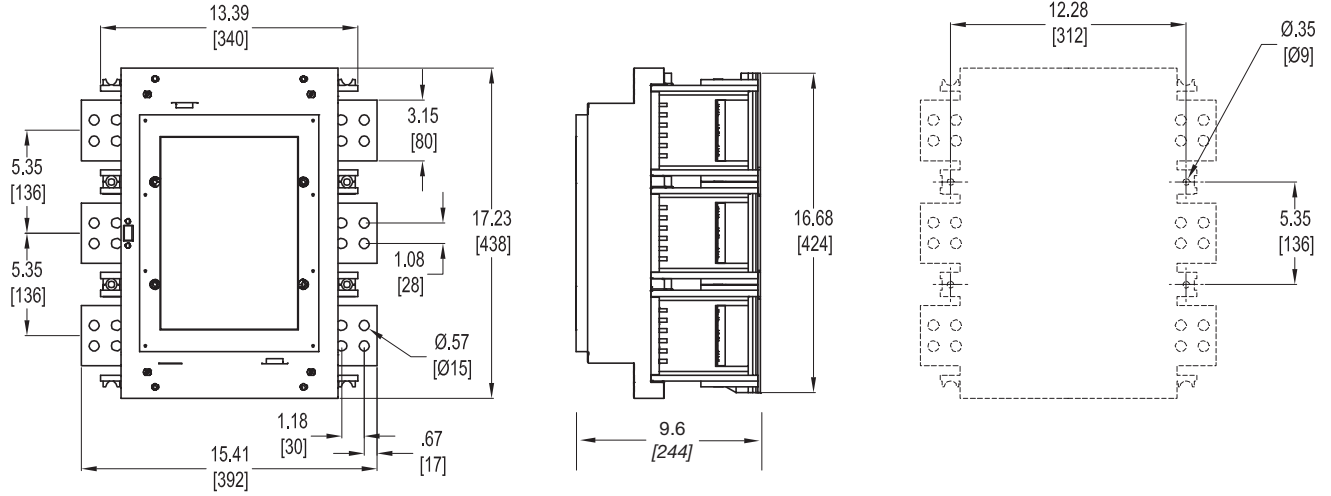
Approximate dimensions AF1350 – AF1650

Across the line
contactors

1

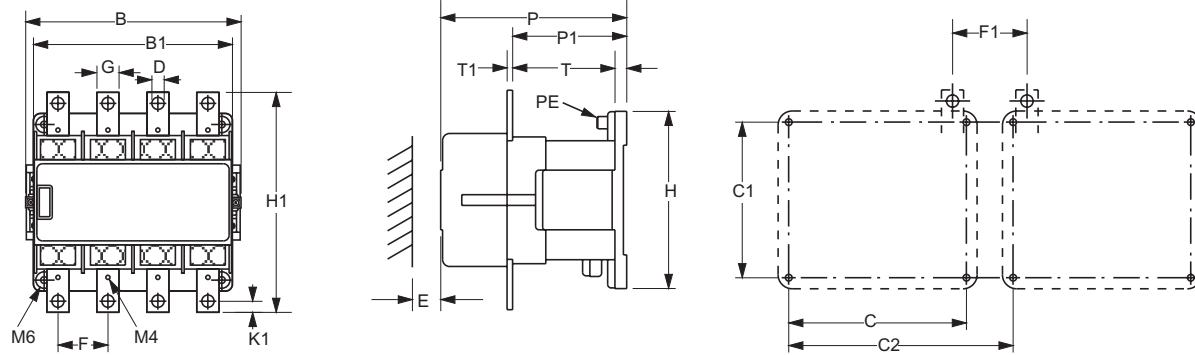
00.00 Inches
00.00 [Millimeters]

AF1350 – AF1650



Approximate dimensions EK110 – EK550, 4 pole, non-reversing

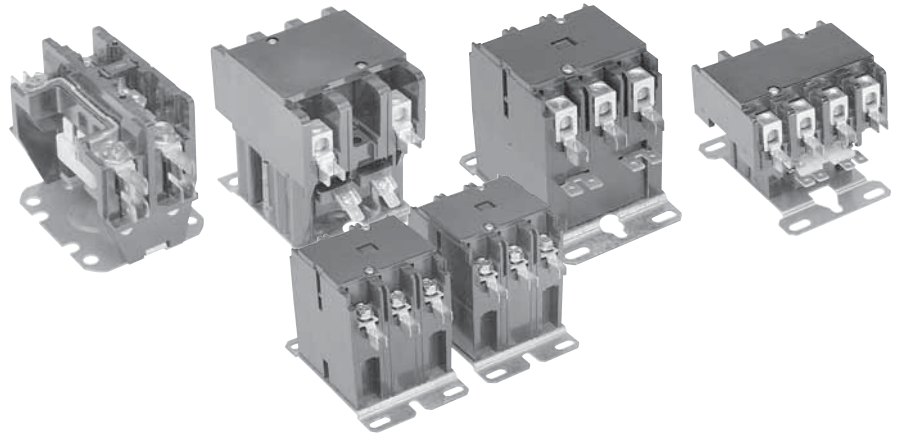
← 00.00 → Inches
00.00 → [Millimeters]



		B	B1	C	C1	D	E	F	F1	G	H	H1	K1	P	P1	T	T1
EK 110	in	6.50	5.35	4.72	5.51	0.26	1.57	1.61	1.69	0.59	6.14	6.14	0.30	6.08	4.03	0.39	0.16
	mm	165	136	120	140	6.6	40	41	43	15	156	156	7.5	154.5	102.3	10	4
EK 150	in	6.50	5.35	4.72	5.51	0.43	1.57	1.65	1.65	0.79	6.14	6.77	0.39	6.08	4.03	0.39	0.16
	mm	165	136	120	140	11	40	42	42	20	156	172	10	154.5	102.3	10	4
EK 175	in	7.91	6.93	6.30	5.51	0.43	0.59	1.77	2.64	0.79	6.14	7.80	0.39	6.77	4.20	0.39	0.20
	mm	201	176	160	140	11	15	45	67	20	156	198	10	172	106.7	10	5
EK 210	in	7.91	6.93	6.30	5.51	0.43	0.59	1.77	2.64	0.79	6.14	7.80	0.39	6.77	4.20	0.39	0.20
	mm	201	176	160	140	11	15	45	67	20	156	198	10	172	106.7	10	5
EK 370	in	10.63	9.61	8.66	7.87	0.43	1.57	2.64	2.76	0.98	8.78	10.71	0.49	8.88	5.49	0.91	0.24
	mm	270	244	220	200	11	40	67	70	25	223	272	12.5	225.5	139.5	23	6
EK 550	in	10.63	9.61	8.66	7.87	0.43	1.57	2.64	2.76	0.98	8.78	10.71	0.49	8.88	5.49	0.91	0.24
EK 1000	mm	270	244	220	200	11	40	67	70	25	223	272	12.5	225.5	139.5	23	6



Definite purpose Contactors



Applications

Type DP contactors provide high performance with flexibility and reliability, designed to match numerous applications including:

- Motors
- Power supplies
- Food service equipment
- Compressors
- Business machines
- Resistive heating
- Air conditioning
- Refrigeration equipment
- Welding

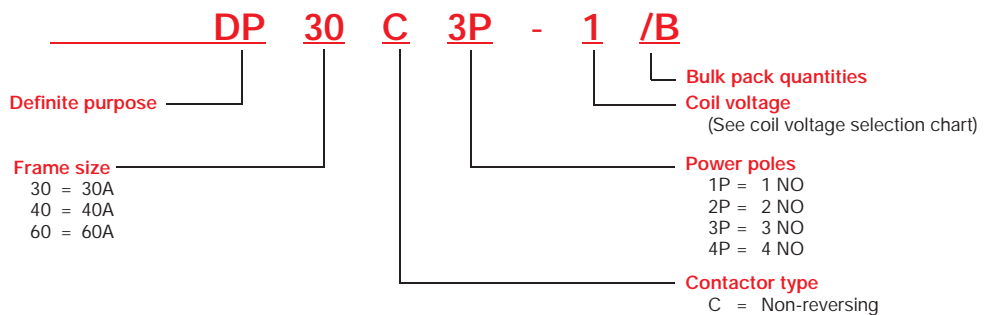
Agency approvals

- UL 508 Guide No. NLDX2, File # E224401
- CE/Semko Certified
- EN60947-4-1:1991
- IEC 947-4-1

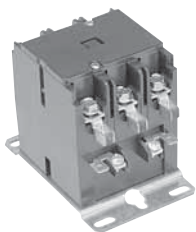
Features

- Available as:
 - 30A, 1, 2, 3 or 4 pole
 - 40A, 2, 3 or 4 pole
 - 60A, 3 pole
- Industry standard mounting plate provides easily accessible mounting holes
- Coil terminals are provided with #6-32 screws and (1) .250 quick connect or dual .250 quick connect terminals
- Exclusive hex, slotted, phillips #10-32 terminal screws for main terminals
- Coil is Class B (130° C) Insulation system with wide range of voltages and 50/60 Hz ratings
- Double E Magnet Assembly provides optimal performance with reduced power consumption
- Snap-in auxiliary switch with 1 SPDT or 2 SPDT contacts available as an option
- 1 NO & 1 NC auxiliary contact block with 600 VAC rating available as an option
- Base assembly is made from high arc-resistant plastic

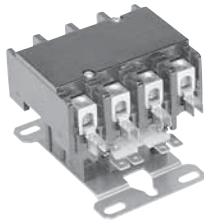
Catalog number explanation



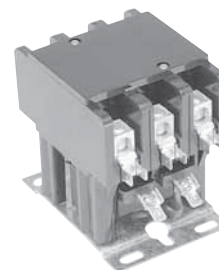
30A, 40A & 60A



DP30C3P-F



DP40C4P-F



DP60C3P-F

30A, 40A & 60A

Full load amps	Number of poles	Locked rotor amps			Resistive amps	Maximum HP 1 phase		Maximum HP 3 phase				Bulk pack ①	Catalog number qty.	Individual pack list price	Bulk pack list price
		240/277V	480V	600V		120V	240V	200/208V	240/277V	480V	600V				
30	1	150	75	50	40	1	2	—	—	—	—	50	DP30C1P-F	\$ 30	\$ 27
30	2	150	125	100	40	2	3	—	—	—	—	50	DP30C2P-F	38	34
30	3	180	150	120	40	2	5	10	10	15	20	25	DP30C3P-F	55	50
30	4	180	150	120	40	2	5	10	10	10	—	20	DP30C4P-F	75	68
40	2	240	200	160	50	2	3	—	—	—	—	50	DP40C2P-F	46	42
40	3	240	200	160	50	3	7.5	10	10	20	25	25	DP40C3P-F	60	54
40	4	240	200	160	50	3	7.5	10	10	10	—	20	DP40C4P-F	100	90
60	3	360	300	240	75	2	10	25	25	30	30	10	DP60C3P-F	147	140

Coil voltage selection chart

Voltage	24VAC	120VAC	208/240VAC	277VAC	480VAC	575VAC
Suffix #	F	1	2	C	4	5

Coil voltage selection

All catalog numbers include a 24VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the first digit after the dash in the catalog number.

Auxiliary contact blocks (3 pole only)

Description	Catalog number 30A - 40A	Catalog number 60A	List price
NO or NC SPDT 1 NO & 1 NC	CADP40-10 CADP40-11	CADP60-10 —	\$ 10

Contact rating of 1 NO & 1 NC

		120V	240V	480V	600V
Break	A	3.0	1.5	.75	.6
Make	A	30	15	7.5	6
Continuous	A	10	10	10	10

Quick connect terminals on all auxiliary switches are .250 wide.

Contact rating of SPDT

Voltage	Current rating
125VAC	10A, 1/3 HP
120VAC	4A on lamp load
250VAC	10A, 1/3 HP
125VDC	.5A
250VDC	.25A

Ordering bulk quantities

To order bulk package quantities add "/B" to the end of the catalog number.

Example: For quantities of 25 of a 30A 3 pole contactor with 24VAC coil, the catalog number would be: DP30C3P-F/B

Mechanical interlock

Frame size	Catalog number	List price
DP30 DP40	VMDP-1	\$ 7

① Must be ordered in standard pack quantities as shown. Add suffix "/B" to the catalog number.

Technical data

30A – 60A

1, 2, 3, & 4 Pole

Definite purpose
1
contactors

30A – 40A — 1 & 2 pole

Coil technical data	DP30C1P				DP30, DP40C2P			
	Nominal coil voltage	24	120	208/240	277	24	120	208/240
Maximum pickup volts	18	88	177	221	18	88	177	221
Drop-out volts range	6 – 15	20 – 70	40 – 170	50 – 165	6 – 15	20 – 70	40 – 140	50 – 165
Nominal inrush VA 50 Hz	31	31	35	31	22	22	22	22
Nominal inrush VA 60 Hz	28	28	32	28	20	20	20	20
Nominal sealed VA 50 Hz	6	6	7	6	5.5	5.5	5.5	5.5
Nominal sealed VA 60 Hz	5	5	6	5	4.5	4.5	4.5	4.5
Nominal DC resistance Ohms	17.5	450	1800	2252	13	275	1056	1772
Other specifications	DP30C1P				DP30, DP40C2P			
Line and load terminals	# 10 – 32 screw ①				Box lug ①			
Wire size AWG min – max	16 – 8 ②				14 – 4 Cu/Al			
Tightening torque (recommended)	25 in. lbs.				40 in. lbs			
Coil termination	Dual .250 QC (2)				Dual .250 QC (2)			
Quick connects .250 std. 1 – 1.5 pole	Quad				Quad			
Quick connects .250 std. 2 pole	Dual or quad				Dual or quad			
Covers	Optional				Standard			
Insulation system	130° C Class B				130° C Class B			

30A- 60A — 3 pole

Coil technical data	DP30, DP40C3P					DP60C3P				
	Nominal coil voltage	24	120	208/240	277	480	24	120	208/240	277
Maximum pickup volts	18	88	177	220	384	18	93	177	235	374
Drop-out volts range	6 – 15	20 – 70	40 – 140	65 – 185	150 – 270	6 – 15	20 – 70	40 – 135	50 – 180	150 – 286
Nominal inrush VA 50 Hz	65	65	65	65	65	140	140	140	140	140
Nominal inrush VA 60 Hz	60	60	60	60	60	132	132	132	132	132
Nominal sealed VA 50 Hz	7.5	7.5	7.5	7.5	7.5	20	20	20	20	20
Nominal sealed VA 60 Hz	6	6	6	6	6	14	14	14	14	14
Nominal DC resistance Ohms	6.6	165	660	880	1320	2.4	45	180	280	852
Other specifications	DP30C3P					DP40C3P				
Line and load terminals	# 10 – 32 Screw ①					Box lug ①				
Wire size AWG min – max	16 – 8 ②					14 – 7 Cu/Al				
Tightening torque (recommended)	25 in. lbs					40 in. lbs				
Quick connects: power terminals	Dual.250 QC					Dual.250 QC				
Coil terminals	Dual .250 QC (2)					Dual .250 QC (2)				
Covers	Optional					Standard				
Insulation system	130° C Class B					130° C Class B				

30A – 40A — 4 Pole

Coil technical data	DP30, DP40C4P					
	Nominal coil voltage	24	120	208/240	277	480
Maximum pickup volts	19.2	88	177	220	384	384
Drop-out volts range	6 – 15	20 – 70	40 – 140	65 – 185	150 – 270	150 – 270
Nominal inrush VA 50 Hz	68	68	58	58	48	48
Nominal inrush VA 60 Hz	60	60	55	52	52	52
Nominal sealed VA 50 Hz	14	14	11	11	11	11
Nominal sealed VA 60 Hz	9	9	9.5	9.5	9	9
Nominal DC resistance Ohms	5	148	550	750	2100	2100
Other specifications	DP30C4P			DP40C4P		
Line and load terminals	# 10 – 32 screw ①			Box Lug		
Wire size AWG Min – Max	16 – 8 ②			14 – 4 Cu/AL		
Tightening torque (recommended)	22 in. lbs			40 in. lbs		
Quick connects: power terminals	Dual .250 QC			Dual .250 QC		
Coil terminals	Dual .250 QC (2)			Dual .250 QC (2)		
Covers	Optional			Standard		
Insulation system	130° C Class B			130° C Class B		

① See page 1.82 to 1.85 for description and approximate dimensions.

② Stranding must be split for #8 wire.

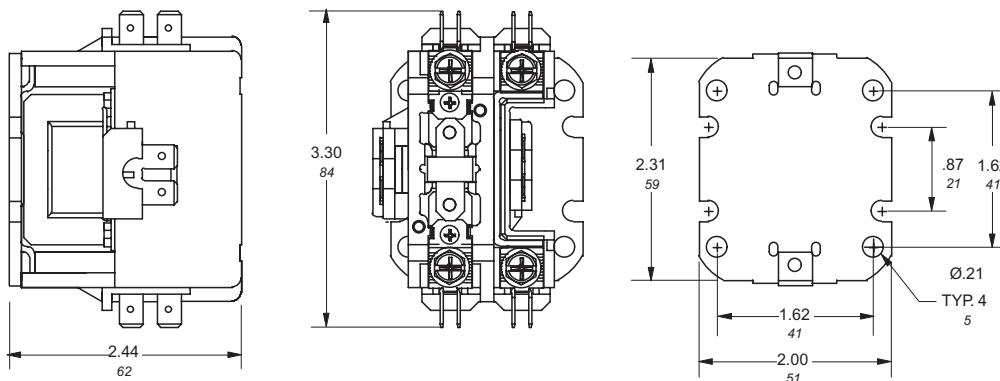
Approximate dimensions

30A

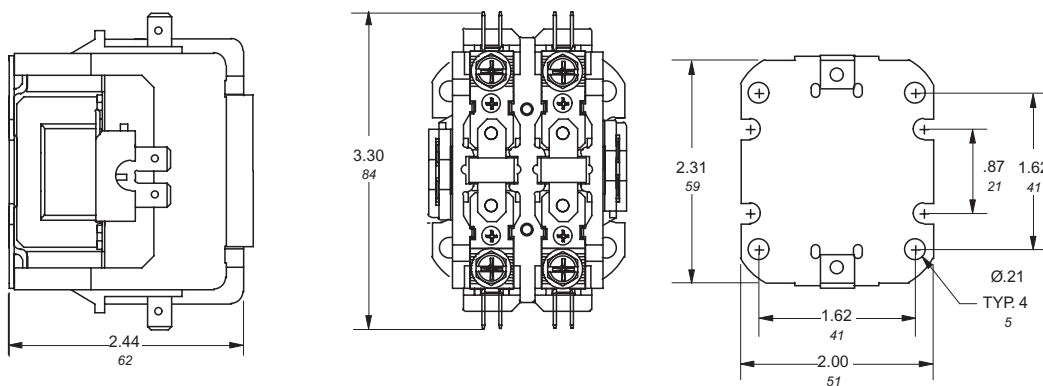
1, 2 & 3 Pole

00.00 — Inches
00.00 — [Millimeters]

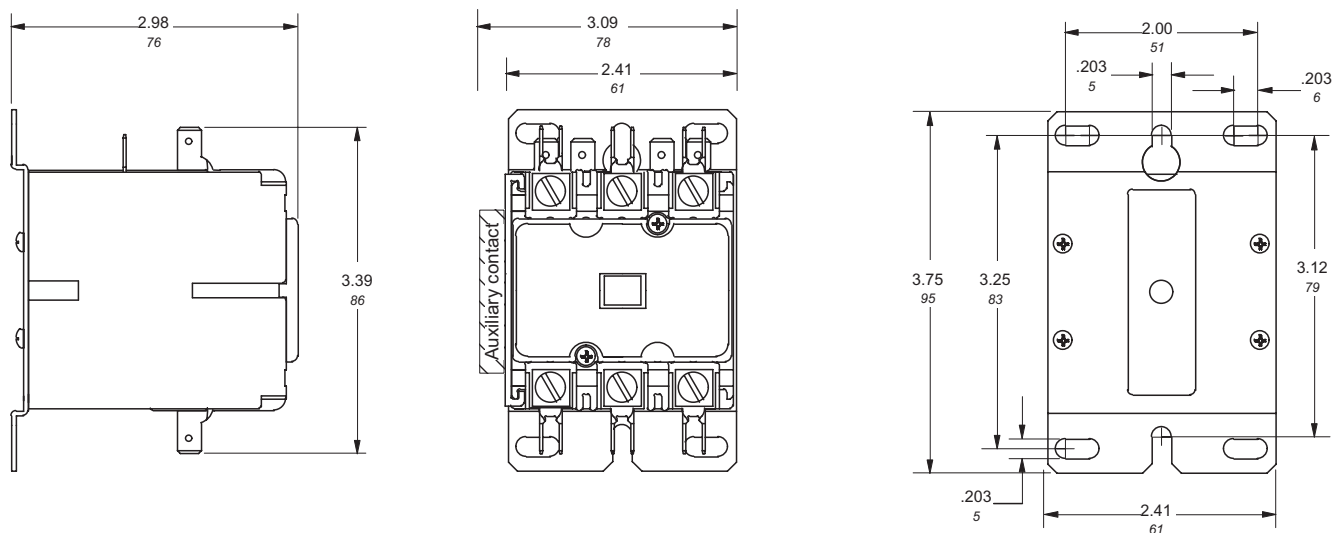
DP30C1P



DP30C2P



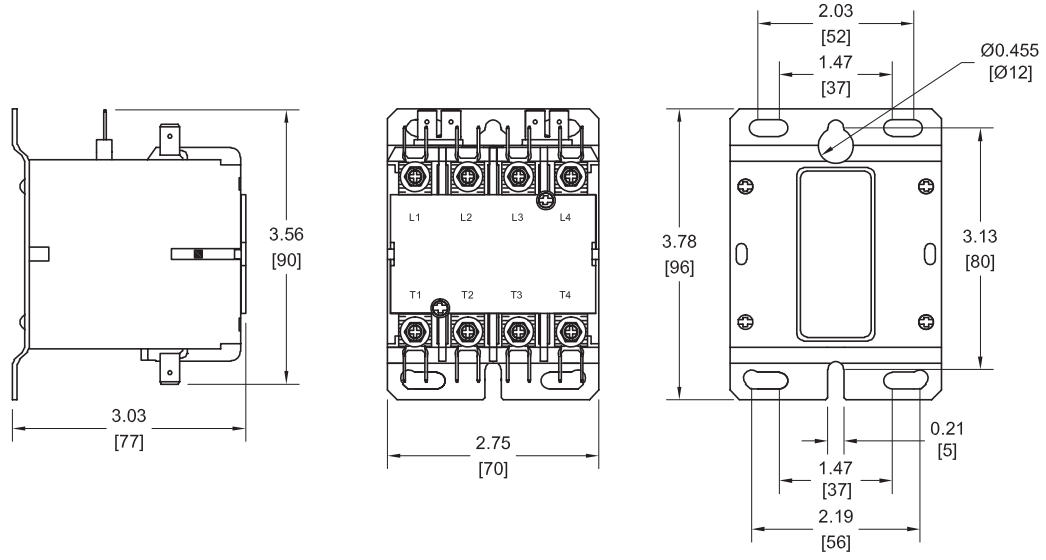
DP30C3P



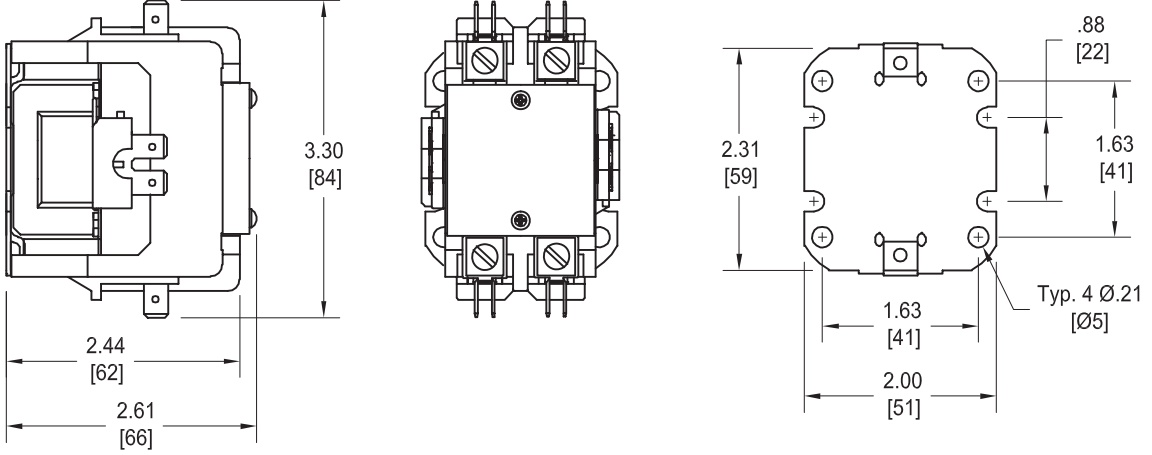
Approximate dimensions
30A 4 Pole
40A 2 & 3 Pole

00.00 — Inches
00.00 — [Millimeters]

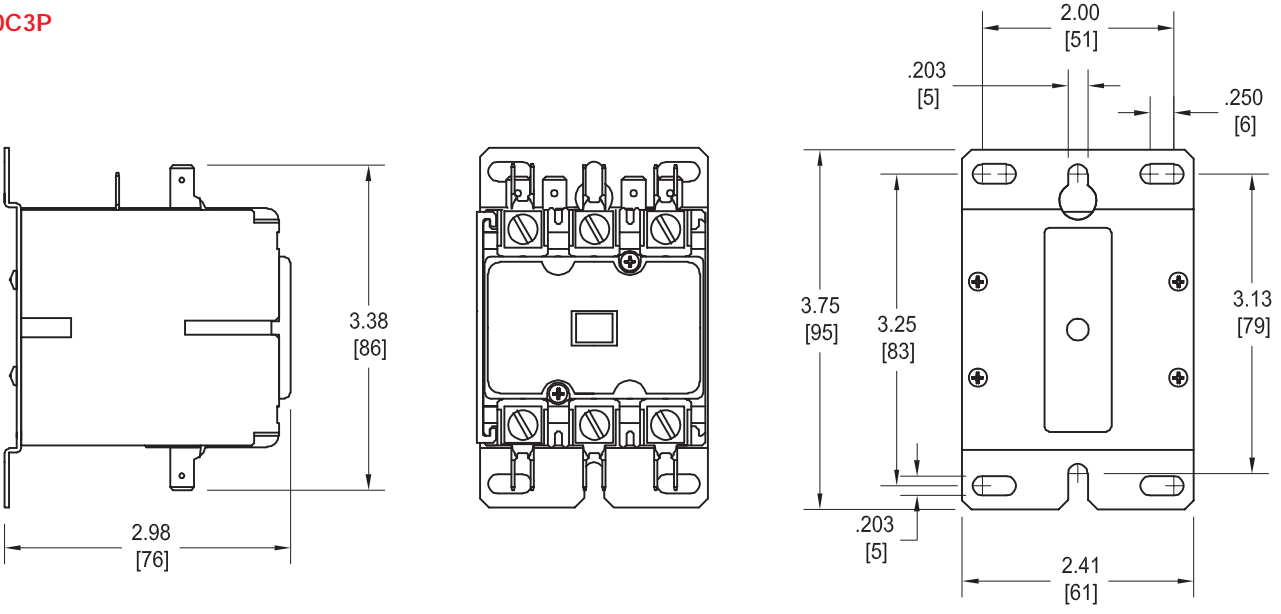
DP30C4P



DP40C2P



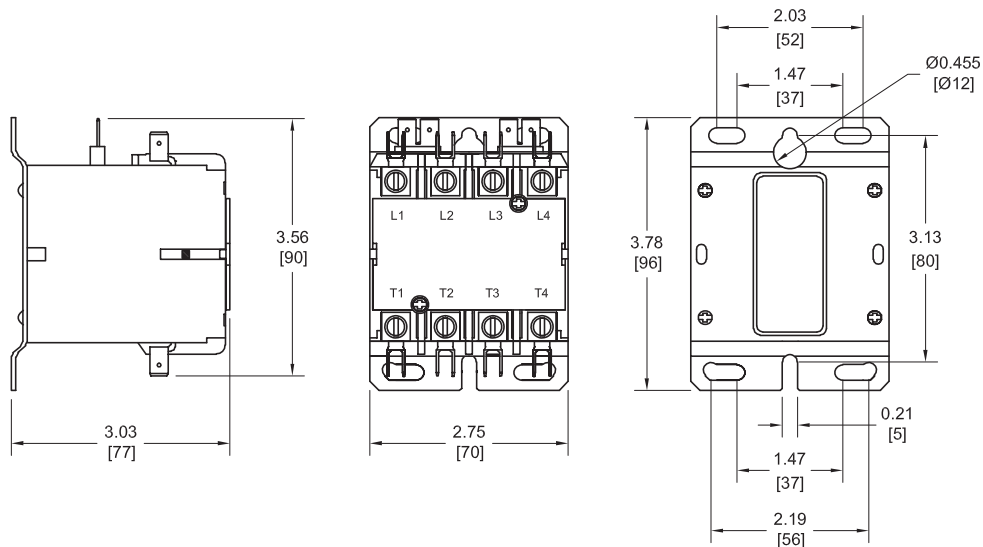
DP40C3P



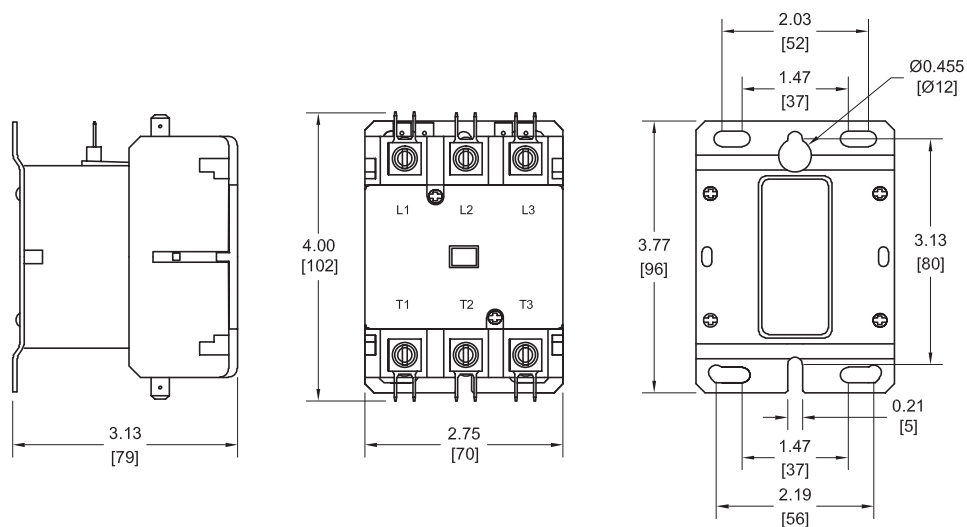
Approximate dimensions

40A 4 Pole
60A 3 Pole

DP40C4P



DP60C3P

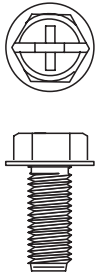


Approximate dimensions Terminations

Definite purpose
contactors

1

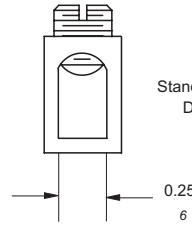
Screw



Standard on
DP30

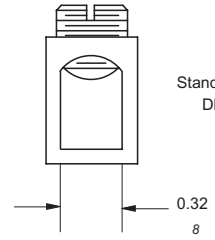
10-32 Combination
Phillips, slotted &
5/16 Hex Head

Lugs



Standard on
DP40

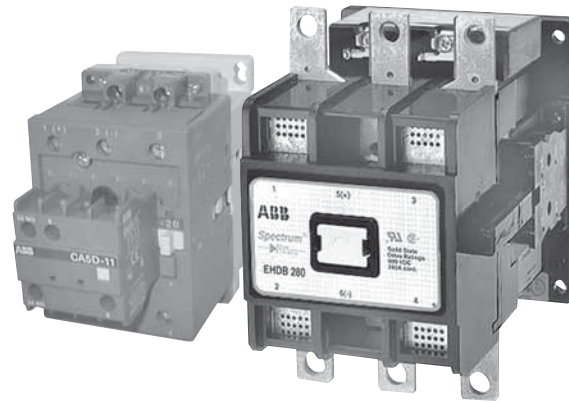
14 - 4 AWG, Cu / Al



Standard on
DP60

14 - 2 AWG, Cu / Al

Notes



Description

Type DA

- 60 amps size
- 500 volt DC ratings
- 160 and 300 volt DC normal closed ratings for dynamic braking
- Low energy auxiliary contacts available (17V, 5mA)
- Mechanically interlocked version available for reversing applications
- Small compact design
- 2 pole (2 N.O.) and 3 pole (2 N.O. & 1 N.C.) available
- Additional auxiliary contact blocks available
- Auxiliary contacts available to meet elevator standards
- Fast, snap-on DIN rail mounting
- Double break contact design
- Captive terminal screws
- Touch-safe design: all connection terminals are protected against accidental touch
- Terminals supplied open for ease of wiring
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- N.C. dynamic braking pole is easily added to two pole contactors
- Screwdriver guide holes
- Snap-on front mounted accessories
- UL and CSA approved

Type EHDB

- 220 amps to 960 amps
- 2 pole (2 N.O.) and 3 pole (2 N.O. & 1 N.C.) power poles available
- 600 VDC making capacity: 300 VDC breaking capacity
- 1 N.O. & 1 N.C. auxiliary contacts are standard and up to six additional auxiliary contacts may be added to provide a total of 8 (4 N.O. & 4 N.C.)
- Early make & late break auxiliary contacts available
- Auxiliary contacts available to meet elevator standards
- EHDB 220, 280 & 360 contactors have withdrawable coils
- Mechanically interlocked contactors available for reversing applications
- Double break contact design with magnetic arc chamber extinguishes arc in shortest possible time
- High temperature encapsulated coil
- Easy removal of arc chute for quick inspection and change of contacts
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- DC control operation available
- UL & CSA approved
UL File # E79416
CSA File # LR19700

Type DA 60 Amps



DA75-21A-11-84

2 & 3 pole — 500 volt N.O. ratings with 160 volt N.C. dynamic braking rating

Thermal amp rating	Maximum amp rating N.C. contact		Auxiliary contacts included		2 pole (2 N.O.)		3 pole (2 N.O. & 1 N.C.)	
	Make 300 VDC	Break 160 VDC	N.O.	N.C.	Catalog number	List price	Catalog number	List price
60	90	55	2 1	1 1	— DA75-20-11-84	— 310	DA75-21-21-84 —	\$ 385 —

3 pole — 500 volt N.O. ratings with 300 volt N.C. dynamic braking rating

Thermal amp rating	Maximum amp rating N.C. contact		Auxiliary contacts included		3 pole (2 N.O. & 1 N.C.)	
	Make 500 VDC	Break 300 VDC	N.O.	N.C.	Catalog number	List price
60	90	55	1	1	DA75-21A-11-84	\$ 430

NOTE: DA75 2 & 3 pole contactors are equipped with polarity-dependent N.O. contacts.

Description

DA drive contactors are specifically designed for use with solid state D.C. adjustable speed drive systems. In drive applications, the contactor is not required to make or break the load during normal operation. The N.C. contact is used for dynamic braking applications.

Coil voltage selection

All DC operated catalog numbers include a 24VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 24V coil is required for an DA75 contactor: DA75-20-11-81

Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80			85	86				

NOTE: DC coils are available for DA75 contactors only. For other voltages, see page 1.26.

Additional auxiliary contacts

Contactor number	Number of auxiliary contacts that may be added to DA contactors
DA75-21-21-84	(1 – 2) CA5 & (1) CAL5 Aux
DA75-20-11-84	(1) DB Adder deck & (2) CA5 & (1) CAL5 Aux

Auxiliary contact block adders

Top mounted for DA9 – DA75	Catalog number	List price
N.O.	CA5-10	\$ 15
N.C.	CA5-01	
1 N.O. & 1 N.C.	CAL5-11	30

All above auxiliary contact blocks fulfill the mirror contacts standards in IEC609 47-1 Annex F, Positive driven action IEC 609 47-1, Chapter 4. They also fulfill elevator standard ASME A17-1-2000.

Type EHDB 220 to 960 Amps



EHDB280C-1L



EHDB520C2P-1L

2 & 3 pole — 600 volt N.O. ratings with 300 volt N.C. dynamic braking rating

Thermal amp rating 600 volts	Maximum amp rating N.C. contact		Auxiliary contacts included		2 pole (2 N.O.)		3 pole (2 N.O. & 1 N.C.)	
	Make 300 VDC	Break 160 VDC	N.O.	N.C.	Catalog number	List price	Catalog number	List price
220	450	285	1	1	EHDB220C2P-1L	\$ 698	EHDB220C-1L	\$ 998
280	565	363	1	1	EHDB280C2P-1L	945	EHDB280C-1L	1290
380	728	472	1	1	EHDB360C2P-1L	1950	EHDB360C-1L	2820
520	1040	680	1	1	EHDB520C2P-1L	2250	EHDB520C-1L	3375
650	1300	850	1	1	EHDB650C2P-1L	3953	EHDB650C-1L	4650
800	1600	1050	1	1	EHDB800C2P-1L	4845	EHDB800C-1L	5700
960	1920	1250	1	1	EHDB960C2P-1L	6120	EHDB960C-1L	7200

Description

EHDB drive contactors are specifically designed for use with solid state D.C. adjustable speed drive systems. In drive applications, the contactor is not required to make or break the load during normal operation. The N.C. contact is used for dynamic braking applications. EHDB contactors are provided less terminal lugs.

Coil voltage selection

All catalog numbers include a 120V coil. To select other coil voltages, substitute the code from the coil voltage selection chart for the first digit after the dash in the catalog number.

Coil voltage selection chart – EHDB contactors

		Volts														
		24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	F	G		1		B	2	2	C				3	4		6
50	N		1			J				3	4				6	
DC	Y	W	P		O	R										

NOTE: For other voltages, consult factory. • 24VAC coils are not available for sizes EHDB520 – EHDB960. • 48VAC coils are not available for sizes EHDB520 – EHDB960. For these 24V and 48V applications, use an interposing control relay. • 12VDC coils are not available for EHDB520 – EHDB960.

DC operated contactors

EHDB220 – EHDB960

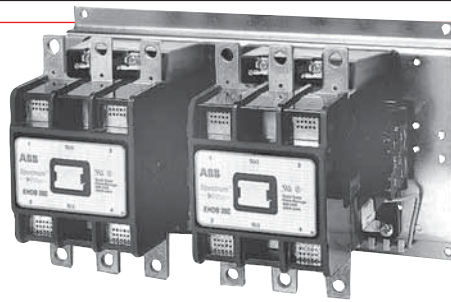
DC and AC operated contactors have the same magnet structure except the DC coil includes a resistor and a normally closed late break auxiliary interlock. To order, substitute the code from the coil voltage selection chart and refer to the DC magnet coils chart for the price adder.

DC operated contactors are supplied with 2 N.O. & 1 N.C. auxiliary contacts. One additional 1 N.O. & 1 N.C. auxiliary contact block can be mounted on the left side of the contactor.

DC magnet coils (per contactor)

Contactor size	List price
EHDB220 – EHDB280	\$ 255
EHDB360	285
EHDB520	360
EHDB650 – EHDB960	495

Type DA & EHDB, mechanically interlocked 60 to 960 Amps



EHDB280M-1L

2 & 3 pole — 600 volt N.O. ratings with 300 volt N.C. dynamic braking rating

Thermal amp rating 500V (DA) 600V (EHDB)	Maximum amp rating N.C. contact		Auxiliary contacts included each contactor		2 pole (2 N.O.)		3 pole (2 N.O. & 1 N.C.)	
	Make	Break	3 Pole N.O.	2 Pole N.C.	Catalog number	List price	Catalog number	List price
60	90	55	1 NO & 1 NC	1 NO & 1 NC	DA75M-20-11-84	\$ 780	DA75M-21A-11-84	\$ 935
220	450	285	1 NO & 1 NC	1 NO & 1 NC	EHDB220M2P-1L	1653	EHDB220M-1L	2253
280	565	363	1 NO & 1 NC	1 NO & 1 NC	EHDB280M2P-1L	2148	EHDB280M-1L	2838
380	728	472	1 NO & 1 NC	1 NO & 1 NC	EHDB360M2P-1L	4296	EHDB360M-1L	6036
520	1040	680	1 NO & 1 NC	1 NO & 1 NC	EHDB520M2P-1L	4986	EHDB520M-1L	7236
650	1300	850	1 NO & 1 NC	1 NO & 1 NC	EHDB650M2P-1L	8391	EHDB650M-1L	9786
800	1600	1050	1 NO & 1 NC	1 NO & 1 NC	EHDB800M2P-1L	10,266	EHDB800M-1L	11,976
950	1920	1250	1 NO & 1 NC	1 NO & 1 NC	EHDB960M2P-1L	12,816	EHDB960M-1L	14,976

DA75 contactors are equipped with polarity dependent N.O. contacts. EHDB contactors are equipped with polarity dependent N.C. contacts.

Description

EHDB mechanically interlocked drive contactors are designed for reversing applications. The complete assembly consists of two mechanically and electrically interlocked contactors supplied without control and power wiring. The coil voltage selection

Coil voltage selection

Type DA

All DC operated catalog numbers include a 24VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 24V coil is required for an DA75M contactor: DA75M-20-11-81

Type EHDB

All catalog numbers include a 120V coil. To select other coil voltages, substitute the code from the coil voltage selection chart for the first digit after the dash in the catalog number.

Ex.: A 220V coil is required for an EHDB960M contactor: EHDB960M2P-2L

Coil voltage selection chart – DA contactors

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84							80		85	86		

NOTE: DC coils are available for DA75 contactors only.

For other voltages, see page 1.26.

Coil voltage selection chart – EHDB contactors

	Volts														
	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	F	G		1		B	2	2	C			3	4		6
50	N		1					J			3	4			6
DC	Y	W	P		O		R								

NOTE: For other voltages, consult factory. • 24VAC coils are not available for sizes EHDB520 – EHDB960. • 48VAC coils are not available for sizes EHDB520 – EHDB960. For these 24V and 48V applications, use an interposing control relay. • 12VDC coils are not available for EHDB520 – EHDB960.

DC magnet coils (per contactor)

Contactor size	List price
EHDB220M – EHDB280M	510
EHDB360M	570
EHDB520M	720
EHDB650M – EHDB960M	990

Replacement parts



Coils

Contactor size	Catalog number	AC coils list price	DC coils list price
DA75	ZA75-★ ①	\$ 57	\$ 57
EHD220, EHD280	EHDRC280-★	150	195
EHD350	EHDRC360-★	180	240
Withdrawable type			
EHDB220, EHDB280	EHDBRC280-★	150	195
EHDB360	EHDBRC360-★	180	240
EHDB520, EHDB650	EHDBRC650-★	360	450
EHDB800, EHDB960	EHDBRC960-★	435	525

★ Substitute the ★ for a coil voltage suffix found in the Coil Voltage Selection Chart. EHDB coils can be used as replacement parts in EHD contactors.

Coil voltage selection chart – DA contactors ①

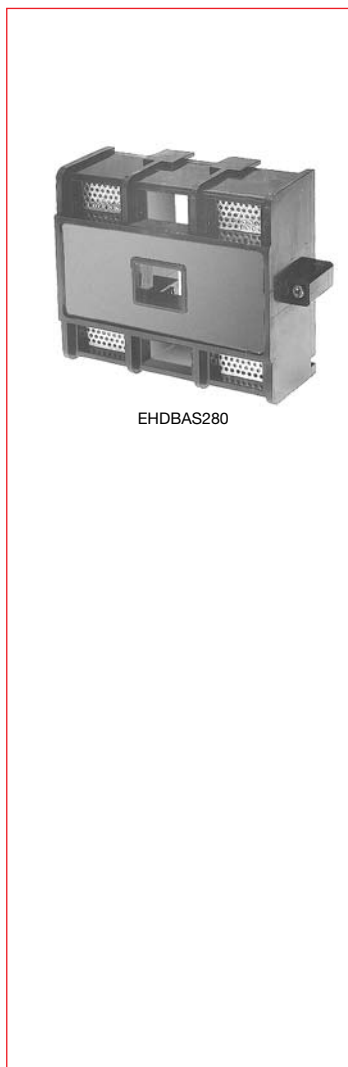
Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84			80				85	86			55	

NOTE: DC coils are available for DA75 contactors only.

Coil voltage selection chart – EHDB contactors

	Volts														
	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	F	G		1		B	2	2	C			3	4		6
50	N		1			J					3	4		6	
DC	Y	W	P		O		R								

NOTE: For other voltages, consult factory. • 24VAC coils are not available for sizes EHDB520 – EHDB960. • 48VAC coils are not available for sizes EHDB520 – EHDB960. For these 24V and 48V applications, use an interposing control relay. • 12VDC coils are not available for EHDB520 – EHDB960.



Arc shields

Contactor size	Catalog number	List price
3 Pole		
EHDB220	EHDBAS220	\$ 200
EHDB280	EHDBAS280	233
EHDB360	EHDBAS360	254
EHDB520	EHDBAS520	305
EHDB650	EHDBAS650	350
EHDB800	EHDBAS800	371
EHDB960	EHDBAS960	396
2 Pole		
EHDB220	EHDBAS220-2	192
EHDB280	EHDBAS280-2	221
EHDB360	EHDBAS360-2	242
EHDB520	EHDBAS520-2	293
EHDB650	EHDBAS650-2	338
EHDB800	EHDBAS800-2	357
EHDB960	EHDBAS960-2	383

Auxiliary contact blocks — EHDB220 to EHDB960

Contactor sizes	Description	Terminal markings		Catalog number	List price
		N.O.	N.C.		
EHDB130 to EHDB960	Standard 1 N.O. & 1 N.C.	13, 14	21, 22	CAL16-11A	L \$ 88
	Standard 1 N.O. & 1 N.C.	43, 44	31, 32	CAL16-11B	R 88
	Standard 1 N.O. & 1 N.C.	53, 54	61, 62	CAL16-11C	L 88
EHDB960	Standard 1 N.O. & 1 N.C.	83, 84	71, 72	CAL16-11D	R 88
	Late break 1 N.O. & 1 N.C.	47, 48	35, 36	CAL16-11E	L,R 100

EHDB130 to EHDB960 contactors are provided with a 1 N.O. & 1 N.C. auxiliary contact block mounted on each contactor. One additional 1 N.O. & 1 N.C. auxiliary contact block can be mounted on the left side of the contactor and two additional 1 N.O. & 1 N.C. contact blocks can be mounted on the right side.

Positive driven action auxiliary contact blocks — EHDB220 to EHDB360

Contactor sizes	Description	Terminal markings		Catalog number	List price
		N.O.	N.C.		
EHDB220 to EHDB360	Standard 1 N.O. & 1 N.C. (left side) Standard 1 N.O. & 1 N.C. (right side)	13, 14 43, 44	21, 22 31, 32	CAL16-11N CAL16-11P	\$ 160

Only one of these auxiliary contact blocks can be mounted on each side of the contactor. They fulfill the mirror contacts IEC609 47-1 Annex F, positive driven action IEC609 47-1, Chapter 4. They also fulfill elevator standard ASME A17-1-2000.

① For other voltages, see page 1.26.

Replacement parts



EHDBCK280-2

Contact kits

Contactor size	Catalog number	List price
2 Pole, N.O.		
DA75	ZL75	\$ 158
EHDB220	EHDBCK220-2	300
EHDB280	EHDBCK280-2	360
EHDB360	EHDBCK360-2	698
EHDB520	EHDBCK520-2	1026
EHDB650	EHDBCK650-2	1368
EHDB800	EHDBCK800-2	1688
EHDB960	EHDBCK960-2	2115

N.C. DB Kit only

Contactor size	Contact rating	Auxiliary interlocks	Catalog number	List price
DA75	55A/160V; 28A/300V	1 NO	CA5D-11	\$ 60
DA75	300V	—	CA5D-01	75
EHDB220	300V	—	EHDBCK220-NC	165
EHDB280	300V	—	EHDBCK280-NC	165
EHDB360	300V	—	EHDBCK360-NC	315
EHDB520	300V	—	EHDBCK520-NC	513
EHDB650	300V	—	EHDBCK650-NC	513
EHDB800	300V	—	EHDBCK800-NC	690
EHDB960	300V	—	EHDBCK960-NC	690



EHDBCK280-NC

Lug kits

Contactor size	Wire size	Catalog number	List price
2 & 3 Pole			
EHDB220 – EHDB280	6-250	EHTK210	\$ 90
EHDB360 – EHDB650	4-500	EHTK550N	150
EHDB800	(2) 4-500	EHTK700	200
EHDB960	(3) 2-600	EHTK800	450

Technical data

Type DA

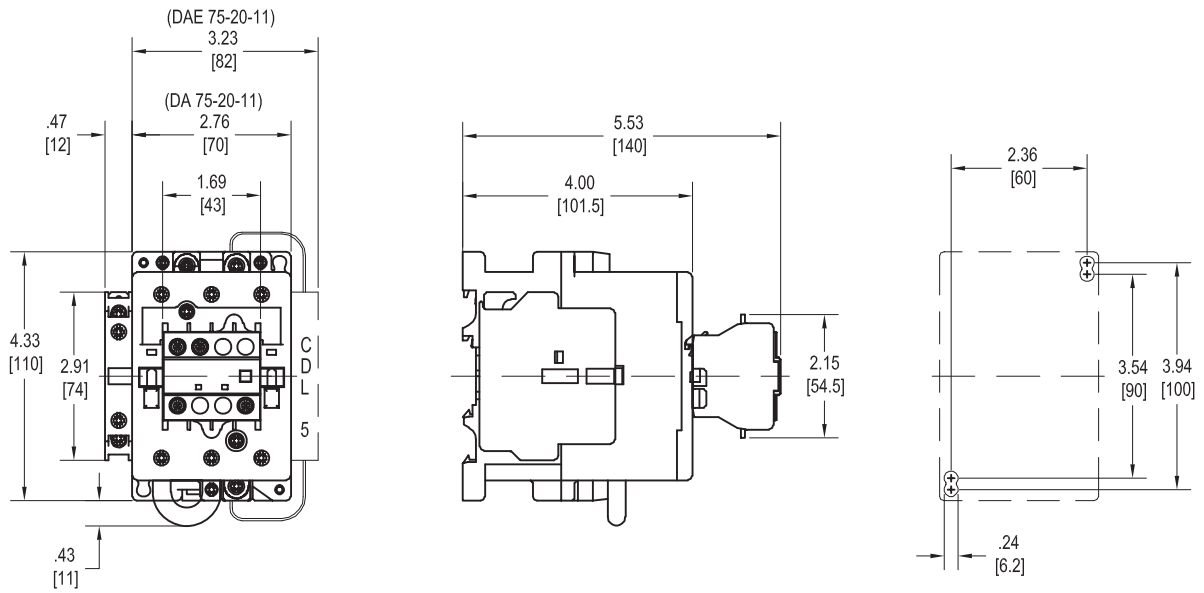
Contactor		DA75-21	DA75-21A
Main poles			
N.O. Poles, Amps @ 500VDC	A	60	60
240 VDC	HP	15	15
500 VDC	HP	30	30
Center pole			
N.C. Pole, 160V Make	Max. Amps	90	—
N.C. Pole, 160V Break	Max. Amps	55	—
N.C. Pole, 300V Make	Max. Amps	—	90
N.C. Pole, 300V Break	Max. Amps	—	55
DC rating			
Maximum thermal current	A	60	60
Peak interrupting current	A	90	90
Connectable wire size			
Main poles with lugs		8 – 1	8 – 1
Auxiliary contacts, min/max		18 – 10	18 – 10
Main contacts (contactor life)			
Mechanical endurance @ no load	mil.	5	5
Electrical endurance, main poles	mil.	1.5	1.5
Frequency of operations	per hour	600	600
Auxiliary contacts			
NEMA rating		A600	A600
AC rated voltage	V	600	600
AC thermal rated current	A	10	10
AC maximum making	VA	7200	7200
AC maximum breaking	VA	720	720
NEMA rating		P600	P600
DC rated voltage	V	600	600
DC thermal rated current	A	5	5
DC maximum make-break	A	0.2	0.2
Min. breakdown AC RMS voltage			
between live parts and ground	V	2200	2200
Minimum permissible load, 17V	A	0.005	0.005
Max. wire size on terminals @ 2/term		10 AWG	10 AWG
Max. operations per hour		600	600
Min. expected mechanical life	mil.	10	10
Min. expected electrical life	mil.	2	2
Coil operating data			
AC power consumption			
Inrush 60 Hz	VA	200	200
Holding 60 Hz	VA	20	20
Holding 60 Hz	W	5.5	5.5
AC operating time (in milliseconds)			
Closing time	ms	20 – 25	20 – 15
Opening time	ms	10 – 15	10 – 15
General data			
Approximate weight	lbs	2.4	2.4
Temperature limits			
Maximum operating temperature	°C	50	50
Minimum operating temperature	°C	-25	-25
Minimum storage temperature	°C	-40	-40
Maximum storage temperature	°C	70	70
Min. breakdown AC RMS voltage	V	2200	2200
Operating altitude			
Maximum operating altitude	feet	10,000	10,000

Technical data Type EHDB

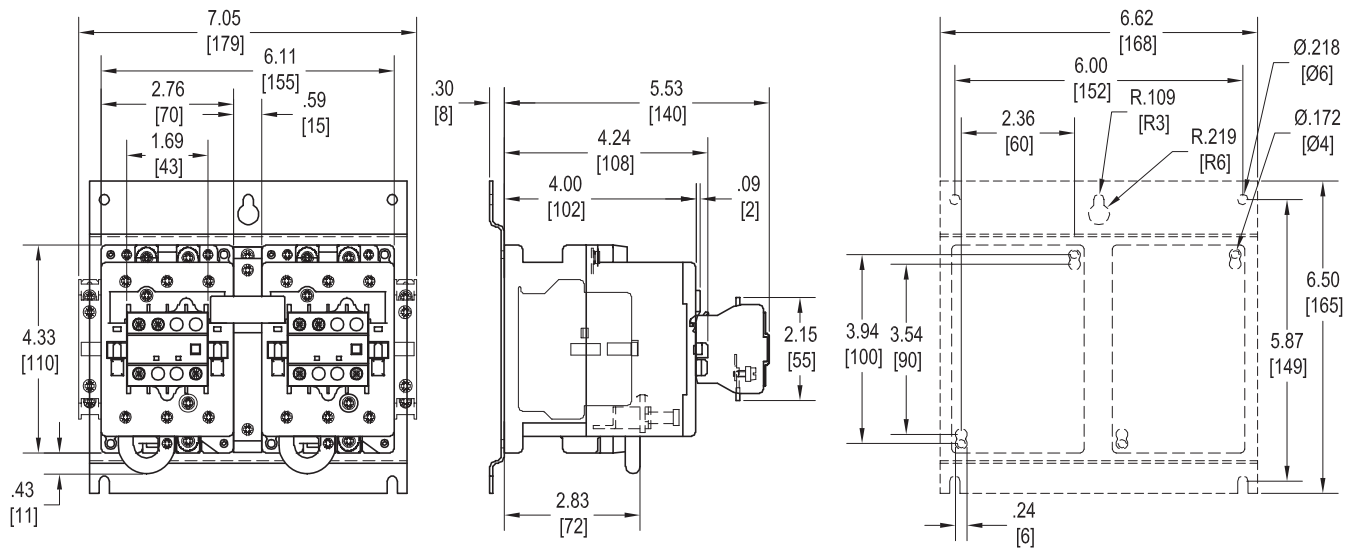
Contactor model number		EHDB220	EHDB280	EHDB360	EHDB520	EHDB650	EHDB800	EHDB960
N.O. poles, Amps	600 VDC	220	280	360	520	650	800	960
N.C. pole, 600V Make	Max. amps	456	565	728	1040	1300	1600	1920
N.C. pole, 300V Break	Max. amps	285	363	472	680	850	1050	1250
Connectable wire size								
Main poles with lugs		8 – 30	5 – 250 kcmils	4 – 500 kcmils	(2) 4 – 500 kcmils	(2) 4 – 500 kcmils	(3) 2 – 600 kcmils	(3) 2 – 600 kcmils
Auxiliary contacts	min./max.	16/10	16/10	16/10	16/10	16/10	16/10	16/10
DC rating information								
	No. Poles							
Peak interrupting current	A	330	420	540	780	975	1200	1440
Maximum thermal current	A	220	280	360	520	650	800	960
Main contacts (contactor life)								
Mechanical endurance @ no load	mil.	5	5	5	5	5	5	5
Electrical endurance	mil.	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Frequency of operations	per hour	300	300	300	300	300	300	300
Auxiliary contacts								
NEMA rating		A600	A600	A600	A600	A600	A600	A600
AC rated voltage	V	600	600	600	600	600	600	600
AC thermal rated current	A	10	10	10	10	10	10	10
AC maximum making	VA	7200	7200	7200	7200	7200	7200	7200
AC maximum breaking	VA	720	720	720	720	720	720	720
NEMA rating								
DC rated voltage	V	600	600	600	600	600	600	600
DC thermal rated current	A	5	5	5	5	5	5	5
DC maximum make-break	A	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Min. breakdown AC RMS voltage between live parts and ground		2200	2200	2200	2200	2200	2200	2200
Min. permissible load, 17V	A	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Expected mechanical life	mil.	5	5	5	5	5	5	5
Max. operations per hour		300	300	300	300	300	300	300
Coil operating data								
AC power consumption								
Inrush 60 Hz	VA	900	900	1200	2900	2900	400	4000
Holding 60 Hz	VA	52	52	65	105	105	140	140
Holding 60 Hz	W	18	18	22	44	44	60	60
DC power consumption								
Inrush	W	500	500	630	800	800	1100	1100
Holding	W	3.6	3.6	4	20	20	20	20
AC operating time								
Closing time	ms	20 – 30	20 – 30	20 – 30	30 – 50	30 – 50	30 – 50	30 – 50
Opening time	ms	7 – 15	7 – 15	7 – 15	10 – 20	10 – 20	10 – 20	10 – 20
DC operating time								
Closing time	ms	30 – 40	30 – 40	30 – 40	60 – 80	60 – 80	60 – 80	60 – 80
Opening time	ms	27 – 37	27 – 37	27 – 37	10 – 20	55 – 75	55 – 75	55 – 75
General data								
Approximate weight	lbs	9.2	9.2	13	27.3	27.3	37	38
Temperature limits								
Maximum operating temperature	°C	70	70	70	70	70	70	70
Minimum operating temperature	°C	-40	-40	-40	-40	-40	-40	-40
Minimum storage temperature	°C	-50	-50	-50	-50	-50	-50	-50
Maximum storage temperature	°C	70	70	70	70	70	70	70
Min. Breakdown AC	RMS Voltage	2200	2200	2200	2200	2200	2200	2200
Operating altitude								
Maximum operating altitude	feet	10,000	10,000	10,000	10,000	10,000	10,000	10,000

Approximate dimensions Type DA, 2 & 3 pole

DA75

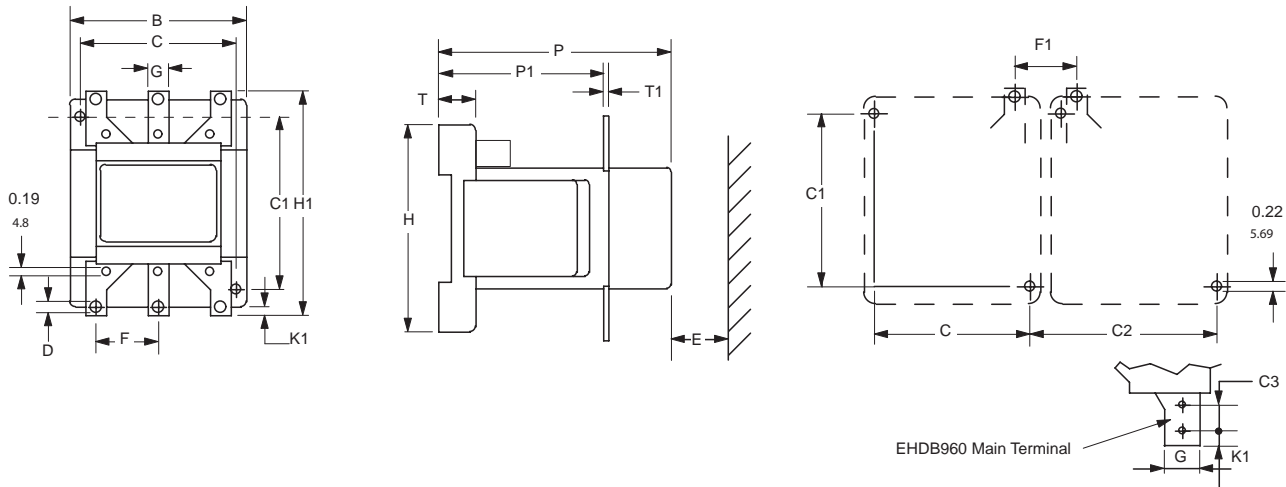


DA75M



Approximate dimensions Type EHDB 2 & 3 pole; Mounting positions

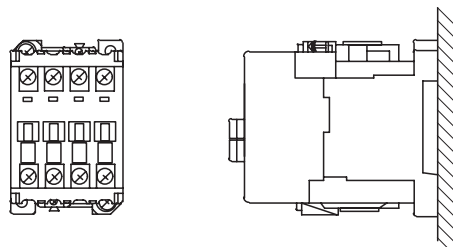
EHDB220 – EHDB960

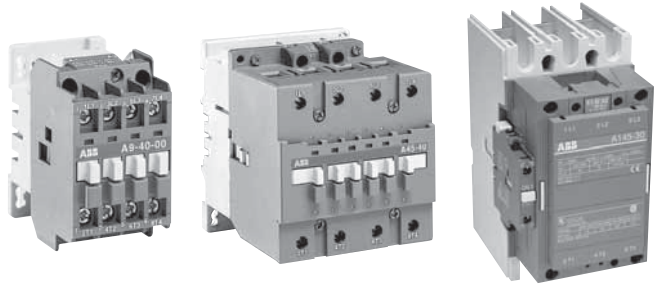


DIM.	B				B2	C	C1	C2				E	D	F	G	H	H1	K1	P	P1	T	T1	C3	
	1, 2	3	4	①				②	③	④														
								Aux. contact block																
EHDB220in	5.35	5.83	6.30	6.46	4.72	5.51	5.39	5.39	5.87	6.34	0.59	0.24	1.77	0.79	6.14	7.79	0.39	6.65	4.06	0.41	0.20	--		
mm	136	148	160	164	120	140	137	137	149	161	15	6	45	20	156	198	10	169	103	10.5	5	--		
EHDB280in	5.35	5.83	6.30	6.46	4.72	5.51	5.39	5.39	5.87	6.34	0.59	0.24	1.77	0.79	6.14	7.79	0.39	6.65	4.06	0.41	0.20	--		
mm	136	148	160	164	120	140	137	137	149	161	15	6	45	20	156	198	10	169	103	10.5	5	--		
EHDB360in	6.92	7.44	7.72	8.11	6.30	5.51	7.20	7.32	7.48	7.76	1.18	0.24	2.44	0.98	6.14	8.14	0.49	6.88	4.21	0.7	0.20	--		
mm	176	189	196	206	160	140	183	186	190	197	30	6	62	25	156	207	12.5	175	107	19	5	--		
EHDB520in	7.80	8.23	8.62	8.90	6.69	7.87	7.91	7.91	8.19	8.54	1.57	0.24	2.64	0.98	8.78	10.71	0.49	8.90	5.51	0.9	0.24	--		
mm	198	209	219	226	170	200	201	201	208	217	40	6	67	25	223	272	12.5	226	140	23	6	--		
EHDB650in	7.80	8.23	8.62	8.90	6.69	7.87	7.91	7.91	8.19	8.54	1.57	0.24	2.64	0.98	8.78	10.71	0.49	8.90	5.51	0.9	0.24	--		
mm	198	209	219	226	170	200	201	201	208	217	40	6	67	25	223	272	12.5	226	140	23	6	--		
EHDB800in	9.61	9.96	10.31	10.63	8.66	7.87	9.69	9.69	10.00	10.35	1.57	0.24	3.23	1.57	8.78	11.57	0.79	8.90	5.51	0.9	0.24	--		
mm	244	253	262	270	220	200	246	246	254	263	40	6	82	40	223	294	20	226	140	23	6	--		
EHDB960in	9.61	9.96	10.31	10.63	8.66	7.87	9.69	9.69	10.00	10.35	1.57	0.24	3.23	1.57	8.78	11.57	0.79	8.90	5.51	0.9	0.24	1.36		
mm	244	253	262	270	220	200	246	246	254	263	40	6	82	40	223	294	20	226	140	23	6	34.5		

- ① Minimum dimension
 - ② Makes distance F1 = F
 - ③ Includes space for three auxiliary contact blocks between the contactors.
 - ④ Includes space for four auxiliary contact blocks between the contactors.
 - ⑤ Damping elements are included.
- NOTE: Screw, nut and washer are included for terminal hardware.

Type DA & EHDB mounting positions





Applications

Lighting contactors can be used to control a variety of lighting loads including:

- Tungsten filament lighting loads (incandescent)
- Electric discharge lighting loads (ballast)

Description

The A-Line lighting contactors are available with or without an enclosure.

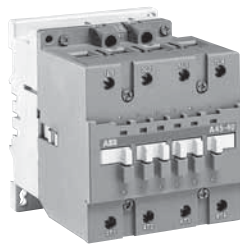
- Maximum operating voltage of 600VAC 60Hz
- Includes 3, 4, 8 or 12 pole versions, other versions on request
- Electrically or mechanically held contactors
- IP 20 protection for connection terminals
- Can be mounted onto a mounting plate or a 35 X 7.5mm DIN rail
- UL/CSA Approved

A9 - A300

Electrically & mechanically held



A9-40-00



A45-40-00



A145-30-11

Normally Open Power Poles			Electrically Held					Mechanically Held				
Ballast Amp Rating	Incandescent (Tungsten) Amp Rating	Number of Power Poles	Open Type		UL Type 1 Enclosed			Open Type		UL Type 1 Enclosed		
			Catalog number	List price	Enclosure Size	Catalog number	List price	Catalog number	List price	Enclosure Size	Catalog number	List price
15	15	4	A9-40-00-84	\$ 120	A	A9C4P1-84	\$ 175	A9L-40-00-84	\$ 214	A	A9LC4P1-84	\$ 269
15	15	8	A9-80-00-84	272	A	A9C8P1-84	327	A9L-80-00-84	460	A	A9LC8P1-84	515
15	15	12	A9-120-00-84	392	A	A9C12P1-84	447	A9L-120-00-84	674	A	A9LC12P1-84	729
30	20	4	A16-40-00-84	165	A	A16C4P1-84	220	A16L-40-00-84	259	A	A16LC4P1-84	314
30	20	8	A16-80-00-84	362	A	A16C8P1-84	417	A16L-80-00-84	550	A	A16LC8P1-84	605
30	20	12	A16-120-00-84	527	A	A16C12P1-84	582	A16L-120-00-84	809	A	A16LC12P1-84	864
30	30	4	A16-40L-00-84	175	A	A16C4PL1-84	230	A16L-40L-00-84	269	A	A16LC4PL1-84	324
30	30	8	A16-80L-00-84	372	A	A16C8PL1-84	427	A16L-80L-00-84	560	A	A16LC8PL1-84	615
30	30	12	A16-120L-00-84	537	A	A16C12PL1-84	592	A16L-120L-00-84	819	A	A16LC12PL1-84	874
35	35	4	A26-40-00-84	228	A	A26C4P1-84	283	A26L-40-00-84	322	B	A26LC4P1-84	409
35	35	8	A26-80-00-84	488	A	A26C8P1-84	543	A26L-80-00-84	676	B	A26LC8P1-84	764
35	35	12	A26-120-00-84	716	B	A26C12P1-84	803	A26L-120-00-84	998	B	A26LC12P1-84	1,085
50	50	3	A30-30-10-84	252	A	A30C3P1-84	328	A30L-30-10-84	346	C	A30LC3P1-84	522
60	60	3	A40-30-10-84	297	A	A40C3P1-84	373	A40L-30-10-84	391	C	A40LC3P1-84	567
60	60	4	A45-40-00-84	360	B	A45C4P1-84	536	A45L-40-00-84	454	C	A45LC4P1-84	730
65	65	3	A50-30-00-84	300	B	A50C3P1-84	424	A50L-30-00-84	394	C	A50LC3P1-84	618
65	65	4	A50-40-00-84	413	B	A50C4P1-84	568	A50L-40-00-84	507	C	A50LC4P1-84	772
85	85	3	A63-30-00-84	342	B	A63C3P1-84	502	A63L-30-00-84	436	C	A63LC3P1-84	696
105	105	3	A75-30-00-84	383	B	A75C3P1-84	576	A75L-30-00-84	477	C	A75LC3P1-84	770
105	105	4	A75-40-00-84	525	B	A75C4P1-84	672	A75L-40-00-84	619	C	A75LC4P1-84	866
120	120	3	A95-30-00-84	420	B	A95C3P1-84	720	---	---	---	---	---
200	200	3	A145-30-00-84	785	E	A145C3P1-84	1,336	---	---	---	---	---
300	300	3	A210-30-00-84	1,595	F	A210C3P1-84	3,624	---	---	---	---	---
400	400	3	A300-30-00-84	1,835	F	A300C3P1-84	3,864	---	---	---	---	---

Normally Closed Power Poles			Electrically Held					Mechanically Held				
Ballast Amp Rating	Incandescent (Tungsten) Amp Rating	Number of Power Poles	Open Type		UL Type 1 Enclosed			Open Type		UL Type 1 Enclosed		
			Catalog number	List price	Enclosure Size	Catalog number	List price	Catalog number	List price	Enclosure Size	Catalog number	List price
30	20	4	A16-04-00-84	\$ 165	A	A16C4NCP1-84	\$ 220	A16L-04-00-84	\$ 259	A	A16LC4NCP1-84	\$ 314
30	20	8	A16-08-00-84	362	A	A16C8NCP1-84	417	A16L-08-00-84	550	A	A16LC8NCP1-84	605
30	20	12	A16-012-00-84	527	A	A16C12NCP1-84	582	A16L-012-00-84	809	A	A16LC12NCP1-84	864

2 Normally Open & 2 Normally Closed Power Poles			Electrically Held					Mechanically Held				
Ballast Amp Rating	Incandescent (Tungsten) Amp Rating	Number of Power Poles	Open Type		UL Type 1 Enclosed			Open Type		UL Type 1 Enclosed		
			Catalog number	List price	Enclosure Size	Catalog number	List price	Catalog number	List price	Enclosure Size	Catalog number	List price
15	15	2NO/2NC	A9-22-00-84	\$ 120	A	A9C22P1-84	\$ 175	A9L-22-00-84	\$ 214	A	A9LC22P1-84	\$ 269
30	20	2NO/2NC	A16-22-00-84	165	A	A16C22P1-84	220	A16L-22-00-84	259	A	A16LC22P1-84	314
35	35	2NO/2NC	A26-22-00-84	228	A	A26C22P1-84	283	A26L-22-00-84	322	B	A26LC22P1-84	409
60	60	2NO/2NC	A45-22-00-84	360	B	A45C22CP1-84	536	A45L-22-00-84	454	C	A45LC22CP1-84	730
105	105	2NO/2NC	A75-22-00-84	525	B	A75C22CP1-84	672	A75L-22-00-84	619	C	A75LC22CP1-84	866

A9 - A300

Electrically & mechanically held



Coil voltage selection

All catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A75-30-00-80

Coil voltage selection

Hz	Cntr Type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84					80			85	86			55

For other voltages, consult factory

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A	0	7	8	9

For other voltages, consult factory

Control transformer option

Contactor size	VA rating	List price adder
A9 - A40	45	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95	100	560
A145	150	720
A210 - A300	250	795

Accessories Factory modifications



CAL5-11

CA5-10



WB75A-01



RV5/50

Accessories

Auxiliary contact blocks

Mounting on contactors	Positioning	Contacts 	Catalog number	List price
A 9 ... A 95	Front face	1 - - 1	CA5-10 CA5-01	\$ 15
A 9 ... A 40	Front face	3 1 2 2	CA5-31M CA5-22M	
A 9 ... A 75	Side	1 1	CAL5-11	30
A 95 ... A 300	Side	1 1	CAL18-11	
A145... A 300	Side	1 1	CAL18-11B	

Mechanical latch

For contactors	Voltage	Catalog number	List price
A 9 ... A 75	24 ... 28 V a.c./d.c.	WB75A-01	\$ 84
	48 ... 55 V a.c./d.c.	WB75A-03	
	110 ... 127V a.c./d.c.	WB75A-04	
	230 ... 277 V a.c./d.c.	WB75A-05	
	380 ... 440 V a.c./d.c.	WB75A-07	
	440 ... 480 V a.c./d.c.	WB75A-08	

Surge suppressor, varistor

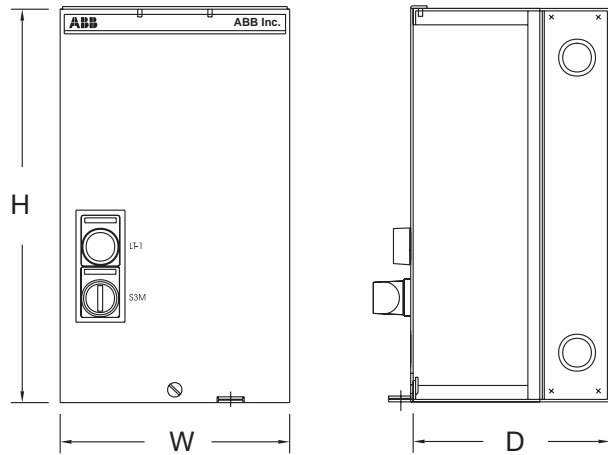
For contactors	Voltage range	Catalog number	List price
A 9 ... A 110	24 ... 50 V a.c./d.c.	RV5/50	\$ 30
	50 ... 133 V a.c./d.c.	RV5/133	
	110 ... 250 V a.c./d.c.	RV5/250	
	250 ... 440 V a.c./d.c.	RV5/440	

Factory modifications for enclosed contactors

Pilot devices

Description	Suffix code	List price
Selector - 2 position maintained OFF - ON	C	\$ 72
Selector - 3 position maintained HAND OFF - AUTO	D	72
Pilot light - ON (green)	R	135

Approximate dimensions



Enclosure dimensions (in)

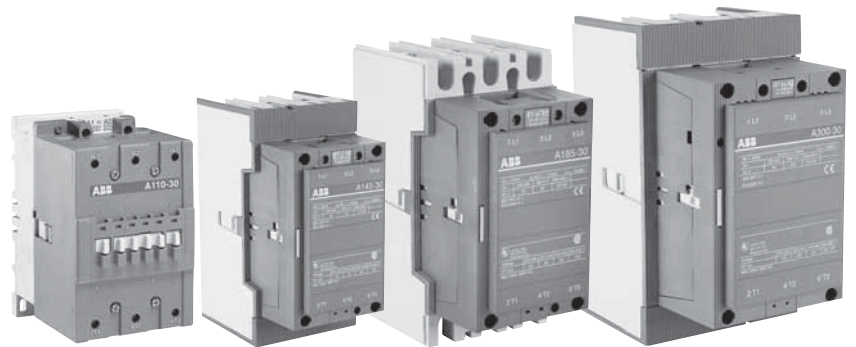
Type	H	W	D
A	11	6	5
B	13	9	7
C	14	12	8
D	24	12	8
E	30	24	9

Welding isolation Contactors



Welding isolation contactors

1



Applications

ABB welding isolation contactors are suited to the rugged demands set forth by the automotive industry and are specifically designed for use in high current welding applications. ABB is the leading contactor supplier for automotive welding applications.

Features

- Includes sizes:
 - W3 thru W6 in 3 pole configurations
 - W4 thru W5 in 2 pole configurations
 - Unique contact design assures reliable and safe operation during high current welding cycles
 - 1 N.O. & 1 N.C. auxiliary contacts are standard and up to 6 additional auxiliary contacts may be added to provide a total of 8 (4 N.O. & 4 N.C.)
 - Easy front removal of arc chute for quick inspection and change of contacts
 - Operates over an extended voltage range of 85% to 110% of rated control voltage
 - UL Listed, File # E79416
 - CSA Certified, File # LR19700
- AW welding isolation contactors can save substantial space compared to other conventional contactors.

140A – 600A 2 & 3 Pole



A110W



A300W



AF460W

3-Pole, A.C.

Size	Amp rating	Catalog number	List price
W3	140	A110W-30-11-84	\$ 480
—	200	A145W-30-11-84	825
W4	250	A185W-30-11-84	1290
—	300	A210W-30-11-84	1635
W5	350	A260W-30-11-84	1815
—	400	A300W-30-11-84	1875
W6	600	AF460W-30-11-70	4425

2-Pole, A.C.

Size	Amp rating	Catalog number	List price
W3	140	—	—
—	200	A145W-20-11-84	\$ 750
W4	250	A185W-20-11-84	1180
—	300	A210W-20-11-84	1500
W5	350	A260W-20-11-84	1675
—	400	A300W-20-11-84	1750
W6	600	—	—

Coil voltage selection – wide range AC/DC coils for AF contactors

All AC operated catalog numbers include a 100-250 V AC/DC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 24V coil is required for a AF460W contactor: AF460W-30-11-68

Coil voltage selection – A contactors

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A75-30-11-80

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations.

Vertical connection bars between 2 pole contactor and MCCB – two bars

MCCB	For contactor	Catalog number	List price
S3, S4	A145W-20 – A185W-20	BEA185-20D/S3S4	\$ 50
S3,S4	A210W-20 – A300W-20	BEA210-20D/S4	55
S5	A210W-20 – A300W-20	BEA300-20D/S5	60

For other accessories, see page 1.16 to 1.35.

Coil voltage selection chart – A contactors

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – AF50 to AF750

AC/DC VOLTS, 40 - 60 HZ			
24 - 60 DC	20 - 60 DC	48 - 130 AC/DC	100 - 250 AC/DC
68 ①	72 ②	69	70

① AF400 – AF750, DC only.

② AF50 – AF300, DC only.

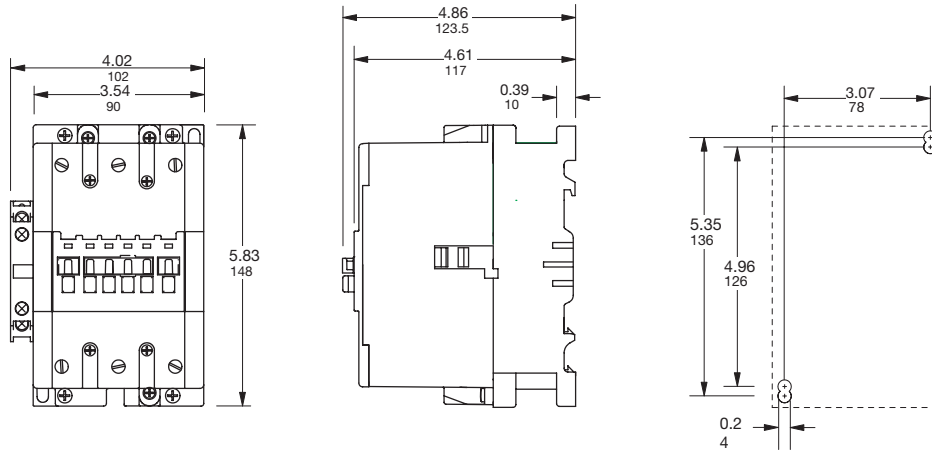
Technical data

Frame size	A110W	A145W	A185W	A210W	A260W	A300W	AF460W
Amp rating, 50°C	140	200	250	300	350	400	600
Making capacity, 600 VAC	1320	1740	2220	2520	3120	3360	4550
Breaking capacity, 480 VAC	880	1160	1480	1680	2080	2240	4180
Withstand current							
RMS	2500	2700	2900	3200	3600	4100	5800
Peak	3500	3900	4100	4600	5200	5900	8816
Short time current							
1 second	1320	1800	2000	2500	3100	3500	4600
10 seconds	800	1200	1500	1700	2100	2400	4400
30 seconds	500	800	1000	1200	1300	1500	3100
1 minute	350	600	800	1000	1000	1100	2500
15 minute	175	280	320	400	450	500	840
Coil operating data							
A.C. power consumption							
Inrush 60 Hz, VA	450	600	600	1350	1350	1350	800
Holding 60 Hz, VA	27	40	40	65	65	65	40
Holding 60 Hz, W	8	12	12	19	19	19	4.5
Maximum short circuit ratings							
MCCB							
kA @ 480VAC	85	85	85	85	85	85	84
kA @ 600VAC	35	35	35	35	35	35	42
Class J fuses							
kA @ 600VAC	200	200	200	200	200	200	–

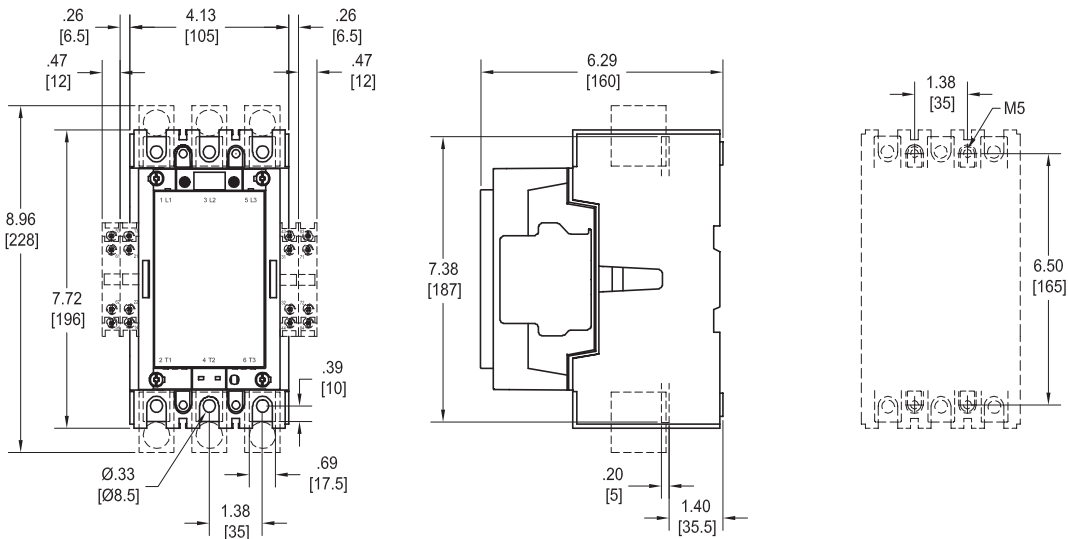
Approximate dimensions A110W – A300W

← 00.00 → Inches
00.00 → [Millimeters]

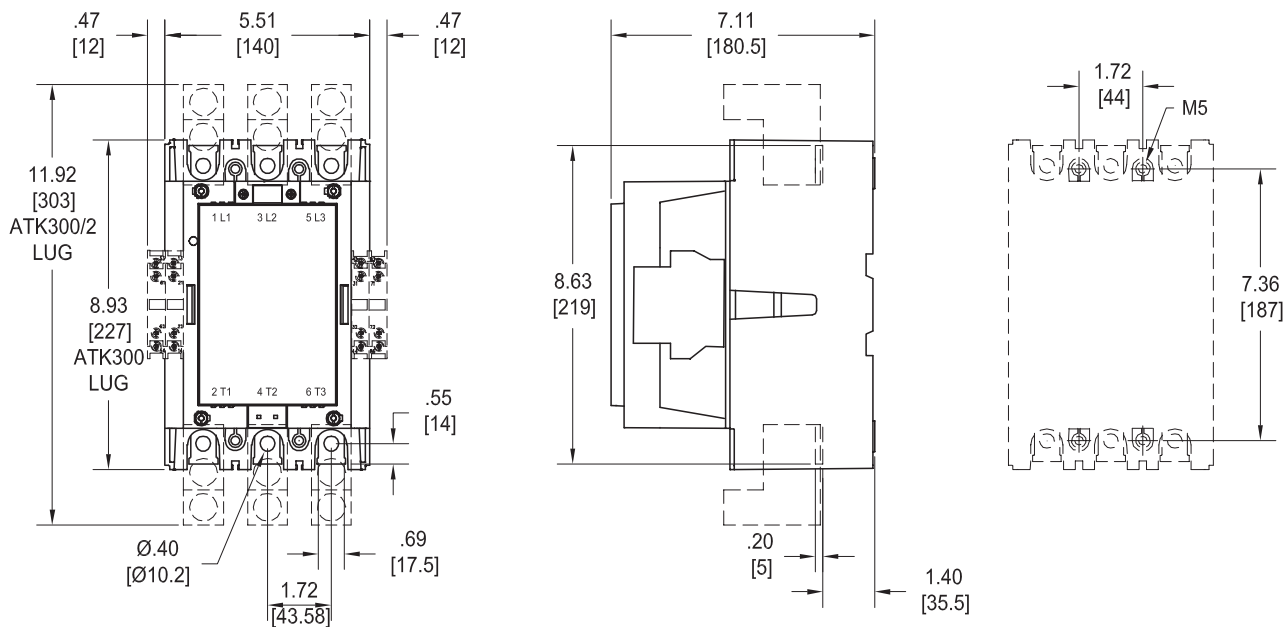
A110W



A145W, A185W



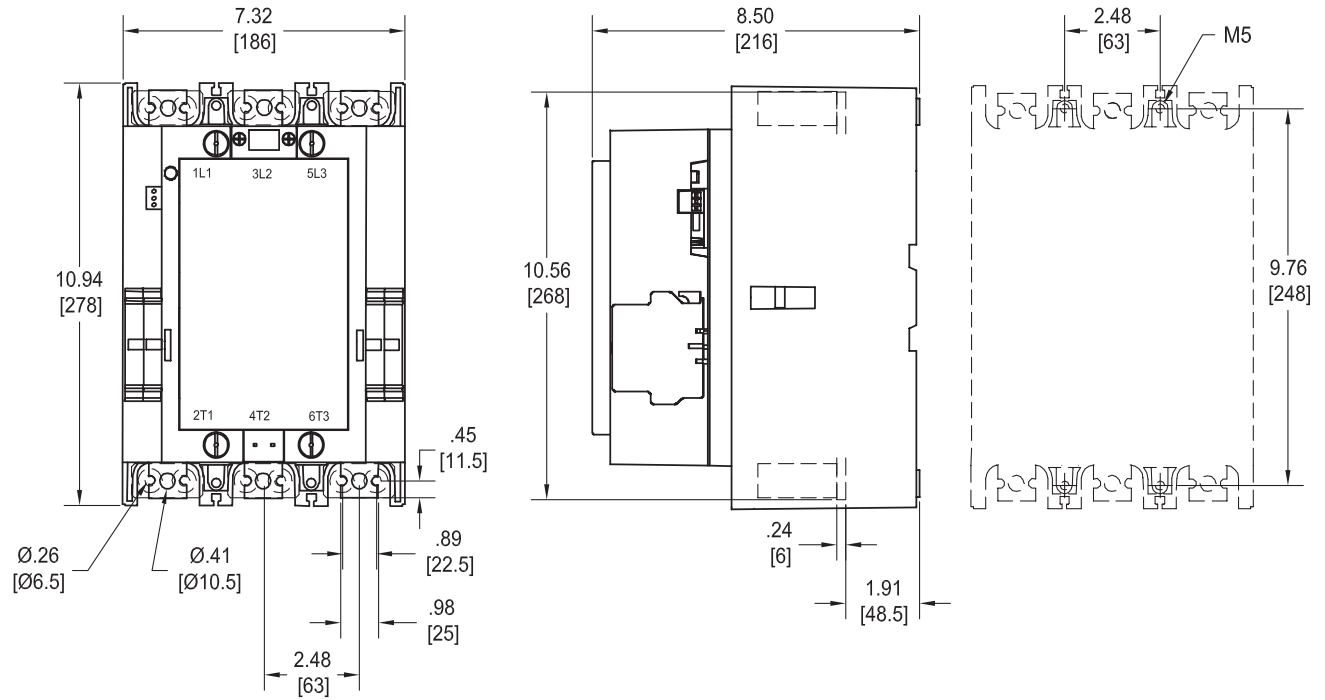
A210W, A260W, A300W



Approximate dimensions AF460W

00.00 Inches
00.00 [Millimeters]

AF460W



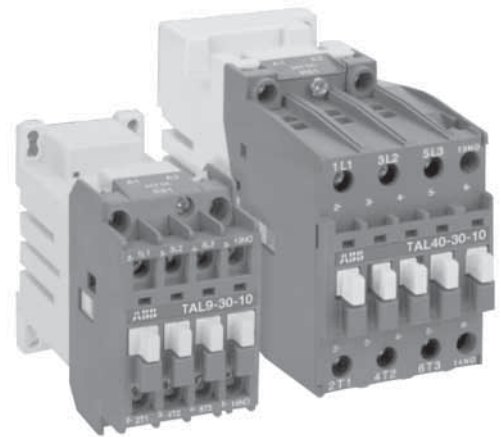
Notes

AC Circuit switching Contactors



AC Circuit switching contactors
Type TAL & TAE

1



Description

TAL and TAE contactors with a wide coil voltage range are designed to operate in control circuits with large voltage variations. Example: battery supply.

TAL9 - TAE110 D.C. Operated 3 & 4 pole



TAL9-30-01

3 Pole

General purpose current		Maximum motor horsepower ratings $\frac{hp}{kw}$				Standard auxiliary contacts		Catalog number	List price
AC1	AC3	208V	240V	480V	575/600V	N.O.	N.C.		
22	9	2	2	5	7.5	1 0	0 1	TAL9-30-10-★ TAL9-30-01-★	\$ 141
25	11	3	3	7.5	10	1 0	0 1	TAL12-30-10-★ TAL12-30-01-★	173
28	16	5	5	10	15	1 0	0 1	TAL16-30-10-★ TAL16-30-01-★	218
45	25	7.5	10	20	25	1 0	0 1	TAL26-30-10-★ TAL26-30-01-★	263
55	30	10	10	25	30	1 0	0 1	TAL30-30-10-★ TAL30-30-01-★	338
60	42	10	15	30	40	1 0	0 1	TAL40-30-10-★ TAL40-30-01-★	354
100	50	15	20	40	50	0 1	0 1	TAE50-30-00-★ TAE50-30-11-★	388 428
125	75	25	30	60	75	0 1	0 1	TAE75-30-00-★ TAE75-30-11-★	560 600
146	96	30	30	60	75	0 1	0 1	TAE95-30-00-★ TAE95-30-11-★	600 640
160	110	30	40	75	100	0 1	0 1	TAE110-30-00-★ TAE110-30-11-★	755 795

★ To select a coil voltage, substitute the code from the Coil Voltage Selection Chart for the ★

4 Pole

Rated operational current		Maximum motor horsepower ratings $\frac{hp}{kw}$				Standard auxiliary contacts		Catalog number	List price
AC1 0≤40°C	AC1 0≤55°C	208V	240V	480V	575/600V	N.O.	N.C.		
22	20	2	2	5	7.5	0	0	TAL9-40-00-★	\$ 190
28	25	5	5	10	15	0	0	TAL16-40-00-★	268
45	40	7.5	10	20	25	0	0	TAL26-40-00-★	303
70	60	10	10	25	30	0	0	TAE45-40-00-★	405
100	85	15	20	40	50	0	0	TAE50-40-00-★	505
125	105	25	30	60	75	0	0	TAE75-40-00-★	615

★ To select a coil voltage, substitute the code from the Coil Voltage Selection Chart for the ★

4 Pole mounted with 2 N.O. & 2 N.C. main poles

Rated operational current		Maximum motor horsepower ratings $\frac{hp}{kw}$				Standard auxiliary contacts		Catalog number	List price
AC1 0≤40°C	AC1 0≤55°C	208V	240V	480V	575/600V	N.O.	N.C.		
22	20	2	2	5	7.5	0	0	TAL9-22-00-★	\$ 190
28	25	5	5	10	15	0	0	TAL16-22-00-★	268
45	40	7.5	10	20	25	0	0	TAL26-22-00-★	303

★ To select a coil voltage, substitute the code from the Coil Voltage Selection Chart for the ★

These contactors can be used for controlling either 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with 1 single supply. When the contactor operates, there is no mechanical overlapping between the N.O. main poles and N.C. main poles: BREAK before MAKE.

NOTE: These contactors are not suitable for a reversing starter or a star-delta starter or for controlling a single load from 2 separate supplies.

Coil characteristics

No extra voltages applicable on the U_c min. - max. values of the Coil Voltage selection table.

Coil consumption at U_c max. and $q = 20$ °C:

- 9 W pull-in/holding for TBC type
- 450 W pull-in/ 7 W holding for TAE 50 and TAE 75 types
- 950 W pull-in/ 7 W holding for TAE 95 and TAE 110 types

Coil voltage selection

Min. U_c	Max	Voltage
17	32	51
24	45	52
36	65	54
42	78	58
50	90	55
77	143	62
90	150	66
152	264	68

Surge suppressors for contactor coils

For mounting on contactor type	Control voltage	Packing	Weight	Catalog number	List price
TAE/AE45 – TAE/AE75 TAL9 – TAL30	12 to 32 VDC	2	0.015	RT5/32	\$ 30
	25 to 65 VDC	2	0.015	RT5/65	
	50 to 90 VDC	2	0.015	RT5/90	
	77 to 150	2	0.015	RT5/150	
	150 to 264	2	0.015	RT5/264	

Technical data

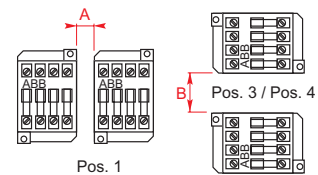
Type	Control circuit	Opening time growth factor	Residual overvoltage or clipping voltage	Remarks
RT5 /...transil diode			Advantages	<ul style="list-style-type: none"> • Good energy absorption • Unpolarized system • Simple, reliable system Disadvantages <ul style="list-style-type: none"> • A certain delay on drop out which does not reduce contactor breaking capacity
32	DC	2.5 to 3	50V	
65	DC	2.5 to 3	100V	
90	DC	2.5 to 3	150V	
150	DC	2.5 to 3	210V	
264	DC	2.5 to 3	390V	

NOTE: For all other accessories, see the Accessories section for across the line contactors, pages 1.16 – 1.32.
 TAL contactors use the same accessories as AL contactors.
 TAE contactors use the same accessories as AE contactors.

Technical data

Mounting Distance – for coil operating limits U_c min. - U_c max.

A mm	B mm	Ambient temp. °C	Max. switching frequency Operating cycles/h
2	20	≤ 20	1200
5	20	≤ 55	1200

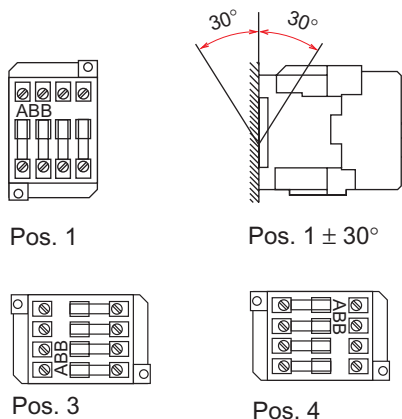


Add-on accessories

Contactors	Max. number of auxiliary contact blocks						Timer TP - A	Interlock unit	Label marker
	CA5-10	CA5-01	CA5-40	CA5-31	CA5-22	CA5-04			
pos. 1, 3 or 4 TAL - -30 - 00 TAL - -30 - 10 TAL - -40 - 00	4	2	1	1	1	-	-	VE5-1	BA5-50
pos. 1, 3 or 4 TAL - -30 - 01	4	1	1	1	-	-	-	VE5-1	BA5-50
pos. 1, 3 or 4 TAL - -22 - 00	4	-	1	-	-	-	-	VE5-1	BA5-50
pos. 1 ± 30° TAL - all types	-	-	-	-	-	-	-	VE5-1	BA5-50
all positions TAE -	6	6	1	1	1	1	1	VE5-2 ①	BA5-50

Note: Railway (traction) projects on request. Type RT surge suppressors are suitable for TAL and TAE contactors.

Mounting positions:



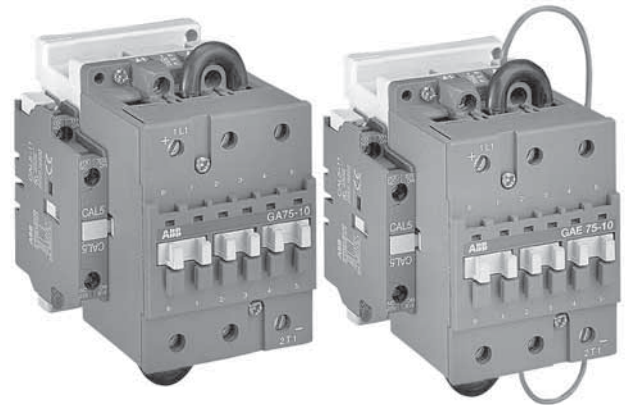
① Only valid for TAE 50-30-00 and TAE 75-30-00.

DC Circuit switching Contactors



DC Circuit switching contactors Type GA75 & GAE75

1



General

Arc suppression is more difficult in DC than in AC. To choose a contactor, it is necessary to know the current and voltage to be broken as well as the L/R time constant of the power circuit to be controlled.

Here are some typical time constant values:

- Non inductive loads such as resistance furnaces: $L/R \approx 1$ ms.
- Shunt motors: $L/R \approx 2$ ms.
- Series motors: $L/R \approx 7.5$ ms.

Remark: the addition of a resistor in parallel with an inductive winding makes arc suppression easier.

Types

GA75-10-... AC operated contactor
GAE75-10-... DC operated contactor

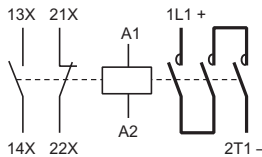
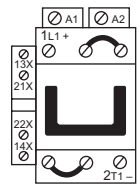
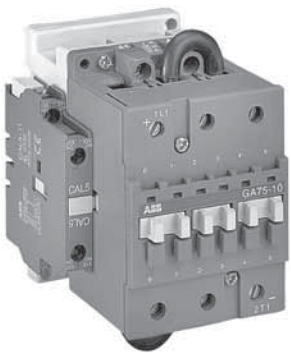
Description

GA and GAE contactors are mounted with arc chutes with permanent magnets specially designed for DC breaking.

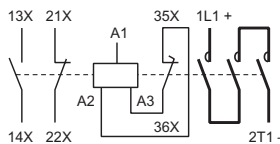
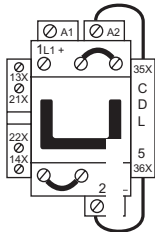
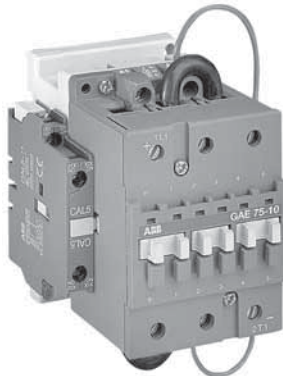
The three contactor paths are arranged in series via two supplied and mounted insulated connections (25 mm²).

The GA75 and GAE75 are "single-pole" devices for which the connection polarities, indicated next to the connection terminals, must be respected. See wiring diagram information on next page.

GA75 - GAE75



GA75-10-00-84



GAE75-10-00-84

Maximum rated operational current					Mounted auxiliary contacts		Catalog number	List price
DC-1		DC-3	DC-5		N.O.	N.C.		
$U_e \leq 440V$ A	$U_e \leq 600V$ A	$U_e \leq 440V$ A	$U_e \leq 220V$ A	$U_e \leq 440V$ A				
100	75	85	85	35	-	-	GA75-10-00-84	\$ 570
100	75	85	85	35	-	-	GAE75-10-00-81	675
					1	1	GAE75-10-11-81	705

Rated insulation voltage $U_i = 1000V$ d.c. according to IEC 947-4-1.
Maximum switching frequencies: 300 operating cycles/h

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. All DC operated catalog numbers include a 24VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240VAC coil is required for a GA75 contactor: GA75-10-00-80
A 110VDC coil is required for a GAE75 contactor: GAE75-10-00-86

Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	GA		81	83	84	84		34	75	80	42	48	86	86	51	53	55
50	GA		81	83	84				80				85	86			55
DC	GAE	80	81	83	86				88	89							

For other voltages, see page 1.26.

Accessories

Standard **A** and **AE 40 - 75** contactor accessories are suitable for **GA75** and **GAE75** contactors. Coils are the standard coils for **A** and **AE50 - 75** contactors. Contacts cannot be changed.

Wiring diagrams

In D.C. circuits, the source to earth (or frame) connection mode is an important element.

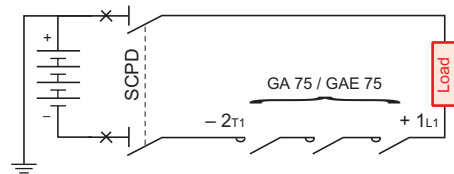
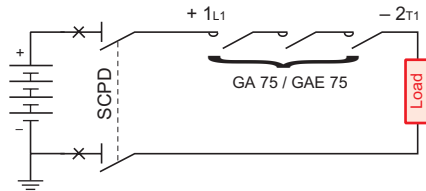
Three modes are mainly used:

- A** – insulated source, i.e. unearthed (or not connected to the frame).
- B** – source earthed via its central point.
- C** – source earthed via one of its outer poles.

Modes **A** and **B** do not impose any constraints with regard to the distribution of the contactor poles between the two source/load connecting branches. Mode **C** requirements are therefore suitable for modes **A** and **B**.

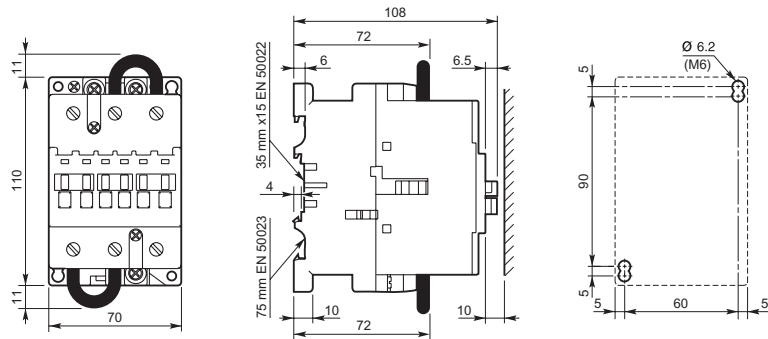
For mode **C**, all the poles necessary for breaking must be installed in series between the load and the ungrounded source polarity. We recommend this solution for all connection modes.

The above provisions relate to power circuit switching, the SCPD (Short-Circuit Protection Device) must comply with protection rules.

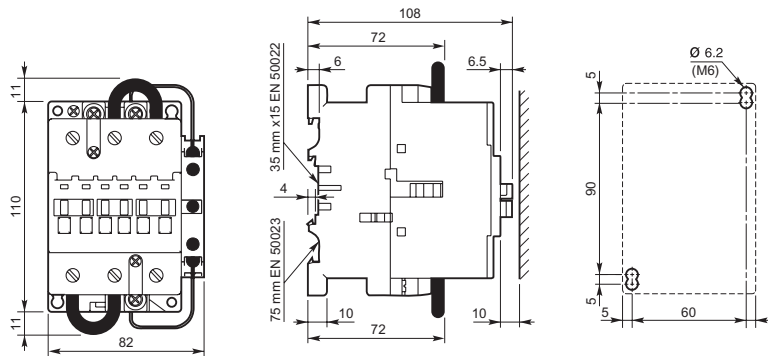


Approximate dimensions (mm)

GA75

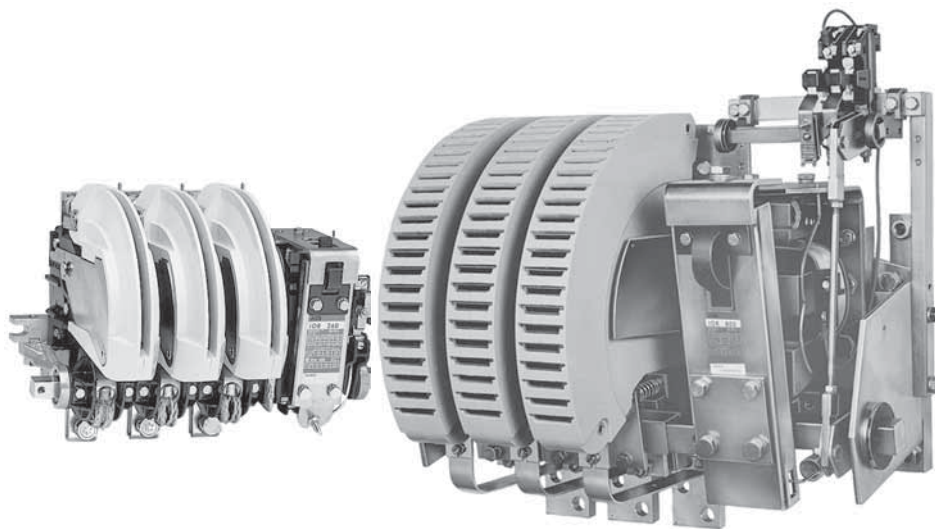


GAE75



Notes

Bar Contactors



Description

- Variable number and type of main poles, (N.O., N.C.)
- Large number and type of auxiliary contacts
- Extremely versatile and easily accessible for maintenance
- Main poles maximum operating voltage:
 - AC switching up to 500 V, Type IOR
 - AC switching up to 1200V, Type IOR – MT
 - DC switching up to 440V, Type IOR
 - DC switching up to 750V, Type IOR – CC
- Specific construction available as standard:
 - Contactors with N.O./N.C. main poles, with or without overlapping
 - Contactors with magnetic latch or mechanical latch

Applications

Bar mounted contactors are largely used in the iron and steel industry for traction (rolling stock), electrolysis and hoisting equipment for applications from 63A to 5000A.

Standards

Bar contactors comply with major international standards:

- | | |
|-------------------|---|
| • IEC 947-4-1 | International Electrotechnical Commission |
| • UTE NF C 63-110 | France |
| • VDE 0660 | Germany |
| • BS 5424 | Great Britain |
| • NBN 222-2 | Belgium |

Please fill out the form on the next page with the required information and fax to us at 940-397-7085, ATTN: Standard control. We will get right back to you!

Specification check list

**Copy, complete, and fax to
us at 940-397-7085. We'll
get right back to you!**

NAME: _____

COMPANY: _____

PHONE: _____

FAX: _____

Control circuit**Supply**
 AC current
VoltageV ... Hz

 DC current
Voltage ... VDC
Operating
 AC current R
Rectified current RR

 DC current RE
(economy resistor)
DC current RC
(solid core
magnetic circuit)
Available auxiliary contacts

NO contacts: _____

NC contacts: _____

Magnetic latch **Mechanical latch**
 Latching voltage
Delatching voltage

 BF: _____
BOI: _____
Switching frequency

Number of operations: _____

On-load factor: _____

Dimensions

Fixing dimension F=: _____mm

Expected delivery date: / /

Alternative current

AC1, AC2, AC3, AC4

Direct current
 DC1, DC2, DC3, DC4, DC5
L/R = ____ ms

 Rated operational current Ie: _____A
Rated operational voltage Ue: _____V
Rated insulation voltage Ui: _____kV
Number of poles

NO main poles: _____

NC main poles: _____

3-phase + Neutral: **Ratings**
 R63/85 R800 R3150
 R125/170 R1000 R4000
 R200/260 R1250 other
 R315/420 R1500
 R500/550 R2000
Contactors with NC main poles:
 With mechanical overlapping
 Without mechanical overlapping
 Adapted blow-out coil: (DC switching)

I = _____A

 No blow-out coil**Climactic conditions**
 Corrosive atmosphere
 Salty mist atmosphere
Additional information you can provide:

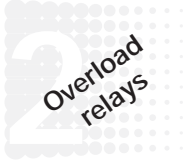
Specification sheet, electrical diagrams, mounting sketches and any other useful information.

Operating altitude

- above 2,000 meters
 below 2,000 meters



Thermal overload relays	2.1 – 2.18
Abstract from IEC 947-4-1	2.1
Accessories	2.7 - 2.8
Description	2.1 - 2.3
Dimensions.....	2.15 - 2.17
Flat pin terminal blocks	2.7
Mounting kit for TA450 overload relay.....	2.7 - 2.8
Remote tripping coils	2.8
Selection guide, TA25DU - TA450DU.....	2.4 - 2.5
Separate mounting kits	2.7
TA25 - TA450	2.6
Technical data	2.9 - 2.14
Terminal block - AWG #8 cable.....	2.7 - 2.8
Terminal lug kits.....	2.7
Terminal shrouds	2.7
Tripping classes of thermal overload relays	2.1
Electronic overload relays	2.19 – 2.28
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Accessories	2.22
Catalog number explanation	2.2
Description	2.19
Dimensions.....	2.27 - 2.28
E16DU - E800DU	2.21
Lug kits.....	2.22
Mounting kits.....	2.22
Separate mounting kits	2.22
Technical data	2.23 - 2.26
Terminal shrouds	2.22
Tripping classes of thermal overload relays	2.19



Notes

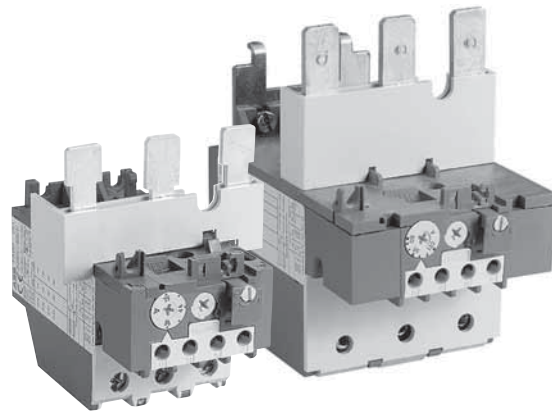
Thermal Overload relays



Thermal overload relays

Type TA
Class 10

2



Description

- Available for starter construction with A Line contactors and separate panel mounting
- Designed for close couple mounting
- Separate base mounting available for all overload relays
- Class 10 adjustable overload relays are standard with all ABB Line starters
- Reset can also be adjusted to function as a stop button
- Screwdriver guide holes
- All terminal screws are available from the front
- UL File No: E48139
- CSA File No: LR98336
- Trip indication
- Remote trip and reset option available
- Single phase and phase unbalance protection
- Isolated alarm circuit (N.O.) contact
- Ambient compensation: -25°C to +55°C (-13°F to +131°F)
- Manual test
- Manual or automatic reset
- Factory calibrated and tested
- Wide adjustment range

Tripping classes of the thermal overload relays

Standard classes in IEC 947-4-1 are classes: 10 A, 10, 20, 30. The tripping class indicates according to IEC 947-4-1 the maximum tripping time in seconds under specified conditions of test at 7.2 times the setting current and specifies tripping and non tripping times for 1.5 and 7.2 times the setting current. Mostly used class is 10 A.

Abstract from IEC 947-4-1

Tripping class	10 A	10	20	30
Max. tripping time at 1.5 x setting current (warm state) (s)	120	240	480	720
Tripping time at 7.2 x setting current (cold state) (s)	2 – 10	4 – 10	6 – 20	9 – 30
At 1.05 x setting current	no tripping			

TA thermal overload relays are used with A Line contactors for the protection of motors having a nominal voltage of up to 600VAC max per UL/CSA (690VAC and 800VDC per IEC).

Product range

• Standard relays:

Types: TA25DU, TA42DU, TA75DU, TA80DU, TA110DU, TA200DU and TA450DU

- TA25 to TA110 and TA200 are directly connected in the motor circuit.
- TA450DU relays are fed through a linear type transformer

• Special construction

Thermal overload relays with different certifications and approvals.
Relays for protection EEx e motors.

Construction and function

• General

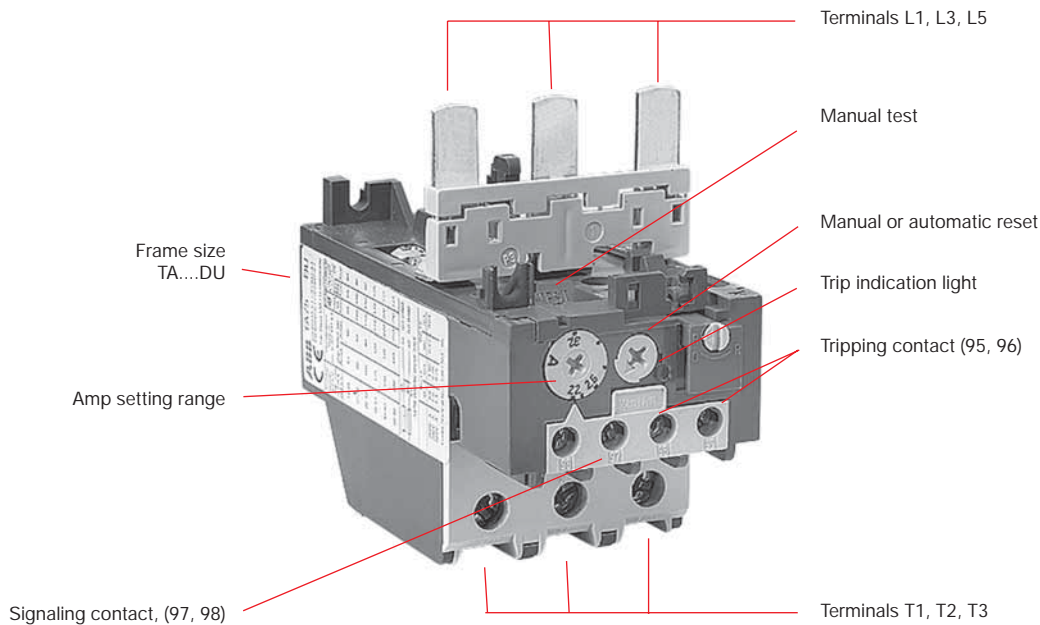
Thermal O/L relays and their accessories meet UL, CSA and most other important international standards (IEC), European standards (EN) and the most important national standards (DIN-VDE, NFC-UTE, BS, etc.). They meet the certification and approval directives required throughout the world.

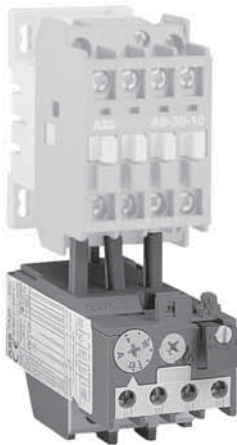
Thermal overload relays are 3 pole. The motor current flows through their bimetals (1 per phase) which are indirectly heated. Under the effect of the heating, the bimetals bend, cause the relay to trip and the position of the auxiliary contacts to change.

The relay setting range is graduated in amps. In compliance with international and national standards, the setting current is the motor nominal current and not the tripping current (no tripping at 1.05 x setting current, tripping at 1.2 times setting current).

The tripping curves (cold or warm starting, 3 phases and 2 phases) are shown on page 2.14.

The relays are built to be self protecting in the event of an overload until the short circuit protection device is activated.





TA25DU

Application

Technical data

• All the relays have:

- Free tripping: the resetting button, even if held in, does not prevent tripping of the thermal overload relay in the event of a fault.
- Temperature compensation
- Phase failure protection according to IEC 947-4-1: Within the limits of the setting range, a reduced tripping time, and thus improved motor protection, is obtained in case of a phase failure.
- Tripping class: 10A, for TA relays
- Test functions and resetting: see table below.

• Auxiliary contacts

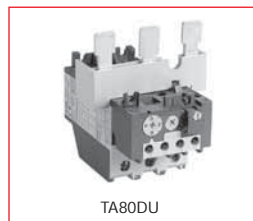
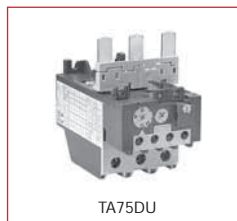
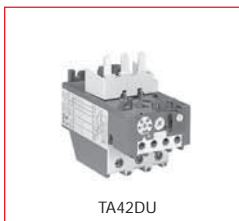
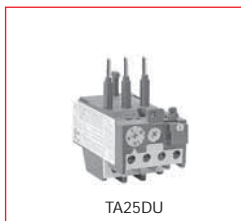
The relays have two built in auxiliary contacts: NC marked 95-96; NO marked 97-98. Both contacts are physically separate and can thus be used for 2 different circuits (control circuit and indication circuit).

Function of TA25DU – TA450DU thermal O/L relays

	Resetting Contacts	Relay tripped		Relay not tripped Both manual and automatic
		Manual	Automatic	
Effect of blue button indexed on R (RESET ONLY)	Resetting	Yes	No	No
	95-96	Closed when the button is pressed	No effect	No effect
	97-98	Open when the button is pressed		
Effect of blue button indexed on R/O (RESET/OFF)	Resetting	Yes	No	No
	95-96	Closed when the button is released	No effect	Open when the button is pressed Closed when the button is released
	97-98	Open when the button is pressed		

Selection guide TA25DU – TA80DU

2



Types

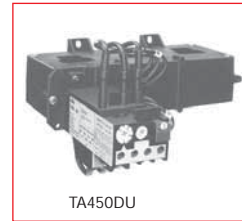
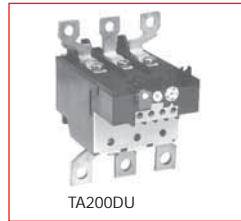
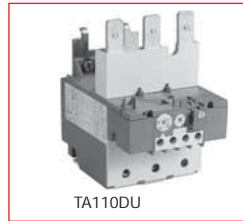
Main characteristics

Construction		3 pole with ambient temperature variation compensation. Protection against single phase operation. Built in auxiliary contacts: 1N.O. + 1N.C.			
Resetting		Convertible: Manual to Automatic			
Setting ranges	Number	18	3	6	4
	from to	0.1 – 0.16A 24 – 32A	18 – 25A 29 – 42A	18 – 25A 60 – 80A	29 – 42A 60 – 80A
Mounted with contactors		No kit is required for mounting thermal O/L relays below contactors			
Mounting kit		No kit is required for mounting thermal O/L relays below contactors			
Types of contactors for combined mounting		A/AE/AL9 A/AE/AL12 A/AE/AL16 A/AE/AL26 A/AE/AL30 A/AE/AL40	A/AE30 A/AE40	A/AE/AF50 A/AE/AF63 A/AE/AF75	A/AE/AF95 A/AE/AF110
Mounted separately (i.e. separate from contactor)		Separate mounting kit		DB25	
Accessories		DB80			
Tripping coil		DS25-A			
Resetting coil		DR25-A			
Terminal shroud		Terminals protected against direct contact (without the addition of terminal shrouds)			
Function markers		BA5-50			

Selection guide TA110DU – TA450DU

Thermal
Overload
relays

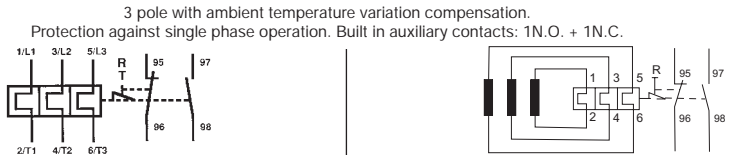
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Types

Main characteristics

Construction



Resetting

Convertible: manual to automatic

Setting ranges

Number		2	6	3
from	A	65 – 90	65 – 90	130 – 185
to	A	80 – 110	150 – 200	220 – 310

Mounted with contactors

Mounting kit

No kit is required for mounting thermal O/L relays

See page 2.7.

Types of contactors
for combined mounting

A/AE/AF95
A/AE/AF110

A/AF145
A/AF185

A/AF210 + DT450/A300
A/AF260 + DT450/A300
A/AF300 + DT450/A300

Mounted separately (i.e. separate from contactor)

Separate mounting kit

DB200

No kit required for separate mounting of thermal O/L relays

Accessories

Tripping coil

Resetting coil

Terminal shroud

Function markers

Ⓢ

LT200 –

BA5-50

LT450 –

Ⓢ Terminals protected against direct contact (without the addition of terminal shrouds)

TA25 - TA450 Class 10 for Contactors A9 – A/AF300

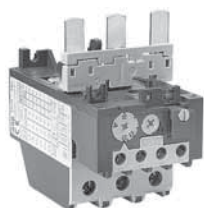
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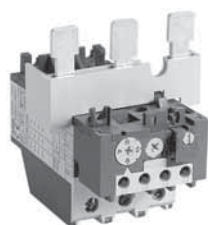
TA25DU



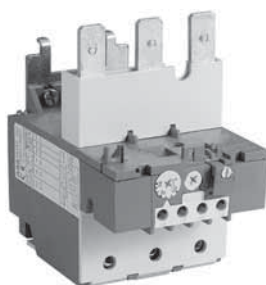
TA42DU



TA75DU



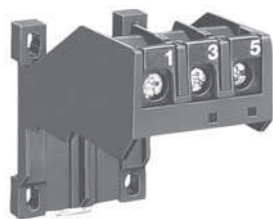
TA80DU



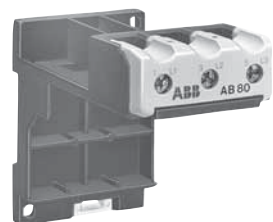
TA110DU

For contactor	Setting range A	Suffix Code	Catalog number	List price
A/AE/AL9 – A/AE/AL40	0.1 – 0.16	A	TA25DU0.16	\$ 63
	0.16 – 0.25	B	TA25DU0.25	
	0.25 – 0.4	C	TA25DU0.4	
	0.4 – 0.63	D	TA25DU0.63	
	0.63 – 1.0	E	TA25DU1.0	
	1.0 – 1.4	F	TA25DU1.4	
	1.3 – 1.8	G	TA25DU1.8	
	1.7 – 2.4	H	TA25DU2.4	
	2.2 – 3.1	J	TA25DU3.1	
	2.8 – 4.0	K	TA25DU4.0	
	3.5 – 5.0	L	TA25DU5.0	
	4.5 – 6.5	M	TA25DU6.5	
	6.0 – 8.5	N	TA25DU8.5	
	7.5 – 11	P	TA25DU11	
10 – 14	Q	TA25DU14		
13 – 19	R	TA25DU19		
18 – 25	S	TA25DU25		
24 – 32	T	TA25DU32		
A/AE30 – A/AE40	18 – 25	A	TA42DU25	78
	22 – 32	B	TA42DU32	
	29 – 42	C	TA42DU42	
A/AE/AF50 – A/AE/AF75	18 – 25	A	TA75DU25	102
	22 – 32	B	TA75DU32	
	29 – 42	C	TA75DU42	
	36 – 52	D	TA75DU52	
	45 – 63	E	TA75DU63	
	60 – 80	F	TA75DU80	
A/AE/AF95 – A/AE/AF110	29 – 42	C	TA80DU42	135
	36 – 52	D	TA80DU52	
	45 – 63	E	TA80DU63	
	60 – 80	F	TA80DU80	
A/AF145 – A/AF185	65 – 90	A	TA110DU90	165
	80 – 110	B	TA110DU110	
A/AF210 – A/AF300	65 – 90	A	TA200DU90	165
	80 – 110	B	TA200DU110	
	100 – 135	C	TA200DU135	225
	110 – 150	D	TA200DU150	
	130 – 175	E	TA200DU175	
	150 – 200	F	TA200DU200	
A/AF210 – A/AF300	130 – 185	A	TA450DU185 ^①	488
	165 – 235	B	TA450DU235	
	220 – 310	C	TA450DU310	
AF400 – AF750	See electronic overloads, pages 2.21			

① TA450 overloads require mounting kits for installation.



DB25/25A



DB80



DB200



LC26-B1

Separate mounting kits

For O/L relays	Amps	Catalog number	List price
TA25DU	0.1 – 25	DB25/25A	\$ 30
TA25DU	24 – 32	DB25/32A	38
TA42DU, TA75DU, TA80DU	18 – 80	DB80	45
TA110DU, TA200DU	100 – 200	DB200	60

Flat pin terminal blocks

Mounting on:	Catalog number	List price
TA25DU relay DB25/25A or DB25/32A	LC30-T LC26-B1	\$ 6

Terminal block — AWG #8 cable

Mounting on:	Catalog number	List price
TA25DU (25A or less) or DB25/25A	DX25	\$ 15

LC terminal blocks can be used to convert standard connections into Faston connections: 2 x 6.3mm or 4 x 2.8mm per pole. The connections are protected against accidental contact.

The LC30-T has a terminal block for the 3 power terminals and a second for the 4 auxiliary terminals of a TA25DU thermal O/L relay.

The LC26-B1 has two identical terminal blocks each for 3 power terminals. This block allows the power terminals to be mounted with two DB25 kits or a TA25DU thermal O/L relay and DB25 kit assembly.

NOTE: According to DIN 46429 part 1 and NFC 20-120 the max. capacity of a Faston connection is 25 A.

Mounting kit – for TA450 overload relay

For contactor	Catalog number	List price
A145 – A185 A210 – A300	DT450/A185 DT450/A300	\$ 225

Terminal shrouds – for contactors and overload relays

Contactor	Overload relay	Catalog number	List price
A9 – A16 A26 – A40	TA25DU	Included	—
A30 – A40	TA42DU	Included	—
A50 – A75	TA75DU	Included	—
A95 – A110	TA80DU TA110DU	Included	—
A145 – A185	TA200DU	LT185-AY	\$ 10
A145 – A185	Load side of TA200DU	LT200A185	50

Terminal lug kits

Wire range	For overloads	Catalog number	List price
6 – 250MCM	TA110DU, TA200DU	EHTK210	\$ 90
4 – 400MCM	TA450DU185	ATK300HK	78
(2) 4 – 500MCM	TA450DU310	ATK300/2HK	120



DS25A



DR25A

Remote tripping coils

	U voltage at 50/60 Hz	Catalog number ①	List price
DS25-A remote tripping coil	24V	DS25-A-24 DS25-A-48 DS25-A-110 DS25-A-220/380 DS25-A-500	\$ 60
	48V		
	110V		
	220/380V		
	500V		
DS25-A remote resetting coil	24V	DR25-A-24 DR25-A-48 DR25-A-110 DR25-A-220/380 DR25-A-500	\$ 60
	48V		
	110V		
	220/380V		
	500V		

Application

• The DS25-A coil is used for remote electrical tripping of the TA25 DU thermal O/L relay and is connected to the relay's normally closed 95-96 auxiliary contact.

• The DR 25-A coil is used for remote electrical resetting of the TA25DU thermal O/L relay which is adjusted for "Manual resetting;" it is connected to the relay's normally open 97-98 auxiliary contact.

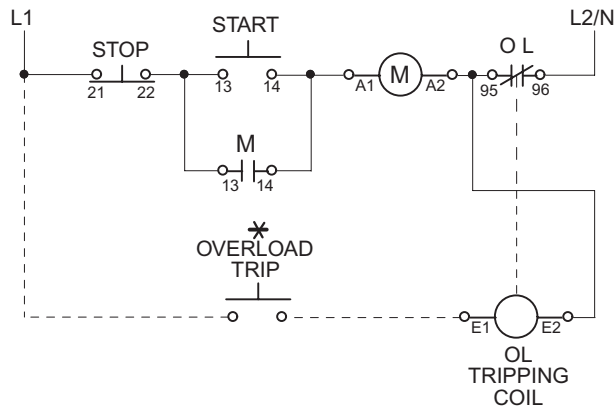
The coils are not designed for continuous duty. Impulse duration: 0.2 to 0.35 s.

Set the button to "Man" (Manual resetting).

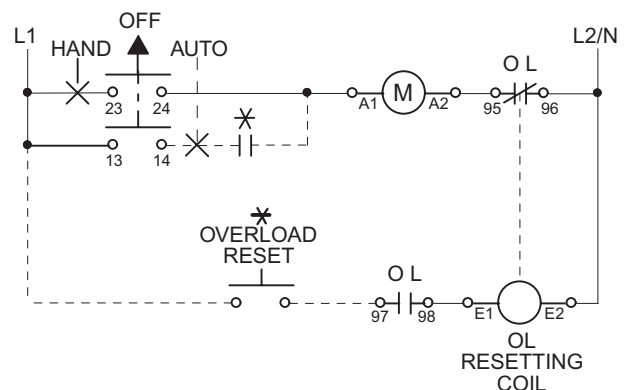
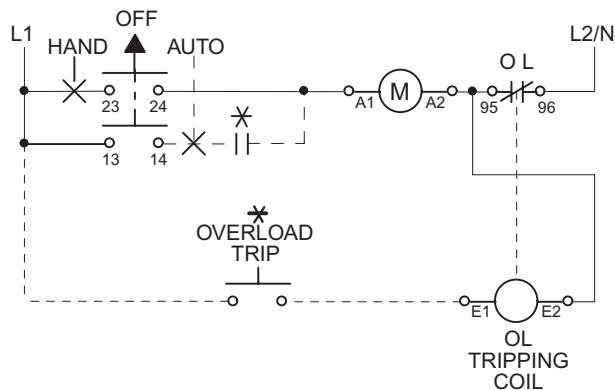
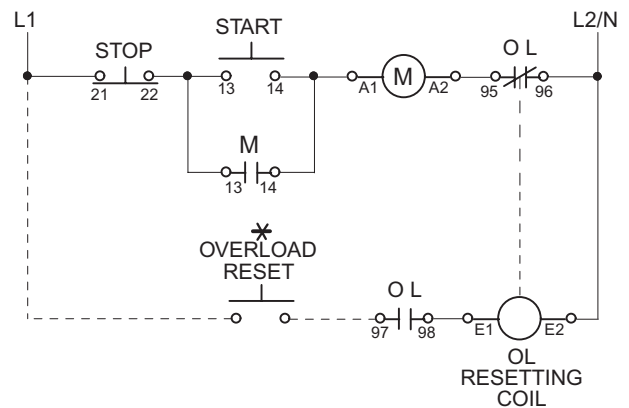
Mounting: clipped on to TA25DU thermal O/L relay.

Installation diagrams

For connection of DS25-A to TA25DU relay



For connection of DR25-A to TA25DU relay

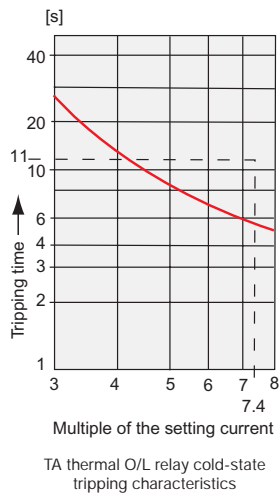
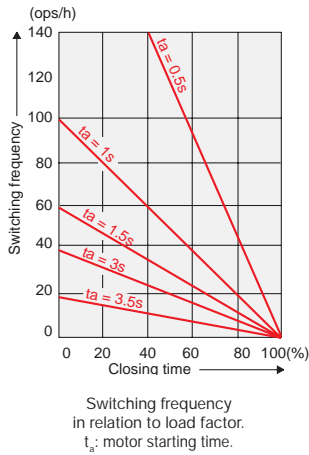


① Cannot be used with TA42, TA75, or TA200 overload relays.

Technical data

TA25DU – TA450DU

Intermittent duty



Switching frequency:

To avoid untimely tripping, TA and T thermal O/L relays have been designed to withstand roughly 15 switching operations per hour with an approximately equal distribution between working and rest cycles.

In these conditions, the motor starting time must not exceed 1 second and the starting current must be lower than or equal to 6 times the motor I_n .

For intermittent operations, the diagram opposite specifies relay operating limits.

Example: Motor starting time: 1 sec.

Load factor: 40 %

Switching frequency: 60 ops./h according to diagram

For a higher number of operations and for load variations (e.g. frequent starting and braking), it is advisable to use CUSTORAPID® protection.

For motors subject to particularly severe operating conditions (e.g. locked rotor) it is advisable to use protection combined with a thermal O/L relay and the CUSTORAPID® system.

Protection of motors with long starting time

See electronic overload relay section, pages 2.21 - 2.32.

Mounting position

On a support at an angle of $\pm 30^\circ$ in relation to the vertical plane (standard position).

Other mounting positions possible, except mounting on a horizontal plane (in this case the tripping mechanism would be located above the bimetals).

Special version for EEx e motors

Consult factory.

Tripping limits at ambient temperatures varying by $+ 20^\circ\text{C}$

Ambient temperature compensation

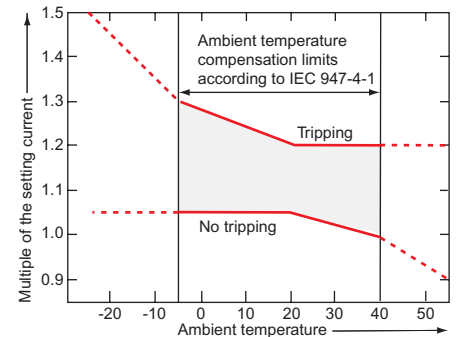
Thermal O/L relays are compensated against ambient temperature variations by a compensation bimetal which is sensitive to the ambient temperature.

Thermal O/L relays are designed to operate between -5°C and $+40^\circ\text{C}$ in compliance with standard IEC 947-4-1. For a wider range of -25°C to $+55^\circ\text{C}$ consult the graph opposite.

Example: tripping at -25°C . Tripping takes place before 1.5 times the setting current.

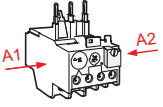
Resetting: TA25DU – TA450 DU thermal O/L relays have convertible manual/automatic resetting.

Delivery: in manual resetting mode.



Technical data TA25DU – TA80DU

2

Types	TA25DU	TA42DU	TA75DU	TA80DU
Standards: (international, European)	IEC 947-4-1, EN 60947-4-1			
Rated insulation voltage U_i according to IEC 947-4-1	V	690		
Rated impulse withstand voltage U_{imp} according to IEC 947-4-1	kV	6		
Permissible ambient temperature – for storage – for operation	°C °C	–40 to +70 –25 to +55 with temperature compensation (maximum values: see page 2.9)		
Climatic withstand DIN 50017	Humidity in alternate climate KFW, 30 cycles			
Mounting positions	On a support at an angle of $\pm 30^\circ$ in relation to the vertical plane (standard position). Other positions possible except mounting on a horizontal plane (in this case the tripping mechanism would be located above the bimetals).			
Shock withstand at nominal I_e Critical direction of shocks A1, A2	shock duration ms multiples of g	15 12		
Resistance to vibrations (± 1 mm, 50 Hz)	multiples of g	8		
Mounting – on contactor – separate with DB - kit	Latching below the contactor, screw fixing on main terminals Using screws: 2 x M4 or 35 mm EN 50022			
Terminals and cross-sectional areas for main conductors (motor side) • screw terminal – with cable clamp – via tunnel connector – flat type for lug or bar • conductor cross-sectional area – rigid solid or rigid stranded – flexible with cable end – recommended bars		TA25DU setting ranges: from 0.1-0.16A 24-32 A to 18-25A		
	M4 – –	– M5 –	M6 –	M6 – M6 –
	2 x 1.5 - 6 2 x 1.5 - 4 –	1 x 10 2 x 0.75 - 6 –	–	1 x 2.5 - 35 or 2 x 2.5 x 16 1 x 2.5 - 25 or 2 x 2.5 x 10 –
Terminals and cross-sectional area for auxiliary conductors • screw terminal (screw size) – with cable clamp • conductor cross-sectional area – rigid solid or rigid stranded – flexible with cable end	mm ² mm ² mm	M 3.5 0.75 - 4 0.75 - 2.5		
Degree of protection	All the terminals are protected against direct contact according to VDE 0106/Part. 100. (without additional terminal shrouds)			All the terminals are protected against direct
				direct contact according to VDE0106/part 100 (with additional terminal shrouds for the main terminals)

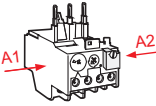
Pole Technical Characteristics

Types	TA25 DU	TA42 DU	TA75 DU	TA80 DU	TA10 DU	TA200 DU	TA450 DU
Number of poles	3						
Setting ranges	see page 2.6						
Tripping class according to IEC 947-4-1, EN 60947-1	10 A						
Rated operational frequencies	Hz						50/60
Max. switching frequency without untimely tripping	Up to 15 starts/h or 60 starts/h with 40 % on-load factor when neither the starting current of $6 \times I_n$ nor the starting time 1 s are exceeded.						
Resistance per phase in mΩ and heat dissipation in W	see page 2.13						

Technical data TA110DU – TA450DU

Thermal
Overload
relays

2

Types	TA110DU	TA200DU	TA450DU	
Standards: (international, European)	IEC 947-4-1, EN 60947-4-1			
Rated insulation voltage U_i according to IEC 947-4-1	V	690	1000	
Rated impulse withstand voltage U_{imp} according to IEC 947-4-1	kV	6	8	
Permissible ambient temperature – for storage – for operation	°C °C	–40 to +70 –25 to +55 with temperature compensation (maximum values: see page 2.9)		
Climatic withstand DIN 50017	Humidity in alternate climate KFW, 30 cycles			
Mounting positions	On a support at an angle of $\pm 30^\circ$ in relation to the vertical plane (standard position). Other positions possible except mounting on a horizontal plane (in this case the tripping mechanism would be located above the bimetals).			
Shock withstand at nominal I_e	shock duration ms	15		
Critical direction of shocks A1, A2	multiples of g	12		
Resistance to vibrations (± 1 mm, 50 Hz)	multiples of g	8		
Mounting – on contactor – separate with DB - kit	4 x M5 screws			
Terminals and cross-sectional areas for main conductors (motor side)				
• screw terminal – with cable clamp – via tunnel connector – flat type for lug or bar		– HC, M8 –	– – M10	– – M10
• conductor cross-sectional area – rigid solid or rigid stranded		mm ² 16 – 35	25 – 120	2 x 240
– flexible with cable end – recommended bars		mm ² 16 – 35 mm 12 x 3	25 – 95 20 x 4	2 x 240 20 x 4...5
Terminals and cross-sectional area for auxiliary conductors				
• screw terminal (screw size) – with cable clamp	M 3.5			
• conductor cross-sectional area – rigid solid or rigid stranded – flexible with cable end	2 x mm ² 2 x mm ²	0.75 - 4 0.75 - 2.5		
Degree of protection	All the terminals are protected against direct contact according to VDE 0106/Part. 100. (with additional terminal shrouds)			

Technical characteristics of auxiliary contacts for thermal O/L relays: TA25DU to TA450DU

Auxiliary contacts		normally closed N.C.	normally open N.O.
Terminal marking		95-96	97-98
Rated operational voltage U_e	VAC	500	500
Conventional thermal current (in free air) I_{th}	A	10	6
Rated operational current I_e , AC-15			
up to 240 V	A	3.0	1.5
up to 440 V	A	1.9	0.95
up to 500 V	A	1.0	0.75
Rated operational current I_e DC-13 up to 250 V	A	0.12	0.04
Protection against short circuits gG (gI) fuses (according to IEC 269)	A	10	6
S 271/S 281 circuit-breaker	A	k3	k1
Maximum potential difference between N.C. and N.O. auxiliary contacts	VAC VDC	500 440	500 440

Technical data

Motor protection; Choice of protective device

2

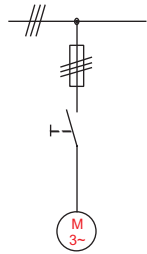
Motor Protection — general

It is very important to choose an adequate protective device for the safety of the motor during operation and for its durability. The efficiency of protection methods varies according to the application. The overview below will help you to choose. There is no general rule and we are available to advise you for special applications and especially in the case of difficult starting.

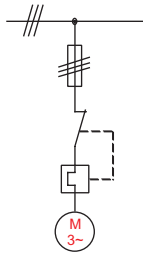
Protective devices and efficiency

Protection in relation to current:

Fuses

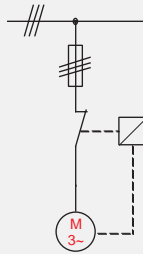


Protective relay with phase fault protection

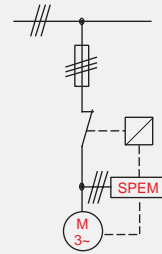


Protection in relation to temperature:

Motor protection via CUSTORAPID® thermistor



Motor protection via SPEM electronic relay



Causes of dangerous overloads for the motor windings

	Fuses	Protective relay with phase fault protection	Motor protection via CUSTORAPID® thermistor	Motor protection via SPEM electronic relay
1 Overload with current 1.2 times the nominal current	☐	●	●	●
2 S1-S8 nominal duties according to IEC 34-I	☐	■	●	●
3 Operation with starting, braking, reversal in operating direction	☐	■	●	●
4 Operation with starting rate at > 15 cycles/hour	☐	■	●	●
5 Locked rotor	■	●	■ for motors with special rotor	●
6 Overloads due to phase failure	☐	●	●	●
7 Network undervoltage or overvoltage	☐	●	●	●
8 Fluctuation of network frequency	☐	●	●	☐
9 Ambient temperature too high	☐	●	●	☐
10 Overheating due to external cause (i.e. overheating of bearings)	☐	☐	●	☐
11 Motor cooling disturbed	☐	☐	●	☐
12				Undercurrent protection on drop in load
13				Protection of asymmetry: wrong phase direction rotation or asymmetrical load
14				Earth fault protection
15				Automatic disconnection for auxiliary load fault

Protection efficiency:

- ☐ unsuitable
- very average efficiency
- perfectly efficient

Note: Fuses

Fuses do not protect motors against overloads. They are only used to protect installations and lines against short circuits.

To ensure efficient protection of a motor against short circuits, it is advisable to use aM type fuses in association with thermal OLR relays.

For the selection of fuses or circuit-breakers, refer to the indications given in this catalogue concerning contactors on the one hand and thermal O/L relays on the other.

In general, fuse protection for direct-on-line starting must be sized as follows:

– aM fuses: choose the fuse rating immediately above the full load value of the motor current.

– gG (gI) fuses: determine the fuse rating immediately above the motor current value and choose the next highest fuse rating.

Technical data

Resistance and Joule losses per phase

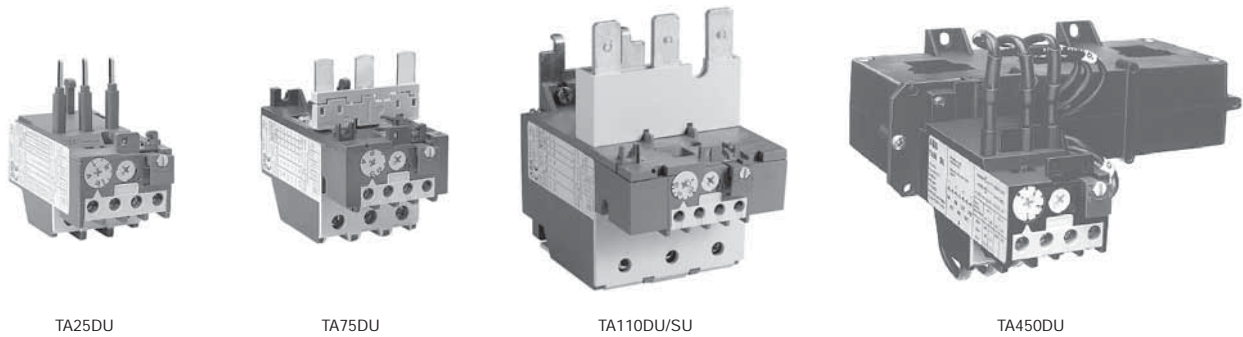
Short circuit protection



Resistance and Joule losses per phase, short circuit protection

Setting range current from – to A A	Resistance per phase mΩ	Joule losses per phase at max. setting W
TA25DU		
0.1 – 0.16	85850	2.2
0.16 – 0.25	85150	2.2
0.25 – 0.4	13750	2.2
0.4 – 0.63	5370	2.2
0.63 – 1.0	2190	2.2
1.0 – 1.4	1120	2.2
1.3 – 1.8	670	2.2
1.7 – 2.4	383	2.2
2.2 – 3.1	229	2.2
2.8 – 4.0	137	2.2
3.5 – 5.0	87.5	2.2
4.5 – 6.5	61	2.2
6.0 – 8.5	30.4	2.2
7.5 – 11	18.2	2.2
10 – 14	11.2	2.2
13 – 19	6.3	2.3
18 – 25	4.7	2.9
24 – 32	3.2	3.3
TA42DU		
18 – 25	5.5	3.43
22 – 32	2.89	2.91
29 – 42	1.84	3.24
TA75DU		
18 – 25	5.5	3.43
22 – 32	2.89	2.91
29 – 42	1.84	3.24
36 – 52	1.3	3.51
45 – 63	0.936	3.72
60 – 80	0.615	3.94
TA80DU		
29 – 42	1.84	3.24
36 – 52	1.3	3.51
45 – 63	0.936	3.72
60 – 80	0.615	3.94

Setting range current from – to A A	Resistance per phase mΩ	Joule losses per phase at max. setting W
TA110DU		
80 – 110	0.378	3.78
TA200DU		
100 – 135	0.318	5.79
110 – 150	0.255	5.74
130 – 175	0.214	6.55
150 – 200	0.182	7.28
TA450DU		
130 – 185	—	2.5
165 – 235	—	2.5
220 – 310	—	2.5



TA-DU thermal O/L relays are 3-pole with manual or automatic resetting mode selection.

The resetting button can also be used for stopping.

Built-in auxiliary contacts are physically separate and, consequently, can be used in different circuits (control circuit/indication circuit).

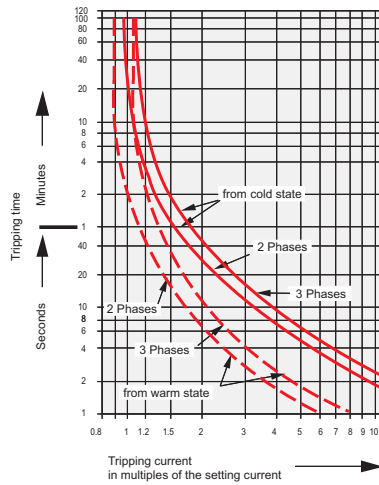
Each relay is temperature compensated and ensures phase failure protection.

Protective relays up to size TA75DU are protected against direct contact via the front face. Terminal shrouds are available for TA200DU to TA450DU size relays.

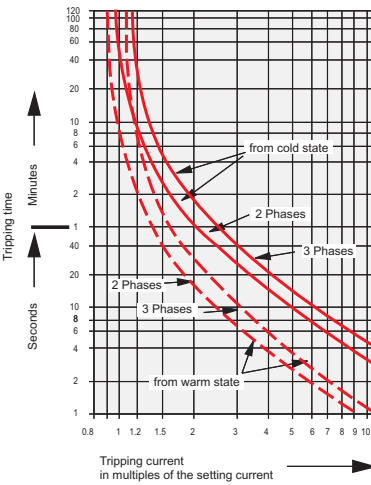
The connecting terminals are delivered in open position with (+, -) pozidriv screws and screwdriver guidance. It is advisable to tighten unused terminal screws.

Thermal O/L relay tripping curves

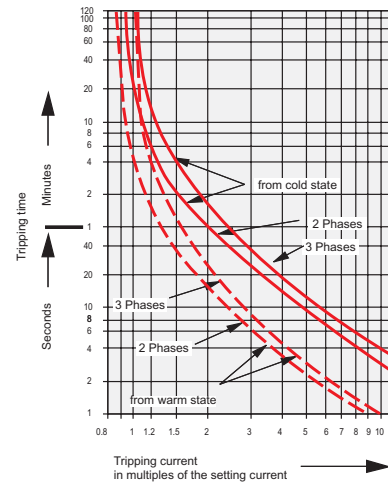
TA25DU
(tripping class 10A)



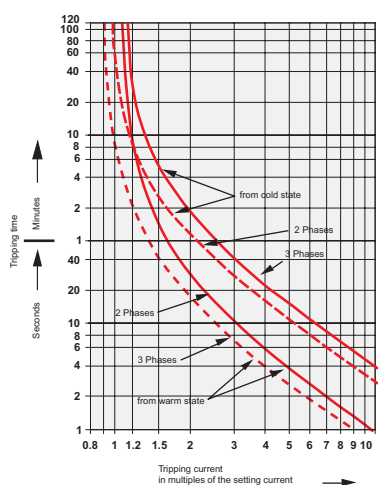
TA42DU, TA75DU and TA80DU
(tripping class 10A)



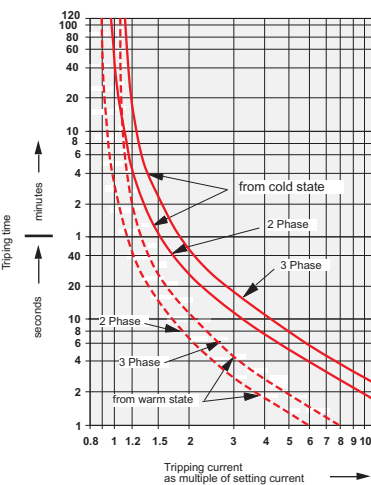
TA110DU
(tripping class 10A)



TA200DU
(tripping class 10A)



TA450DU
(tripping class 10A)

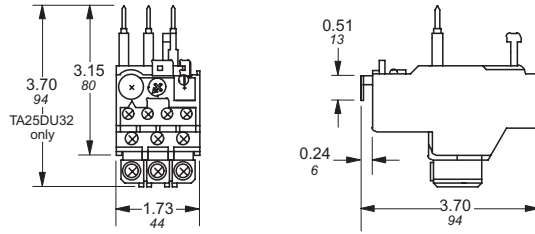


Approximate dimensions T25DU – TA42DU

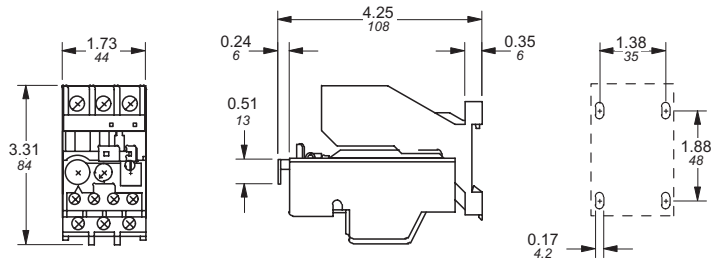
Thermal
Overload
relays

00.00 — Inches
00.00 — [Millimeters]

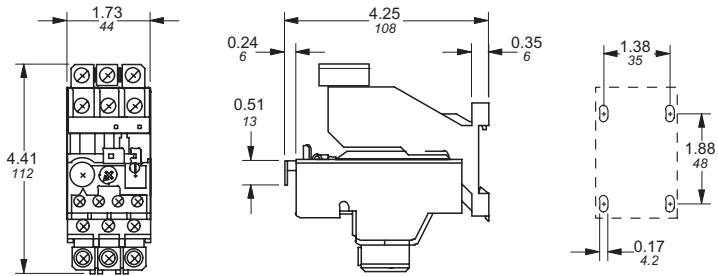
TA25DU



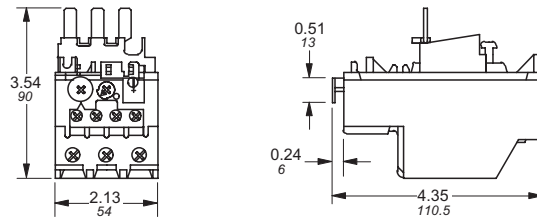
TA25DU & DB25



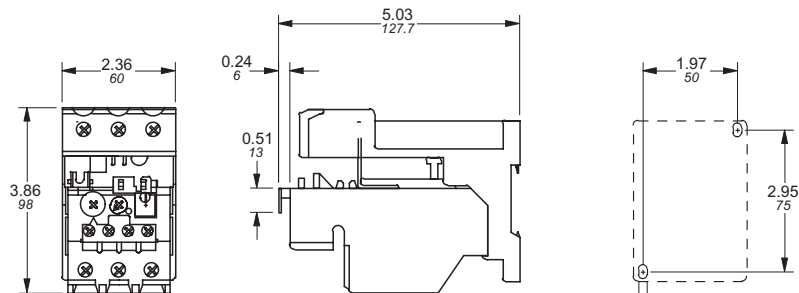
TA25DU & DB25/32



TA42DU



TA42DU / TA75DU & DB80

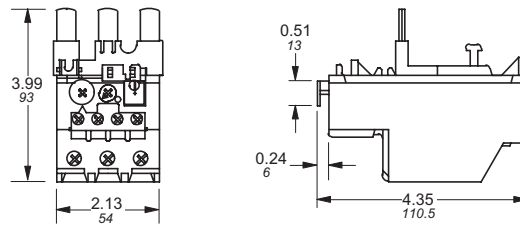


Approximate dimensions TA75DU – TA200DU

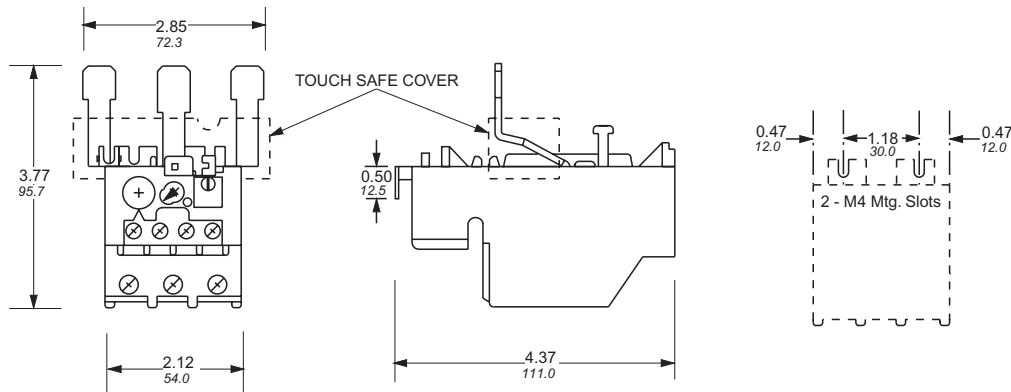
00.00 Inches
00.00 [Millimeters]

2

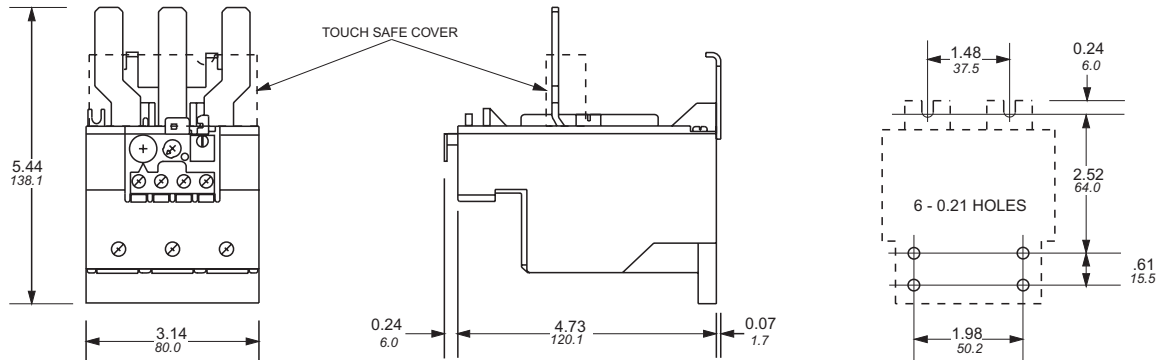
TA75DU



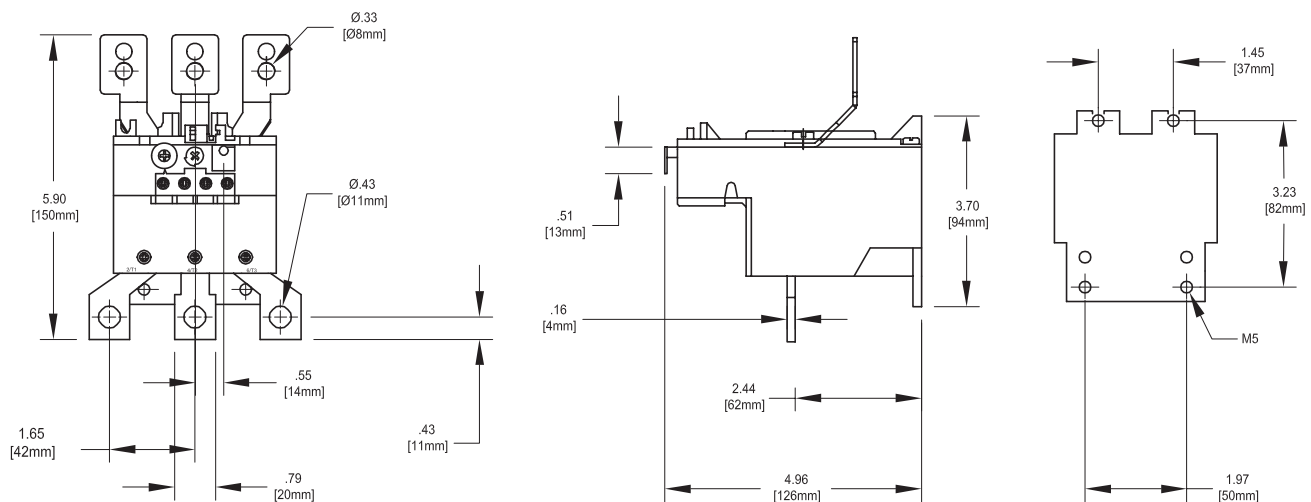
TA80DU



TA110DU



TA200DU



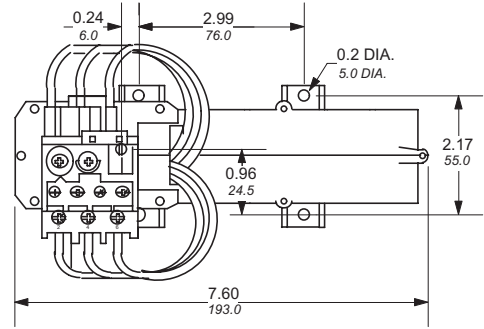
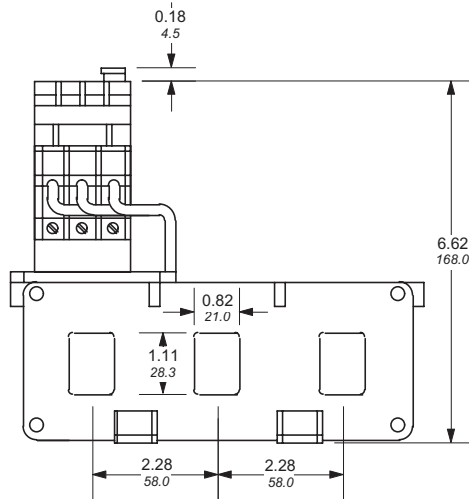
Approximate dimensions TA450DU

Thermal
Overload
relays

00.00 Inches
00.00 [Millimeters]

2

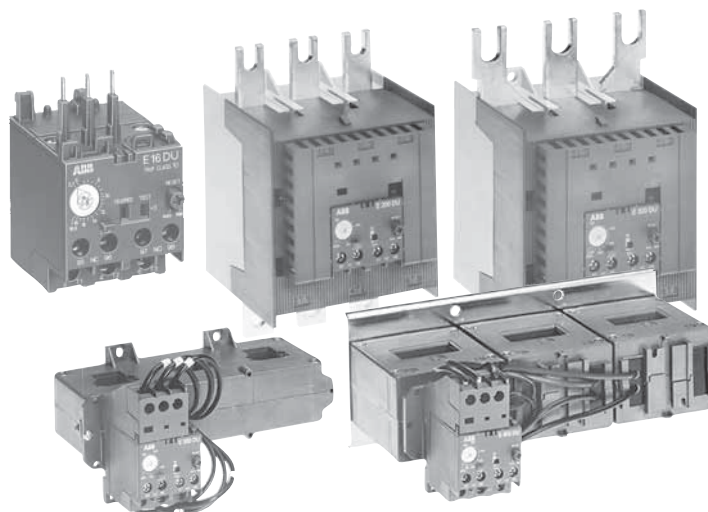
TA450DU



Electronic Overload relays



Electronic overload relays E16DU – E1250DU



Description

- Available for starter construction with A Line contactors and separate panel mounting
- Designed for close couple mounting
- Separate base mounting available for all overload relays
- E16DU Class 10, 20, & 30, factory selectable
- E200DU – E800DU Class 10, 20 & 30, field selectable
- Stop button
- Screwdriver guide holes
- All terminal screws are available from the front
- Single phase and phase unbalance protection
- Isolated alarm circuit (N.O.) contact
- Ambient compensation: -25°C to +70°C (-13°F to +158°F)
- Manual test
- Manual or automatic reset
- Factory calibrated and tested
- Wide adjustment range
- UL File No: E48139
- CSA File No: LR98336

Tripping classes of the thermal overload relays

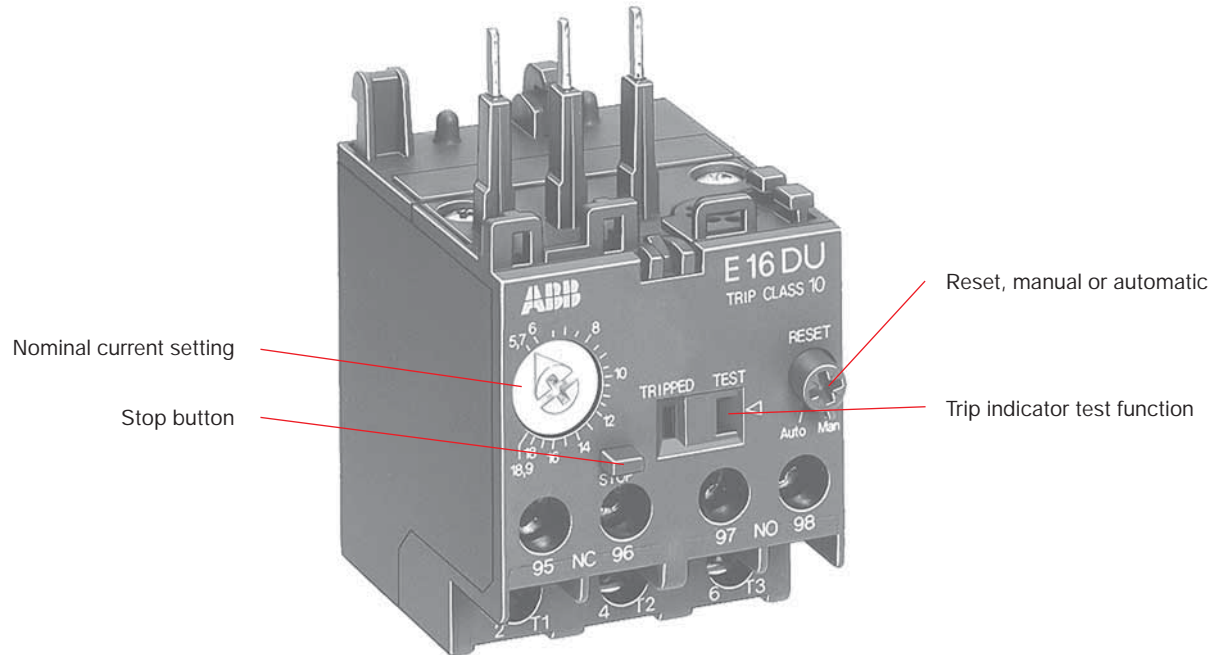
Standard classes in IEC 947-4-1 are classes: 10 A, 10, 20, 30. The tripping class indicates according to IEC 947-4-1 the maximum tripping time in seconds under specified conditions of test at 7.2 times the setting current and specifies tripping and non tripping times for 1.5 and 7.2 times the setting current. Mostly used class is 10 A.

Abstract from IEC 947-4-1

Tripping class	10 A	10	20	30
Max. tripping time at 1.5 x setting current (s) (warm state)	120	240	480	720
Tripping time at 7.2 x setting current (s) (cold state)	2 – 10	4 – 10	6 – 20	9 – 30
At 1.05 x setting current	no tripping			

Catalog number explanation

2



Catalog number explanation

E16DU 1.0 10

Frame size

E16DU
E200DU
E320DU
E500DU
E800DU

Class size

10
20
30

Amp rating

1.0
200
320
500
800

E16DU – E800DU for contactors and mini contactors

Electronic
Overload
relays

2



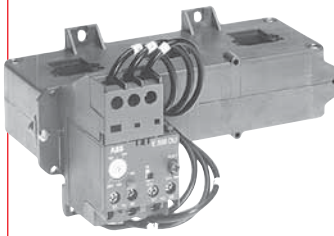
E16DU



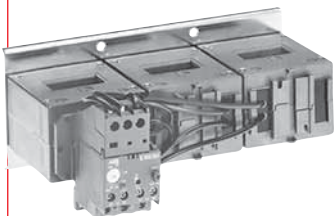
E200DU



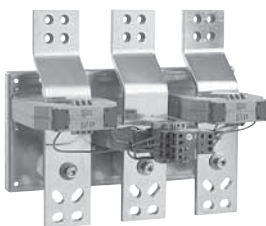
E320DU



E500DU



E800DU



E1250DU

E16DU – Tripping Class 10

For contactor	Setting range	Suffix code	Catalog number ①	List price
B/BC6 – B/BC7 A/AE/AL9 – A/AE/AL16	0.1 – 0.32	A1	E16DU0.32-10	\$ 96
	0.3 – 1.0	B1	E16DU1.0-10	
	0.9 – 2.7	C1	E16DU2.7-10	
	2.0 – 6.3	D1	E16DU6.3-10	
	5.7 – 18.9	E1	E16DU18.9-10	

E16DU – Tripping class 20

For contactor	Setting range	Suffix code	Catalog number ①	List price
B/BC6 – B/BC7 A/AE/AL9 – A/AE/AL16	0.1 – 0.32	A2	E16DU0.32-20	\$ 96
	0.3 – 1.0	B2	E16DU1.0-20	
	0.9 – 2.7	C2	E16DU2.7-20	
	2.0 – 6.3	D2	E16DU6.3-20	
	5.7 – 18.9	E2	E16DU18.9-20	

E16DU – Tripping class 30

For contactor	Setting range	Suffix code	Catalog number ①	List price
B/BC6 – B/BC7 A/AE/AL9 – A/AE/AL16	0.1 – 0.32	A3	E16DU0.32-30	\$ 96
	0.3 – 1.0	B3	E16DU1.0-30	
	0.9 – 2.7	C3	E16DU2.7-30	
	2.0 – 6.3	D3	E16DU6.3-30	
	5.7 – 18.9	E3	E16DU18.9-30	

E200DU – E1250DU – Tripping class 10, 20 & 30

For contactor	Setting range	Suffix code	Catalog number ①	List price
A/AF145 – A/AF185	65 – 200	E2	E200DU200	\$ 325
A/AF210a – A/AF300	105 – 320	E3	E320DU320	775
AF400 – AF460	170 – 500	E5	E500DU500	865
AF580 – AF750	270 – 800	E8	E800DU800	950
AF1350	375 – 1250	E9	E1250DU1250	2970

① Not suitable for single-phase motors and direct current (DC) motors.



DB16E



A300 contactor with E320 overload & LT320E terminal shrouds

Mounting kits

for direct mounting on contactors AF400 – AF750

For overload relays	On contactor	Catalog number	List price
E500DU	AF400 – AF460	DT500/AF460S	\$ 395
	AF400 – AF460 w/reversing kits	DT500/AF460L	
E800DU	AF580 – AF750	DT800/AF750S	415
	AF580 – AF750 w/reversing kits	DT800/AF750L	

Separate mounting kits

For overload relays	Catalog number	List price
E16DU	DB16E	\$ 15

Lug kits

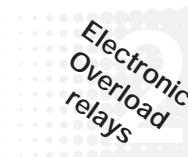
Wire range	Electronic overload	Catalog number	List price
6 – 250 MCM	E200DU200	ATK185	\$ 45
4 – 400 MCM	E320DU320	ATK300	68
(2) 4 – 500 MCM	E320DU320	ATK300/2	110
(2) 2/0 – 500 MCM	E500DU500	ATK580/2HK	160
(3) 2/0 – 500 MCM	E800DU800	ATK750/3HK	235
(4) 1/0 – 750 MCM	E12150DU1250	ATK1350/4HK	275

Terminal shrouds

For overload relays	Catalog number	List price
E200DU E320DU	LT200E	\$ 41
	LT320E	
E500DU E800DU	LT500E	52
	LT800E	56

Technical data

E16DU



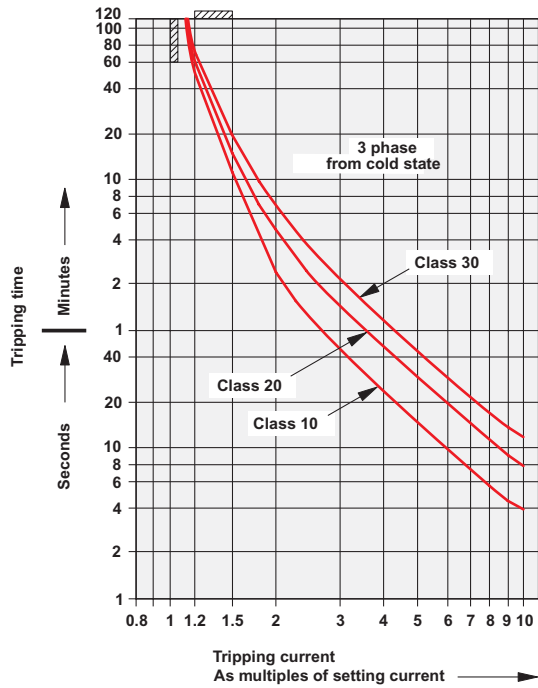
General technical data

Type	E 16 DU	
Standards:	UL508, IEC 60 947-4-1 / IEC 60 947-5-1 EN 60 947-4-1 / EN 60 947-5-1	
Rated insulation voltage U_i	UL / IEC V	600 / 690
Rated operational voltage U_e	UL / IEC V	600 / 690
Impulse withstand voltage U_{imp}	kV	6
Permissible ambient temperature		
- for storage	°C	- 25 to 70
- with compensated operation	°C	- 25 to 70
Climatic resistance acc. to	IEC 68-2-1, IEC 68-2-2, IEC 68-2-14, IEC 68-2-30	
Resistance to shock	Shock duration ms	11
	multiple of g	15
Resistance to vibrations (±1 mm, 10 ... 100 Hz)	multiple of g	5
Mounting	- on contactor - with AB... kit	Direct to contactor's main terminal
Terminal types and connecting capacity of main conductors (on load side) /and auxiliary contacts.		
- Screw terminals (screw size)		M3.5
- with self-disengaging clamping piece		-
- with terminal block		-
- with busbar or cable lugs		-
- Torque	lbin / Nm	7 / 1.0
- connection cross sections		
- copper stranded	AWG / mm ²	10 - 20 / 2X0.75...4
- flexible with connector sleeve	AWG / mm ²	10 - 20 / 2X0.75...4
Protection degree to IEC 947-1/EN 60 947-1	All terminals are safe from finger-touch and touch by the back of the hand in acc. with VDE 0106, Part 100	
Weight	lbs / kg	.33 / .15

Technical data of the current paths

Type	E 16 DU	
Number of paths	3	
Setting ranges	see page 2.21	
Tripping class acc. to IEC 947-4-1/EN 60 947-4-1	see page 2.21	
Operating frequency	Hz	50 and 60
Switching frequency without early tripping	up to 80 ops./h with 40 % continuous duty if starting current not higher than $6 \times I_n$ and starting time not longer than 1s	
Resistance per phase q and heat dissipation per phase in W acc. to max. setting current	see page 2.24	
Required fuses for short circuit protection	see page 2.24	

Tripping characteristics



Resistance and power dissipation

Setting range	gL/gG	Short circuit protection		Resistance per phase		Joule losses per phase at upper current setting
		UL/CSA 600V 5kA	UL/CSA 480V/50kA	mΩ	q	W
A – A	A	RK5	Class J			
0.1 – 0.32	1	2	2	970	0.97	0.1
0.3 – 1.0	4	2	2	113	0.113	0.11
0.9 – 2.7	10	4	4	14	0.014	0.1
2.0 – 6.3	20	15	15	2.4	0.0024	0.1
5.7 – 18.9	50	30	30	0.8	0.0008	0.29

Technical characteristics of auxiliary contacts

Type	N.C.		N.O.	
	95-96	97-98		
Rated operational voltage U_e	V		500	
Conventional free air thermal current I_{th}	A		6	
Rated operational current I_{th}				
on AC-15, 230V	A		3	
on AC-15, 400V	A		1.1	
on AC-15, 500V	A		0.9	
on AC-15, 690V	A		0.7	
on DC-13, 24V	A		1.5	
on DC-13, 60V	A		0.5	
on DC-13, 110V	A		0.4	
on DC-13, 220V	A		0.2	
Short circuit protection gG (gf) fuses	A		6	

Technical data

E200DU – E1250DU



Type	E 200 DU	E 320 DU	E 500 DU	E 800 DU	E 1250 DU
Standards: (major European and international standards)	IEC 60947-4-1 / IEC 60947-5-1 EN 60947-4-1 / EN 60947-5-1				
Rated insulation voltage U_i	V 690				
Rated operating voltage U_e	V 690				
Impulse withstand voltage U_{imp}	kV 6				
Permissible ambient temperature	- Storage °C - 25 to +70 - Operation °C - 25 to +70				
Climatic resistance according to	IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-14, IEC 60068-2-30 IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-30				
Mounting position	any				
Resistance to shock	Shock duration ms 30 multiple of g 5				—
Resistance to vibrations to IEC/EN 61373	category 1, class B				—
Mounting	- onto contactor - with DT.. mounting kit for single set-ups - onto panel plate				Clipped beneath the contactor, fixed by screws on its main terminals By screws: 2 x M4 or DIN rail By screws: 4 x M5 By screws: 4 x M6
Connection terminals and attachment type Auxiliary contacts	• Screw terminal (screw size) - with self-disengaging clamping piece • Tightening torque Nm M3.5 1 • Connection cross-sections - single-core or stranded mm ² 2 x 0.75...4 - flexible with wire end ferrule mm ² 2 x 0.75...4				
Connection terminals and attachment type Main conductors	• Screw terminal (screw size) M8 M10 (M10) (M12) (M12) (rail order separately)				
Protection degree to IEC 60947-1/EN 60947-1	All terminals are protected against access to hazardous parts with back hand and finger in acc. with EN 50274 IP 00 (Main terminals) (auxiliary circuits are protected)				

Technical data of the conducting paths

Type	E 200 DU	E 320 DU	E 500 DU	E 800 DU	E 1250 DU
Number of conducting paths	3				
Setting ranges	A 60 ... 200 100 ... 320 150 ... 500 250 ... 800 375 ... 1250				
Tripping classes to IEC 60947-4-1/EN 60947-4-1	10, 20, 30 eligible				
Frequency range	Hz 50 and 60 (only for a.c. operating 3 phase)				
Load rating of auxiliary contacts	E 200 DU, E320 DU, E 500 DU, E 800 DU, E 1250 DU				
Type	NC (95-96)		NO (97-98)		
Contact					
Rated operating voltage U_e	V 600		600		
Rated thermal continuous current	A 6		6		
Rated operating current I_e	at AC-15 230 V A 3 at AC-15 400 V A 1.1 at AC-15 500 V A 0.7 at DC-13 24 V A 1.5 at DC-13 60 V A 0.5 at DC-13 110 V A 0.4 at DC-13 220 V A 0.2		3 1.1 0.7 1.5 0.5 0.4 0.2		
Short-circuit protection fuse or STOTZ safety circuit-breaker:	gG A 6 S271 S281		(1) (1)		

(1) on request

Altitude

Characterizes the place of use. It is expressed in meters above sea level.

Circuits

- **Auxiliary circuit** – all the conductive parts of a contactor designed to be inserted in a different circuit from the main circuit and the contactor control circuits.
- **Control circuit** – all the conductive parts of a contactor (other than the main circuit and the auxiliary circuit) used to control the contactor's closing operation or opening operation or both.
- **Main circuit** – all the conductive parts of a contactor designed to be inserted in the circuit that it controls.

Insulation Class according to NFC 20 040 and VDE 0110

Characterizes adaptation of the devices to ambient temperature and operating conditions. For given clearances and creepage distances, a device will have different insulating voltages depending on insulation classes A, B, C & D. Class C corresponds to most industrial applications. The devices in this catalog belong to Class C.

Coordination of equipment protections during a short circuit

This is the addition upstream of the contactor and thermal overload relay of a short circuit (SCPD) protection device such as a circuit breaker, a fuse with a high breaking capacity or other fuses.

IEC publication 947-4-1 defines coordination Types 1 & 2:

- **Type 1** – Coordination requires that, in the event of a short circuit, the contactor or starter does not endanger persons or installations and will not be able to operate without being repaired or parts being replaced.
- **Type 2** – Coordination requires that, in short circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts being welded is acceptable. In this case, the manufacturer must stipulate the measures to be taken with respect to maintenance of the equipment.

Rated operational current I_e

Current rated by the manufacturer. It is mainly based on the rated operational voltage U_e , the rated frequency, the utilization category, the rated duty and the type of protective enclosure, if necessary.

Conventional free air thermal current I_{th}

Current that the contactor can withstand in free air for a duty time of 8 hours without the temperature rise of its various parts exceeding the maximum values given by the standard.

Cycle time

Cycle time is the sum of the current flow time and the no-current time for given cycle.

Electrical durability

Number of on-load operations that the contactor is able to carry out; it depends on the utilization category.

Mechanical durability

Number of no-current operations that a contactor is able to carry out.

Load factor

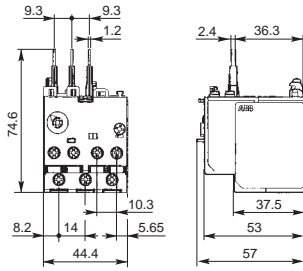
Ratio of the on-load operating time to the total cycle time x 100.

Switching frequency

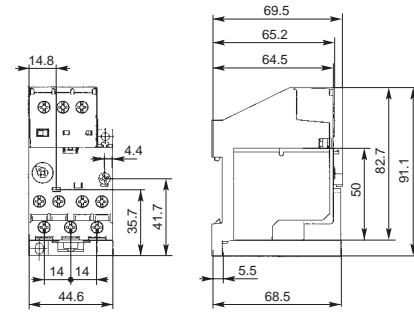
Number of switching cycles per hour.

Approximate dimensions E16DU – E200DU

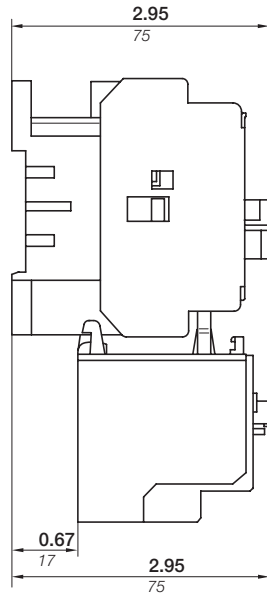
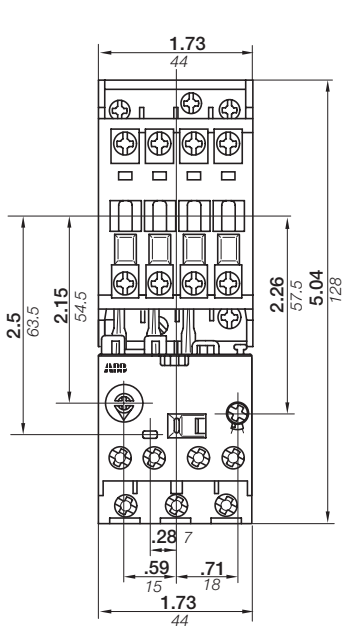
E16DU



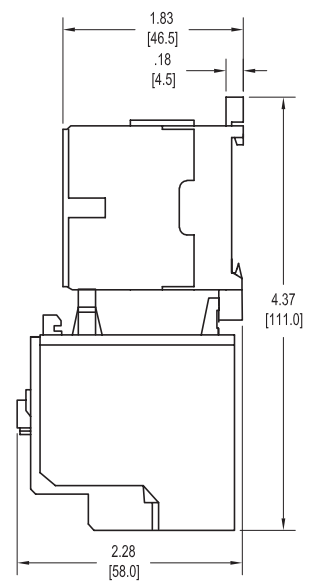
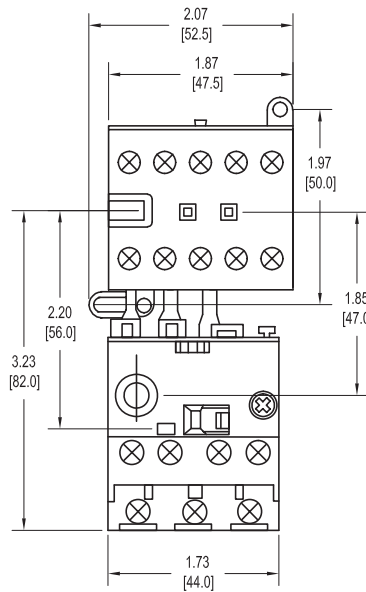
E16DU with DB16E



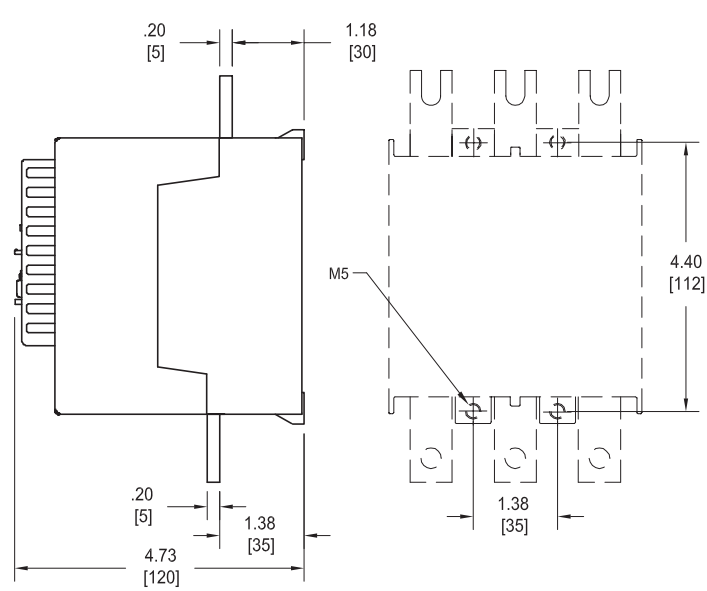
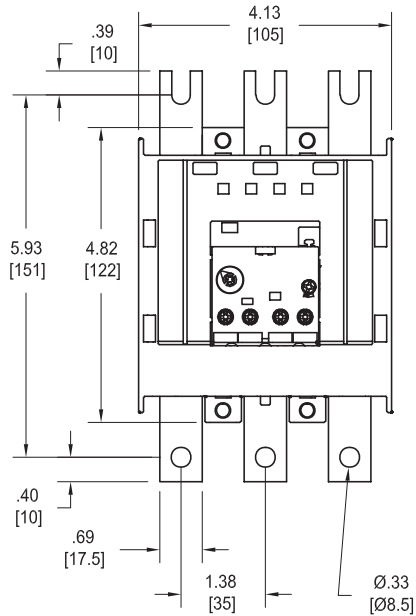
E16DU with A/AE9, A/AE12, A/AE16



E16DU with B/BC6, B/BC7



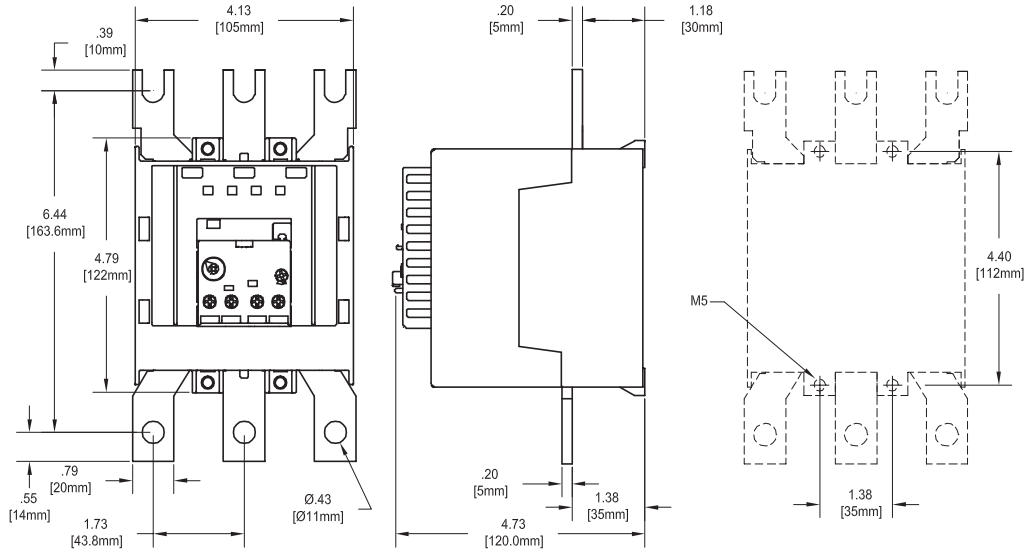
E200DU



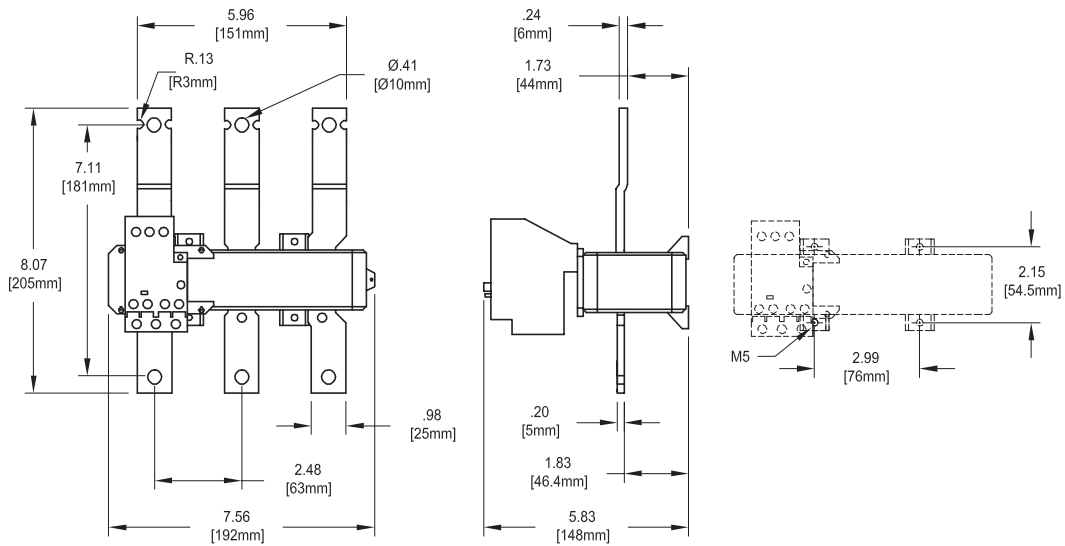
Approximate dimensions E320DU – E800DU

2

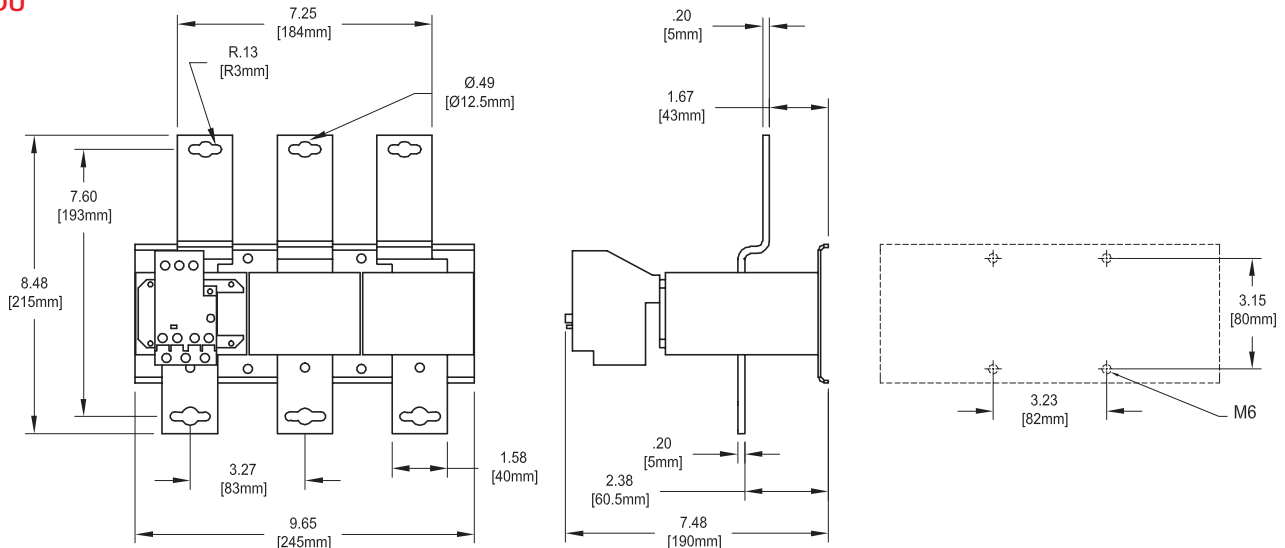
E320DU



E500DU



E800DU



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Across the line • Combination • Reduced voltage

Starters



Starters
Across the line
Combination
Reduced voltage

3





General information

Field modification kits

A Starters

Start-Stop pushbutton kit – dual element

3

Starter size	Catalog number	List price
A9 – A750	MPSSK	\$ 38

For field installation on NEMA 1 enclosures. Kit includes **one dual element pushbutton** and hardware.

Start-Stop pushbutton kit

Starter size	Catalog number	List price
A9 – A750	MP4SSK4	\$ 48

For field installation on all enclosures. Kit includes **two momentary pushbuttons** and hardware. ①

Fwd-Rev-Stop pushbutton kit

Starter size	Catalog number	List price
A9 – A750	MPFRK-4	\$ 120

For field installation on all enclosures. Kit includes three momentary pushbuttons and hardware. ①

2 Position selector switch kit

Starter size	Catalog number	List price
A9 – A750	MPSL2K-4	\$ 90

For field installation on all enclosures. Labels for ON-OFF are included. Kits include mounting hardware. ①

3 Position selector switch kit

Starter size	Catalog number	List price
A9 – A750	MPSL3K-4	\$ 90

For field installation on all enclosures. Labels for HAND-OFF-AUTO are included. Kits include mounting hardware. ①

Pilot light kits

Starter size	Voltage	Catalog number	List price
A9 – A750	120	MPPLK-41	\$ 90
	240	MPPLK-42	
	480V	MPPLK-44	

For field installation on all enclosures. ①

Reset button kits

Starter size	Catalog number	List price
A9 – A750	KPR3-104B	\$ 14

For field installation on all enclosures. ①

① For use with UL Type 3R, 4, 4X, 12 & 13.

General information

Factory modifications

Starters
3

Control cover accessories – A9-A750

Description	Control suffix ①	List price adder
		NEMA 1 3R 4, 4X & 12
Start-stop pushbutton	A	\$ 72
Fwd-rev-stop pushbutton	B	360
2 position selector switch (Std. ON-OFF)	C	72
3 position selector switch (Std. HAND-OFF-AUTO)	D	72
Pilot light, Red, RUN (Std.)	E	135
Pilot light, Green, RUN	R	135
Pilot light suffix + V= Neon bulb	V	–
Pilot light suffix + X= LED bulb	X	–
Start-stop pushbutton & pilot light	F	207
Fwd-rev-stop pushbutton & pilot light	G	496
2 position selector switch & pilot light	H	207
3 position selector switch & pilot light	J	207
Fast-slow-stop pushbuttons	K	360
Fast-slow-stop pushbuttons & pilot light	L	495
Fast-slow-off-auto selector switch	M	150
Emergency stop	P	100
F suffix + 1NO & 1NC auxiliary contact	T	237
J suffix + 1NO & 1NC auxiliary contact	U	237
Pushbutton (standard START)	Y	36

Special modifications

Contact configuration	Suffix code ①	List price adder
Contactor		
Coil surge suppressor	S	\$ 75
Auxiliary relays		
Type N control relay (4 pole)	CR	225
Electronic timer		
1.5 – 30, On Delay	TN30	300
5 – 100, On Delay	TN100	300
1.5 – 30, Off Delay	TF30	300
5 – 100, Off Delay	TF100	300
Phase failure phase reversal with over and undervoltage relays	PFPR	525
Ground fault protection	GFP	2250
For multi-speed controllers		
Compelling relay	CPR	600
Accelerating relay	ACR	600
Decelerating relay	DCR	600
Meters & metering		
Current transformer	CT	375
Ammeter (including C.T.)	AM	705
Ammeter & ammeter switch	AMS	1800
Voltmeter	VM	1200
Voltmeter & voltmeter switch	VMS	1800
Elapsed time meter	ETM	375
Operation counter	OC	560
Wattmeter	WM	3650
Miscellaneous		
Lightning arrester	LA	320
Space heater, 100W with thermostat	SH	600

Control circuit transformer (standard VA) – A9 - A750 ②

Standard size with fused secondary			Coil suffix	Starter size	CCT VA	List price
Primary	Secondary	Hz				
				A9 – A40	45 ③	\$ 300
				A9 – A40	50	360
200/208V	110V	50/60	0	A50 – A75	75	435
220/240V	110/120V	50/60	7	A95 – A110	100	560
440/480V	110/120V	50/60	8	A145 – A185	150	720
550/600V	110/120V	50/60	9	A210 – A300	250	795
				A400 – A460	150	720 ④
				A580 – A750	250	795 ④

Control circuit transformers do include two primary fuses and one secondary fuse.

- ① Add this suffix to the last digit of the catalog number.
 ② Consult factory if additional VA is required.
 ③ Does not include primary fusing.
 ④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Additional auxiliary contact blocks — A9 – A750

Contact configuration	Suffix code ①	A9 – A110 list price adder	A145 – A750 list price adder
1 N.O.	10	\$ 20	–
1 N.C.	01	20	–
2 N.O.	20	30	–
1 N.O. & 1 N.C.	11	30	\$ 30
2 N.C.	02	30	–
4 N.O.	40	60	–
3 N.O. & 1 N.C.	31	60	–
2 N.O. & 2 N.C.	22	60	60
1 N.O. & 3 N.C.	13	60	–
4 N.C.	04	60	–
3 N.O. & 3 N.C.	33	90	90

Reduced voltage & multi-speed starters — price adders

Starter size	Non-fusible switch price adder	Fusible switch price adder	MCCB or MCP price adder
A9	\$ 990	\$ 1008	\$ 1287
A12	990	1008	1287
A16	990	1008	1287
A26	990	1008	1287
A30	990	1224	1350
A40	990	1224	1350
A50	1152	1224	1350
A63	1230	1350	1785
A75	1494	1602	1809
A95 – A110	2310	2565	2982
A145	3042	3366	4158
A185	3300	3735	4533
A210	3450	3825	6000
A260	3744	4068	6849
A300	4200	6000	8750
A400	6600	9450	9030
A460	8200	11,100	9475
A580	8400	11,800	10,200
A750	9000	12,450	12,900

Hazardous location enclosure accessories, NEMA 7 & 9

Item	Catalog ① Suffix No.	List price
3R Breather/drain	A	\$ 80
Start PB green	B	180
Stop PB red	C	180
St/St dual PB	D	360
Em. Stop mush momentary	E	220
Em. Stop mush maintained	F	460
Black PB N.O. auxiliary	G	180
Black PB N.C. auxiliary	H	180
Pilot light	J	180
Illuminated PB	K	460
Push-to-test pilot light	L	450
Potentiometer	M	460
2-Pos Selector Maintained	N	260
2-Pos Selector spring L to R	P	280
2-Pos Selector spring R to L	Q	280
3-Pos Selector sw. main.	R	260
3-Pos Selector spring L to R	S	280
3-Pos Selector spring R to L	T	280
3-Pos Selector spring to C	U	280
2-Pos Selector key operated	V	450
3-Pos Selector key operated	W	450



General information

Catalog number explanation

A110 SR F 1 - 84 C 6 D 4 L A

3 Starter size

Starter type

- S - Non-reversing
- SR - Reversing
- SS - Single phase, non-reversing
- ST - Multi-speed, 2 speed 1 winding, 2 speed 2 winding
- SA - Autotransformer
- SG - Wye-delta open transition
- SY - Wye-delta closed transition
- SH - Part winding
- N - NEMA

Combination type

- N - Non-fusible disconnect
- F - Fusible disconnect
- B - Thermal magnetic or electronic trip type circuit breaker
- M - Motor Circuit Protection (MCP)

Enclosure

- 1 - UL Type 1
- 2 - UL Type 12
- 3 - UL Type 3R
- 4 - UL Type 4
- X - UL Type 4X stainless steel
- P - Plastic
- 7 - UL Type 7 & 9
- Class I, Group C, D, Div 1 & 2
- Class II, Groups E, F & G, Div 1 & 2
- Class III
- 74 - Hazardous Type 4

Coil voltage/CCT

Coil voltage selection – A9 - A300 ①

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84					80			85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ②
50	AF	68	69	70	71 ②
DC	AF	68	69	70	71 ②

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Overload range

See Overload Relay Selection chart, see page 3.6.

Accessories

See Factory modifications, page 3.3.

Horsepower

- A - 10
- B - 15
- C - 20
- D - 25
- E - 30
- F - 40
- G - 50
- H - 60
- J - 75
- K - 100
- L - 125
- M - 150
- N - 200
- P - 250
- R - 300
- S - 350
- T - 400
- U - 500
- V - 600
- W - 700
- X - 800
- Y - 900
- Z - 1000

Line voltage

- 1 - 200 – 208V
- 2 - 230 – 240V
- 3 - 380 – 415V
- 4 - 460 – 480V
- 6 - 575 – 600V

Fuse clip

- 6A - 30A, 600V, Class J
- 6B - 60A, 600V, Class J
- 6C - 100A, 600V, Class J
- 6D - 200A, 600V, Class J
- 6E - 400A, 600V, Class J
- 6F - 600A, 600V, Class J
- 6G - 800A, 600V, Class L
- 6H - 1200A, 600V, Class L

Circuit breaker amp rating (600V)

- 6D-15
- 6E-20
- 6F-25
- 6G-30
- 6H-35
- 6J-40
- 6K-50
- 6L-60
- 6M-70
- 6N-80
- 6P-90
- 6R-100
- 6S-125
- 6T-150
- 6U-175
- 6V-200
- 6W-225
- 6X-250
- 6Y-300
- 6Z-350
- 6A-400
- 6B-450
- 6C-500
- 6D-600
- 6E-700
- 6F-800
- 6G-900
- 6H-1000
- 6J-1200

Circuit breaker amp rating (200V – 480V)

- 4D-15
- 4E-20
- 4F-25
- 4G-30
- 4H-35
- 4J-40
- 4K-50
- 4L-60
- 4M-70
- 4N-80
- 4P-90
- 4R-100
- 4S-125
- 4T-150
- 4U-175
- 4V-200
- 4W-225
- 4X-250
- 4Y-300
- 4Z-350
- 4A-400
- 4B-450
- 4C-500
- 4D-600
- 4E-700
- 4F-800
- 4G-900
- 4H-1000
- 4J-1200

MCP amp rating (600V)

- 6A - 3
- 6B - 5
- 6C - 10
- 6D - 25
- 6E - 50
- 6F - 100
- 6G - 150
- 6H - 250
- 6J - 400
- 6K - 600
- 6L - 800
- 6M - 1000
- 6N-1200

MCP amp rating (200V – 480V)

- 4A - 3
- 4B - 5
- 4C - 10
- 4D - 25
- 4E - 50
- 4F - 100
- 4G - 150
- 4H - 250
- 4J - 400
- 4K - 600
- 4L - 800
- 4M - 1000
- 4N - 1200

① For AF50 - AF300 starters, consult factory.

② For AF400 - AF750 only.

General information

Motor data ①



3

Ampere ratings of 3 phase, AC induction motors

Horse power	110 – 120V			200 – 208V			220 – 240V			380 – 415V		440 – 480V			550 – 600V		
	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase	Single phase	Three phase	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase
1/10	3.0	—	—	1.65	—	—	1.5	—	—	1.0	—	—	—	—	—	—	—
1/8	3.8	—	—	2.1	—	—	1.9	—	—	1.2	—	—	—	—	—	—	—
1/6	4.4	—	—	2.4	—	—	2.2	—	—	1.4	—	—	—	—	—	—	—
1/4	5.8	—	—	3.2	—	—	2.9	—	—	1.8	—	—	—	—	—	—	—
1/3	7.2	—	—	4.0	—	—	3.6	—	—	2.3	—	—	—	—	—	—	—
1/2	9.8	4.0	4.4	5.4	2.2	2.4	4.9	2.0	2.2	3.2	1.3	2.5	1.0	1.1	2.0	0.8	0.9
3/4	13.8	4.8	6.4	7.6	2.6	3.5	6.9	2.4	3.2	4.5	1.8	3.5	1.2	1.6	2.8	1.0	1.3
1	16.0	6.4	8.4	8.8	3.6	4.6	8.0	3.2	4.2	5.1	2.3	4.0	1.6	2.1	3.2	1.3	1.7
1 1/2	20.0	9.0	12.0	11.0	5.0	6.6	10.0	4.5	6.0	6.4	3.3	5.0	2.3	3.0	4.0	1.8	2.4
2	24.0	11.8	13.6	13.2	6.5	7.5	12.0	5.9	6.8	7.7	4.3	6.0	3.0	3.4	4.8	2.4	2.7
3	34.0	16.6	19.2	18.7	9.2	10.6	17.0	8.3	9.6	10.9	6.1	8.5	4.2	4.8	6.8	3.3	3.9
5	56.0	26.4	30.4	30.8	14.5	16.8	28.0	13.2	15.2	17.9	9.7	14.0	6.6	7.6	11.2	5.3	6.1
7 1/2	80.0	38.0	44.0	44.0	21.0	24.2	40.0	19.0	22.0	27.0	14.0	21.0	9.0	11.0	16.0	8.0	9.0
10	100.0	48.0	56.0	55.0	26.4	30.8	50.0	24.0	28.0	33.0	18.0	26.0	12.0	14.0	20.0	10.0	11.0
15	135.0	72.0	84.0	75.0	39.6	46.2	68.0	36.0	42.0	44.0	27.0	34.0	18.0	21.0	27.0	14.0	17.0
20	—	94.0	108.0	96.8	52.0	60.0	88.0	47.0	54.0	56.0	34.0	44.0	23.0	27.0	35.0	19.0	22.0
25	—	118.0	136.0	121.0	65.0	75.0	110.0	59.0	68.0	70.0	44.0	55.0	29.0	34.0	44.0	24.0	27.0
30	—	138.0	160.0	150.0	76.0	88.0	136.0	69.0	80.0	87.0	51.0	68.0	35.0	40.0	54.0	28.0	32.0
40	—	180.0	208.0	194.0	100.0	115.0	176.0	90.0	104.0	112.0	66.0	88.0	45.0	52.0	70.0	36.0	41.0
50	—	226.0	260.0	238.0	125.0	143.0	216.0	113.0	130.0	139.0	83.0	108.0	56.0	65.0	86.0	45.0	52.0
60	—	—	—	—	147.0	160.0	—	133.0	154.0	—	103.0	—	67.0	77.0	—	53.0	62.0
75	—	—	—	—	183.0	212.0	—	166.0	192.0	—	128.0	—	83.0	96.0	—	66.0	77.0
100	—	—	—	—	240.0	273.0	—	218.0	248.0	—	165.0	—	109.0	124.0	—	87.0	99.0
125	—	—	—	—	—	344.0	—	—	312.0	—	208.0	—	135.0	156.0	—	108.0	125.0
150	—	—	—	—	—	396.0	—	—	360.0	—	240.0	—	156.0	180.0	—	125.0	144.0
200	—	—	—	—	—	528.0	—	—	480.0	—	320.0	—	208.0	240.0	—	167.0	192.0
250	—	—	—	—	—	663.0	—	—	602.0	—	403.0	—	—	302.0	—	—	242.0
300	—	—	—	—	—	—	—	—	—	—	482.0	—	—	361.0	—	—	289.0
350	—	—	—	—	—	—	—	—	—	—	560.0	—	—	414.0	—	—	336.0
400	—	—	—	—	—	—	—	—	—	—	636.0	—	—	477.0	—	—	382.0
500	—	—	—	—	—	—	—	—	—	—	786.0	—	—	590.0	—	—	472.0

① The above values of full-load currents are typical for motors running at speeds normal for belted motors and motors with normal torque characteristics. Whenever possible, use the actual motor nameplate full-load current when selecting motor control products.

General information Standard thermal overload relays

Standard – Thermal, Type TA, Class 10 & Electronic, Type E, Class 10, 20 & 30



A9



A50

For contactor	Setting range A	Suffix code for all other starters	Catalog number
A/AE9 – A/AE40 BC9 – BC30	0.1 – 0.16	A	TA25DU0.16
	0.16 – 0.25	B	TA25DU0.25
	0.25 – 0.4	C	TA25DU0.4
	0.4 – 0.63	D	TA25DU0.63
	0.63 – 1.0	E	TA25DU1.0
	1.0 – 1.4	F	TA25DU1.4
	1.3 – 1.8	G	TA25DU1.8
	1.7 – 2.4	H	TA25DU2.4
	2.2 – 3.1	J	TA25DU3.1
	2.8 – 4.0	K	TA25DU4.0
	3.5 – 5.0	L	TA25DU5.0
	4.5 – 6.5	M	TA25DU6.5
	6.0 – 8.5	N	TA25DU8.5
	7.5 – 11	P	TA25DU11
10 – 14	Q	TA25DU14	
13 – 19	R	TA25DU19	
18 – 25	S	TA25DU25	
24 – 32	T	TA25DU32	
A/AE30 – A/AE40	18 – 25	A	TA42DU25
	22 – 32	B	TA42DU32
	29 – 42	C	TA42DU42
A/AE/AF50 – A/AE/AF75	18 – 25	A	TA75DU25
	22 – 32	B	TA75DU32
	29 – 42	C	TA75DU42
	36 – 52	D	TA75DU52
	45 – 63	E	TA75DU63
	60 – 80	F	TA75DU80
A/AE/AF95 – A/AE/AF110	29 – 42	C	TA80DU42
	36 – 52	D	TA80DU52
	45 – 63	E	TA80DU63
	60 – 80	F	TA80DU80
	65 – 90	A	TA110DU90
	80 – 110	B	TA110DU110
A/AF145 – A/AF185	65 – 90	A	TA200DU90
	80 – 110	B	TA200DU110
	100 – 135	C	TA200DU135
	110 – 150	D	TA200DU150
	130 – 175	E	TA200DU175
	150 – 200	F	TA200DU200
A/AF210 – A/AF300	130 – 185	A	TA450DU185 ①
	165 – 235	B	TA450DU235
	220 – 310	C	TA450DU310
A/AF400 – A/AF460	170 – 500	E5	E500DU500 ②
A/AF580 – A/AF750	270 – 800	E8	E800DU800 ②

① TA450 overloads require mounting kits for installation.
② Not suitable for single-phase motors or direct current (DC) motors.

General information

Electronic overload relays

Starters 3



A145

Optional – Electronic, Type E, Class 10, 20 & 30

For contactor	Setting range	Suffix code	Catalog number ①	List price adder
E16DU – Tripping Class 10 A/AE9 – A/AE16	0.1 – 0.32	A1	E16DU0.32-10	\$ 33
	0.3 – 1.0	B1	E16DU1.0-10	
	0.9 – 2.7	C1	E16DU2.7-10	
	2.0 – 6.3	D1	E16DU6.3-10	
	5.7 – 18.9	E1	E16DU18.9-10	
E16DU – Tripping Class 20 A/AE9 – A/AE16	0.1 – 0.32	A2	E16DU0.32-20	33
	0.3 – 1.0	B2	E16DU1.0-20	
	0.9 – 2.7	C2	E16DU2.7-20	
	2.0 – 6.3	D2	E16DU6.3-20	
	5.7 – 18.9	E2	E16DU18.9-20	
E16DU – Tripping Class 30 A/AE9 – A/AE16	0.1 – 0.32	A3	E16DU0.32-30	33
	0.3 – 1.0	B3	E16DU1.0-30	
	0.9 – 2.7	C3	E16DU2.7-30	
	2.0 – 6.3	D3	E16DU6.3-30	
	5.7 – 18.9	E3	E16DU18.9-30	
E200DU – Tripping Class 10, 20 & 30 A/AF145 – A/AF185 A/AF210 – A/AF300 AF400 – AF460 AF580 – AF750	65 – 200	E2	E200DU200	325
	105 – 320	E3	E320DU320	775
	170 – 500	E5	E500DU500	865
	270 – 800	E8	E800DU800	950

① Not suitable for single-phase motors and direct current (DC) motors.



General information Enclosures

Type enclosure	For use with	Dimensions H x W x D (inches)	Catalog number	List price
IP65	A9 – A16 Contactors & starters, blank cover	7 x 3.5 x 5.2	EKA16S-0	\$ 75
	A9 – A16 Contactors & starters, start & stop/reset		EKA16S-A	90
	A9 – A16 Contactors & starters, reset only		EKA16S-R	90
NEMA 1 Lift off cover	A9 – A26 Contactors, non-reversing & reversing starters A30 – A75 Contactors, non-reversing & reversing starters	11.5 x 7 x 6 13 x 9 x 7	EK-N1A9A26 EK-N1A30A75	113 188
NEMA 1 Indoor metal hinged cover	A9 – A40 Non-reversing starters + CCT A9 – A40 Reversing contactors A9 – A40 Reversing starters	10 x 8 x 6	EK-11H	160
	A50 – A75 Contactors A50 – A75 Non-reversing starters + CCT A50 – A75 Reversing starters	14 x 12 x 8	EK-12	205
NEMA 1, 3R 4, 4X & 12 Plastic	A95 – A110 Contactors A95 – A110 Non-reversing starters + CCT	24 x 12 x 8	EK-13	405
	A9 – A40 Contactors A9 – A40 Non-reversing starters + CCT A9 – A40 Reversing starters	10 x 8 x 7	EK-W	160
NEMA 12 Indoor metal dusttight	A50 – A75 Contactors A50 – A75 Non-reversing starters + CCT A50 – A75 Reversing starters	12 x 10 x 7	EK-W2	220
	A9 – A40 Contactors A9 – A40 Non-reversing starters A9 – A40 Reversing contactors A9 – A40 Reversing starters	10 x 8 x 6	EK-24	180
NEMA 3R Outdoor metal	A50 – A75 Contactors + CCT A50 – A75 Non-reversing starters + CCT A50 – A75 Reversing starters	14 x 12 x 8	EK-22	270
	A9 – A40 Contactors + CCT A9 – A40 Non-reversing starters + CCT A9 – A40 Reversing contactors A9 – A40 Reversing starters	10 x 8 x 6	EK-31	225
NEMA 3R Outdoor metal	A50 – A75 Contactors + CCT A50 – A75 Non-reversing starters + CCT A50 – A75 Reversing contactors A50 – A75 Reversing starters A95 – A110 Contactors + CCT A110 Non-reversing starters + CCT A110 Non-reversing starters + CCT	14 x 12 x 8	EK-32	435

NOTE : (1) All enclosures come standard with reset button and predrilled back panel.

General information

Enclosure rating definitions

Introduction

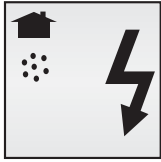
An enclosure is a surrounding case constructed to provide a degree of protection to personnel against accidental contact with the enclosed equipment and to provide a degree of protection to the enclosed equipment against specified environmental conditions.

A brief description of the more common types of enclosures used by the electrical industry relating to their environmental capabilities follows.

Refer to NEMA Standards Publication for more information regarding applications, features and design tests.

Individual NEMA product Standards Publications or third party certification standards may contain additional requirements for product testing and performance.

Definitions pertaining to nonhazardous locations



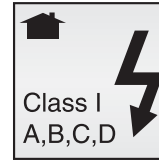
Type 1

Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt. (NEMA Standard 7-15-1991.)



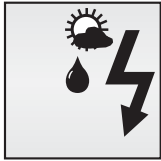
Type 4X

Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979)



Type 7

Enclosures are intended for indoor use in locations classified as Class I, Groups, A, B, C, or D, as defined in the National Electrical Code. (NEMA Standard 7-15-1991.)



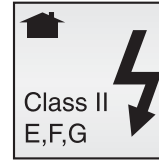
Type 3R

Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet and damage from external ice formation. (NEMA Standard 7-15-1991.)



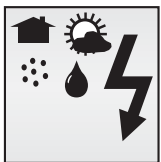
Type 12

Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids. (NEMA Standard 7-15-1991.)



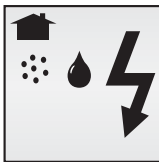
Type 9

Enclosures are intended for indoor use in locations classified as Class II, Groups E, F, or G, as defined in the National Electrical Code. (NEMA Standard 7-15-1991.)



Type 4

Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979.)



Type 13

Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil and noncorrosive coolant. (NEMA Standard 1-10-1979.)




Legend

- Indoors
- Outdoors
- Water
- Dirt/dust
- Corrosion

General information IP Environmental ratings

IP ratings

indicate the degree of protection against dust, liquids and impacts. The IP degrees of protection are defined by the French standard NFC 20-010. To rate a device's degrees of protection, the letters IP are followed by up to three numbers. These numbers are defined as follows:

first number protection against solid objects	second number protection against liquids	third number protection against mechanical impacts
<p>IP 0  no protection</p>	<p>IP 0  no protection</p>	<p>IP 0  no protection</p>
<p>1  protected against solid objects over 50mm (e.g. accidental touch by hands.)</p>	<p>1  protected against vertically falling rain or condensation</p>	<p>1  impact 0.225 joule 150g falling from 15cm</p>
<p>2  protected against solid objects over 12mm (e.g. fingers)</p>	<p>2  protected against direct sprays of water up to 15° from vertical</p>	<p>2  impact 0.375 joule 250g falling from 15cm</p>
<p>3  protected against solid objects over 2.5mm (tools & wires)</p>	<p>3  protected against sprays to 60° from vertical</p>	<p>3  impact 0.50 joule 250g falling from 20cm</p>
<p>4  protected against solid objects over 1mm (small tools & small wires)</p>	<p>4  protected against water sprayed from all directions</p>	<p>5  impact 2.00 joule 500g falling from 40cm</p>
<p>5  protected against dust (no harmful deposit)</p>	<p>5  protected against low pressure jets of water from all directions</p>	<p>7  impact 6.00 joule 1.5kg falling from 40cm</p>
<p>6  totally protected against dust</p>	<p>6  protected from strong jets of water (e.g. for use on ship decks)</p>	<p>9  impact 20.00 joule 5 kg falling from 40cm</p>
	<p>7  protected against the effects of immersion between 15cm and 1m</p>	

Across the line Starters



Across the line starters

Open & enclosed

A9 – A750



Description A9 – A750

- Maximum UL/CSA horsepower ratings
- UL508A Panel Program, #E105450
- NEMA sizes 00 – 7 available
- Compact space-saving design
- Standard auxiliary contact configurations:
A9 – A40 1 NO or 1 NC
A50 – A750 1 NO & 1 NC
- Additional auxiliary contact blocks are available
- DC ratings & DC control operation available
- Fast, snap-on DIN rail mounting (A9 - A110)
- Double break contact design
- Snap-on front and side mounted accessories include mechanical latch, pneumatic timer and 1 & 4 pole auxiliary contact blocks (A9 – A110)
- Easy coil change
- Captive terminal screws
- NEMA, UL, CSA, and most other international standards
- cUL marked
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- Screwdriver guide holes

Enclosure types

- NEMA 1 (Indoor metal)
- NEMA 3R (Outdoor metal)
- NEMA 12 (Metal dusttight)
- NEMA 4X (Stainless steel)
- NEMA 4 (Water tight)
- NEMA 1, 3R, 4, 4X, & 12 (Plastic)
- IP 65 plastic A9 – A16 starters
- NEMA 7 & 9
Class I, Group C, D, Div 1 & 2
Class II, Groups E, F, & G, Div 1 & 2
Class III, 4X

Overload relay protection

Starters, sizes A9–A185, have Class 10 adjustable thermal bimetallic overload relay protection as standard.

Sizes A210 – A750, have selectable Class 10, 20, 30 adjustable electronic overload relay protection as standard.

Electronic overload relay protection is available for other starter sizes.

A110 SR 1 - 84 C A

Starter size

Starter type

- S - Non-reversing
- SR - Reversing
- SS - Single phase, non-reversing
- ST - Multi-speed, 2 speed 1 winding, 2 speed 2 winding
- N - NEMA

Enclosure

- 1 - UL Type 1
- 2 - UL Type 12
- 3 - UL Type 3R
- 4 - UL Type 4
- X - UL Type 4X stainless steel
- P - Plastic
- 7 - UL Type 7 & 9
Class I, Group C, D, Div 1 & 2
Class II, Groups E, F & G, Div 1 & 2
Class III
- 74 - Hazardous Type 4

Coil voltage/CCT

See Coil Voltage Selection charts on page 3.12

Overload range

See Overload Relay Selection chart, see page 3.6.

Accessories

See Factory modifications, page 3.3



Starter selection by motor horsepower & voltage

Maximum UL/CSA ratings, three phase

3

Motor horsepower				Complete starter		Starter components						
3-phase, 1800 RPM ①				Catalog number	List price	Contactors		Overload relays				
200V	230V	460V	575V			Catalog number	List price	Catalog number	List price			
—	—	—	1/4	A9S-84C	\$ 165	A9-30-10-84	\$ 78	TA25DU0.4 (0.25 - .4)	\$ 63			
—	—	1/4,1/3	1/3	A9S-84D		A9-30-10-84		TA25DU0.63 (0.4 - .63)				
—	—	—	1/2	A9S-84E		A9-30-10-84		TA25DU1.0 (0.63 - 1.0)				
—	—	1/2	3/4	A9S-84F		A9-30-10-84		TA25DU1.4 (1.0 - 1.4)				
—	—	3/4	—	A9S-84G		A9-30-10-84		TA25DU1.8 (1.3 - 1.8)				
—	1/2	1	1.5	A9S-84H		A9-30-10-84		TA25DU2.4 (1.7 - 2.4)				
1/2	—	1.5	2	A9S-84J		A9-30-10-84		TA25DU3.1 (2.2 - 3.1)				
3/4	3/4	2	—	A9S-84K		A9-30-10-84		TA25DU4.0 (2.8 - 4.0)				
—	1	—	3	A9S-84L		A9-30-10-84		TA25DU5.0 (3.5 - 5.0)				
1	1.5	3	5	A9S-84M		A9-30-10-84		TA25DU6.5 (4.5 - 6.5)				
2	2	5	—	A9S-84N		A9-30-10-84		TA25DU8.5 (6.0 - 8.5)				
—	—	—	7.5	A9S-84P		A9-30-10-84		TA25DU11 (7.5 - 11)				
3	3	7.5	10	A12S-84Q		171		A12-30-10-84		84	TA25DU14 (10 - 14)	\$ 78
5	5	10	15	A16S-84R		200		A16-30-10-84		102	TA25DU19 (13 - 19)	
—	7.5	15	20	A26S-84S		294		A26-30-10-84		183	TA25DU25 (18 - 25)	
7.5	10	20	25	A26S-84T		—		A26-30-10-84		—	TA25DU32 (24 - 32)	\$ 102
10	10	—	—	A30S-84B	365	A30-30-10-84	252	TA42DU32 (22 - 32)				
—	—	25	30	A30S-84C	—	—	—	TA42DU42 (29 - 42)	\$ 165			
10	15	30	40	A40S-84C	423	A40-30-10-84	297	TA42DU42 (29 - 42)				
15	—	40	50	A50S-84D	458	A50-30-11-84	330	TA75DU52 (36 - 52)	\$ 225			
—	20	—	—	A50S-84E	—	A50-30-11-84	—	TA75DU63 (45 - 63)				
20	—	—	—	A63S-84F	522	A63-30-11-84	372	TA75DU80 (60 - 80)	\$ 775			
—	—	50	60	A63S-84F	—	A63-30-11-84	—	—				
25	30	60	75	A75S-84F	563	A75-30-11-84	413	—	\$ 865			
30	—	—	—	A95S-84A	735	A95-30-11-84	450	TA110DU90 (65 - 90)				
—	40	75	100	A110S-84B	765	A110-30-11-84	480	TA110DU110 (80 - 110)	\$ 950			
40	—	—	—	A145S-84C	1315	A145-30-11-84	825	TA200DU135 (100 - 135)				
—	50	100	125	A145S-84D	—	—	—	TA200DU150 (110 - 150)	\$ 1635			
50	60	125	150	A185S-84E	1730	A185-30-11-84	1290	TA200DU175 (130 - 175)				
60	75	150	200	A210S-84E3	2135	A210-30-11-84	1635	—	\$ 865			
75	100	200	250	A260S-84E3	2740	A260-30-11-84	1815	E320D4320 (105-320)				
100	—	250	300	A300S-84E3	2890	A300-30-11-84	1875	—	\$ 950			
125	125, 150	350	400	A400S-70E5	4125	AF400-30-11-70	3120	E500DU500 (170 - 500)				
150	200	400	500	A460S-70E5	5700	AF460-30-11-70	4425	—	\$ 950			
200	250	500	600	A580S-70E8	8346	AF580-30-11-70	6900	E800DU800 (270 - 800)				
250	300	600	700	A750S-70E8	8646	AF750-30-11-70	7200	—				

CAUTION: The above ratings are based on average motor FLA. Actual FLA on the motor nameplate should be used for overload relay setting.

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75S-80F

D.C. operated starters

If DC operation is required, consult factory.

Factory modifications

See page 3.3

Coil voltage selection - A9 - A300 ②

Hz	type	Volts																		
		Cntr																		
60	A	81	83	84	84	84	34	36	80	42										
50	A	81	83	84					80						85	86				55

For other voltages, see page 1.26.

Coil voltage selection - A400 - A750 ②

Hz	type	Cntr/Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71
50	AF	68	69	70	71
DC	AF	68	69	70	71

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

① For motors with RPM greater or less than 1800 RPM, check full load amp rating on motor nameplate to ensure proper overload protection.
 ② For AF50 - AF 300 starters, consult factory.

Starter selection by motor horsepower & voltage

NEMA sizes & ratings, three phase



NEMA size	Motor horsepower				Complete starter		Starter components			
	3-phase, 1800 RPM ①				Catalog number	List price	Contactors		Overload relays	
	200V	230V	460V	575V			Catalog number	List price	Catalog number	List price
00	—	—	—	1/4	A9N00S-84C	\$ 165	A9N00-30-10-84	\$ 78	TA25DU0.4 (0.25 - .4)	\$ 63
	—	—	—	1/3	A9N00S-84D		A9N00-30-10-84		TA25DU0.63 (0.4 - .63)	
	—	—	1/4	1/2	A9N00S-84E		A9N00-30-10-84		TA25DU1.0 (0.63 - 1.0)	
	—	1/4	1/3, 1/2	—	A9N00S-84F		A9N00-30-10-84		TA25DU1.4 (1.0 - 1.4)	
	—	1/3	3/4	3/4	A9N00S-84G		A9N00-30-10-84		TA25DU1.6 (1.3 - 1.6)	
	1/3, 1/4	1/2	1	1	A9N00S-84H		A9N00-30-10-84		TA25DU2.4 (1.7 - 2.4)	
	1/2	—	—	1.5, 2	A9N00S-84J		A9N00-30-10-84		TA25DU3.1 (2.2 - 3.1)	
	3/4	3/4	1.5, 2	—	A9N00S-84K		A9N00-30-10-84		TA25DU4.0 (2.8 - 4.0)	
	—	1	—	—	A9N00S-84L		A9N00-30-10-84		TA25DU5.0 (3.5 - 5.0)	
	1	1.5	—	—	A9N00S-84M		A9N00-30-10-84		TA25DU6.5 (4.5 - 6.5)	
—	—	—	—	A9N00S-84N	A9N00-30-10-84	TA25DU8.5 (6.0 - 8.5)				
0	—	—	—	3	A16N0S-84L	200	A16N0-30-10-84	102	TA25DU5.0 (3.5 - 5.0)	
	—	—	3	5	A16N0S-84M		A16N0-30-10-84		TA25DU6.5 (4.5 - 6.5)	
	2	2	5	—	A16N0S-84N		A16N0-30-10-84		TA25DU8.5 (6.0 - 8.5)	
	3	3	—	—	A16N0S-84P		A16N0-30-10-84		TA25DU11 (7.5 - 11)	
1	—	—	—	7.5	A26N1S-84P	294	A26N1-30-10-84	183	TA25DU11 (7.5 - 11)	
	—	—	7.5	10	A26N1S-84Q		A26N1-30-10-84		TA25DU14 (10 - 14)	
	5	5	10	—	A26N1S-84R		A26N1-30-10-84		TA25DU19 (13 - 19)	
—	—	—	—	A26N1S-84S	A26N1-30-10-84	TA25DU25 (18 - 25)				
2	—	—	—	15	A50N2S-84R	393	A50N2-30-11-84	330	TA25DU19 (13 - 19) ③	
	—	—	15	20	A50N2S-84A		A50N2-30-11-84		TA75DU25 (18 - 25)	
	—	10	20	25	A50N2S-84B		A50N2-30-11-84		TA75DU32 (22 - 32)	
	10	15	25	—	A50N2S-84C		A50N2-30-11-84		TA75DU42 (29 - 42)	
3	—	—	—	30	A75N3S-84C	563	A75N3-30-11-84	413	TA75DU42 (29 - 42)	
	15	—	30	40	A75N3S-84D		A75N3-30-11-84		TA75DU52 (36 - 52)	
	20	20	40	50	A75N3S-84E		A75N3-30-11-84		TA75DU63 (45 - 63)	
	25	25, 30	50	—	A75N3S-84F		A75N3-30-11-84		TA75DU80 (60 - 80)	
4	—	—	60	60, 75	A145N4S-84A	1315	A145N4-30-11-84	825	TA200DU90 (65 - 90)	165
	30	40	75	100	A145N4S-84B		A145N4-30-11-84		TA200DU110 (80 - 110)	
	40	50	100	—	A145N4S-84C		A145N4-30-11-84		TA200DU135 (100 - 135)	
5	50, 60, 75	60, 75, 100	125, 150, 200	200	A260N5S-8E3	2740	A260N5-30-11-84	1815	E320DU320 (105-320)	775
	—	100	200	—	A260N5S-8E3		A260N5-30-11-84		E320DU320 (105-320)	
6	100, 125	125, 150	250, 300	250, 300	A460N6S-70E5	5700	AF460N6-3011-70	4425	E500DU500 (170 - 500)	865
	150	200	400	400	A460N6S-70E5		AF460N6-3011-70		E500DU500 (170 - 500)	
7	—	250, 300	500, 600	500, 600	A750N7S-70E8	8646	AF750N7-3011-70	7200	E800DU800 (270 - 800)	950

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CAUTION: The above ratings are based on average motor FLA. Actual FLA on the motor nameplate should be used for overload relay setting.

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75NS-80F

D.C. operated starters

If DC operation is required, consult factory.

Factory modifications

See page 3.3

Coil voltage selection – A9 - A300 ②

Hz	type	Cntr Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80			85	86			55	

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ②

Hz	type	Cntr Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ④
50	AF	68	69	70	71 ④
DC	AF	68	69	70	71 ④

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

① For motors with RPM greater or less than 1800 RPM, check full load amp rating on motor nameplate to ensure proper overload protection.

② For AF50 - AF 300 starters, consult factory.

③ Overload to be base mounted.

④ AF400 - AF750 only.



Non-reversing A9 - A750 Three phase

Open & enclosed

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UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type1 (Indoor metal) ⑤		UL Type 3R (Outdoor metal)	
	Maximum motor horsepower ratings ④						Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V						
UL rated										
9	2	2	5	7.5	A9S-84★	\$ 165	A9S1-84★	\$ 255	A9S3-84★	\$ 330
11	3	3	7.5	10	A12S-84★	171	A12S1-84★	285	A12S3-84★	360
17	5	5	10	15	A16S-84★	200	A16S1-84★	300	A16S3-84★	383
28	7.5	10	20	25	A26S-84★	294	A26S1-84★	405	A26S3-84★	465
34	10	10	25	30	A30S-84★	365	A30S1-84★	473	A30S3-84★	533
42	10	15	30	40	A40S-84★	423	A40S1-84★	525	A40S3-84★	578
54	15	20	40	50	A50S-84★	458	A50S1-84★	600	A50S3-84★	719
65	20	25	50	50	A63S-84★	522	A63S1-84★	713	A63S3-84★	795
80	25	30	60	75	A75S-84★	563	A75S1-84★	975	A75S3-84★	1058
95	30	30	60	75	A95S-84★	735	A95S1-84★	1140	A95S3-84★	1485
110	30	40	75	100	A110S-84★	765	A110S1-84★	1170	A110S3-84★	1515
130	40	50	100	125	A145S-84★	1315	A145S1-84★	1765	A145S3-84★	2130
156	50	60	125	150	A185S-84★	1730	A185S1-84★	2400	A185S3-84★	2805
192	60	75	150	200	A210S-84★	2135	A210S1-84★	2650	A210S3-84★	3375
248	75	100	200	250	A260S-84★	2740	A260S1-84★	3825	A260S3-84★	4650
302	100	100	250	300	A300S-84★	2890	A300S1-84★	4125	A300S3-84★	4875
414	125	150	350	400	A400S-70★	4125	A400S1-70★	7857	A400S3-70★	8625
480	150	200	400	500	A460S-70★	5700	A460S1-70★	9375	A460S3-70★	9435
590	200	250	500	600	A580S-70★	8346	A580S1-70★	12,400	A580S3-70★	13,465
810	250	300	600	700	A750S-70★	8646	A750S1-70★	13,350	A750S3-70★	14,325

NEMA rated

NEMA size	Continuous current	200V	230V	460/575V						
00	9	1.5	1.5	2	A9N00S-84★	\$ 165	A9NS1-84★	\$ 255	A9NS3-84★	\$ 330
0	18	3	3	5	A16N0S-84★	200	A16NS1-84★	300	A16NS3-84★	383
1	27	7.5	7.5	10	A26N1S-84★	294	A26NS1-84★	405	A26NS3-84★	465
2	45	10	15	25	A50N2S-84★	458	A50NS1-84★	600	A50NS3-84★	719
3	90	25	30	50	A75N3S-84★	563	A75NS1-84★	975	A75NS3-84★	1058
4	135	40	50	100	A145N4S-84★	1315	A145NS1-84★	1765	A145NS3-84★	2130
5	270	75	100	200	A260N5S-84★	2740	A260NS1-84★	3825	A260NS3-84★	4650
6	540	150	200	400	A460N6S-70★	5700	A460NS1-70★	9375	A460NS3-70★	9435
7	810	—	300	600	A750N7S-70★	8646	A750NS1-70★	13,350	A750NS3-70★	14,325

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75S-80F

D.C. operated starters

If DC operation is required, consult factory.

Factory modifications

See page 3.3

Control transformer option

Contact size	VA rating	List price adder
A9 – A40	45 ①	\$ 300
A9 – A40	50	360
A9 – A40 (N7 & 9)	50	630 ②
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ④
A580 – A750	250	795 ④

Coil voltage selection – A9 - A300 ②

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ②

Hz	type	Cntr/Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ⑥
50	AF	68	69	70	71 ⑥
DC	AF	68	69	70	71 ⑥

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

① No primary fusing provided.

② For AF50 – AF 300 starters, consult factory.

③ List price reflects larger enclosure for starters with control transformer.

④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

⑤ A9 – A75 starters are mounted in a UL Type 1 lift-off cover enclosure.

⑥ AF400 - AF750 only.

Non-reversing A9 - A750 Three phase



UL Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)		UL Type 7 & 9 non-reversing (Explosion proof)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price

UL rated

A9S2-84★	\$ 330	A9S4-84★	\$ 495	A9SX-84★	\$ 645	A9SP-84★	\$ 315	A9S7-84★	\$ 1500
A12S2-84★	360	A12S4-84★	540	A12SX-84★	713	A12SP-84★	345	A12S7-84★	1560
A16S2-84★	383	A16S4-84★	570	A16SX-84★	743	A16SP-84★	360	A16S7-84★	1590
A26S2-84★	465	A26S4-84★	630	A26SX-84★	831	A26SP-84★	443	A26S7-84★	1680
A30S2-84★	533	A30S4-84★	690	A30SX-84★	885	A30SP-84★	510	A30S7-84★	2040
A40S2-84★	578	A40S4-84★	1050	A40SX-84★	1275	A40SP-84★	555	A40S7-84★	2410
A50S2-84★	719	A50S4-84★	1103	A50SX-84★	1328	A50SP-84★	698	A50S7-84★	2600
A63S2-84★	795	A63S4-84★	1170	A63SX-84★	1410	A63SP-84★	773	A63S7-84★	3350
A75S2-84★	1058	A75S4-84★	1425	A75SX-84★	2010	A75SP-84★	1035	A75S7-84★	3900
A95S2-84★	1485	A95S4-84★	2070	A95SX-84★	2783	A95SP-84★	1410	A95S7-84★	5510
A110S2-84★	1515	A110S4-84★	2100	A110SX-84★	2813	A110SP-84★	1440	A110S7-84★	5550
A145S2-84★	2130	A145S4-84★	2700	A145SX-84★	3375	A145SP-84★	1950	A145S7-84★	6040
A185S2-84★	2805	A185S4-84★	3340	A185SX-84★	3900	A185SP-84★	2440	A185S7-84★	8100
A210S2-84★	3375	A210S4-84★	3900	A210SX-84★	4785	A210SP-84★	3000	A210S7-84★	9600
A260S2-84★	4650	A260S4-84★	5175	A260SX-84★	5815	A260SP-84★	4200	A260S7-84★	11,740
A300S2-84★	4875	A300S4-84★	5400	A300SX-84★	6040	A300SP-84★	4425	A300S7-84★	11,965
A400S2-70★	8625	A400S4-70★	9000	A400SX-70★	9855	—	—	—	—
A460S2-70★	10,380	A460S4-70★	10,800	A460SX-70★	11,700	—	—	—	—
A580S2-70★	13,465	A580S4-70★	14,250	A580SX-70★	14,590	—	—	—	—
A750S2-70★	14,325	A750S4-70★	14,850	A750SX-70★	15,745	—	—	—	—

NEMA rated

A9NS2-84★	\$ 330	A9NS4-84★	\$ 495	A9NSX-84★	\$ 645	A9NSP-84★	\$ 315	A9NS7-84★	\$ 1500
A16NS2-84★	383	A16NS4-84★	570	A16NSX-84★	743	A16NSP-84★	360	A16NS7-84★	1590
A26NS2-84★	465	A26NS4-84★	630	A26NSX-84★	831	A26NSP-84★	443	A26NS7-84★	1680
A50NS2-84★	719	A50NS4-84★	1103	A50NSX-84★	1328	A50NSP-84★	698	A50NS7-84★	2600
A75NS2-84★	1058	A75NS4-84★	1425	A75NSX-84★	2010	A75NSP-84★	1035	A75NS7-84★	3900
A145NS2-84★	2130	A145NS4-84★	2700	A145NSX-84★	3375	A145NSP-84★	1950	A145NS7-84★	6040
A260NS2-84★	4650	A260NS4-84★	5175	A260NSX-84★	5815	A260NSP-84★	4200	A260NS7-84★	11,740
A460NS2-70★	10,380	A460NS4-70★	10,800	A460NSX-70★	11,700	—	—	—	—
A750NS2-70★	14,325	A750NS4-70★	14,850	A750NSX-70★	15,745	—	—	—	—

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.



Non-reversing A9 - A185 Single phase

Open & enclosed

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UL motor switching current	Maximum ratings – UL Listed		Open type		UL Type 1 (Indoor metal)		
	Maximum motor horsepower ratings ^①		Catalog number	List price	Catalog number	List price	
	115V	230V					
UL rated							
9	1/2	1	A9SS-84★	\$ 165	A9SS1-84★	\$ 255	
11	3/4	2	A12SS-84★	171	A12SS1-84★	285	
17	1	3	A16SS-84★	200	A16SS1-84★	300	
28	1.5	5	A26SS-84★	294	A26SS1-84★	405	
34	2	7.5	A30SS-84★	372	A30SS1-84★	473	
42	3	7.5	A40SS-84★	423	A40SS1-84★	525	
54	3	7.5	A50SS-84★	458	A50SS1-84★	600	
65	5	10	A63SS-84★	522	A63SS1-84★	713	
80	7.5	15	A75SS-84★	563	A75SS1-84★	975	
95	7.5	20	A95SS-84★	735	A95SS1-84★	1140	
110	10	25	A110SS-84★	765	A110SS1-84★	1170	
130	10	25	A145SS-84★	1315	A145SS1-84★	1765	
156	15	30	A185SS-84★	1728	A185SS1-84★	2400	
NEMA rated							
NEMA size	Continuous current	115V	230V				
00	9	1/3	1	A9N00SS-84★	\$ 165	A9N00SS1-84★	\$ 255
0	18	1	2	A16N0SS-84★	200	A16N0SS1-84★	300
1	27	2	3	A26N1SS-84★	294	A26N1SS1-84★	405
2	45	3	7.5	A50N2SS-84★	458	A50N2SS1-84★	600

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SS-80F

D.C. operated starters

If DC operation is required, consult factory.

Factory modifications

See page 3.3

DC ratings

Frame size	Max current	Maximum DC HP ratings (UL)	
		125VDC	250VDC
A9	9.5	1	2
A12	13.2	1.5	3
A16	17	2	3
A26	25	3	5
A30	25	3	7.5
A40	40	5	10
A50	58	7.5	15
A63	76	10	20
A75	76	10	25

Control transformer option

Contactors size	VA rating	List price adder
A9 – A30	45 ①	\$ 300
A9 – A30	50	360
A40 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720

Coil voltage selection – A9 - A300 ②

Hz	type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A	81	83	84	84		34	36	80	42		86	86	51	53	55	
50	A	81	83	84					80			85	86			55	

For other voltages, see page 1.26.

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

① No primary fusing provided.

② For AF50 – AF 300 starters, consult factory.

Non-reversing A9 - A185 Single phase



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UL Type 3R (Outdoor metal)		UL Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated									
A9SS3-84★	\$ 330	A9SS2-84★	\$ 330	A9SS4-84★	\$ 495	A9SSX-84★	\$ 645	A9SSP-84★	\$ 315
A12SS3-84★	360	A12SS2-84★	360	A12SS4-84★	540	A12SSX-84★	713	A12SSP-84★	345
A16SS3-84★	383	A16SS2-84★	383	A16SS4-84★	570	A16SSX-84★	743	A16SSP-84★	360
A26SS3-84★	465	A26SS2-84★	465	A26SS4-84★	630	A26SSX-84★	831	A26SSP-84★	443
A30SS3-84★	533	A30SS2-84★	533	A30SS4-84★	690	A30SSX-84★	885	A30SSP-84★	510
A40SS3-84★	578	A40SS2-84★	578	A40SS4-84★	1050	A40SSX-84★	1275	A40SSP-84★	555
A50SS3-84★	719	A50SS2-84★	719	A50SS4-84★	1103	A50SSX-84★	1328	A50SSP-84★	698
A63SS3-84★	795	A63SS2-84★	795	A63SS4-84★	1170	A63SSX-84★	1410	A63SSP-84★	773
A75SS3-84★	1058	A75SS2-84★	1058	A75SS4-84★	1425	A75SSX-84★	2010	A75SSP-84★	1035
A95SS3-84★	1485	A95SS2-84★	1485	A95SS4-84★	2070	A95SSX-84★	2783	A95SSP-84★	1075
A110SS3-84★	1515	A110SS2-84★	1515	A110SS4-84★	2100	A110SSX-84★	2813	A110SSP-84★	1440
A145SS3-84★	2130	A145SS2-84★	2130	A145SS4-84★	2700	A145SSX-84★	3375	A145SSP-84★	1950
A185SS3-84★	2805	A185SS2-84★	2805	A185SS4-84★	3340	A185SSX-84★	3900	A185SSP-84★	2440
NEMA Rated									
A9N00SS3-84★	\$ 330	A9N00SS2-84★	\$ 330	A9N00SS4-84★	\$ 495	A9N00SX-84★	\$ 645	A9N00SP-84★	\$ 315
A16N0SS3-84★	383	A16N0SS2-84★	383	A16N0SS4-84★	570	A16N0SX-84★	743	A16N0SP-84★	360
A26N1SS3-84★	465	A26N1SS2-84★	465	A26N1SS4-84★	630	A26N1SX-84★	831	A26N1SP-84★	443
A50N2SS3-84★	719	A50N2SS2-84★	719	A50N2SS4-84★	1103	A50N2SX-84★	1328	A50N2SP-84★	698

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.



Reversing A9 - A750 Three phase

Open & enclosed

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UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type 1 (Indoor metal)	
	Maximum motor horsepower ratings ^①				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
UL rated								
9	2	2	5	7.5	A9SR-84★	\$ 342	A9SR1-84★	\$ 510
11	3	3	7.5	10	A12SR-84★	387	A12SR1-84★	585
17	5	5	10	15	A16SR-84★	443	A16SR1-84★	630
28	7.5	10	20	25	A26SR-84★	503	A26SR1-84★	810
34	10	10	25	30	A30SR-84★	675	A30SR1-84★	953
42	10	15	30	40	A40SR-84★	765	A40SR1-84★	1080
54	15	20	40	50	A50SR-84★	1152	A50SR1-84★	1395
65	20	25	50	50	A63SR-84★	1515	A63SR1-84★	1780
80	25	30	60	75	A75SR-84★	1620	A75SR1-84★	1905
95	30	30	60	75	A95SR-84★	1697	A95SR1-84★	2767
110	30	40	75	100	A110SR-84★	1800	A110SR1-84★	2970
130	40	50	100	125	A145SR-84★	2997	A145SR1-84★	3570
156	50	60	125	150	A185SR-84★	3996	A185SR1-84★	4755
192	60	75	150	200	A210SR-84★	4650	A210SR1-84★	5580
248	75	100	200	250	A260SR-84★	5436	A260SR1-84★	7615
302	100	100	250	300	A300SR-84★	6190	A300SR1-84★	8070
414	125	150	350	400	A400SR-70★	7980	A400SR1-70★	15,450
480	150	200	400	500	A460SR-70★	14,550	A460SR1-70★	22,482
590	200	250	500	600	A580SR-70★	19,755	A580SR1-70★	25,800
810	250	300	600	700	A750SR-70★	21,105	A750SR1-70★	29,250

NEMA rated

NEMA size	Continuous current	200V	230V	460/575V				
00	9	1.5	1.5	2	A9N00SR-84★	\$ 342	A9NSR1-84★	\$ 510
0	18	3	3	5	A16N0SR-84★	443	A16NSR1-84★	630
1	27	7.5	7.5	10	A26N1SR-84★	503	A26NSR1-84★	810
2	45	10	15	25	A50N2SR-84★	1152	A50NSR1-84★	1395
3	90	25	30	50	A75N3SR-84★	1620	A75NSR1-84★	1905
4	135	40	50	100	A145N4SR-84★	2997	A145NSR1-84★	3570
5	270	75	100	200	A260N5SR-84★	5436	A260NSR1-84★	7615
6	540	150	200	400	A460N6SR-70★	14,550	A460NSR1-70★	22,482
7	810	—	300	600	A750N7SR-70★	21,105	A750NSR1-70★	29,250

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SS-80F

D.C. operated starters

If DC operation is required, consult factory.

Factory modifications

See page 3.3

Control transformer option

Contactors size	VA rating	List price adder
A9 – A40	45 ^①	\$ 300
A9 – A40	50	360
A9 – A40 (N7 & 9)	50	630
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ^③
A580 – A750	250	795 ^③

Coil voltage selection – A9 - A300 ^②

Hz	Cntr type	Volts																	
		12	24	48	110	125	208	220	240	277	380	415	440	480	500	600			
60	A		81	83	84	84			34	36	80	42			86	86	51	53	55
50	A		81	83	84					80					85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ^②

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71
50	AF	68	69	70	71
DC	AF	68	69	70	71

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

^① No primary fusing provided.

^② For AF50 – AF 300 starters, consult factory.

^③ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Reversing A9 - A750 Three phase



UL Type 3R (Outdoor metal)		UL Type 12 (Metal dustight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price

UL rated

A9SR3-84★	\$ 630	A9SR2-84★	\$ 630	A9SR4-84★	\$ 810	A9SRX-84★	\$ 1125	A9SRP-84★	\$ 608
A12SR3-84★	705	A12SR2-84★	705	A12SR4-84★	915	A12SRX-84★	1230	A12SRP-84★	683
A16SR3-84★	750	A16SR2-84★	750	A16SR4-84★	990	A16SRX-84★	1313	A16SRP-84★	765
A26SR3-84★	900	A26SR2-84★	900	A26SR4-84★	1125	A26SRX-84★	1725	A26SRP-84★	960
A30SR3-84★	1043	A30SR2-84★	1043	A30SR4-84★	1313	A30SRX-84★	1868	A30SRP-84★	1103
A40SR3-84★	1305	A40SR2-84★	1305	A40SR4-84★	1500	A40SRX-84★	2010	A40SRP-84★	1230
A50SR3-84★	1763	A50SR2-84★	1763	A50SR4-84★	1875	A50SRX-84★	2213	A50SRP-84★	1530
A63SR3-84★	2310	A63SR2-84★	2310	A63SR4-84★	2588	A63SRX-84★	3143	A63SRP-84★	1695
A75SR3-84★	2813	A75SR2-84★	2813	A75SR4-84★	3113	A75SRX-84★	3600	A75SRP-84★	2250
A95SR3-84★	3427	A95SR2-84★	3427	A95SR4-84★	3697	A95SRX-84★	4276	A95SRP-84★	3025
A110SR3-84★	3630	A110SR2-84★	3630	A110SR4-84★	3900	A110SRX-84★	4479	A110SRP-84★	3230
A145SR3-84★	4275	A145SR2-84★	4275	A145SR4-84★	4650	A145SRX-84★	5665	A145SRP-84★	3804
A185SR3-84★	5215	A185SR2-84★	5215	A185SR4-84★	5550	A185SRX-84★	6555	A185SRP-84★	4640
A210SR3-84★	6255	A210SR2-84★	6255	A210SR4-84★	6640	A210SRX-84★	7680	A210SRP-84★	5566
A260SR3-84★	8355	A260SR2-84★	8355	A260SR4-84★	9340	A260SRX-84★	11,995	A260SRP-84★	7434
A300SR3-84★	8835	A300SR2-84★	8835	A300SR4-84★	10,015	A300SRX-84★	12,055	A300SRP-84★	7861
A400SR3-70★	16,125	A400SR2-70★	16,125	A400SR4-70★	17,100	A400SRX-70★	20,690	—	—
A460SR3-70★	23,230	A460SR2-70★	23,230	A460SR4-70★	23,625	A460SRX-70★	24,250	—	—
A580SR3-70★	26,250	A580SR2-70★	26,250	A580SR4-70★	27,000	A580SRX-70★	28,500	—	—
A750SR3-70★	30,225	A750SR2-70★	30,225	A750SR4-70★	31,275	A750SRX-70★	32,625	—	—

NEMA rated

A9NSR3-84★	\$ 630	A9NSR2-84★	\$ 630	A9NSR4-84★	\$ 810	A9NSRX-84★	\$ 1125	A9NSRP-84★	\$ 608
A16NSR3-84★	750	A16NSR2-84★	750	A16NSR4-84★	990	A16NSRX-84★	1313	A16NSRP-84★	765
A26NSR3-84★	900	A26NSR2-84★	900	A26NSR4-84★	1125	A26NSRX-84★	1725	A26NSRP-84★	960
A50NSR3-84★	1763	A50NSR2-84★	1763	A50NSR4-84★	1875	A50NSRX-84★	2213	A50NSRP-84★	1530
A75NSR3-84★	2813	A75NSR2-84★	2813	A75NSR4-84★	3113	A75NSRX-84★	3600	A75NSRP-84★	2250
A145NSR3-84★	4275	A145NSR2-84★	4275	A145NSR4-84★	4650	A145NSRX-84★	5665	A145NSRP-84★	3804
A260NSR3-84★	8355	A260NSR2-84★	8355	A260NSR4-84★	9340	A260NSRX-84★	11,995	A260NSRP-84★	7434
A460NSR3-70★	23,230	A460NSR2-70★	23,230	A460NSR4-70★	23,625	A460NSRX-70★	24,250	—	—
A750NSR3-70★	30,225	A750NSR2-70★	30,225	A750NSR4-70★	31,275	A750NSRX-70★	32,625	—	—

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.



2 Speed, 1 winding A9 - A750 Three phase

Open & enclosed

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UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type 1 (Indoor metal)	
	Maximum motor horsepower ratings ①				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
UL rated								
9	2	2	5	7.5	A9ST-84★1★	\$ 504	A9ST1-84★1★	\$ 690
11	3	3	7.5	10	A12ST-84★1★	525	A12ST1-84★1★	771
17	5	5	10	15	A16ST-84★1★	581	A16ST1-84★1★	837
28	7.5	10	20	25	A26ST-84★1★	752	A26ST1-84★1★	1097
34	10	10	25	30	A30ST-84★1★	1038	A30ST1-84★1★	1316
42	10	15	30	40	A40ST-84★1★	1259	A40ST1-84★1★	1577
54	15	20	40	50	A50ST-84★1★	1697	A50ST1-84★1★	1940
65	20	25	50	50	A63ST-84★1★	2150	A63ST1-84★1★	2195
80	25	30	60	75	A75ST-84★1★	2307	A75ST1-84★1★	2592
95	30	30	60	75	A95ST-84★1★	2495	A95ST1-84★1★	2950
110	30	40	75	100	A110ST-84★1★	2681	A110ST1-84★1★	3851
130	40	50	100	125	A145ST-84★1★	4506	A145ST1-84★1★	5079
156	50	60	125	150	A185ST-84★1★	5845	A185ST1-84★1★	6605
192	60	75	150	200	A210ST-84★1★	6895	A210ST1-84★1★	7825
248	75	100	200	250	A260ST-84★1★	8535	A260ST1-84★1★	10,710
302	100	100	250	300	A300ST-84★1★	9171	A300ST1-84★1★	11,391
414	125	150	350	400	A400ST-70★1★	10,100	A400ST1-70★1★	19,460
480	150	200	400	500	A460ST-70★1★	17,995	A460ST1-70★1★	28,910
590	200	250	500	600	A580ST-70★1★	23,735	A580ST1-70★1★	35,400
810	250	300	600	700	A750ST-70★1★	26,645	A750ST1-70★1★	39,195

NEMA rated								
NEMA size	Continuous current	200V	230V	460/575V				
00	9	1.5	1.5	2	A9N00ST-84★1★	\$ 504	A9NST1-84★1★	\$ 690
0	18	3	3	5	A16N0ST-84★1★	581	A16NST1-84★1★	837
1	27	7.5	7.5	10	A26N1ST-84★1★	752	A26NST1-84★1★	1097
2	45	10	15	25	A50N2ST-84★1★	1697	A50NST1-84★1★	1940
3	90	25	30	50	A75N3ST-84★1★	2307	A75NST1-84★1★	2589
4	135	40	50	100	A145N4ST-84★1★	4506	A145NST1-84★1★	5079
5	270	75	100	200	A260N5ST-84★1★	8535	A260NST1-84★1★	10,710
6	540	150	200	400	A460N6ST-70★1★	17,995	A460NST1-70★1★	28,910
7	810	—	300	600	A750N7ST-70★1★	26,645	A750NST1-70★1★	39,195

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.
1st ★ low speed, 2nd ★ high speed

Description

Motors that have separate windings for each speed provide more combinations of speed variations. Multi-speed starters from ABB Control are available for constant horsepower, constant torque and variable torque motors.

Constant horsepower

Motors that maintain the same horsepower regardless of speed are called constant horsepower motors. These motors are used in applications like metal working.

Constant torque

Motors that maintain constant torque at all speeds are called constant torque motors. In applications like conveyors, horsepower varies directly with speed.

Variable torque motors

Motors that produce a torque characteristic which varies as the square of the speed are called variable torque motors and are used in applications like blowers and fans.

Control transformer option

Contactor size	VA rating	List price adder
A9 – A40	45 ①	\$ 300
A9 – A40	50	360
A9 – A40 (N7 & 9)	50	630
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ③
A580 – A750	250	795 ③

① No primary fusing provided.

② For AF50 – AF 300 starters, consult factory.

③ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

④ AF400 - AF750 only.

Coil voltage selection

All catalog numbers include a 120V coil. To select other coil voltages, substitute the code from the coil voltage selection chart for the first digit after the dash in the catalog number.

Ex.: A 240V coil is required for an A95-starter: A95ST-80★1B★

D.C. operated starters

If DC operation is required, consult factory.

Factory modifications

See page 3.3

Coil voltage selection – A9 - A300 ②

Hz	type	Volts															
		Cntr															
60	A	12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
		81	83	84	84			34	36	80	42		86	86	51	53	55
50	A	81	83	84					80			85	86				55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ②

Hz	type	Volts			
		Cntr			
60	AF	24 - 60	48 - 130	100 - 250	250 - 500
		68	69	70	71 ④
50	AF	68	69	70	71 ④
DC	AF	68	69	70	71 ④

Control transformer voltage selection

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

2 Speed, 1 winding A9 - A750 Three phase



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UL Type 3R (Outdoor metal)		UL Type 12 (Metal dustight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated									
A9ST3-84★1★	\$ 810	A9ST2-84★1★	\$ 810	A9ST4-84★1★	\$ 1020	A9STX-84★1★	\$ 1305	A9STP-84★1★	\$ 788
A12ST3-84★1★	891	A12ST2-84★1★	891	A12ST4-84★1★	1095	A12STX-84★1★	1416	A12STP-84★1★	869
A16ST3-84★1★	957	A16ST2-84★1★	957	A16ST4-84★1★	1215	A16STX-84★1★	1520	A16STP-84★1★	972
A26ST3-84★1★	1187	A26ST2-84★1★	1187	A26ST4-84★1★	1515	A26STX-84★1★	2012	A26STP-84★1★	1247
A30ST3-84★1★	1406	A30ST2-84★1★	1406	A30ST4-84★1★	1688	A30STX-84★1★	2231	A30STP-84★1★	1466
A40ST3-84★1★	1802	A40ST2-84★1★	1802	A40ST4-84★1★	2100	A40STX-84★1★	2507	A40STP-84★1★	1727
A50ST3-84★1★	2307	A50ST2-84★1★	2307	A50ST4-84★1★	2528	A50STX-84★1★	2757	A50STP-84★1★	2075
A63ST3-84★1★	2945	A63ST2-84★1★	2945	A63ST4-84★1★	3285	A63STX-84★1★	3777	A63STP-84★1★	2330
A75ST3-84★1★	3500	A75ST2-84★1★	3500	A75ST4-84★1★	3788	A75STX-84★1★	4287	A75STP-84★1★	2835
A95ST3-84★1★	3900	A95ST2-84★1★	3900	A95ST4-84★1★	4250	A95STX-84★1★	4850	A95STP-84★1★	3200
A110ST3-84★1★	4511	A110ST2-84★1★	4511	A110ST4-84★1★	4800	A110STX-84★1★	5358	A110STP-84★1★	4300
A145ST3-84★1★	5784	A145ST2-84★1★	5784	A145ST4-84★1★	6265	A145STX-84★1★	7175	A145STP-84★1★	5513
A185ST3-84★1★	7059	A185ST2-84★1★	7059	A185ST4-84★1★	7440	A185STX-84★1★	8400	A185STP-84★1★	6729
A210ST3-84★1★	8500	A210ST2-84★1★	8500	A210ST4-84★1★	8890	A210STX-84★1★	9925	A210STP-84★1★	8103
A260ST3-84★1★	11,455	A260ST2-84★1★	11,455	A260ST4-84★1★	12,940	A260STX-84★1★	15,090	A260STP-84★1★	10,919
A300ST3-84★1★	12,155	A300ST2-84★1★	12,155	A300ST4-84★1★	13,425	A300STX-84★1★	16,275	A300STP-84★1★	11,586
A400ST3-70★1★	20,135	A400ST2-70★1★	20,135	A400ST4-70★1★	21,600	A400STX-70★1★	24,700	—	—
A460ST3-70★1★	29,652	A460ST2-70★1★	29,652	A460ST4-70★1★	30,000	A460STX-70★1★	30,675	—	—
A580ST3-70★1★	35,850	A580ST2-70★1★	35,850	A580ST4-70★1★	36,225	A580STX-70★1★	38,097	—	—
A750ST3-70★1★	40,170	A750ST2-70★1★	40,170	A750ST4-70★1★	40,875	A750STX-70★1★	42,570	—	—
NEMA rated									
A9NST3-84★1★	\$ 810	A9NST2-84★1★	\$ 810	A9NST4-84★1★	\$ 1020	A9NSTX-84★1★	\$ 1305	A9NSTP-84★1★	\$ 788
A16NST3-84★1★	957	A16NST2-84★1★	957	A16NST4-84★1★	1215	A16NSTX-84★1★	1520	A16NSTP-84★1★	972
A26NST3-84★1★	1187	A26NST2-84★1★	1187	A26NST4-84★1★	1515	A26NSTX-84★1★	2012	A26NSTP-84★1★	1247
A50NST3-84★1★	2307	A50NST2-84★1★	2307	A50NST4-84★1★	2528	A50NSTX-84★1★	2757	A50NSTP-84★1★	2075
A75NST3-84★1★	3500	A75NST2-84★1★	3500	A75NST4-84★1★	3788	A75NSTX-84★1★	4287	A75NSTP-84★1★	2835
A145NST3-84★1★	5784	A145NST2-84★1★	5784	A145NST4-84★1★	6265	A145NSTX-84★1★	7175	A145NSTP-84★1★	5513
A260NST3-84★1★	11,455	A260NST2-84★1★	11,455	A260NST4-84★1★	12,940	A260NSTX-84★1★	15,090	A260NSTP-84★1★	10,919
A460NST3-70★1★	29,652	A460NST2-70★1★	29,652	A460NST4-70★1★	30,000	A460NSTX-70★1★	30,675	—	—
A750NST3-70★1★	40,170	A750NST2-70★1★	40,170	A750NST4-70★1★	40,875	A750NSTX-70★1★	42,570	—	—

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.
1st ★ low speed, 2nd ★ high speed



2 Speed, 2 winding A9 - A750 Three phase

Open & enclosed

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UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type 1 (Indoor metal)	
	Maximum motor horsepower ratings ^①				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
AC3	UL rated							
9	2	2	5	7.5	A9ST-84★2★	\$ 396	A9ST1-84★2★	\$ 582
11	3	3	7.5	10	A12ST-84★2★	426	A12ST1-84★2★	657
17	5	5	10	15	A16ST-84★2★	476	A16ST1-84★2★	702
28	7.5	10	20	25	A26ST-84★2★	552	A26ST1-84★2★	882
34	10	10	25	30	A30ST-84★2★	747	A30ST1-84★2★	1025
42	10	15	30	40	A40ST-84★2★	834	A40ST1-84★2★	1152
54	15	20	40	50	A50ST-84★2★	1224	A50ST1-84★2★	1467
65	20	25	50	50	A63ST-84★2★	1587	A63ST1-84★2★	1632
80	25	30	60	75	A75ST-84★2★	1692	A75ST1-84★2★	1977
95	30	30	60	75	A95ST-84★2★	1795	A95ST1-84★2★	2450
110	30	40	75	100	A110ST-84★2★	1872	A110ST1-84★2★	3042
130	40	50	100	125	A145ST-84★2★	3069	A145ST1-84★2★	3642
156	50	60	125	150	A185ST-84★2★	4068	A185ST1-84★2★	4827
192	60	75	150	200	A210ST-84★2★	4722	A210ST1-84★2★	5652
248	75	100	200	250	A260ST-84★2★	5500	A260ST1-84★2★	7685
302	100	100	250	300	A300ST-84★2★	6340	A300ST1-84★2★	8142
414	125	150	350	400	A400ST-70★2★	6855	A400ST1-70★2★	15,522
480	150	200	400	500	A460ST-70★2★	13,560	A460ST1-70★2★	22,554
590	200	250	500	600	A580ST-70★2★	18,660	A580ST1-70★2★	25,872
810	250	300	600	700	A750ST-70★2★	20,025	A750ST1-70★2★	29,322

NEMA rated

NEMA size	Continuous current	200V	230V	460/575V				
00	9	1.5	1.5	2	A9N00ST-84★2★	\$ 396	A9NST1-84★2★	\$ 582
0	18	3	3	5	A16N0ST-84★2★	476	A16NST1-84★2★	702
1	27	7.5	7.5	10	A26N1ST-84★2★	552	A26NST1-84★2★	882
2	45	10	15	25	A50N2ST-84★2★	1224	A50NST1-84★2★	1467
3	90	25	30	50	A75N3ST-84★2★	1692	A75NST1-84★2★	1977
4	135	40	50	100	A145N4ST-84★2★	3069	A145NST1-84★2★	3642
5	270	75	100	200	A260N5ST-84★2★	5508	A260NST1-84★2★	7685
6	540	150	200	400	A460N6ST-70★2★	13,560	A460NST1-70★2★	22,554
7	810	—	300	600	A750N7ST-70★2★	20,025	A750NST1-70★2★	29,322

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.
1st ★ low speed, 2nd ★ high speed

Description

Motors that have separate windings for each speed provide more combinations of speed variations. Multi-speed starters from ABB Control are available for constant horsepower, constant torque and variable torque motors.

Constant horsepower

Motors that maintain the same horsepower regardless of speed are called constant horsepower motors. These motors are used in applications like metal working.

Constant torque

Motors that maintain constant torque at all speeds are called constant torque motors. In applications like conveyors, horsepower varies directly with speed.

Variable torque motors

Motors that produce a torque characteristic which varies as the square of the speed are called variable torque motors and are used in applications like blowers and fans.

Control transformer option

Contacting size	VA rating	List price adder
A9 – A40	45 ①	\$ 300
A9 – A40	50	360
A9 – A40 (N7 & 9)	50	630
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ③
A580 – A750	250	795 ③

① No primary fusing provided.

② For AF50 – AF 300 starters, consult factory.

③ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

④ AF400 - AF 750 only.

Coil voltage selection

All catalog numbers include a 120V coil. To select other coil voltages, substitute the code from the coil voltage selection chart for the first digit after the dash in the catalog number.

Ex.: A 240V coil is required for an A95-starter: A95ST-80★2★

D.C. operated starters

If DC operation is required, consult factory.

Factory modifications

See page 3.3

Coil voltage selection – A9 - A300 ②

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84					80			85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ②

Hz	type	Cntr/Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ④
50	AF	68	69	70	71 ④
DC	AF	68	69	70	71 ④

Control transformer voltage selection

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

2 Speed, 2 winding A9 - A750 Three phase



3

UL Type 3R (Outdoor metal)		UL Type 12 (Metal dustight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog Number	List Price	Catalog Number	List Price	Catalog Number	List Price	Catalog Number	List Price	Catalog Number	List Price
UL rated									
A9ST3-84★2★	\$ 702	A9ST2-84★2★	\$ 702	A9ST4-84★2★	\$ 915	A9STX-84★2★	\$ 1197	A9STP-84★2★	\$ 680
A12ST3-84★2★	777	A12ST2-84★2★	777	A12ST4-84★2★	990	A12STX-84★2★	1302	A12STP-84★2★	755
A16ST3-84★2★	822	A16ST2-84★2★	822	A16ST4-84★2★	1065	A16STX-84★2★	1385	A16STP-84★2★	837
A26ST3-84★2★	972	A26ST2-84★2★	972	A26ST4-84★2★	1200	A26STX-84★2★	1797	A26STP-84★2★	1032
A30ST3-84★2★	1115	A30ST2-84★2★	1115	A30ST4-84★2★	1388	A30STX-84★2★	1940	A30STP-84★2★	1175
A40ST3-84★2★	1377	A40ST2-84★2★	1377	A40ST4-84★2★	1545	A40STX-84★2★	2082	A40STP-84★2★	1302
A50ST3-84★2★	1835	A50ST2-84★2★	1835	A50ST4-84★2★	1988	A50STX-84★2★	2285	A50STP-84★2★	1602
A63ST3-84★2★	2382	A63ST2-84★2★	2382	A63ST4-84★2★	2513	A63STX-84★2★	3215	A63STP-84★2★	1767
A75ST3-84★2★	2885	A75ST2-84★2★	2885	A75ST4-84★2★	3090	A75STX-84★2★	3672	A75STP-84★2★	2200
A95ST3-84★2★	3500	A95ST2-84★2★	3500	A95ST4-84★2★	3700	A95STX-84★2★	3950	A95STP-84★2★	2650
A110ST3-84★2★	3702	A110ST2-84★2★	3702	A110ST4-84★2★	3863	A110STX-84★2★	4550	A110STP-84★2★	3300
A145ST3-84★2★	4347	A145ST2-84★2★	4347	A145ST4-84★2★	4650	A145STX-84★2★	5735	A145STP-84★2★	3919
A185ST3-84★2★	5285	A185ST2-84★2★	5285	A185ST4-84★2★	5740	A185STX-84★2★	6627	A185STP-84★2★	4857
A210ST3-84★2★	6327	A210ST2-84★2★	6327	A210ST4-84★2★	6510	A210STX-84★2★	7752	A210STP-84★2★	5899
A260ST3-84★2★	8427	A260ST2-84★2★	8427	A260ST4-84★2★	9150	A260STX-84★2★	12,065	A260STP-84★2★	7512
A300ST3-84★2★	8905	A300ST2-84★2★	8905	A300ST4-84★2★	9750	A300STX-84★2★	13,025	A300STP-84★2★	7990
A400ST3-70★2★	16,197	A400ST2-70★2★	16,197	A400ST4-70★2★	17,100	A400STX-70★2★	20,760	—	—
A460ST3-70★2★	23,300	A460ST2-70★2★	23,300	A460ST4-70★2★	23,700	A460STX-70★2★	24,320	—	—
A580ST3-70★2★	26,322	A580ST2-70★2★	26,322	A580ST4-70★2★	27,000	A580STX-70★2★	28,570	—	—
A750ST3-70★2★	30,297	A750ST2-70★2★	30,297	A750ST4-70★2★	30,900	A750STX-70★2★	32,697	—	—

NEMA rated									
A9NST3-84★2★	\$ 702	A9NST2-84★2★	\$ 702	A9NST4-84★2★	\$ 915	A9NSTX-84★2★	\$ 1197	A9NSTP-84★2★	\$ 680
A16NST3-84★2★	822	A16NST2-84★2★	822	A16NST4-84★2★	1065	A16NSTX-84★2★	1385	A16NSTP-84★2★	837
A26NST3-84★2★	972	A26NST2-84★2★	972	A26NST4-84★2★	1200	A26NSTX-84★2★	1797	A26NSTP-84★2★	1032
A50NST3-84★2★	1835	A50NST2-84★2★	1835	A50NST4-84★2★	1988	A50NSTX-84★2★	2285	A50NSTP-84★2★	1602
A75NST3-84★2★	2885	A75NST2-84★2★	2885	A75NST4-84★2★	3090	A75NSTX-84★2★	3672	A75NSTP-84★2★	2200
A145NST3-84★2★	4347	A145NST2-84★2★	4347	A145NST4-84★2★	4650	A145NSTX-84★2★	5735	A145NSTP-84★2★	3919
A260NST3-84★2★	8427	A260NST2-84★2★	8427	A260NST4-84★2★	9150	A260NSTX-84★2★	12,065	A260NSTP-84★2★	7512
A460NST3-70★2★	23,300	A460NST2-70★2★	23,300	A460NST4-70★2★	23,700	A460NSTX-70★2★	24,320	—	—
A750NST3-70★2★	30,297	A750NST2-70★2★	30,297	A750NST4-70★2★	30,900	A750NSTX-70★2★	32,697	—	—

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.
1st ★ low speed, 2nd ★ high speed



Plastic enclosed, IP65

A9 - A16

Three phase & single phase

Open & enclosed – Three phase

3

Maximum motor horsepower ratings				Catalog number with blank cover	List price	Catalog number with reset only	List price	Catalog number with start & stop/reset	List price
208V	240V	480V	575V/600V						
2	2	5	7.5	A9SD-84★	\$ 233	A9SD-84★R	\$ 240	A9SD-84★A	\$ 278
3	3	7.5	10	A12SD-84★	248	A12SD-84★R	255	A12SD-84★A	293
5	5	10	15	A16SD-84★	278	A16SD-84★R	293	A16SD-84★A	330

★ Overload Relay suffix code. Select from the overload relay selection chart on page 3.6.

Open & enclosed – Single phase

Maximum motor horsepower ratings		Catalog number with blank cover	List price	Catalog number with reset only	List price	Catalog number with start & stop/reset	List price
115V	230V						
0.50	1.00	A9SSD-84★	\$ 233	A9SSD-84★R	\$ 240	A9SSD-84★A	\$ 278
0.75	2.00	A12SSD-84★	248	A12SSD-84★R	255	A12SSD-84★A	293
1.00	3.00	A16SSD-84★	278	A16SSD-84★R	293	A16SSD-84★A	330

Overload relay selection chart

For contactor sizes	Current range (motor fla)	Catalog number	Starter suffix code
A16	0.1 – 0.16	TA25DU0.16	A
	0.16 – 0.25	TA25DU0.25	B
	0.25 – 0.4	TA25DU0.4	C
	0.4 – 0.63	TA25DU0.63	D
	0.63 – 1.0	TA25DU1.0	E
	1.0 – 1.4	TA25DU1.4	F
	1.4 – 1.8	TA25DU1.8	G
	1.7 – 2.4	TA25DU2.4	H
	2.2 – 3.1	TA25DU3.1	J
	2.8 – 4.0	TA25DU4.0	K
	3.5 – 5.0	TA25DU5.0	L
	4.5 – 6.5	TA25DU6.5	M
	6.0 – 8.5	TA25DU8.5	N
	7.5 – 11	TA25DU11	P
	10 – 14	TA25DU14	Q
	13 – 19	TA25DU19	R

Coil voltage selection

All catalog numbers include a 120V coil. To select other coil voltages, substitute the code from the coil voltage selection chart for the first digit after the dash in the catalog number.

Ex.: A 240V coil is required for an A9 starter: A9SD-80E

D.C. operated starters

If DC operation is required, consult factory.

Coil voltage selection – A9 - A16 starters

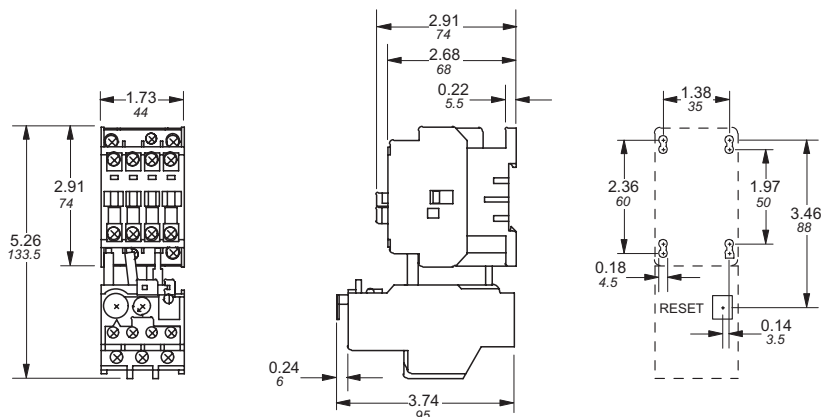
Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			

For other voltages, see page 1.26.

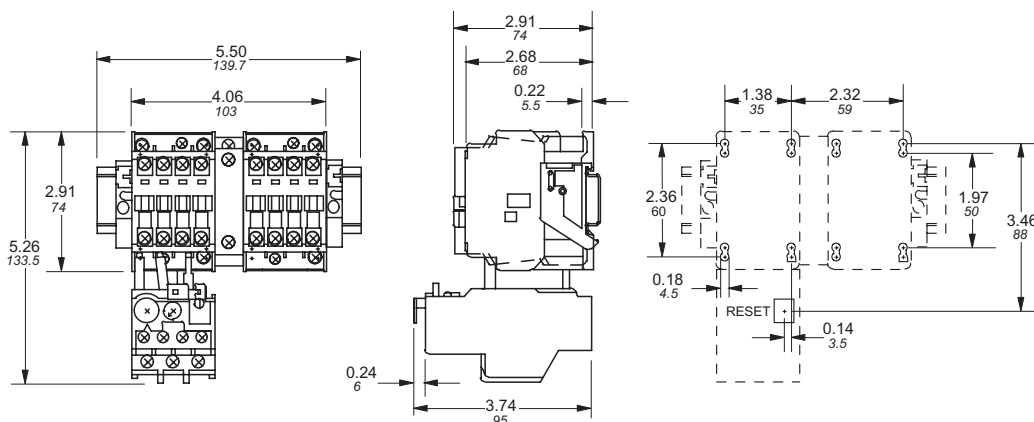
Approximate dimensions AC/DC operated, 3 pole A/AE9 – A/AE16

00.00 Inches
00.00 (Millimeters)

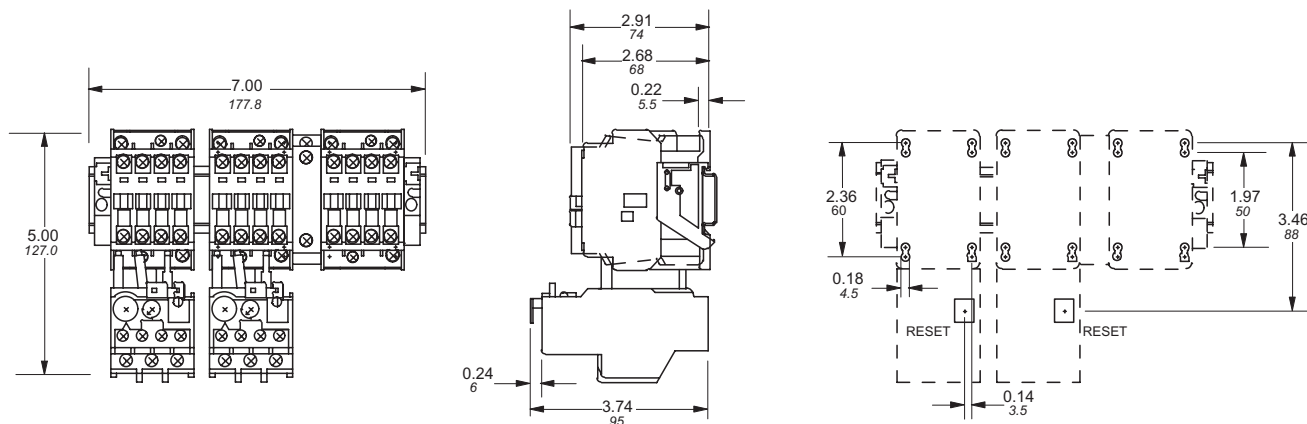
A/AE9 – A/AE16 + TA25 — Starter



A/AE9 – A/AE16 + VM5 or VE5 + TA25 — Reversing starter



A/AE9 – A/AE16 — 2 Speed, 1 winding starter

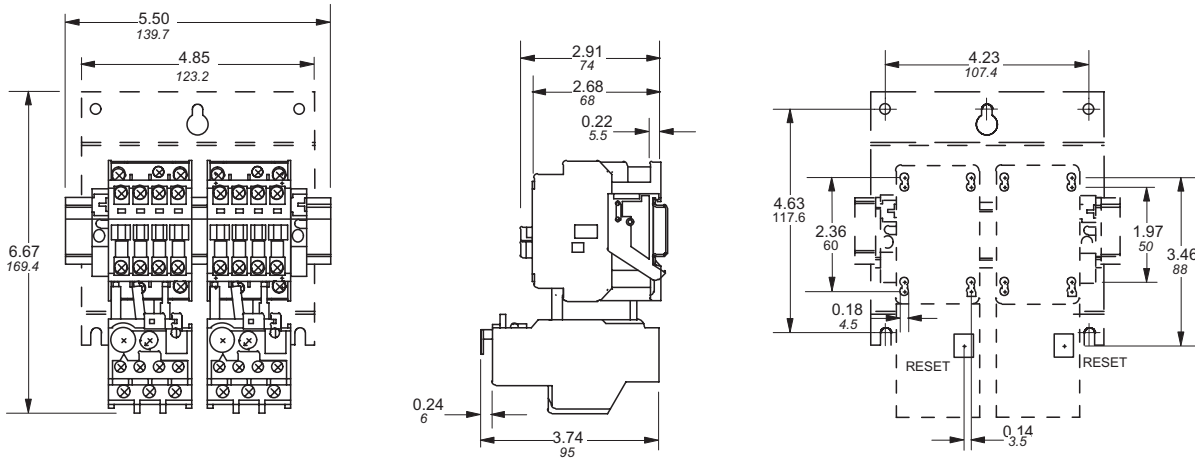


Approximate dimensions
AC/DC operated, 3 pole
A/AE9 – A/AE26

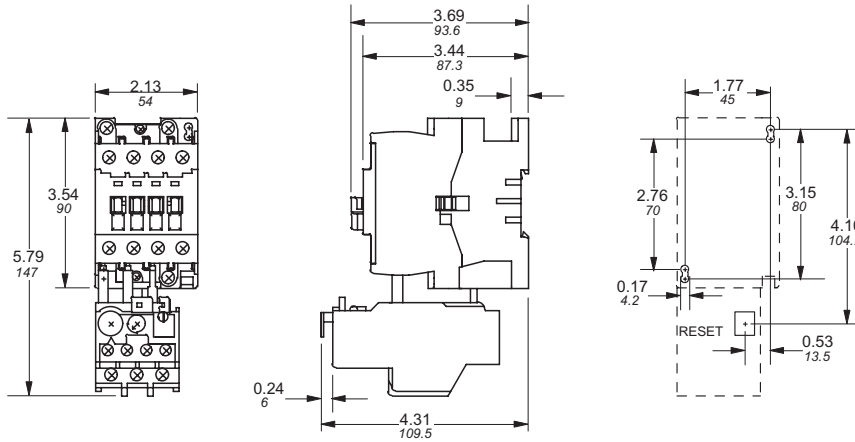
← 00.00 → Inches
00.00 [Millimeters]

A/AE9 – A/AE16 — 2 Speed, 2 winding starter

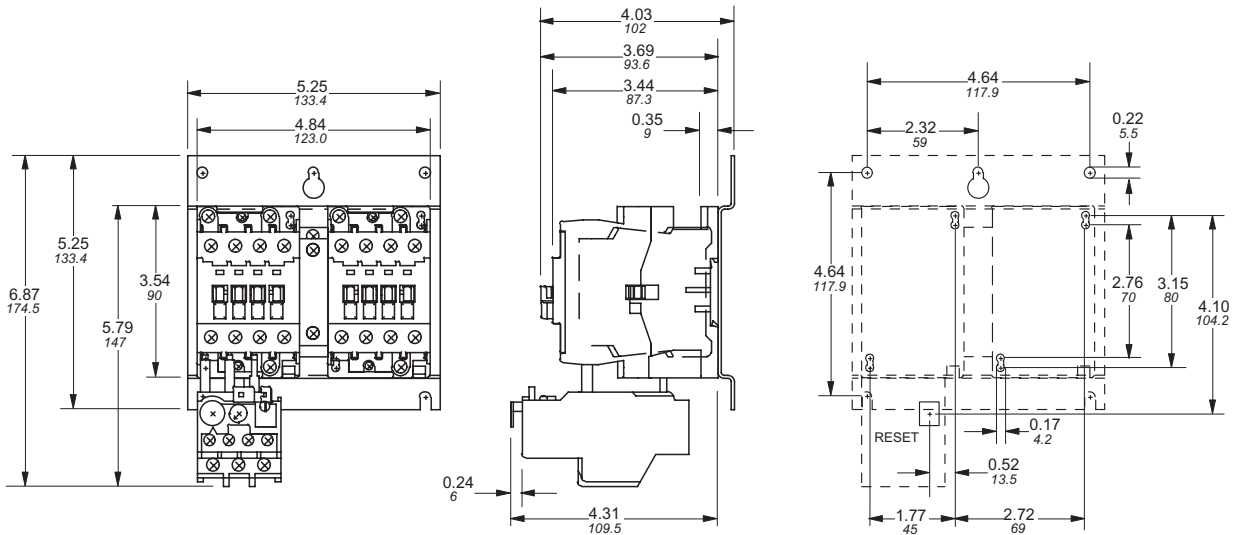
3



A/AE26 + TA25 — Starter



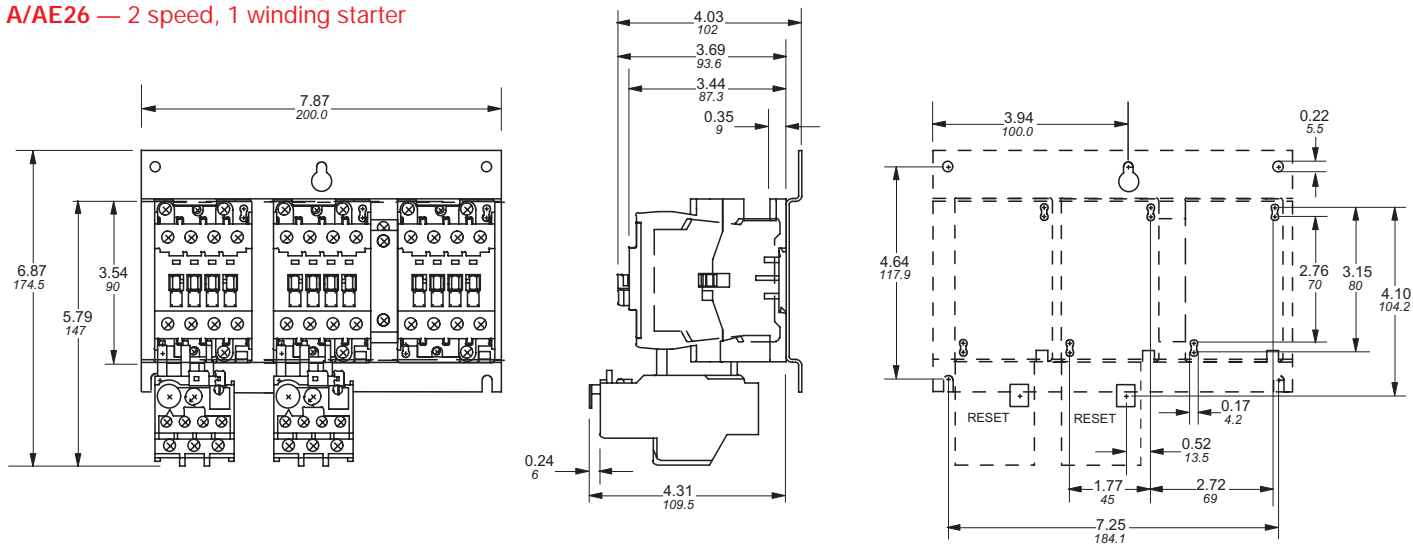
A/AE26 + VM5 or VE5 + TA25 — Reversing starter



Approximate dimensions AC/DC operated, 3 pole A/AE26 to A/AE40

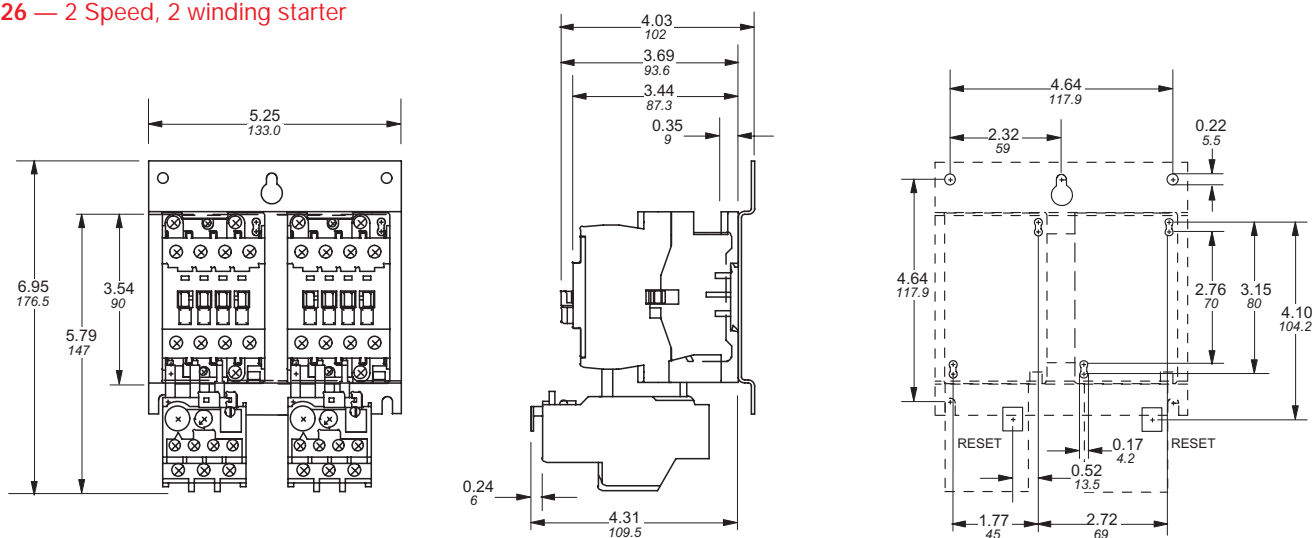
00.00 — Inches
00.00 — (Millimeters)

A/AE26 — 2 speed, 1 winding starter

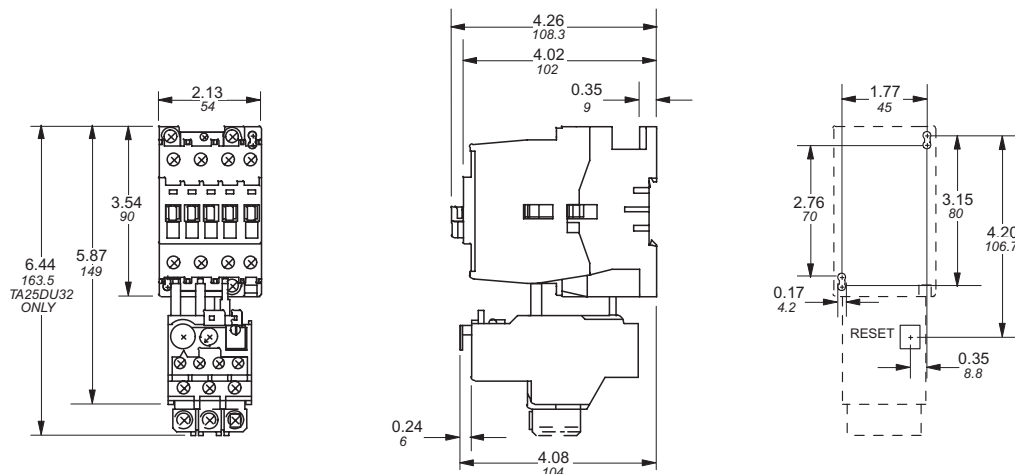


3

A/AE26 — 2 Speed, 2 winding starter



A/AE30 & A/AE40 + TA25 — Starter

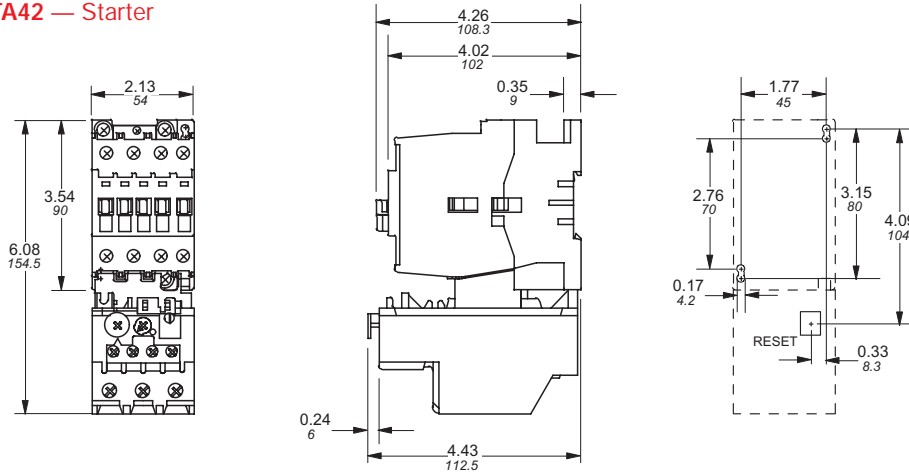


Approximate dimensions
 AC/DC operated, 3 pole
 A/AE30 – A/AE40

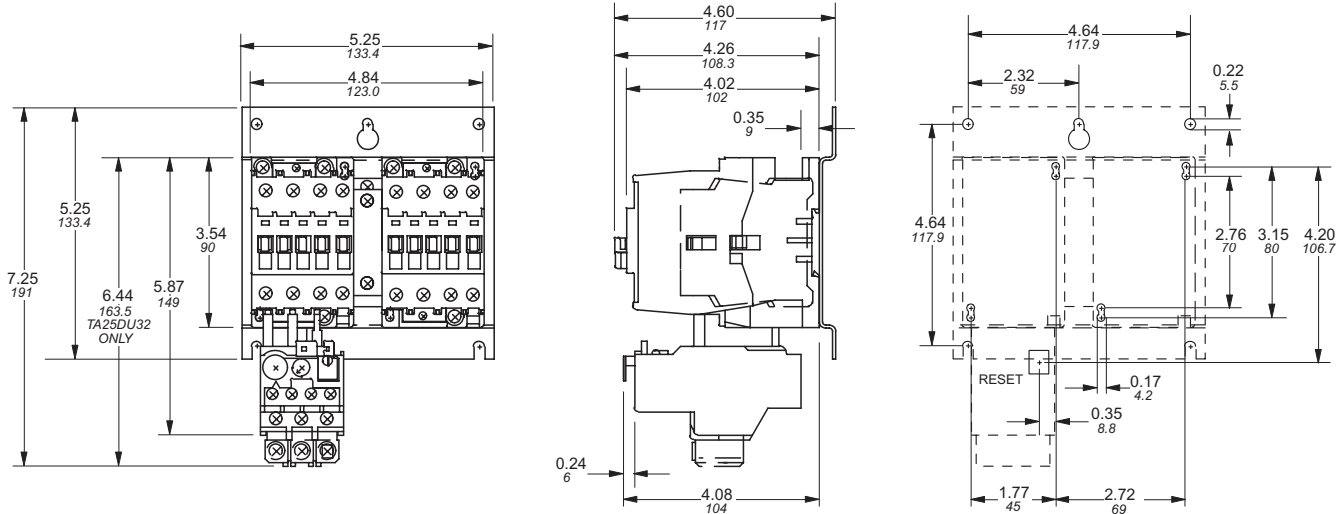
← 00.00 → Inches
 00.00 [Millimeters]

A/AE30 & A/AE40 + TA42 — Starter

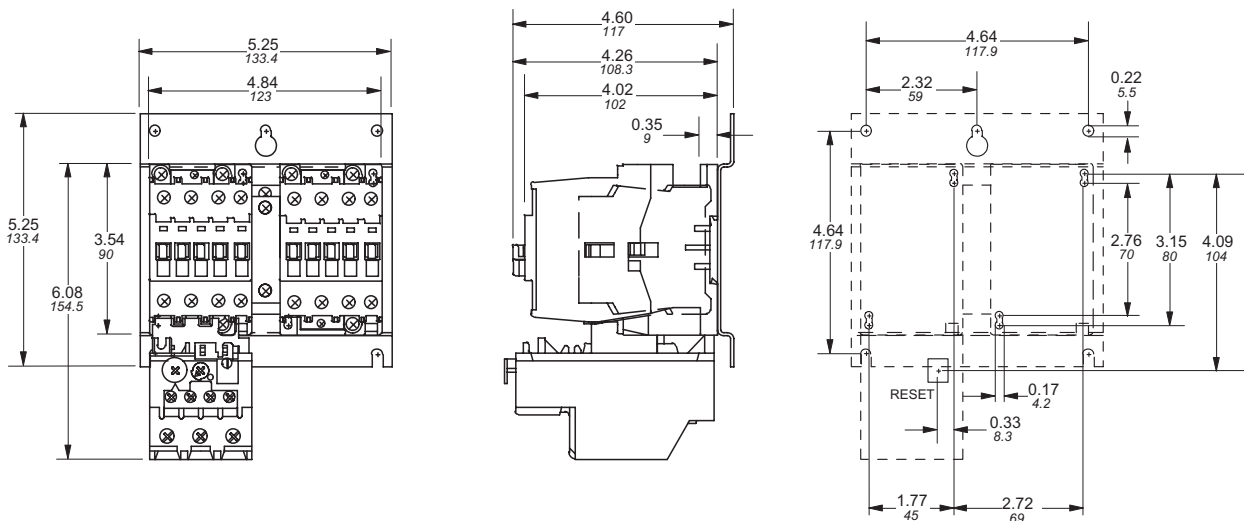
3



A/AE30 & A/AE40 + VM5 or VE5 + TA25 — Reversing starter



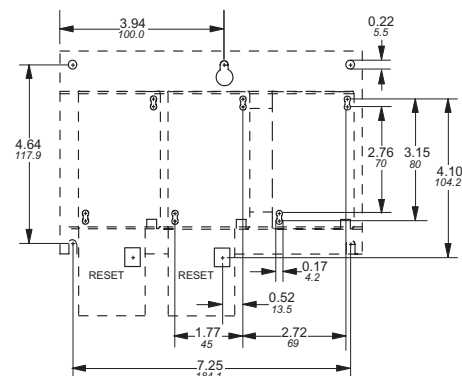
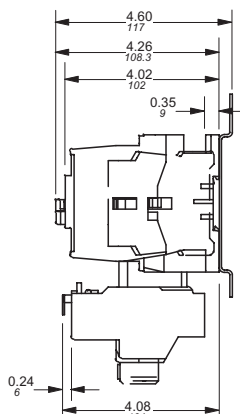
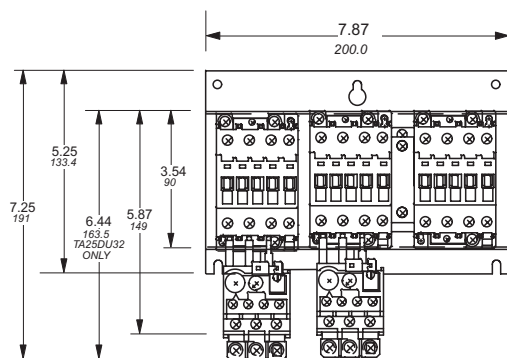
A/AE30 & A/AE40 + VM5 or VE5 + TA42 — Reversing starter



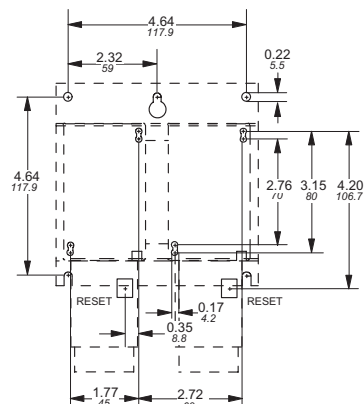
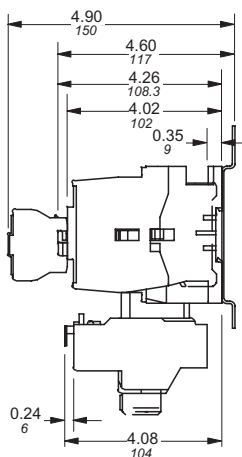
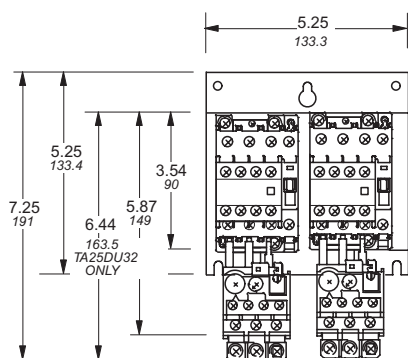
Approximate dimensions AC/DC operated, 3 pole A/AE30 – A/AE75

00.00 Inches
00.00 (Millimeters)

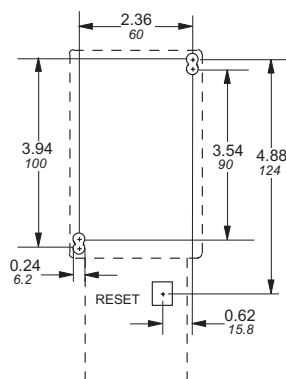
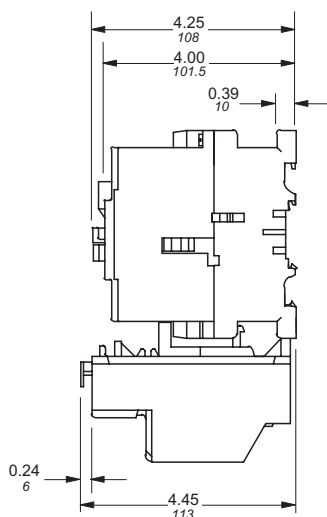
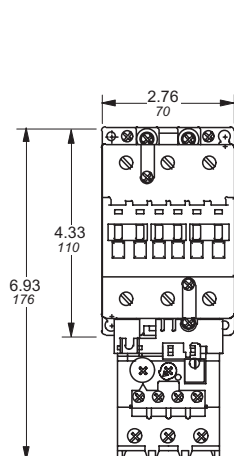
A/AE30 & A/AE40 — 2 Speed, 1 winding starter



A/AE30 & A/AE40 — 2 Speed, 2 winding starter



A/AE50 – A/AE75 + TA75 — Starter

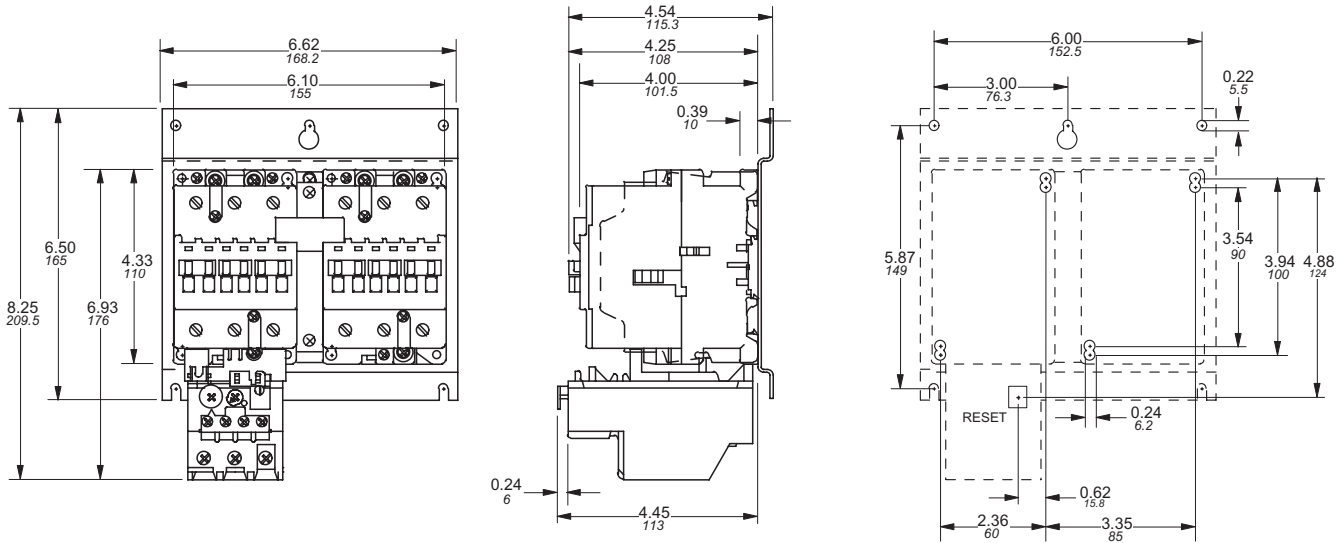


Approximate dimensions
AC/DC operated, 3 pole
A/AE50 – A/AE75

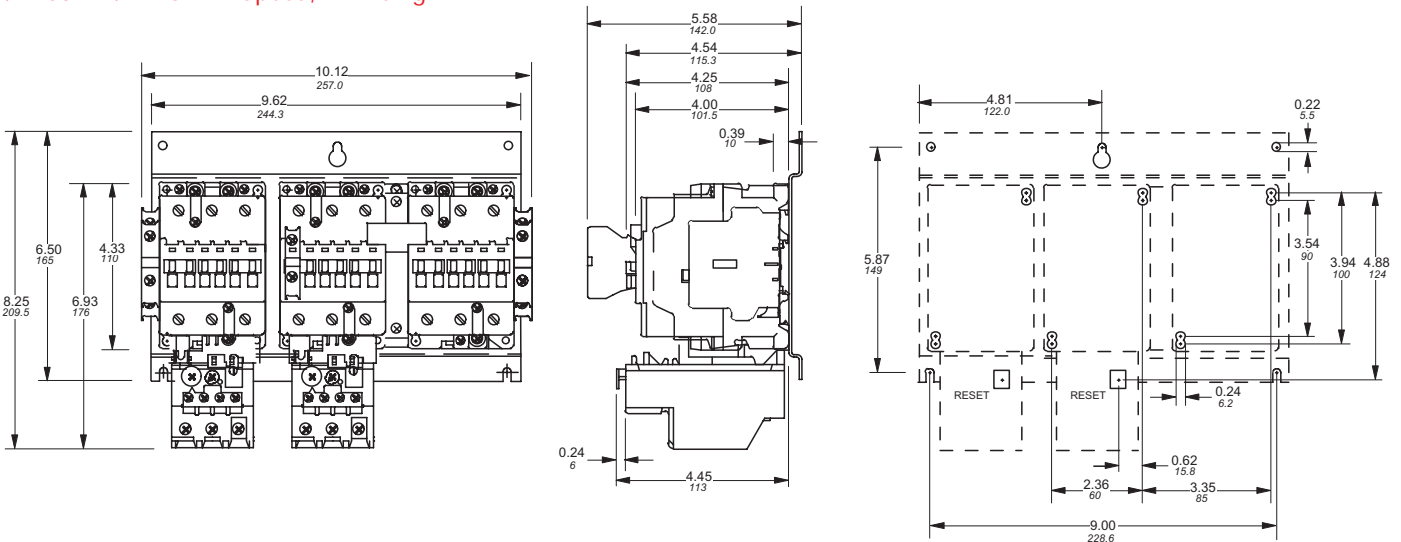
← 00.00 → Inches
00.00 [Millimeters]

A/AE50 – A/AE75 + VM5 or VE5 + TA75 — Reversing starter

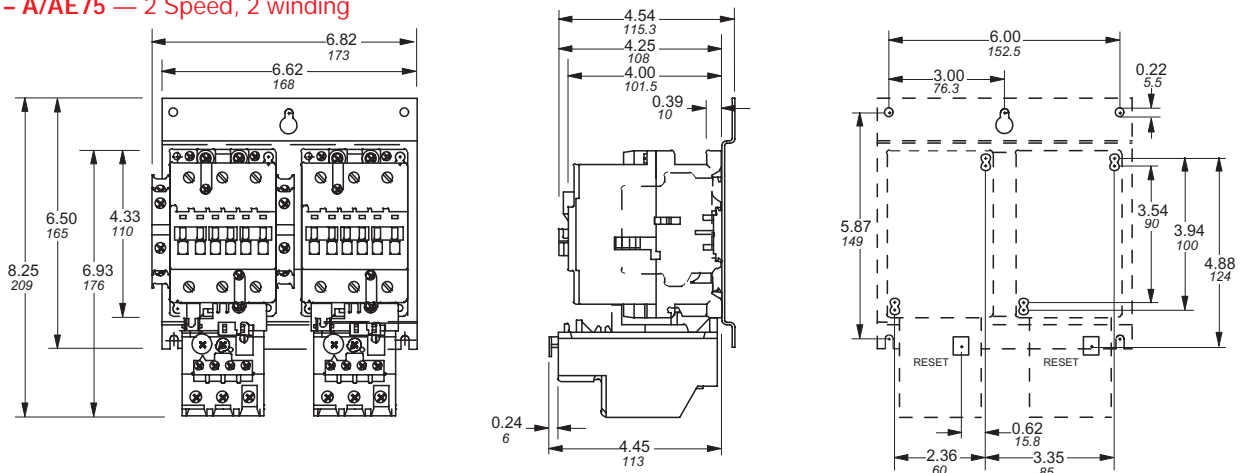
3



A/AE50 – A/AE75 — 2 Speed, 1 winding



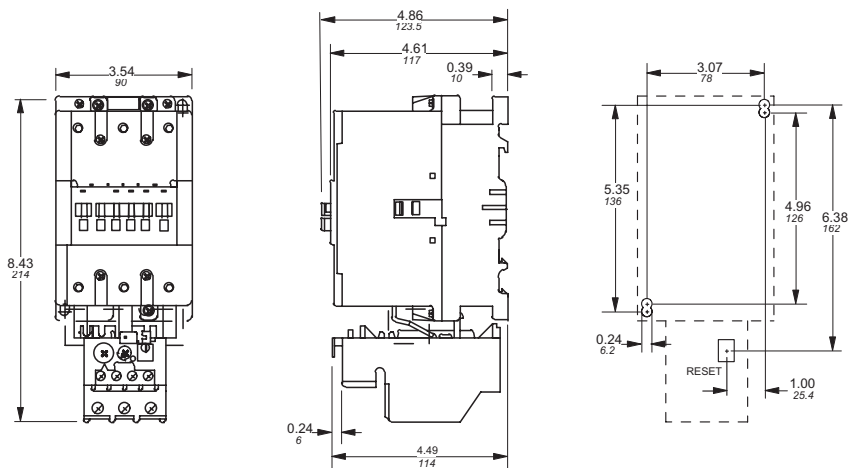
A/AE50 – A/AE75 — 2 Speed, 2 winding



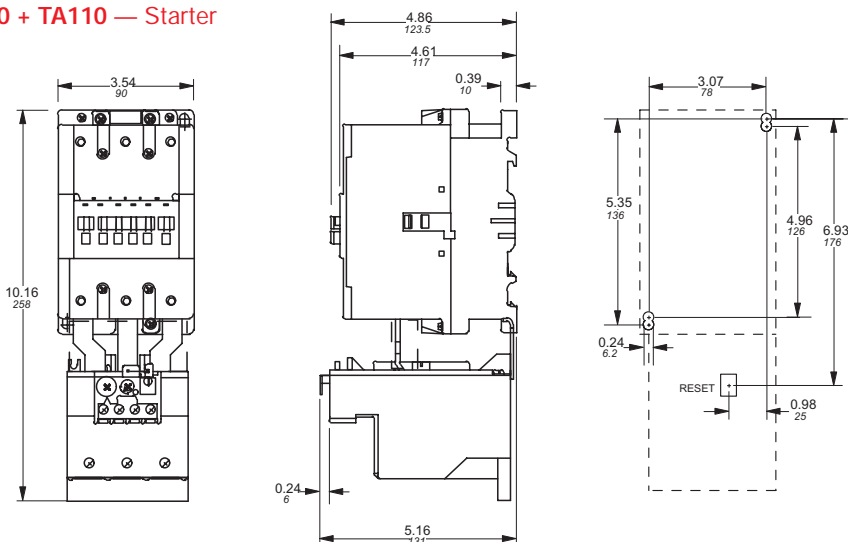
Approximate dimensions AC/DC operated, 3 pole A/AE/AF95 & A/AE/AF110

00.00 Inches
00.00 (Millimeters)

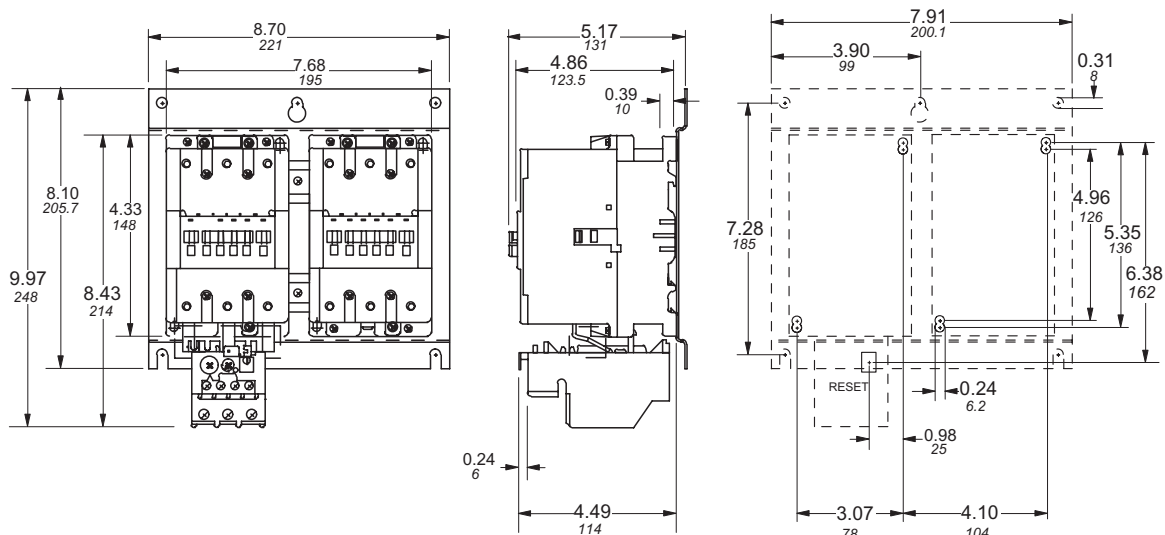
A/AE/AF95 & A/AE/AF110 + TA80 — Starter



A/AE/AF95 & A/AE/AF110 + TA110 — Starter



A/AE/AF95 & A/AE/AF110 + VE5 + TA80 — Reversing starter

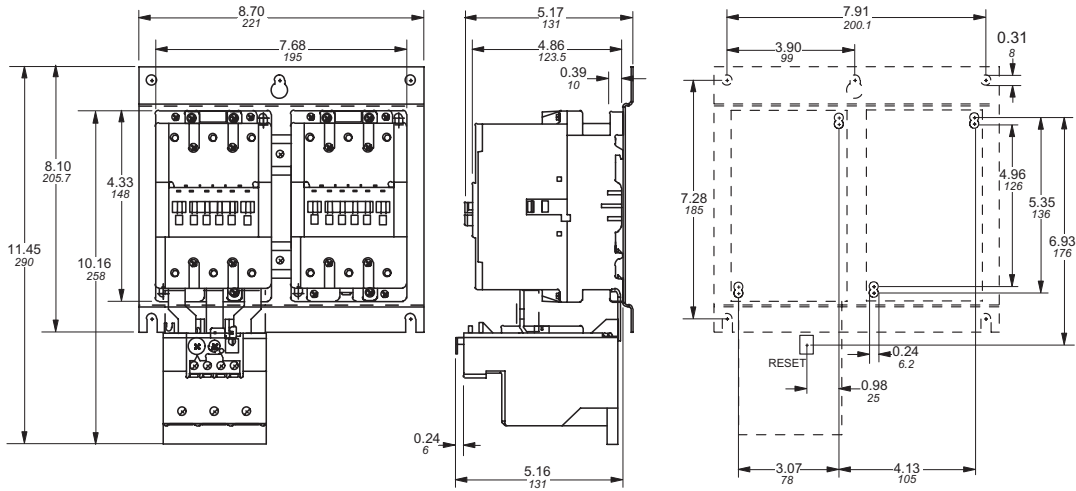


Approximate dimensions
AC/DC operated, 3 pole
A/AE/AF95 & A/AE/AF110

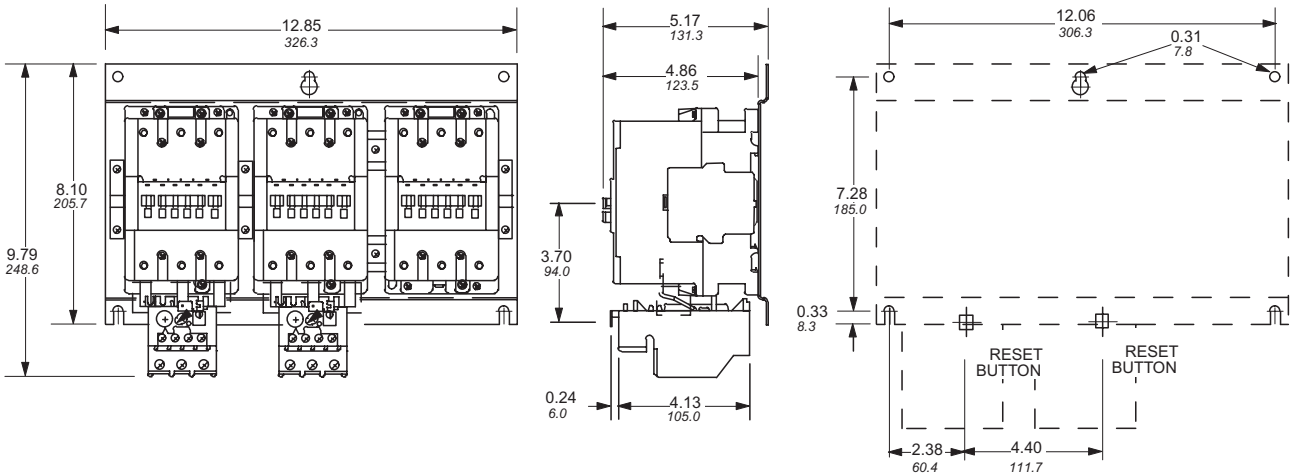
← 00.00 → Inches
00.00 [Millimeters]

A/AE/AF95 & A/AE/AF110 + VE5 + TA110 — Reversing starter

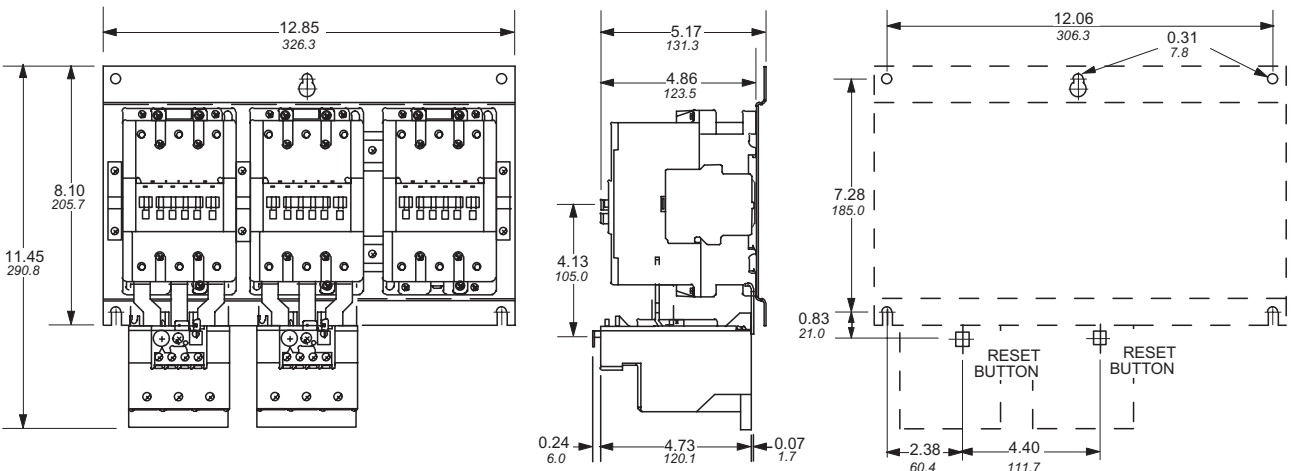
3



A/AE/AF95 & A/AE/AF110 + TA80 — 2 Speed, 1 winding starter



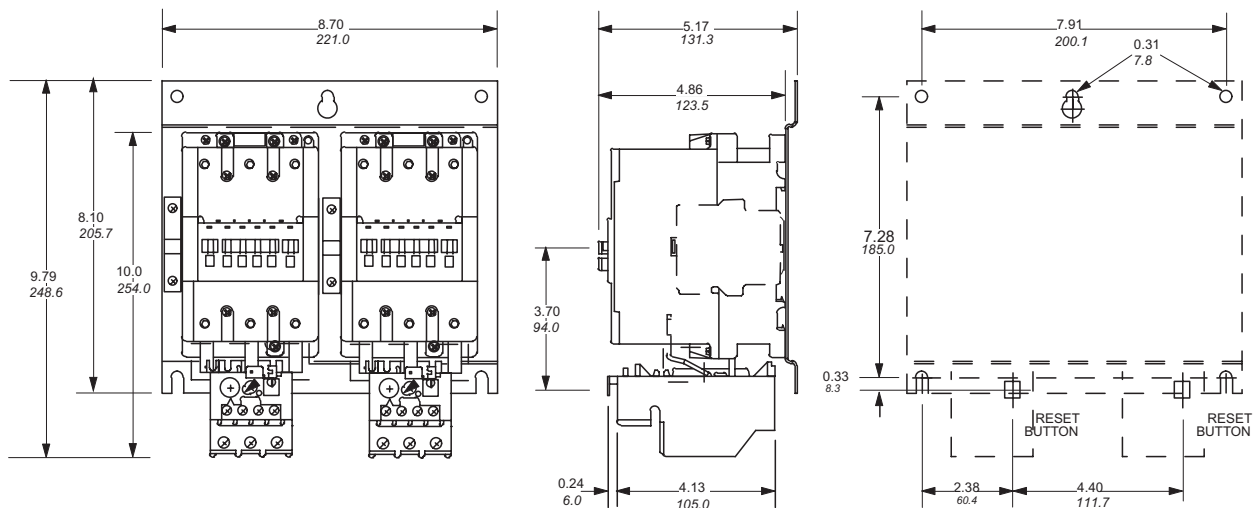
A/AE/AF95 & A/AE/AF110 + TA110 — 2 Speed, 1 winding starter



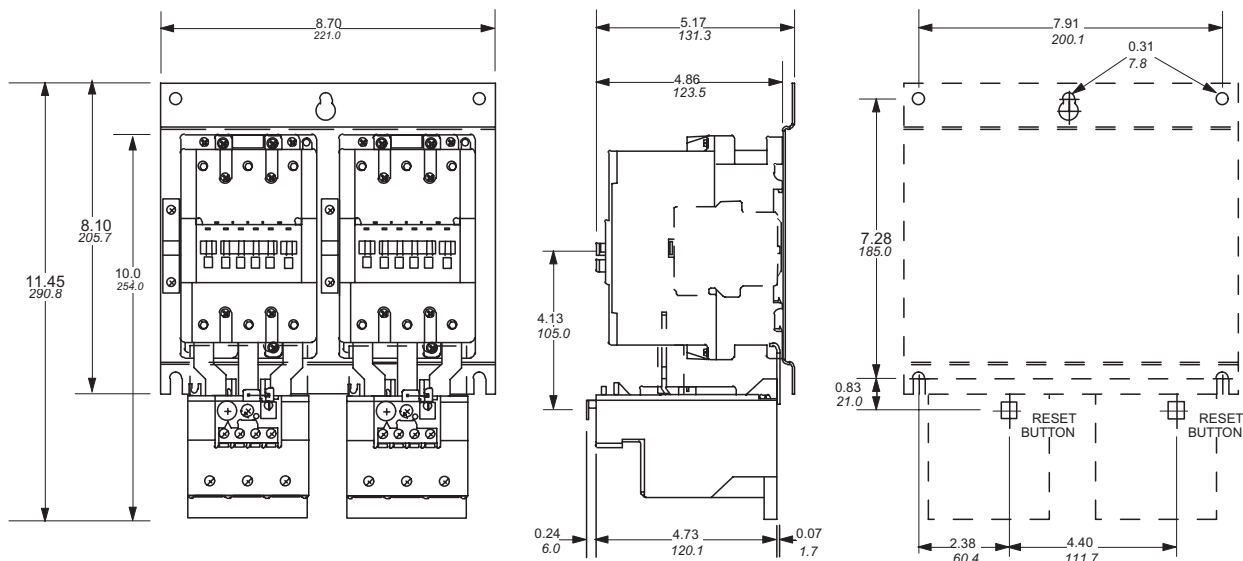
Approximate dimensions AC/DC operated, 3 pole A/AE/AF95 & A/AE/AF110

00.00 Inches
00.00 (Millimeters)

A/AE/AF95 & A/AE/AF110 + TA80 — 2 Speed, 2 winding starter



A/AE/AF95 & A/AE/AF110 + TA110 — 2 Speed, 2 winding starter

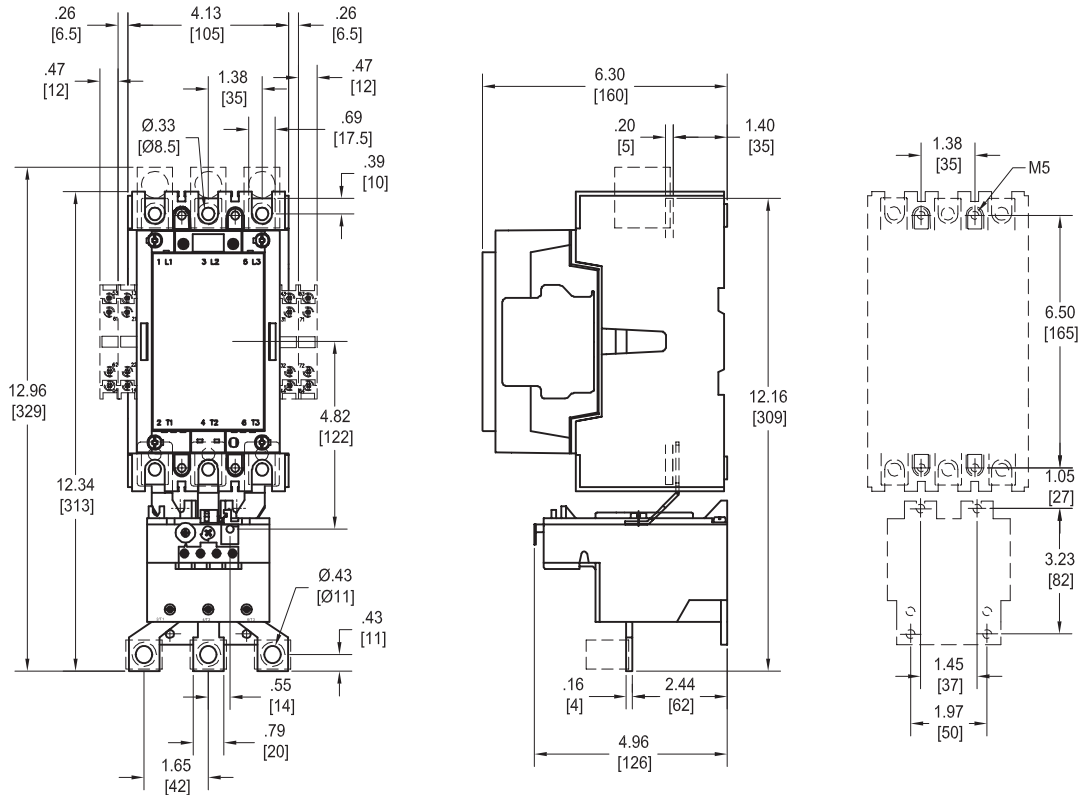


Approximate dimensions AC/DC operated, 3 pole A/AF145 & A/AF185

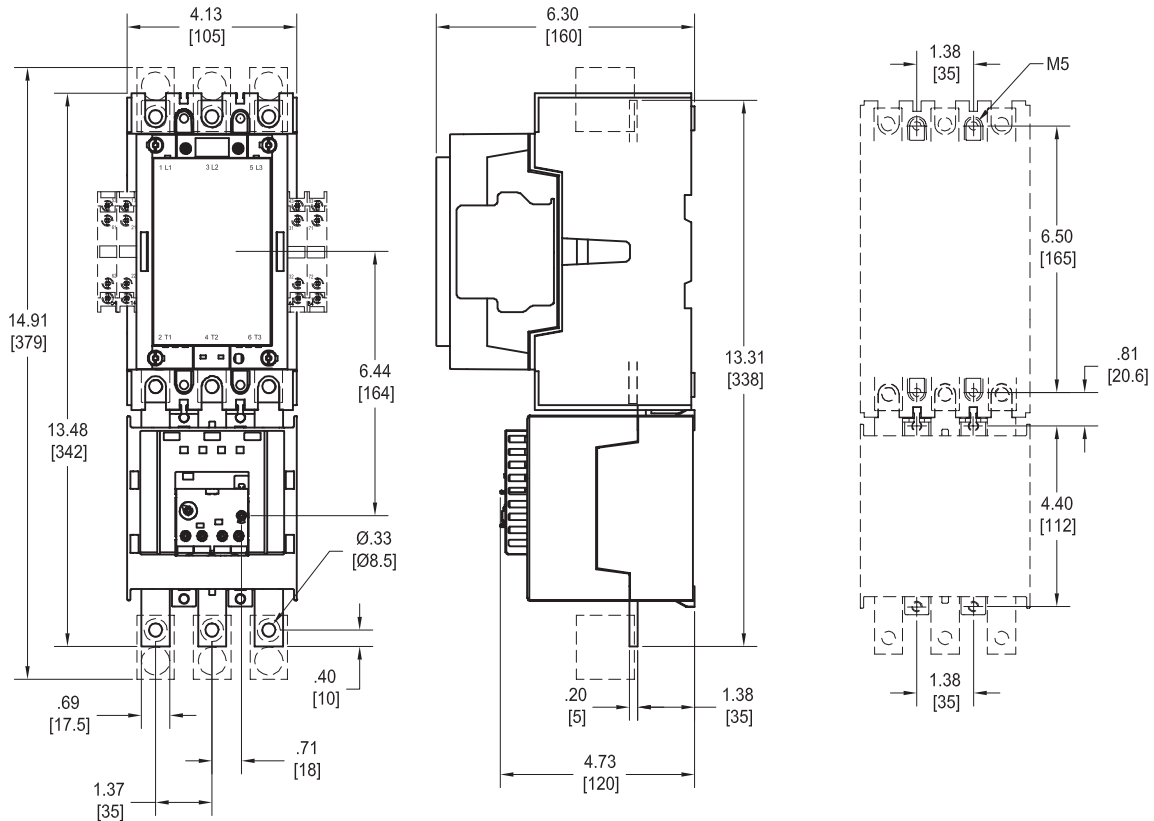
← 00.00 → Inches
00.00 [Millimeters]

A/AF145 - A/AF185 + TA200 — Starter

3



A/AF145 - A/AF185 + E200 — Starter

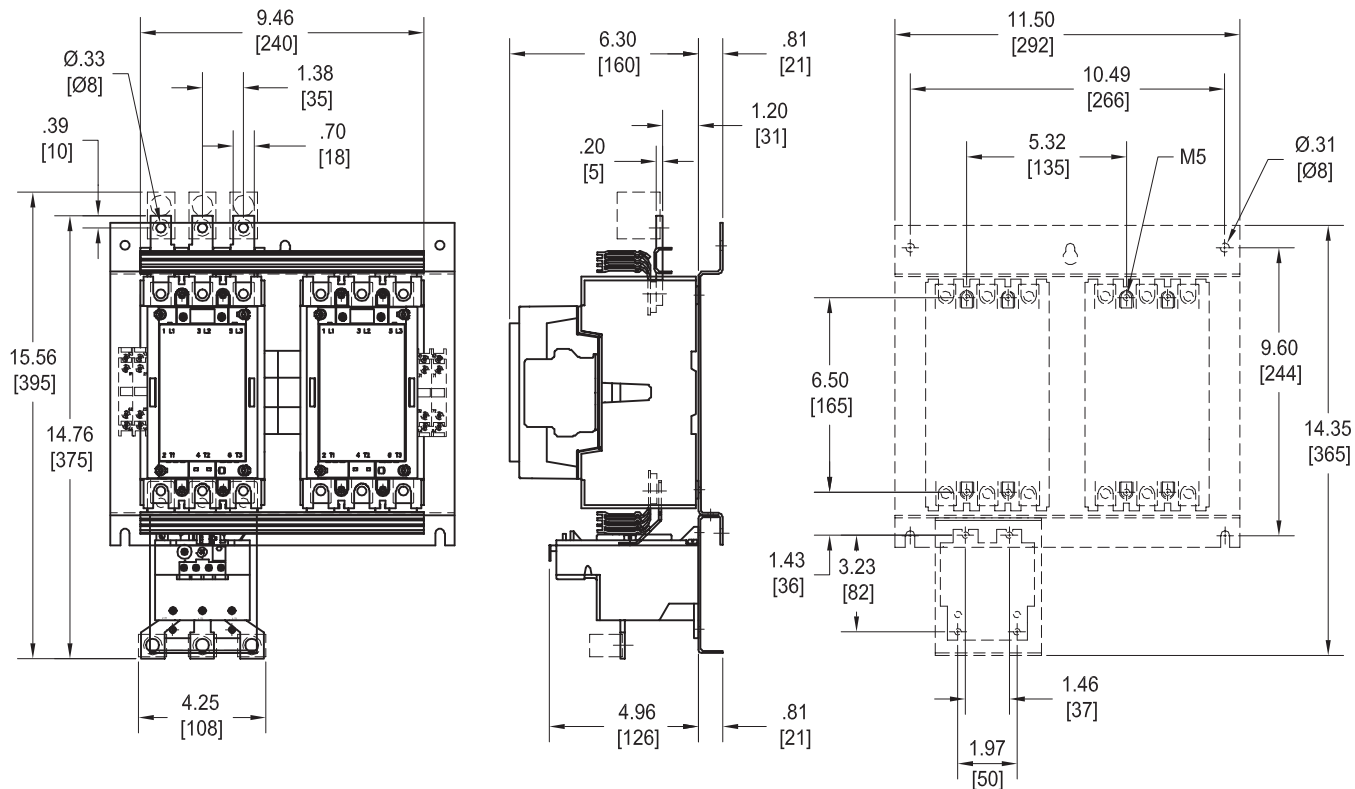


Approximate dimensions AC/DC operated, 3 pole A/AF145 & A/AF210

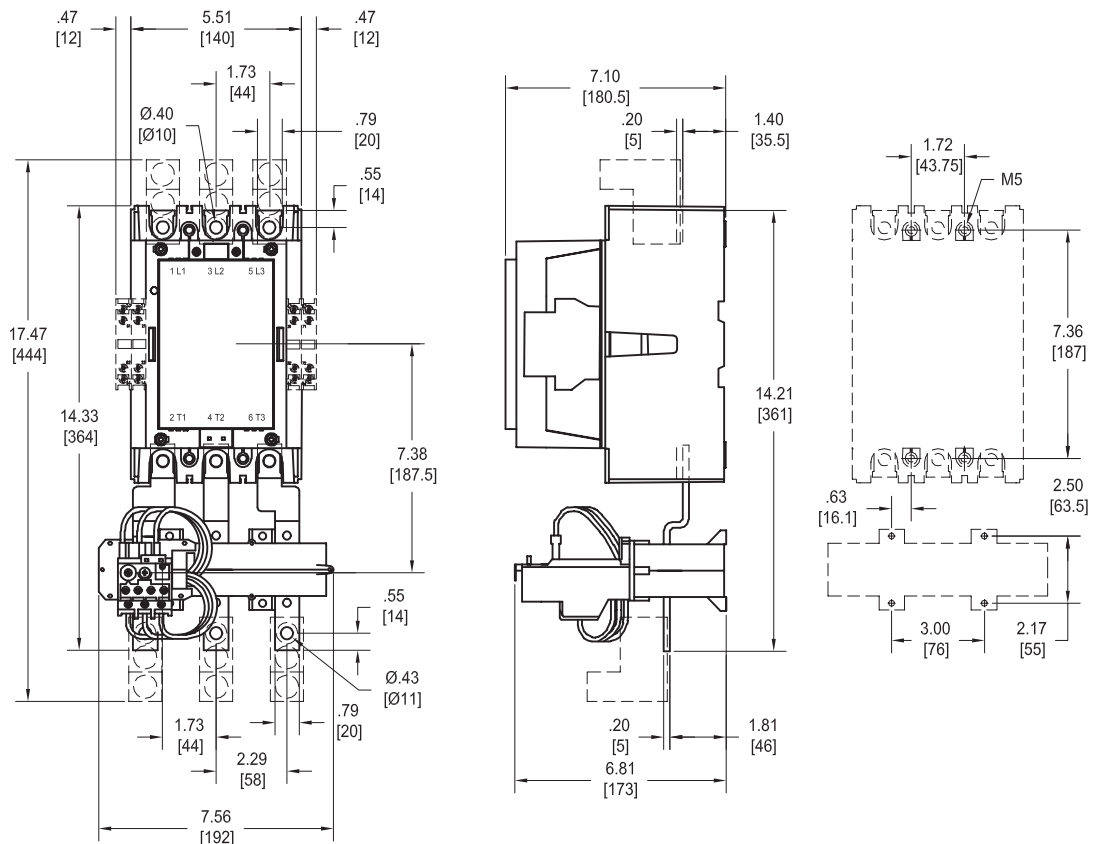
00.00 — Inches
00.00 — (Millimeters)

A/AF145 – A/AF185 + TA200 – Reversing starter

3



A210 – A300 + TA450

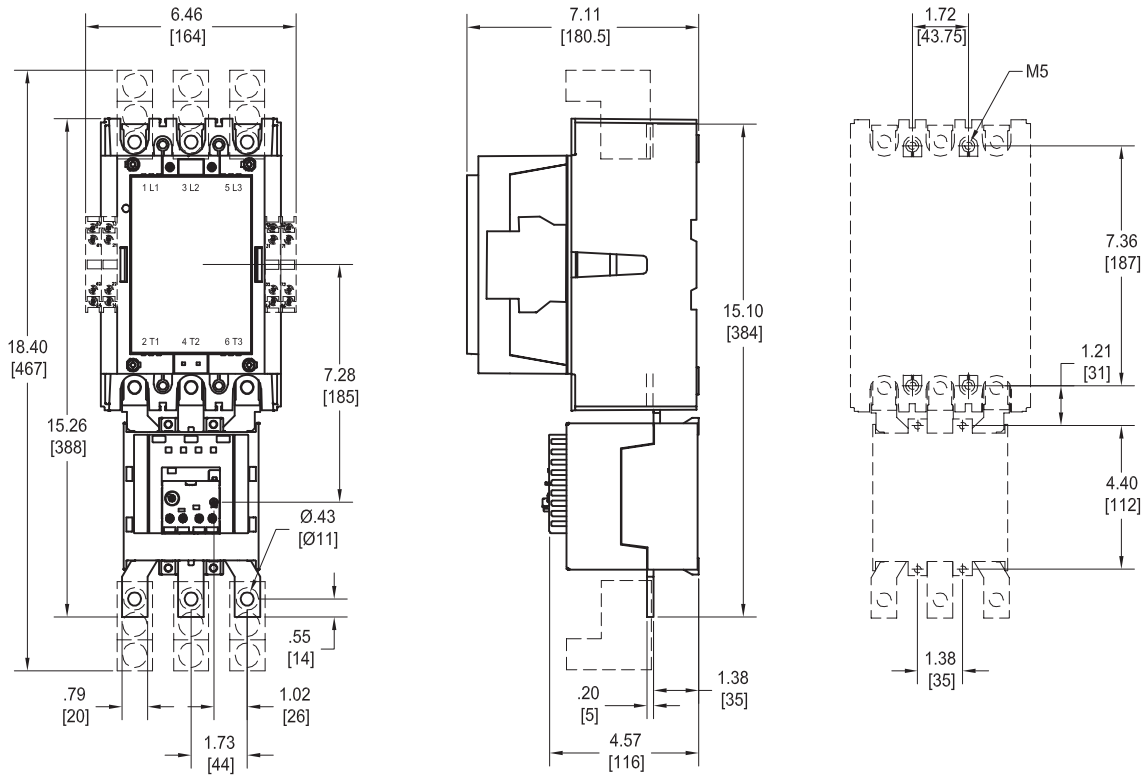


Approximate dimensions
AC/DC operated, 3 pole
A/AF210

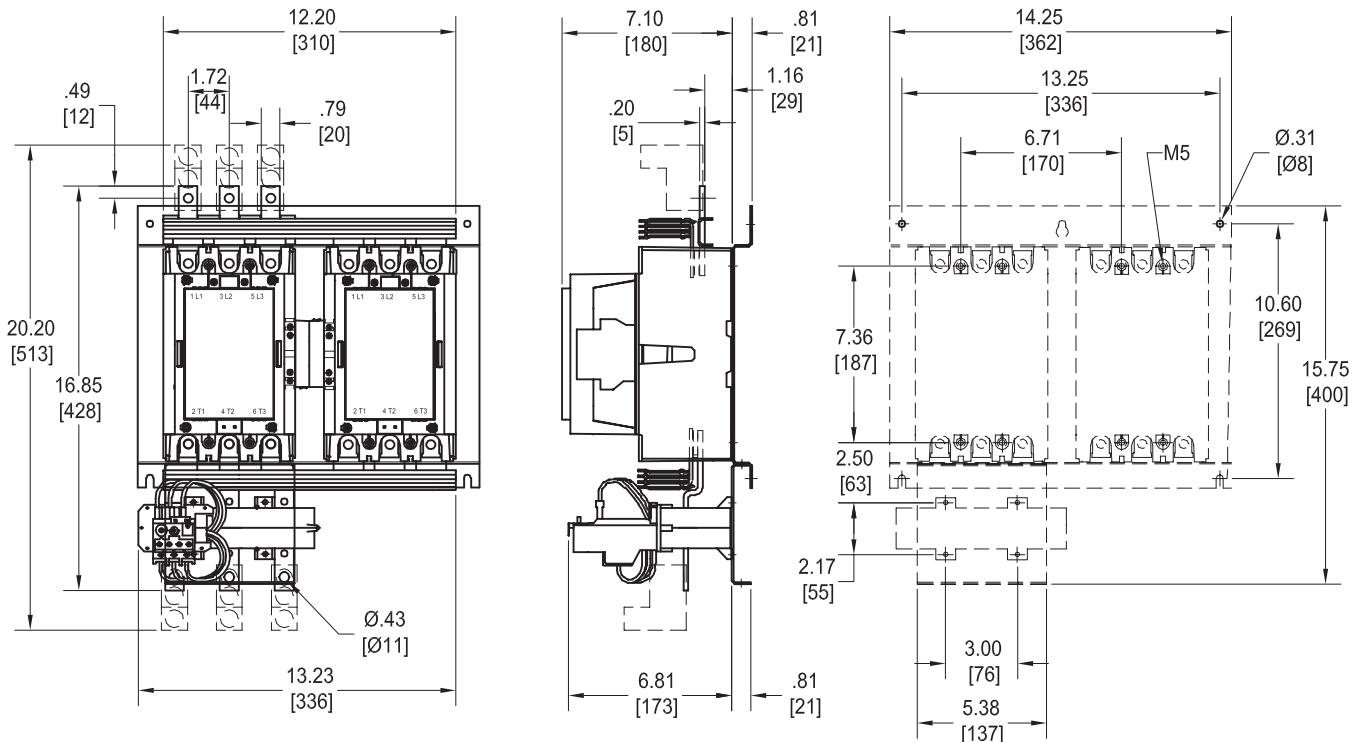
← 00.00 → Inches
00.00 → [Millimeters]

A210 – A300 + E320

3



A210 – A300 + TA450 – Reversing starter

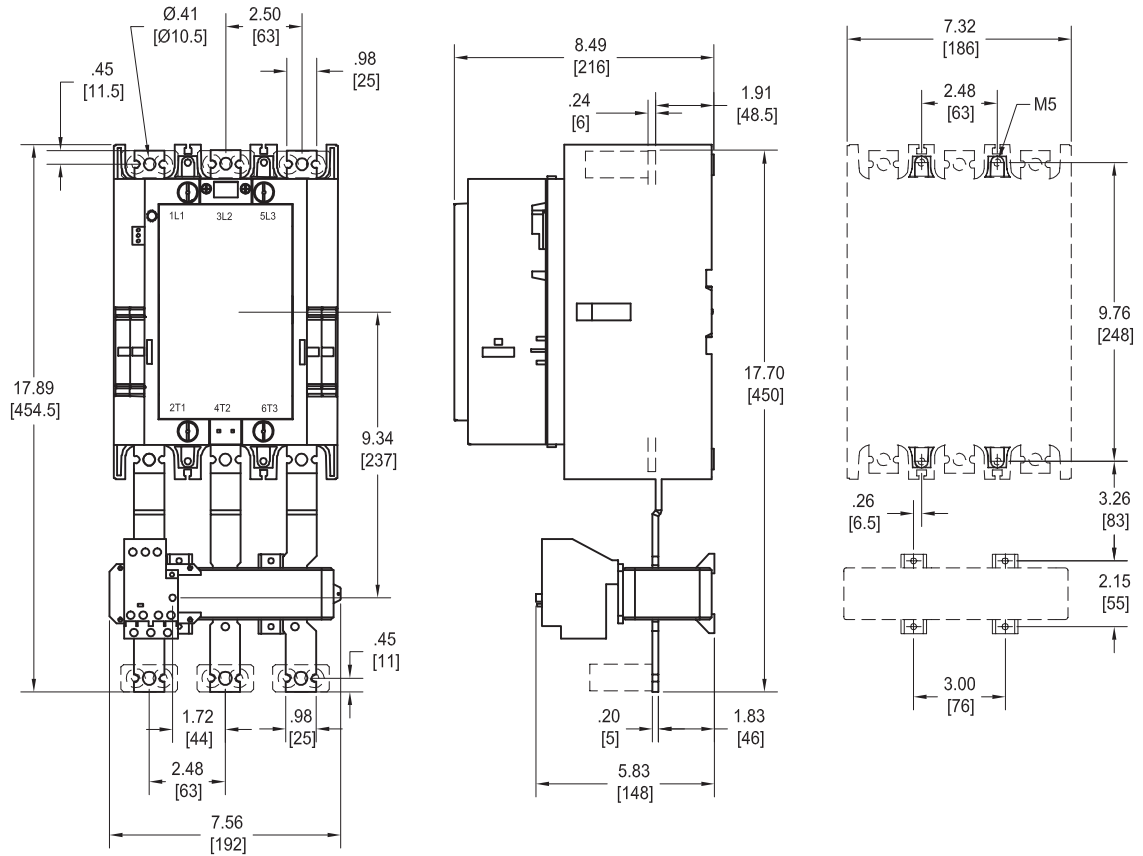


Approximate dimensions
AC/DC operated, 3 pole
A/AF400 & A/AF460

Across the
Line Starters

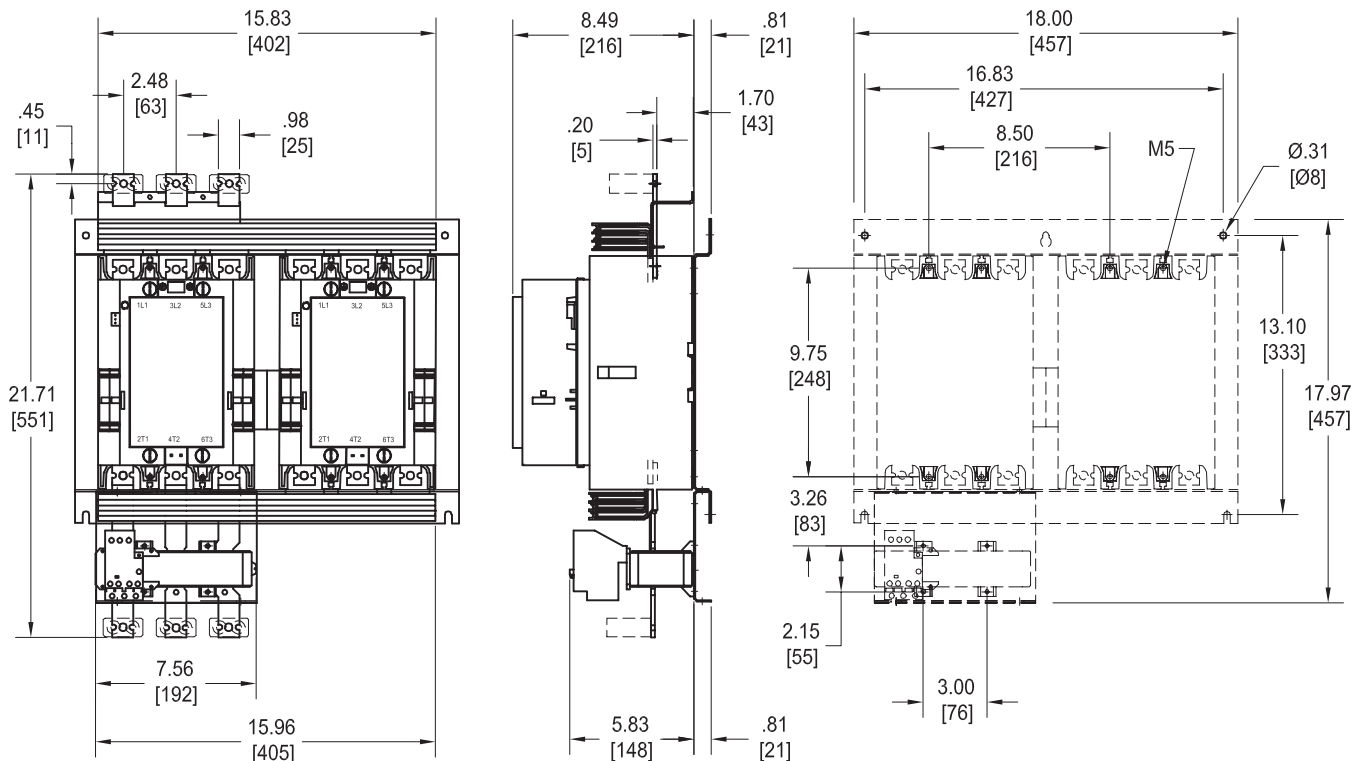
00.00 Inches
00.00 (Millimeters)

AF400 – AF460 + E500 — Starter



3

AF400 – AF460 + E500 – Reversing starter

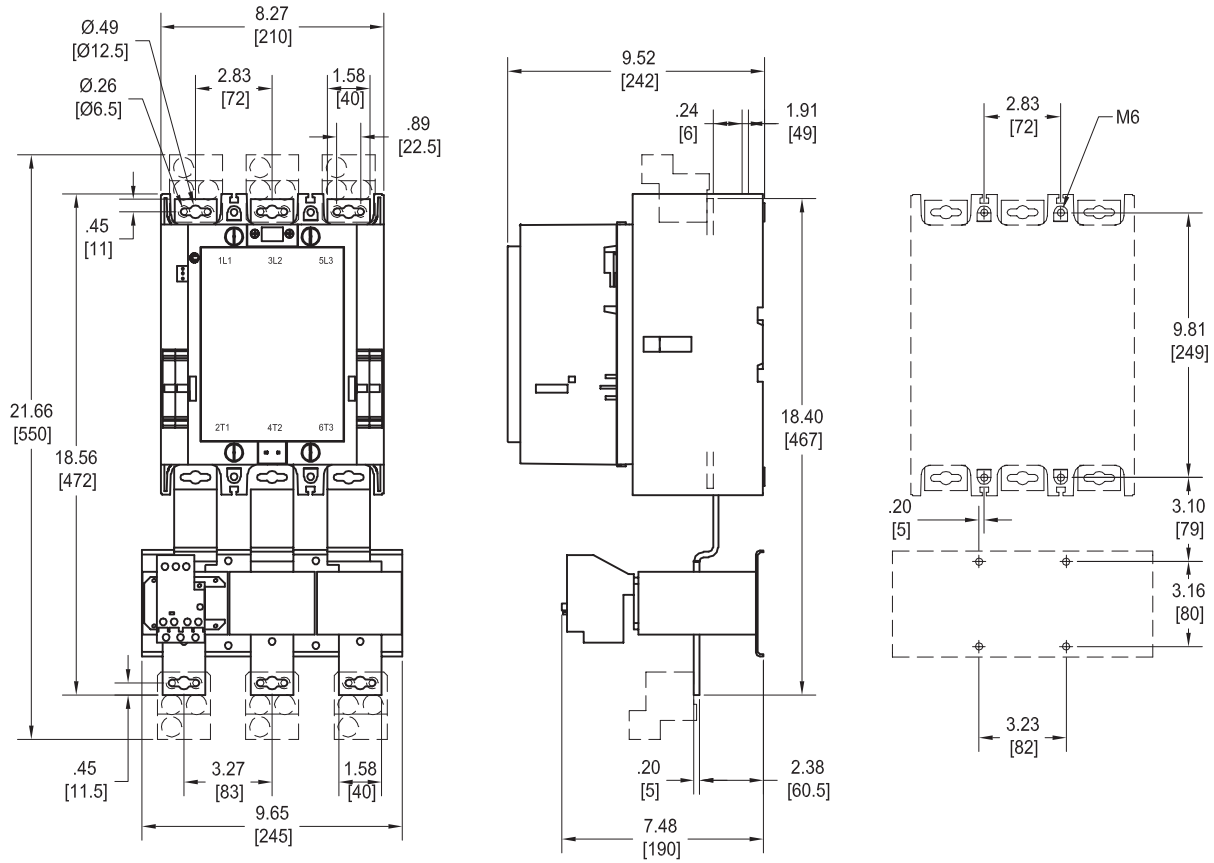


Approximate dimensions AC/DC operated, 3 pole A/AF580 & A/AF750

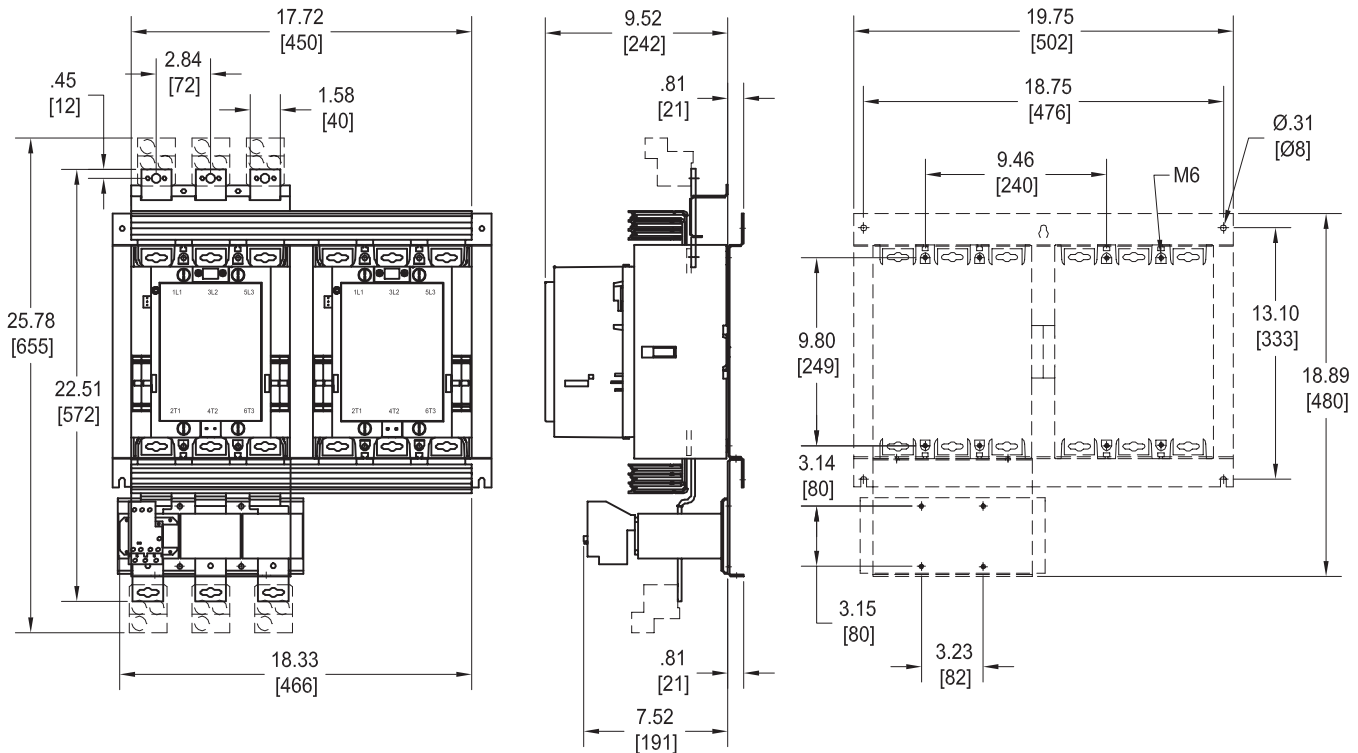
00.00 Inches
00.00 [Millimeters]

AF580 – AF750 + E800 — Starter

3



AF580 – AF750 + E800 – Reversing starter

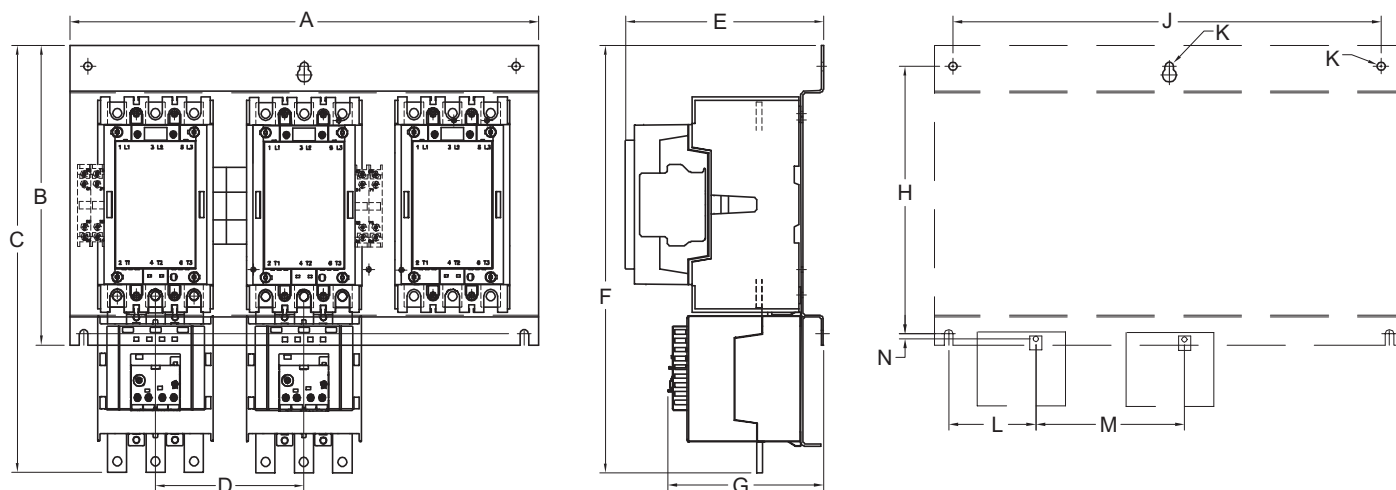


Approximate dimensions 2 speed, 1 winding A/AE26 – AF750, AC & DC operated, 3 pole

00.00 Inches
00.00 (Millimeters)

A26 – AF750 – 2 Speed, 1 Winding

3



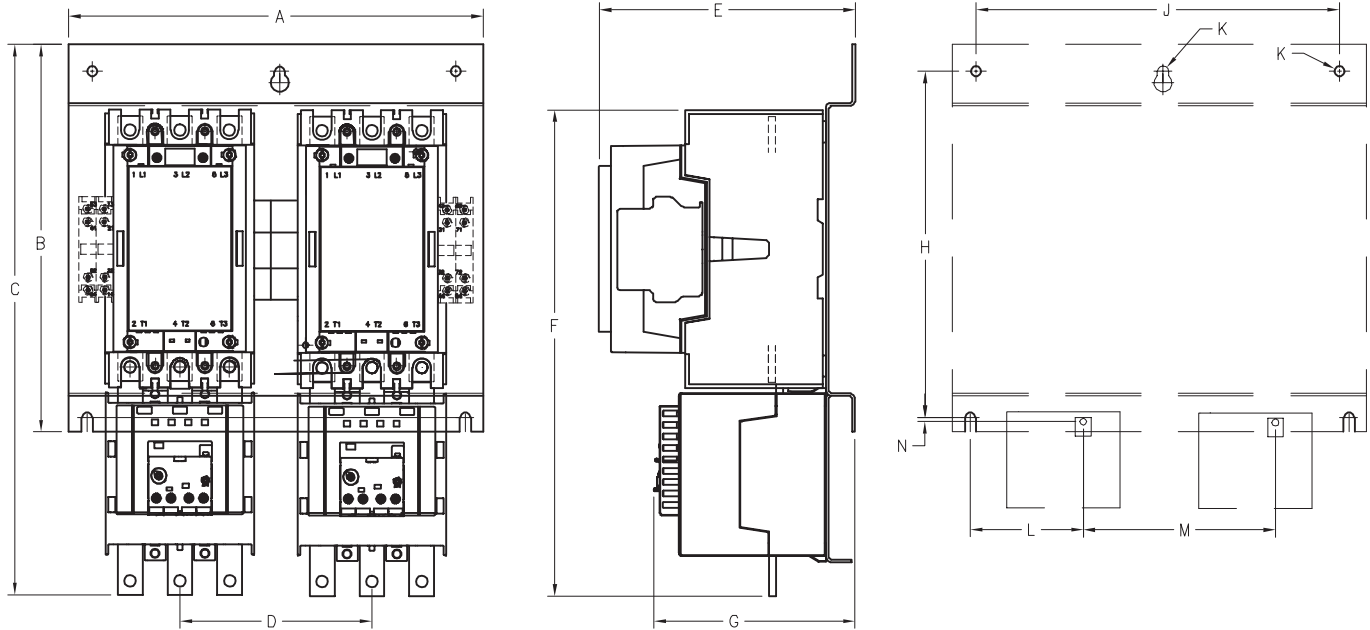
Item	A	B	C	D	E	F	G	H	J	K	L	M	N
A26	7.87 200	5.25 133	6.87 175	2.6 66	4.03 102	5.78 147	4.64 118	4.64 118	7.23 184	0.22 6	1.54 39	2.35 60	0.36 9
A30 - A40	7.87 200	5.25 133	7.25 191	2.43 62	4.6 117	5.85 149	4.42 112	4.64 118	7.23 184	0.22 6	1.56 40	2.33 59	0.36 9
A50 - A75	9.62 244	6.5 165	8.25 210	3.13 80	5.58 142	6.9 175	4.45 113	5.87 149	9 229	0.22 6	1.88 48	3 76	0.2 5
A95-A110+TA80	12.85 326	8.1 206	9.79 249	4.08 104	5.17 131	8.34 212	4.93 125	7.28 185	12.06 306	0.31 8	2.38 60	4.4 112	0.33 8
A95-A110+TA110	12.85 326	8.1 206	11.45 291	4 102	5.17 131	9.4 239	5.4 137	7.28 185	12.06 306	0.31 8	2.38 60	4.4 112	0.83 21
A145-A185+TA200	16.81 427	10.75 273	14.6 371	5.33 135	7.1 180	14.73 374	5.77 147	9.6 244	15.36 390	0.31 8	2.57 65	5.33 135	0.42 11
A145-A185+E200	16.81 427	10.75 273	15.33 371	5.33 135	7.1 180	15.34 389	5.58 142	9.6 244	15.36 390	0.31 8	-	-	-
A210-A300+E320	20.92 531	11.75 298	16.98 431	6.71 170	7.92 201	17.02 432	5.6 142	10.6 269	19.62 498	0.31 8	-	-	-
A400-A460+E500	26.33 669	14.25 362	19.61 498	4.96 126	9.27 235	19.53 496	6.62 168	13.1 333	25.33 643	0.31 8	-	-	-
A580-A750+E800	29.75 756	14.25 362	20.2 513	6.54 166	10.3 269	20.25 514	8.33 212	13.1 333	28.75 730	0.31 8	-	-	-

Approximate dimensions 2 speed, 2 winding A/AE26 – AF750, AC & DC operated, 3 pole

00.00 Inches
00.00 [Millimeters]

A26 – AF750 – 2 Speed, 2 Winding

3

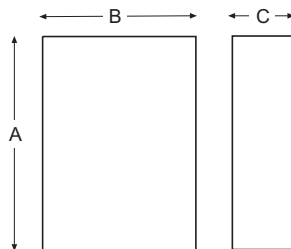


Item	A	B	C	D	E	F	G	H	J	K	L	M	N
A26	5.25 133	5.79 147	6.95 177	2.6 66	4.02 102	5.78 147	4.64 118	4.64 118	4.64 118	0.22 6	1.77 45	2.72 69	0.36 9
A30 - A40	5.25 133	5.25 133	7.25 191	2.43 62	4.9 150	5.85 149	4.42 112	4.64 118	4.64 118	0.22 6	1.77 45	2.72 69	0.36 9
A50 - A75	6.62 168	6.5 165	8.25 210	3.42 87	4.54 115	6.9 175	4.82 122	5.87 149	6 152	0.22 6	2.36 60	335 85	0.2 5
A95-A110	8.7 221	8.1 206	11.45 291	4.14 105	5.17 131	9.39 239	5.42 138	7.28 185	7.91 200	0.31 8	2.36 60	4.4 111	0.83 21
A145-A185+TA200	11.5 292	10.75 273	14.6 371	3.31 84	7.03 179	12.69 322	5.7 145	9.6 244	10.09 256	0.31 8	3.13 80	5.33 135	0.51 13
A145-A185+E200	11.5 292	10.75 273	15.27 388	2.76 70	7.11 181	13.48 342	5.58 142	9.6 244	10.09 256	0.31 8	-	-	-
A210-A300+TA450	11.5 292	10.75 273	14.35 364.5	2.76 70	7.11 180	14.18 360	6.81 173	9.6 244	10.09 256	0.31 8	-	-	-
A210-A300+E320	14.25 362	11.75 298	16.98 431	3.45 88	7.92 201	15.29 388	5.6 142	10.6 269	12.84 326	0.31 8	-	-	-
A400-A460+E500	18 457	14.25 362	19.61 498	2.48 63	9.3 236	16.68 423	6.62 168	11.32 288	16.83 427	0.31 8	-	-	-
A580-A750+E800	19.75 502	14.25 362	20.2 513	3.27 83	10.05 255	17.41 442	8.33 212	13.1 333	18.75 476	0.31 8	-	-	-

Approximate dimensions

Across the line w/CCT
Across the line, reversing w/CCT

00.00 Inches
00.00 (Millimeters)



3

Across the line w/CCT

Starter size	Enclosure type	A	B	C
A9 – A26	1	11	6	5
A9 – A40	3R	10	8	6
	4	10	8	6
	4X Stainless	10	8	6
	4X Plastic	10	8	7
	12	10	8	6
	7 (w/o CCT) ①	11	6	5
A30 – A75	1	13	9	7
A50 – A75	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
	12	14	12	8
A9 – A75	7 ①	12	8	6
A95 – A110	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
	12	20	16	8
	7 ①	18	12	6
A145 – A185	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
	12	30	20	8
	7 ①	30	12	6
A210 – A300	1	30	24	12
	3R	30	20	10
	4	30	20	10
	4X Stainless	30	24	12
	4X Plastic	30	20	12
	12	30	20	10
	7 ①	30	12	6
A400	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	–	–	–
	12	36	24	12
A460	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
	12	42	36	12
A580	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	–	–	–
	12	36	24	12
A750	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
	12	42	36	12

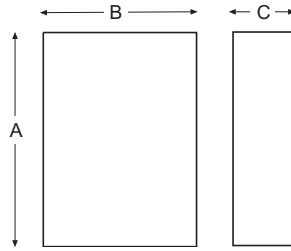
Across the line, reversing w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	12	10	6
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
	12	14	12	8
A50 – A75	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
	12	14	12	8
A95 – A110	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
	12	20	16	8
A145 – A185	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
	12	30	20	8
A210 – A300	1	30	24	12
	3R	30	20	10
	4	30	20	10
	4X Stainless	30	24	12
	4X Plastic	30	20	12
	12	30	20	10
A400	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	–	–	–
	12	36	24	12
A460	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
	12	42	36	12
A580	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	–	–	–
	12	36	24	12
A750	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
	12	42	36	12

① Type 7, explosion-proof inside dimensions.

Approximate dimensions 2-Speed, 1 Winding w/CCT 2-Speed, 2-Winding w/CCT

00.00 Inches
00.00 [Millimeters]



2 Speed, 1 winding w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A95 – A110	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A145 – A185	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
A210 – A300	1	30	24	12
	3R	30	24	12
	4	30	24	12
	4X Stainless	30	24	12
	4X Plastic	30	20	12
A400	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	-	-	-
A460	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	-	-	-
A580 – A750	1	42	36	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	-	-	-

2 Speed, 2 winding w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	12	10	6
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A50 – A75	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A95 – A110	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A145 – A185	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
A210 – A300	1	30	24	12
	3R	30	20	10
	4	30	20	10
	4X Stainless	30	24	12
	4X Plastic	30	20	12
A400	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	-	-	-
A460	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	-	-	-
A580	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	-	-	-
A750	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	-	-	-

① Type 7, explosion-proof inside dimensions.

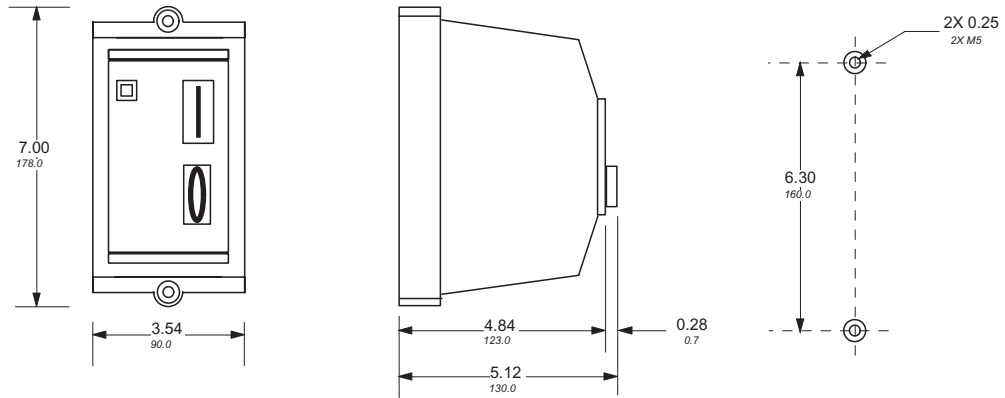
Approximate dimensions

Plastic enclosed, IP65

Across the
Line Starters

00.00 Inches
00.00 (Millimeters)

Plastic enclosed, IP65



Circuit diagrams

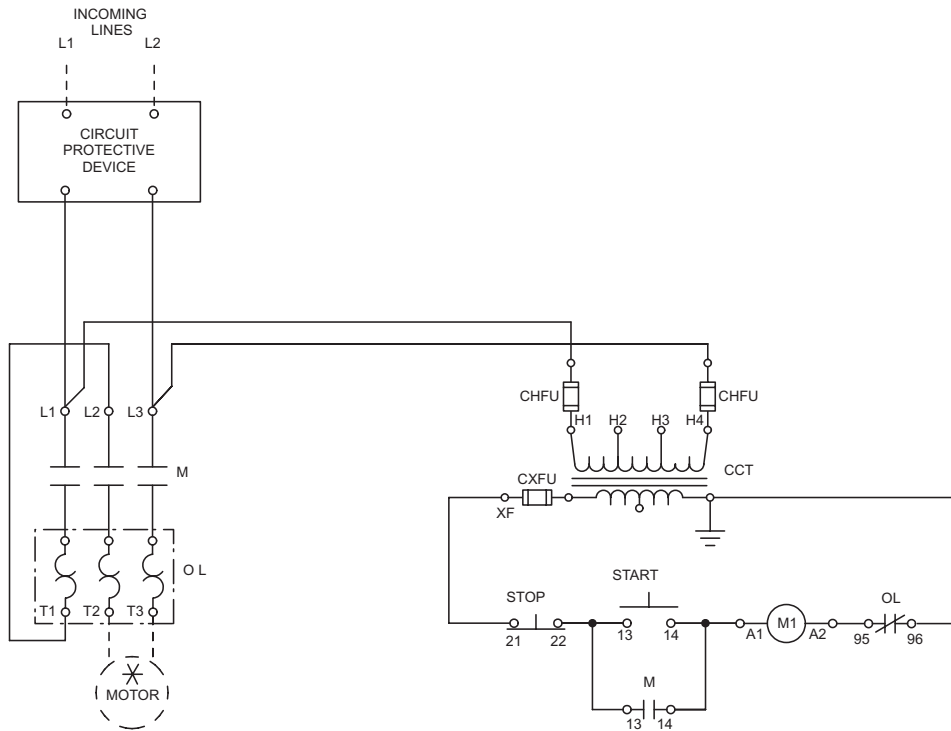
Non-reversing, single phase

A9 – A185

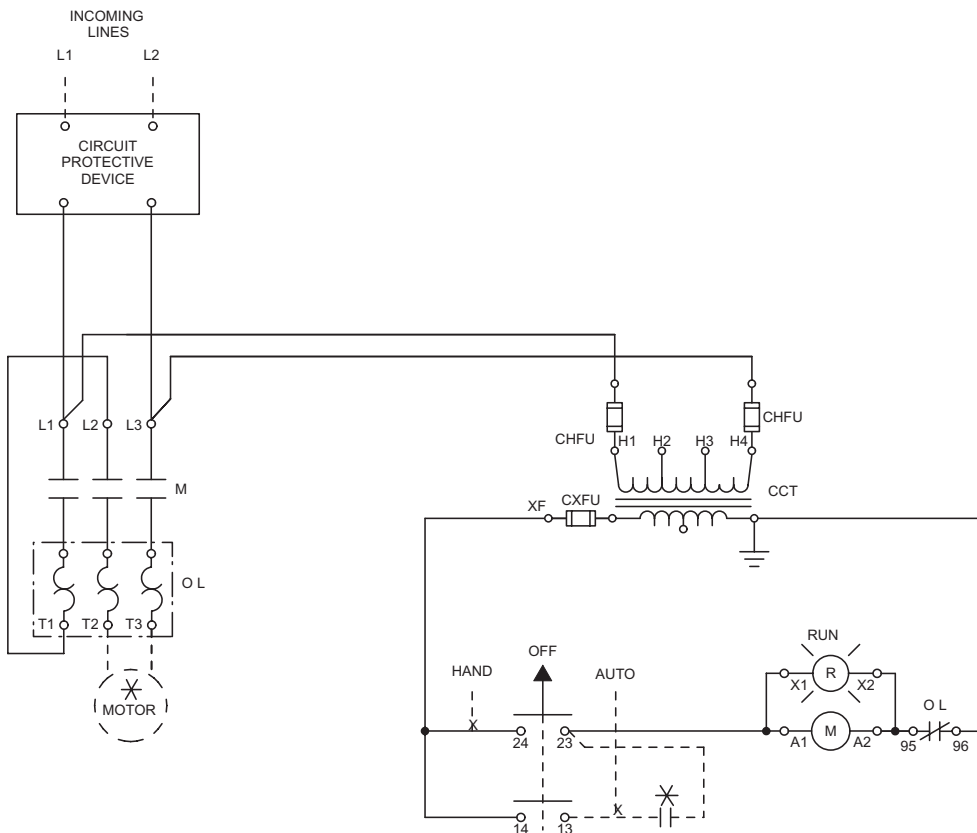
00.00 Inches
00.00 [Millimeters]

Non-reversing, single phase – A9 - A185 shown with control circuit transformer, START-STOP

3



Non-reversing, single phase – A9 - A185 shown with control circuit transformer, HOA



Circuit diagrams

Non-reversing, reversing

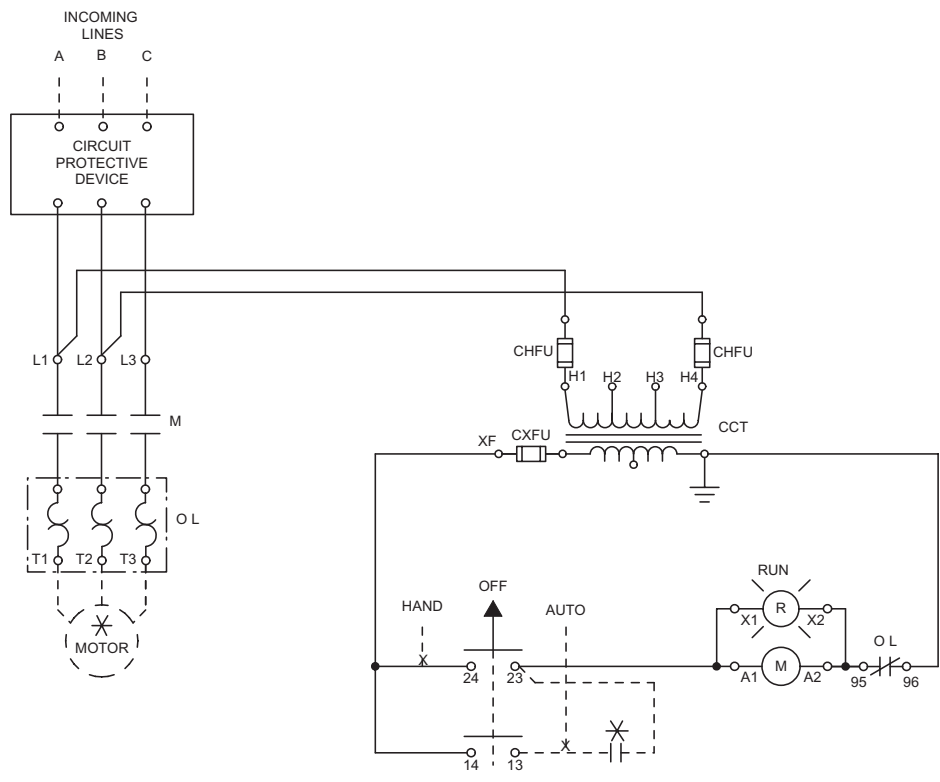
A9 – A750

00.00 Inches
00.00 (Millimeters)

Non-reversing

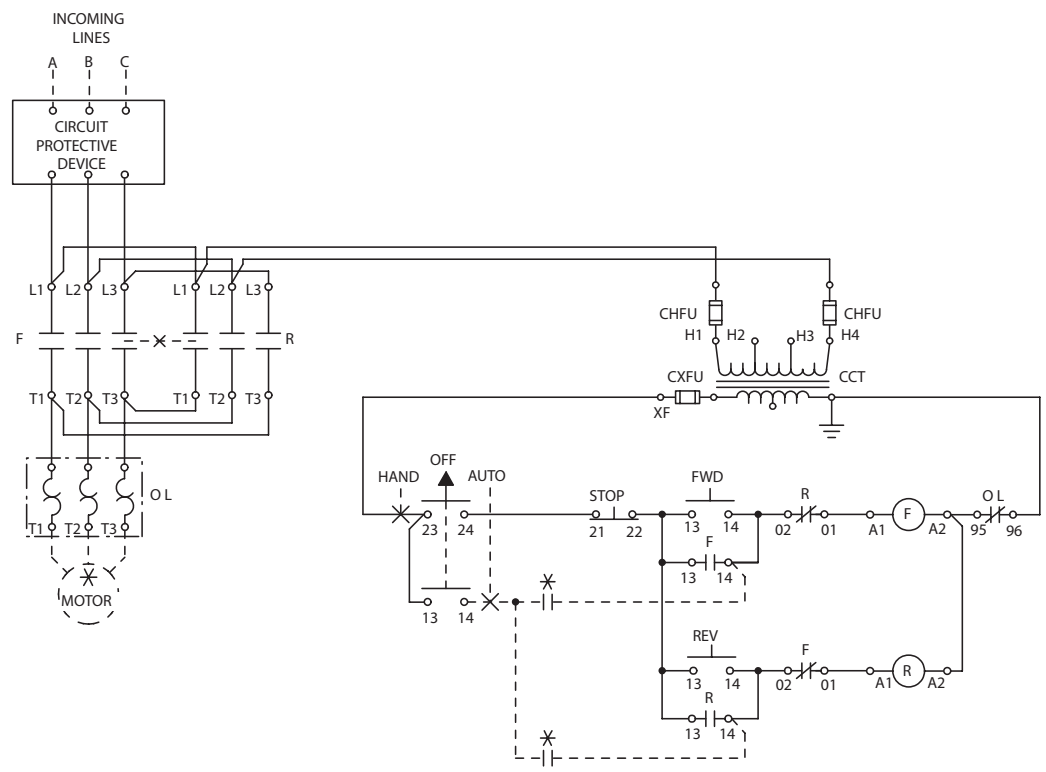
A9 – A750 shown with control circuit transformer, HOA

3



Reversing

A9 – A750 shown with control circuit transformer, HOA, STOP, FWD, REV



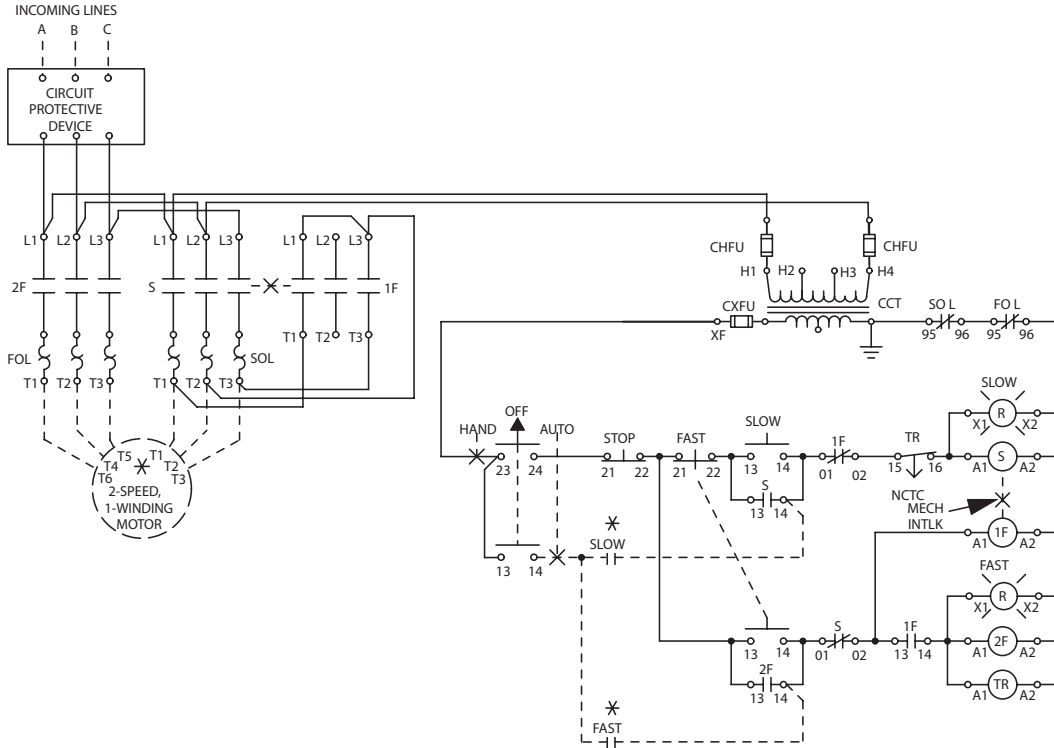
Circuit diagrams

2 Speed, 1 Winding; 2 Speed, 2 Winding

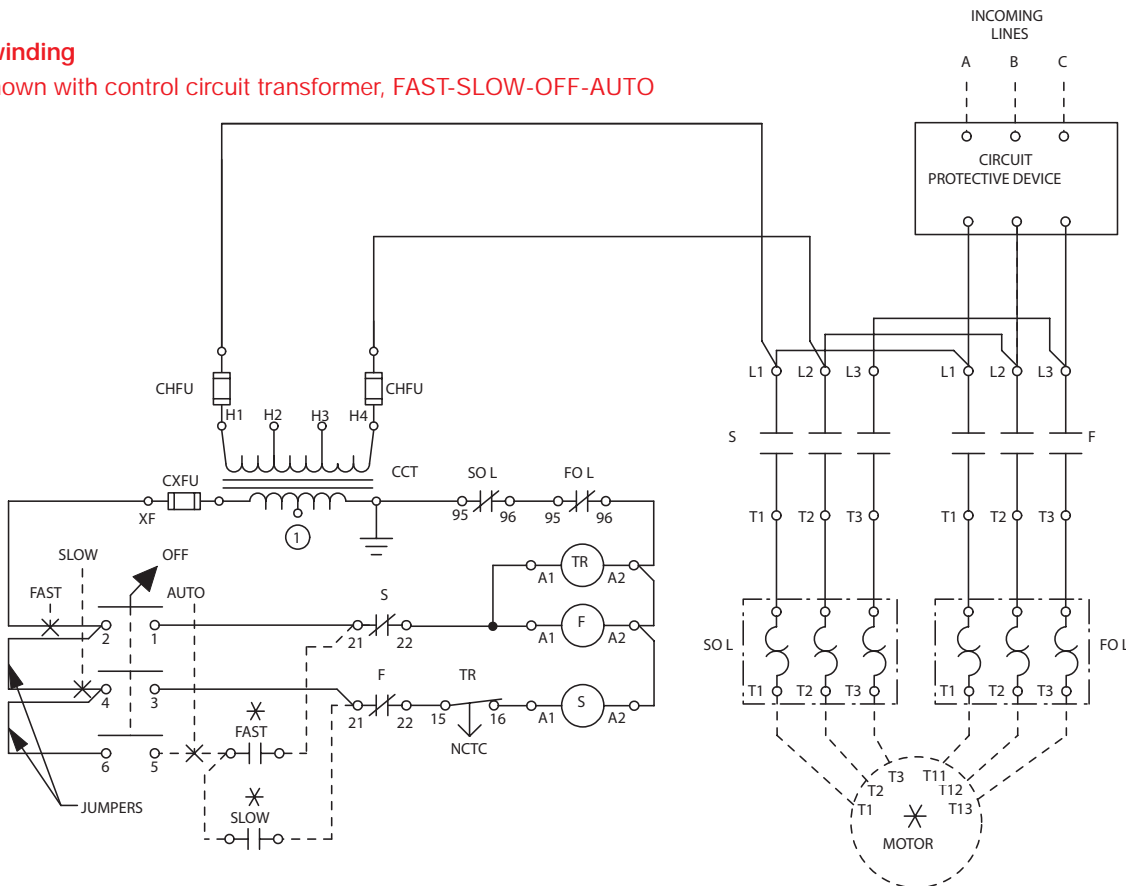
A9 – A750

00.00 Inches
00.00 [Millimeters]

2 Speed, 1 winding — constant or variable torque, selective control
A9 – A750 shown with control circuit transformer, HOA, STOP-FAST-SLOW



2 Speed, 2 winding
A9 – A750 shown with control circuit transformer, FAST-SLOW-OFF-AUTO



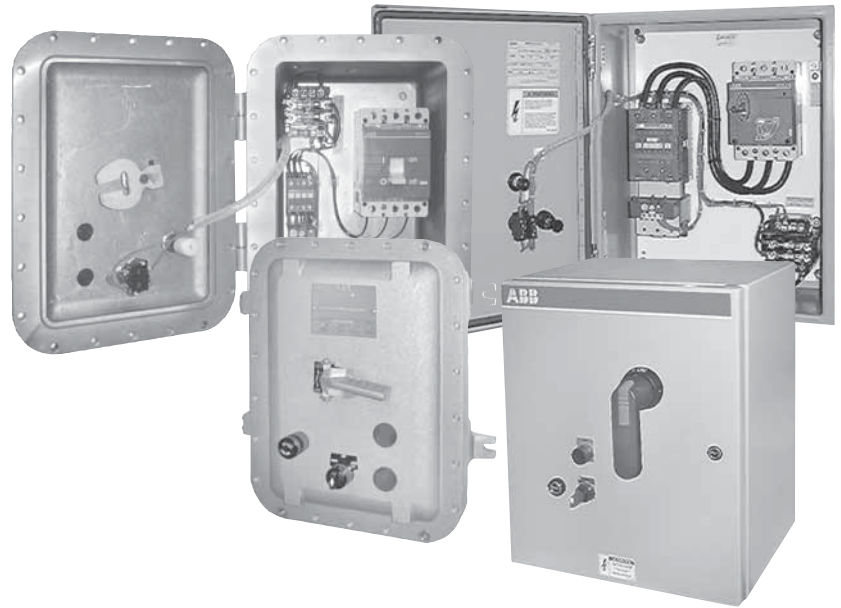
Combination Starters



Combination starters

Enclosed
A9 – A750

3



Description

A9 – A750

- Maximum UL/CSA horsepower ratings
- Available with ABB non-fusible or fusible disconnect switches and MCP, thermal magnetic or electronic trip type circuit breakers
- Compact space saving design
- Standard auxiliary contact configurations:
 - A9 – A40 1 N.O. or 1 N.C.
 - A50 – A750 1 N.O. & 1 N.C.
- Double break contact design
- Lowest possible contact bounce
- Early make & late break auxiliary contacts available
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- UL listed

Overload relay protection

Starters, sizes A9–A185, have Class 10 adjustable thermal bimetallic overload relay protection as standard.

Sizes A210 – A750, have selectable Class 10, 20, 30 adjustable electronic overload relay protection as standard.

Electronic overload relay protection is available for other starter sizes.

General information

Catalog number explanation

A110 SR F 1 - 84 C 6 D A

3

Starter size

Starter type

S - Non-reversing
SR - Reversing
SS - Single phase, non-reversing
N - NEMA

Combination type

N - Non-fusible disconnect
F - Fusible disconnect
B - Thermal magnetic or electronic trip type circuit breaker
M - Motor Circuit Protection (MCP)

Enclosure

1 - UL Type 1	7 - UL Type 7 & 9
2 - UL Type 12	Class I, Group D, Div 1 & 2
3 - UL Type 3R	Class II, Groups E, F & G, Div 1 & 2
4 - UL Type 4	Class III
X - UL Type 4X stainless steel	74 - Hazardous Type 4
P - Plastic	

Coil voltage/CCT

Overload range

See Overload Relay Selection chart, see page 3.6.

Accessories

See Factory modifications, page 3.3.

Fuse clip

6A - 30A, 600V, Class J
6B - 60A, 600V, Class J
6C - 100A, 600V, Class J
6D - 200A, 600V, Class J
6E - 400A, 600V, Class J
6F - 600A, 600V, Class J
6G - 800A, 600V, Class L
6H - 1200A, 600V, Class L

Circuit breaker amp rating (600V)

6D -15	6M -70	6W - 225	6E - 700
6E -20	6N - 80	6X - 250	6F - 800
6F -25	6P - 90	6Y - 300	6G - 900
6G -30	6R - 100	6Z - 350	6H - 1000
6H -35	6S - 125	6A - 400	6J - 1200
6J -40	6T - 150	6B - 450	
6K -50	6U - 175	6C - 500	
6L -60	6V - 200	6D - 600	

Circuit breaker amp rating (200V – 480V)

4D -15	4M -70	4W - 225	4E - 700
4E -20	4N - 80	4X - 250	4F - 800
4F -25	4P - 90	4Y - 300	4G - 900
4G -30	4R - 100	4Z - 350	4H - 1000
4H -35	4S - 125	4A - 400	4J - 1200
4J -40	4T - 150	4B - 450	
4K -50	4U - 175	4C - 500	
4L -60	4V - 200	4D - 600	

MCP amp rating (600V)

6A - 3	6D - 25	6G -	1506K	-600
6N - 1200				
6B - 5	6E - 50	6H -	2506L	-800
6C - 10	6F - 100	6J -	4006M	-1000

MCP amp rating (200V – 480V)

4A - 3	4D - 25	4G -150	4K - 600	
4N - 1200				
4B - 5	4E - 50	4H -	2504L	-800
4C - 10	4F - 100	4J -	4004M	-1200

General information

Factory modifications

Combination
starters

Control cover accessories – A9-A750

Description	Control suffix ①	List price adder
		NEMA 1 3R 4, 4X & 12
Start-stop pushbutton	A	\$ 72
Fwd-rev-stop pushbutton	B	360
2 position selector switch (Std. ON-OFF)	C	72
3 position selector switch (Std. HAND-OFF-AUTO)	D	72
Pilot light, Red, RUN (Std.)	E	135
Pilot light, Green, RUN	R	135
Pilot light suffix + V= Neon bulb	V	–
Pilot light suffix + X= LED bulb	X	–
Start-stop pushbutton & pilot light	F	207
Fwd-rev-stop pushbutton & pilot light	G	496
2 position selector switch & pilot light	H	207
3 position selector switch & pilot light	J	207
Fast-slow-stop pushbuttons	K	360
Fast-slow-stop pushbuttons & pilot light	L	495
Fast-slow-off-auto selector switch	M	150
Emergency stop	P	100
F suffix + 1NO & 1NC auxiliary contact	T	237
J suffix + 1NO & 1NC auxiliary contact	U	237
Pushbutton (standard START)	Y	36

Special modifications

Contact configuration	Suffix code ①	List price adder
Contactor		
Coil surge suppressor	S	\$ 75
Auxiliary relays		
Type N control relay (4 pole)	CR	225
Electronic timer		
1.5 – 30, On Delay	TN30	300
5 – 100, On Delay	TN100	300
1.5 – 30, Off Delay	TF30	300
5 – 100, Off Delay	TF100	300
Phase failure phase reversal with over and undervoltage relays	PFPR	525
Ground fault protection	GFP	2250
For multi-speed controllers		
Compelling relay	CPR	600
Accelerating relay	ACR	600
Decelerating relay	DCR	600
Meters & metering		
Current transformer	CT	375
Ammeter (including C.T.)	AM	705
Ammeter & ammeter switch	AMS	1800
Voltmeter	VM	1200
Voltmeter & voltmeter switch	VMS	1800
Elapsed time meter	ETM	375
Operation counter	OC	560
Wattmeter	WM	3650
Miscellaneous		
Lightning arrestor	LA	320
Space heater, 100W with thermostat	SH	600

Control circuit transformer (standard VA) – A9 - A750 ②

Standard size with fused secondary			Coil suffix	Starter size	CCT VA	List price
Primary	Secondary	Hz				
				A9 – A40	45 ③	\$ 300
				A9 – A40	50	360
200/208V	110V	50/60	0	A50 – A75	75	435
220/240V	110/120V	50/60	7	A95 – A110	100	560
440/480V	110/120V	50/60	8	A145 – A185	150	720
550/600V	110/120V	50/60	9	A210 – A300	250	795
				A400 – A460	150	720 ④
				A580 – A750	250	795 ④

Control circuit transformers do include two primary fuses and one secondary fuse.

- ① Add this suffix to the last digit of the catalog number.
 ② Consult factory if additional VA is required.
 ③ Does not include primary fusing.
 ④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Additional auxiliary contact blocks — A9 – A750

Contact configuration	Suffix code ①	A9 – A110 list price adder	A145 – A750 list price adder
1 N.O.	10	\$ 20	–
1 N.C.	01	20	–
2 N.O.	20	30	–
1 N.O. & 1 N.C.	11	30	\$ 30
2 N.C.	02	30	–
4 N.O.	40	60	–
3 N.O. & 1 N.C.	31	60	–
2 N.O. & 2 N.C.	22	60	60
1 N.O. & 3 N.C.	13	60	–
4 N.C.	04	60	–
3 N.O. & 3 N.C.	33	90	90

Reduced voltage & multi-speed starters — price adders

Starter size	Non-fusible switch price adder	Fusible switch price adder	MCCB or MCP price adder
A9	\$ 990	\$ 1008	\$ 1287
A12	990	1008	1287
A16	990	1008	1287
A26	990	1008	1287
A30	990	1224	1350
A40	990	1224	1350
A50	1152	1224	1350
A63	1230	1350	1785
A75	1494	1602	1809
A95 – A110	2310	2565	2982
A145	3042	3366	4158
A185	3300	3735	4533
A210	3450	3825	6000
A260	3744	4068	6849
A300	4200	6000	8750
A400	6600	9450	9030
A460	8200	11,100	9475
A580	8400	11,800	10,200
A750	9000	12,450	12,900

Hazardous location enclosure accessories, NEMA 7 & 9

Item	Catalog Suffix No.	List price
3R Breather/drain	A	\$ 80
Start PB green	B	180
Stop PB red	C	180
St/St dual PB	D	360
Em. Stop mush momentary	E	220
Em. Stop mush maintained	F	460
Black PB N.O. auxiliary	G	180
Black PB N.C. auxiliary	H	180
Pilot light	J	180
Illuminated PB	K	460
Push-to-test pilot light	L	450
Potentiometer	M	460
2-Pos Selector Maintained	N	260
2-Pos Selector spring L to R	P	280
2-Pos Selector spring R to L	Q	280
3-Pos Selector sw. main.	R	260
3-Pos Selector spring L to R	S	280
3-Pos Selector spring R to L	T	280
3-Pos Selector spring to C	U	280
2-Pos Selector key operated	V	450
3-Pos Selector key operated	W	450

Non-fusible disconnect switch type A9 - A750 Non-reversing, three phase

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UL motor switching current	Maximum ratings – UL Listed				UL Type 1 (Indoor metal)		UL Type 3R (Outdoor metal)	
	Maximum motor horsepower ratings ^①				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
UL rated								
9	2	2	5	7.5	A9SN1-84★	\$ 825	A9SN3-84★	\$ 1005
11	3	3	7.5	10	A12SN1-84★	855	A12SN3-84★	1035
17	5	5	10	15	A16SN1-84★	885	A16SN3-84★	1065
28	7.5	10	20	25	A26SN1-84★	968	A26SN3-84★	1148
34	10	10	25	30	A30SN1-84★	1050	A30SN3-84★	1230
42	10	15	30	40	A40SN1-84★	1155	A40SN3-84★	1335
54	15	20	40	50	A50SN1-84★	1650	A50SN3-84★	1830
65	20	25	50	50	A63SN1-84★	1875	A63SN3-84★	2055
80	25	30	60	75	A75SN1-84★	2295	A75SN3-84★	2775
95	30	30	60	75	A95SN1-84★	2650	A95SN3-84★	3200
110	30	40	75	100	A110SN1-84★	2865	A110SN3-84★	3765
130	40	50	100	125	A145SN1-84★	3675	A145SN3-84★	4890
156	50	60	125	150	A185SN1-84★	4050	A185SN3-84★	5250
192	60	75	150	200	A210SN1-84★	5685	A210SN3-84★	7650
248	75	100	200	250	A260SN1-84★	6090	A260SN3-84★	8085
302	100	100	250	300	A300SN1-84★	7080	A300SN3-84★	8850
414	125	150	350	400	A400SN1-70★	11,250	A400SN3-70★	12,285
480	150	200	400	500	A460SN1-70★	17,100	A460SN3-70★	18,900
590	200	250	500	600	A580SN1-70★	20,490	A580SN3-70★	22,290
810	250	300	600	700	A750SN1-70★	21,990	A750SN3-70★	25,050

NEMA rated								
NEMA size	Continuous current	200V	230V	460/575V				
00	9	1.5	1.5	2	A9NSN1-84★	\$ 825	A9NSN3-84★	\$ 1005
0	18	3	3	5	A16NSN1-84★	885	A16NSN3-84★	1065
1	27	7.5	7.5	10	A26NSN1-84★	968	A26NSN3-84★	1148
2	45	10	15	25	A50NSN1-84★	1650	A50NSN3-84★	1830
3	90	25	30	50	A75NSN1-84★	2295	A75NSN3-84★	2775
4	135	40	50	100	A145NSN1-84★	3675	A145NSN3-84★	4890
5	270	75	100	200	A260NSN1-84★	6090	A260NSN3-84★	8085
6	540	150	200	400	A460NSN1-70★	17,100	A460NSN3-70★	18,900
7	810	—	300	600	A750NSN1-70★	21,990	A750NSN3-70★	25,050

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

Example: A9SN1-84X \$ 825 List
- 63 - OLR
\$ 762 Net price

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SN1-80F

To select starter with control transformer, substitute the code from the Control transformer voltage selector chart for the two digits after the last dash in the catalog number.

Ex.: A 480V primary voltage with a 120V secondary voltage is required for an A75 starter: A75SN1-8F

Coil voltage selection – A9 - A300 ②

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ②

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ④
50	AF	68	69	70	71 ④
DC	AF	68	69	70	71 ④

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

- ① No primary fusing provided.
- ② For AF50 – AF 300 starters, consult factory.
- ③ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.
- ④ AF400 - AF750 only.

Control transformer option

Contactor size	VA rating	List price adder
A9 – A40	45 ①	\$ 300
A9 – A40	50	360
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ③
A580 – A750	250	795 ③

Factory modifications

See page 3.3

Non-fusible disconnect switch type A9 - A750 Non-reversing, three phase



3

UL Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated							
A9SN2-84★	\$ 1005	A9SN4-84★	\$ 1290	A9SNX-84★	\$ 1600	A9SNP-84★	\$ 945
A12SN2-84★	1035	A12SN4-84★	1320	A12SNX-84★	1630	A12SNP-84★	975
A16SN2-84★	1065	A16SN4-84★	1365	A16SNX-84★	1675	A16SNP-84★	1005
A26SN2-84★	1148	A26SN4-84★	1448	A26SNX-84★	1790	A26SNP-84★	1088
A30SN2-84★	1230	A30SN4-84★	1613	A30SNX-84★	2110	A30SNP-84★	1170
A40SN2-84★	1335	A40SN4-84★	1800	A40SNX-84★	2500	A40SNP-84★	1275
A50SN2-84★	1830	A50SN4-84★	2190	A50SNX-84★	3100	A50SNP-84★	1770
A63SN2-84★	2055	A63SN4-84★	2535	A63SNX-84★	3550	A63SNP-84★	1995
A75SN2-84★	2775	A75SN4-84★	3015	A75SNX-84★	4000	A75SNP-84★	2415
A95SN2-84★	3200	A95SN4-84★	3650	A95SNX-84★	4800	A95SNP-84★	2950
A110SN2-84★	3765	A110SN4-84★	4163	A110SNX-84★	5530	A110SNP-84★	3225
A145SN2-84★	4890	A145SN4-84★	5175	A145SNX-84★	6450	A145SNP-84★	4360
A185SN2-84★	5250	A185SN4-84★	5775	A185SNX-84★	7650	A185SNP-84★	5100
A210SN2-84★	7650	A210SN4-84★	9150	A210SNX-84★	12,000	A210SNP-84★	8300
A260SN2-84★	8085	A260SN4-84★	9600	A260SNX-84★	16,500	A260SNP-84★	8750
A300SN2-84★	8850	A300SN4-84★	10,350	A300SNX-84★	21,000	A300SNP-84★	9750
A400SN2-70★	12,285	A400SN4-70★	13,800	A400SNX-70★	25,800	-	-
A460SN2-70★	18,900	A460SN4-70★	20,700	A460SNX-70★	27,900	-	-
A580SN2-70★	22,290	A580SN4-70★	24,750	A580SNX-70★	32,550	-	-
A750SN2-70★	25,050	A750SN4-70★	26,850	A750SNX-70★	34,800	-	-

NEMA rated							
A9NSN2-84★	\$ 1005	A9NSN4-84★	\$ 1290	A9NSNX-84★	\$ 1600	A9NSNP-84★	\$ 945
A16NSN2-84★	1065	A16NSN4-84★	1365	A16NSNX-84★	1675	A16NSNP-84★	1005
A26NSN2-84★	1148	A26NSN4-84★	1448	A26NSNX-84★	1780	A26NSNP-84★	1088
A50NSN2-84★	1830	A50NSN4-84★	2190	A50NSNX-84★	3100	A50NSNP-84★	1770
A75NSN2-84★	2775	A75NSN4-84★	3015	A75NSNX-84★	4000	A75NSNP-84★	2415
A145NSN2-84★	4890	A145NSN4-84★	5175	A145NSNX-84★	6450	A145NSNP-84★	4360
A260NSN2-84★	8085	A260NSN4-84★	9600	A260NSNX-84★	16,500	A260NSNP-84★	8750
A460NSN2-70★	18,900	A460NSN4-70★	20,700	A460NSNX-70★	27,900	-	-
A750NSN2-70★	25,050	A750NSN4-70★	26,850	A750NSNX-70★	34,800	-	-

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

Fusible disconnect switch type ①

A9 - A750

Non-reversing, three phase

3

UL motor switching current	Maximum ratings - UL Listed					UL Type 1 (Indoor metal)		UL Type 3R (Outdoor metal)	
	Maximum motor horsepower ratings ^②					Catalog number	List price	Catalog number	List price
	200V/208V	230/240V	460/480V	575/600V	Fuse clip rating amp/volts				
UL rated									
9	2	2	5	7.5	30/600	A9SF1-84★6A	\$ 885	A9SF3-84★6A	\$ 1065
11	3	3	7.5	10	30/600	A12SF1-84★6A	915	A12SF3-84★6A	1095
17	5	5	10	15	30/600	A16SF1-84★6A	945	A16SF3-84★6A	1125
28	7.5	10	20	25	60/600	A26SF1-84★6B	1020	A26SF3-84★6B	1230
34	10	10	25	30	60/600	A30SF1-84★6B	1095	A30SF3-84★6B	1313
42	10	15	30	40	60/600	A40SF1-84★6B	1185	A40SF3-84★6B	1418
54	15	20	40	50	100/600	A50SF1-84★6C	1725	A50SF3-84★6C	1913
65	20	25	50	50	100/600	A63SF1-84★6C	1980	A63SF3-84★6C	2138
80	25	30	60	75	200/600	A75SF1-84★6D	2445	A75SF3-84★6D	2858
95	30	30	60	75	200/600	A95SF1-84★6D	2590	A95SF3-84★6D	3290
110	30	40	75	100	200/600	A110SF1-84★6D	2925	A110SF3-84★6D	3818
130	40	50	100	125	200/600	A145SF1-84★6E	3735	A145SF3-84★6E	5183
156	50	60	125	150	400/600	A185SF1-84★6E	4650	A185SF3-84★6E	5400
192	60	75	150	200	400/600	A210SF1-84★6E	6870	A210SF3-84★6E	8850
248	75	100	200	250	400/600	A260SF1-84★6E	7680	A260SF3-84★6E	9930
302	100	100	250	300	400/600	A300SF1-84★6E	8100	A300SF3-84★6E	10,350
414	125	150	350	400	600/600	A400SF1-70★6F	11,895	A400SF3-70★6F	12,600
480	150	-	-	-	600/600	A460SF1-70★6F	16,890	A460SF3-70★6F	19,560
480	-	200	400	500	800/600	A460SF1-70★6G	18,750	A460SF3-70★6G	21,600
590	200	250	500	600	1200/600	A580SF1-70★6H	22,050	A580SF3-70★6H	25,050
810	250	300	600	700	1200/600	A750SF1-70★6H	23,550	A750SF3-70★6H	28,050

NEMA rated									
NEMA size	Continuous current	200V	230V	460/575V					
00	9	1.5	1.5	2	30/600	A9NSF1-84★6A	\$ 885	A9NSF3-84★6A	\$ 1065
0	18	3	3	5	30/600	A16NSF1-84★6A	945	A16NSF3-84★6A	1125
1	27	-	7.5	10	30/600	A26NSF1-84★6A	1020	A26NSF3-84★6A	1230
1	27	7.5	-	-	60/600	A26NSF1-84★6B	1020	A26NSF3-84★6B	1230
2	45	10	15	25	60/600	A50NSF1-84★6B	1725	A50NSF3-84★6B	1913
3	90	-	-	50	100/600	A75NSF1-84★6C	2021	A75NSF3-84★6C	2434
3	90	25	30	-	200/600	A75NSF1-84★6D	2445	A75NSF3-84★6D	2858
4	135	40	50	100	200/600	A145NSF1-84★6E	3735	A145NSF3-84★6E	5183
5	270	75	100	200	400/600	A260NSF1-84★6E	7680	A260NSF3-84★6E	9930
6	540	150	-	-	600/600	A460NSF1-70★6F	16,890	A460NSF3-70★6F	19,560
6	540	-	200	400	800/600	A460NSF1-70★6G	18,750	A460NSF3-70★6G	21,600
7	810	-	300	600	1200/600	A750NSF1-70★6H	23,550	A750NSF3-70★6H	28,050

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

Example: A9SF1-84X6A \$ 885 List
 - 63 - OLR
 \$ 823 Net price

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 fused starter: A75SF1-80F6D

To select starter with control transformer, substitute the code from the Control transformer voltage selector chart for the two digits after the last dash in the catalog number.

Ex.: A 480V primary voltage with a 120V secondary voltage is required for an A75 starter: A75SF1-8F

Coil voltage selection - A9 - A300 ③

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84					80			85	86			55

For other voltages, see page 1.26.

Coil voltage selection - A400 - A750 ③

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ⑤
50	AF	68	69	70	71 ⑤
DC	AF	68	69	70	71 ⑤

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Control transformer option

Contactor size	VA rating	List price adder
A9 - A40	45 ①	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95 - A110	100	560
A145 - A185	150	720
A210 - A300	250	795
A400 - A460	150	720 ④
A580 - A750	250	795 ④

Factory modifications

See page 3.3

① Power fuses are not included as standard.

② No primary fusing provided.

③ For AF50 - AF300 starters, consult factory.

④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

⑤ AF400 - AF750 only.

Fusible disconnect switch type A9 - A750 Non-reversing, three phase



3

UL Type 12 (Metal Dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated							
A9SF2-84★6A	\$ 1065	A9SF4-84★6A	\$ 1350	A9SFX-84★6A	\$ 1800	A9SFP-84★6A	\$ 1005
A12SF2-84★6A	1095	A12SF4-84★6A	1380	A12SFX-84★6A	1830	A12SFP-84★6A	1035
A16SF2-84★6A	1125	A16SF4-84★6A	1425	A16SFX-84★6A	1860	A16SFP-84★6A	1065
A26SF2-84★6B	1230	A26SF4-84★6B	1530	A26SFX-84★6B	1965	A26SFP-84★6B	1148
A30SF2-84★6B	1313	A30SF4-84★6B	1688	A30SFX-84★6B	2295	A30SFP-84★6B	1230
A40SF2-84★6B	1418	A40SF4-84★6B	1898	A40SFX-84★6B	2685	A40SFP-84★6B	1335
A50SF2-84★6C	1913	A50SF4-84★6C	2400	A50SFX-84★6C	3340	A50SFP-84★6C	1830
A63SF2-84★6C	2138	A63SF4-84★6C	2640	A63SFX-84★6C	3600	A63SFP-84★6C	2055
A75SF2-84★6D	2858	A75SF4-84★6D	3300	A75SFX-84★6D	4020	A75SFP-84★6D	2475
A95SF2-84★6D	3290	A95SF4-84★6D	3950	A95SFX-84★6D	4990	A95SFP-84★6D	3125
A110SF2-84★6D	3818	A110SF4-84★6D	4275	A110SFX-84★6D	5850	A110SFP-84★6D	3550
A145SF2-84★6E	5183	A145SF4-84★6E	5685	A145SFX-84★6E	7455	A145SFP-84★6E	4880
A185SF2-84★6E	5400	A185SF4-84★6E	6200	A185SFX-84★6E	8865	A185SFP-84★6E	5400
A210SF2-84★6E	8850	A210SF4-84★6E	9600	A210SFX-84★6E	12,375	A210SFP-84★6E	8800
A260SF2-84★6E	9930	A260SF4-84★6E	10,950	A260SFX-84★6E	16,800	A260SFP-84★6E	10,100
A300SF2-84★6E	10,350	A300SF4-84★6E	12,000	A300SFX-84★6E	22,350	A300SFP-84★6E	11,200
A400SF2-70★6F	12,600	A400SF4-70★6F	14,663	A400SFX-70★6F	26,400	-	-
A460SF2-70★6F	19,560	A460SF4-70★6F	21,360	A460SFX-70★6F	26,955	-	-
A460SF2-70★6G	21,600	A460SF4-70★6G	23,400	A460SFX-70★6G	28,995	-	-
A580SF2-70★6H	25,050	A580SF4-70★6H	27,000	A580SFX-70★6H	37,350	-	-
A750SF2-70★6H	28,050	A750SF4-70★6H	30,000	A750SFX-70★6H	39,000	-	-

NEMA rated							
A9NSF2-84★6A	\$ 1065	A9NSF4-84★6A	\$ 1350	A9NSFX-84★6A	\$ 1800	A9NSFP-84★6A	\$ 1005
A16NSF2-84★6A	1125	A16NSF4-84★6A	1425	A16NSFX-84★6A	1860	A16NSFP-84★6A	1065
A26NSF2-84★6A	1230	A26NSF4-84★6A	1530	A26NSFX-84★6A	1965	A26NSFP-84★6A	1148
A26NSF2-84★6B	1230	A26NSF4-84★6B	1530	A26NSFX-84★6B	1965	A26NSFP-84★6B	1148
A50NSF2-84★6B	1913	A50NSF4-84★6B	2400	A50NSFX-84★6B	3240	A50NSFP-84★6B	1830
A75NSF2-84★6C	2434	A75NSF4-84★6C	2876	A75NSFX-84★6C	3596	A75NSFP-84★6C	2051
A75NSF2-84★6D	2858	A75NSF4-84★6D	3300	A75NSFX-84★6D	4020	A75NSFP-84★6D	2475
A145NSF2-84★6E	5183	A145NSF4-84★6E	5685	A145NSFX-84★6E	7455	A145NSFP-84★6E	4880
A260NSF2-84★6E	9930	A260NSF4-84★6E	10,950	A260NSFX-84★6E	16,800	A260NSFP-84★6E	10,100
A460NSF2-70★6F	19,560	A460NSF4-70★6F	21,360	A460NSFX-70★6F	26,955	-	-
A460NSF2-70★6G	21,600	A460NSF4-70★6G	23,400	A460NSFX-70★6G	28,995	-	-
A750NSF2-70★6H	28,050	A750NSF4-70★6H	30,000	A750NSFX-70★6H	39,000	-	-

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

Maximum short circuit ratings for UL listed combination starters

Contactor size	Switch/fuse at 600VAC	KA at 600VAC
A9	CF30/30J	200
A12	CF30/30J	
A16	CF30/30J	
A26	F60/60J	
A30	F60/60J	
A40	F100/100J	
A50	F100/100J	
A63	OES200/200J	
A75	OES200/200J	
A95	OES200/200J	
A110	OES200/200J	
A145	OES400/400J	
A185	OES400/400J	
A210	OES400/400J	
A260	OES400/400J or OES600/600J	
A300	OES400/400J or OES600/600J	
A400	OES600/600J	
A460	OES800/800L	
A580	OETL1200W/1200L fuses	
A750	OETL1200W/1200L fuses	

Fusible disconnect switch type ①

A9 - A750

Reversing, three phase

3

UL motor switching current	Maximum ratings – UL Listed					UL Type 1 (Indoor metal)		UL Type 3R (Outdoor metal)	
	Maximum motor horsepower ratings ②					Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V	Fuse clip rating amp/volts				
UL rated									
9	2	2	5	7.5	30/600	A9SRF1-84★6A	\$ 1140	A9SRF3-84★6A	\$ 1320
11	3	3	7.5	10	30/600	A12SRF1-84★6A	1230	A12SRF3-84★6A	1410
17	5	5	10	15	30/600	A16SRF1-84★6A	1290	A16SRF3-84★6A	1470
28	7.5	10	20	25	60/600	A26SRF1-84★6B	1425	A26SRF3-84★6B	1635
34	10	10	25	30	60/600	A30SRF1-84★6B	1643	A30SRF3-84★6B	1860
42	10	15	30	40	60/600	A40SRF1-84★6B	1860	A40SRF3-84★6B	2093
54	15	20	40	50	100/600	A50SRF1-84★6C	2438	A50SRF3-84★6C	2625
65	20	25	50	50	100/600	A63SRF1-84★6C	2850	A63SRF3-84★6C	3008
80	25	30	60	75	200/600	A75SRF1-84★6D	3600	A75SRF3-84★6D	4013
95	30	30	60	75	200/600	A95SRF1-84★6D	3890	A95SRF3-84★6D	4700
110	30	40	75	100	200/600	A110SRF1-84★6D	4290	A110SRF3-84★6D	5183
130	40	50	100	125	200/600	A145SRF1-84★6E	5970	A145SRF3-84★6E	7418
156	50	60	125	150	400/600	A185SRF1-84★6E	8010	A185SRF3-84★6E	8760
192	60	75	150	200	400/600	A210SRF1-84★6E	10,905	A210SRF3-84★6E	12,885
248	75	100	200	250	400/600	A260SRF1-84★6E	12,165	A260SRF3-84★6E	14,415
302	100	100	250	300	400/600	A300SRF1-84★6E	13,560	A300SRF3-84★6E	15,810
414	125	150	350	400	600/600	A400SRF1-70★6F	17,880	A400SRF3-70★6F	18,585
480	150	—	—	—	600/600	A460SRF1-70★6F	29,175	A460SRF3-70★6F	32,025
480	—	200	400	500	800/600	A460SRF1-70★6G	31,035	A460SRF3-70★6G	33,885
590	200	250	500	600	1200/600	A580SRF1-70★6H	39,435	A580SRF3-70★6H	42,435
810	250	300	600	700	1200/600	A750SRF1-70★6H	42,285	A750SRF3-70★6H	46,785
NEMA rated									
NEMA size	Continuous current	200V	230V	460/575V					
00	9	1.5	1.5	2	30/600	A9NSRF1-84★6A	\$ 1140	A9NSRF3-84★6A	\$ 1320
0	18	3	3	5	30/600	A16NSRF1-84★6A	1290	A16NSRF3-84★6A	1470
1	27	—	7.5	10	30/600	A26NSRF1-84★6A	1425	A26NSRF3-84★6A	1635
1	27	7.5	—	—	60/600	A26NSRF1-84★6B	1425	A26NSRF3-84★6B	1635
2	45	10	15	25	60/600	A50NSRF1-84★6B	2438	A50NSRF3-84★6B	2625
3	90	—	—	50	100/600	A75NSRF1-84★6C	3176	A75NSRF3-84★6C	3589
3	90	25	30	—	200/600	A75NSRF1-84★6D	3600	A75NSRF3-84★6D	4013
4	135	40	50	100	200/600	A145NSRF1-84★6E	5970	A145NSRF3-84★6E	7418
5	270	75	100	200	400/600	A260NSRF1-84★6E	12,165	A260NSRF3-84★6E	14,415
6	540	150	—	—	600/600	A460NSRF1-70★6F	29,175	A460NSRF3-70★6F	32,025
6	540	—	200	400	800/600	A460NSRF1-70★6G	31,035	A460NSRF3-70★6G	33,885
7	810	—	300	600	1200/600	A750NSRF1-70★6H	42,285	A750NSRF3-70★6H	46,785

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

Example: A9SRF1-84X6A \$ 1140 List
 - 63 - OLR
 \$ 1077 Net price

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SRF1-80FC

To select starter with control transformer, substitute the code from the Control transformer voltage selector chart for the two digits after the last dash in the catalog number.

Ex.: A 480V primary voltage with a 120V secondary voltage is required for an A75 starter: A75SRF1-8F

Coil voltage selection – A9 - A300 ③

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A	81	83	84	84		34	36	80	42			86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ③

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ⑤
50	AF	68	69	70	71 ⑤
DC	AF	68	69	70	71 ⑤

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Control transformer option

Contacting size	VA rating	List price adder
A9 – A40	45 ①	\$ 300
A9 – A40	50	360
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ④
A580 – A750	250	795 ④

Factory modifications

See page 3.3

① Power fuses are not included as standard.

② No primary fusing provided.

③ For AF50 – AF 300 starters, consult factory.

④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

⑤ AF400 - AF750 only.

Fusible disconnect switch type A9 - A750 Reversing, three phase

Combination
starters

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UL Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated							
A9SRF2-84★6A	\$ 1320	A9SRF4-84★6A	\$ 1425	A9SRFX-84★6A	\$ 1955	A9SRFP-84★6A	\$ 1275
A12SRF2-84★6A	1410	A12SRF4-84★6A	1515	A12SRFX-84★6A	2045	A12SRFP-84★6A	1365
A16SRF2-84★6A	1470	A16SRF4-84★6A	1575	A16SRFX-84★6A	2105	A16SRFP-84★6A	1425
A26SRF2-84★6B	1635	A26SRF4-84★6B	1763	A26SRFX-84★6B	2270	A25SRFP-84★6B	1560
A30SRF2-84★6B	1860	A30SRF4-84★6B	1988	A30SRFX-84★6B	2745	A30SRFP-84★6B	1778
A40SRF2-84★6B	2093	A40SRF4-84★6B	2213	A40SRFX-84★6B	3260	A40SRFP-84★6B	1995
A50SRF2-84★6C	2625	A50SRF4-84★6C	2850	A50SRFX-84★6C	3855	A50SRFP-84★6C	2573
A63SRF2-84★6C	3008	A63SRF4-84★6C	3225	A63SRFX-84★6C	4370	A63SRFP-84★6C	2985
A75SRF2-84★6D	4013	A75SRF4-84★6D	4200	A75SRFX-84★6D	5075	A75SRFP-84★6D	3735
A95SRF2-84★6D	4700	A95SRF4-84★6D	5100	A95SRFX-84★6D	6250	A95SRFP-84★6D	4125
A110SRF2-84★6D	5183	A110SRF4-84★6D	5550	A110SRFX-84★6D	7115	A110SRFP-84★6D	4600
A145SRF2-84★6E	7418	A145SRF4-84★6E	7800	A145SRFX-84★6E	9690	A145SRFP-84★6E	7600
A185SRF2-84★6E	8760	A185SRF4-84★6E	9225	A185SRFX-84★6E	12,225	A185SRFP-84★6E	9000
A210SRF2-84★6E	12,885	A210SRF4-84★6E	13,238	A210SRFX-84★6E	16,410	A210SRFP-84★6E	13,000
A260SRF2-84★6E	14,415	A260SRF4-84★6E	15,150	A260SRFX-84★6E	21,285	A260SRFP-84★6E	14,885
A300SRF2-84★6E	15,810	A300SRF4-84★6E	16,530	A300SRFX-84★6E	27,810	A300SRFP-84★6E	16,200
A400SRF2-70★6F	18,585	A400SRF4-70★6F	20,625	A400SRFX-70★6F	32,385	A400SRFP-70★6F	20,000
A460SRF2-70★6F	32,025	A460SRF4-70★6F	33,540	A460SRFX-70★6F	39,420	-	-
A460SRF2-70★6G	33,885	A460SRF4-70★6G	35,400	A460SRFX-70★6G	41,280	-	-
A580SRF2-70★6H	42,435	A580SRF4-70★6H	45,150	A580SRFX-70★6H	54,735	-	-
A750SRF2-70★6H	46,785	A750SRF4-70★6H	48,450	A750SRFX-70★6H	57,735	-	-

NEMA rated							
A9NSRF2-84★6A	\$ 1320	A9NSRF4-84★6A	\$ 1425	A9NSRFX-84★6A	\$ 1955	A9NSRFP-84★6A	\$ 1275
A16NSRF2-84★6A	1470	A16NSRF4-84★6A	1575	A16NSRFX-84★6A	2105	A16NSRFP-84★6A	1425
A26NSRF2-84★6A	1635	A26NSRF4-84★6A	1763	A26NSRFX-84★6A	2270	A26NSRFP-84★6A	1560
A26NSRF2-84★6B	1635	A26NSRF4-84★6B	1763	A26NSRFX-84★6B	2270	A26NSRFP-84★6B	1560
A50NSRF2-84★6B	2625	A50NSRF4-84★6B	2850	A50NSRFX-84★6B	3855	A50NSRFP-84★6B	2573
A75NSRF2-84★6C	3589	A75NSRF4-84★6C	3776	A75NSRFX-84★6C	4651	A75NSRFP-84★6C	3311
A75NSRF2-84★6D	4013	A75NSRF4-84★6D	4200	A75NSRFX-84★6D	5075	A75NSRFP-84★6D	3735
A145NSRF2-84★6E	7418	A145NSRF4-84★6E	7800	A145NSRFX-84★6E	9690	A145NSRFP-84★6E	7600
A260NSRF2-84★6E	14,415	A260NSRF4-84★6E	15,150	A260NSRFX-84★6E	21,285	A260NSRFP-84★6E	14,885
A460NSRF2-70★6F	32,025	A460NSRF4-70★6F	33,540	A460NSRFX-70★6F	39,420	-	-
A460NSRF2-70★6G	33,885	A460NSRF4-70★6G	35,400	A460NSRFX-70★6G	41,280	-	-
A750NSRF2-70★6H	46,785	A750NSRF4-70★6H	48,450	A750NSRFX-70★6H	57,735	-	-

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

Maximum short circuit ratings for UL listed combination starters

Contactor size	Switch/fuse at 600VAC	KA at 600VAC
A9	CF30/30J	200
A12	CF30/30J	
A16	CF30/30J	
A26	F60/60J	
A30	F60/60J	
A40	F100/100J	
A50	F100/100J	
A63	OES200/200J	
A75	OES200/200J	
A95	OES200/200J	
A110	OES200/200J	
A145	OES400/400J	
A185	OES400/400J	
A210	OES400/400J	
A260	OES400/400J or OES600/600J	
A300	OES400/400J or OES600/600J	
A400	OES600/600J	
A460	OES800/800L	
A580	OETL1200W/1200L fuses	
A750	OETL1200W/1200L fuses	

Circuit breaker type ①

A9 - A750

Non-reversing, three phase

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UL motor switching current	Maximum ratings – UL Listed				UL Listed 1 (Indoor metal)		UL Listed 3R (Outdoor metal)	
	Maximum motor horsepower ratings ②				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
UL rated								
9	2	2	5	7.5	A9SM1-84★◆◆	\$ 930	A9SM3-84★◆◆	\$ 1110
11	3	3	7.5	10	A12SM1-84★◆◆	960	A12SM3-84★◆◆	1140
17	5	5	10	15	A16SM1-84★◆◆	990	A16SM3-84★◆◆	1170
28	7.5	10	20	25	A26SM1-84★◆◆	1073	A26SM3-84★◆◆	1253
34	10	10	25	30	A30SM1-84★◆◆	1155	A30SM3-84★◆◆	1335
42	10	15	30	40	A40SM1-84★◆◆	1260	A40SM3-84★◆◆	1440
54	15	20	40	50	A50SM1-84★◆◆	1755	A50SM3-84★◆◆	1935
65	20	25	50	50	A63SM1-84★◆◆	2070	A63SM3-84★◆◆	2160
80	25	30	60	75	A75SM1-84★◆◆	2550	A75SM3-84★◆◆	2880
95	30	30	60	75	A95SM1-84★◆◆	2750	A95SM3-84★◆◆	3125
110	30	40	75	100	A110SM1-84★◆◆	2970	A110SM3-84★◆◆	3870
130	40	50	100	125	A145SM1-84★◆◆	4020	A145SM3-84★◆◆	5235
156	50	60	125	150	A185SM1-84★◆◆	4950	A185SM3-84★◆◆	5610
192	60	75	150	200	A210SM1-84★◆◆	7080	A210SM3-84★◆◆	9045
248	75	100	200	250	A260SM1-84★◆◆	8160	A260SM3-84★◆◆	10,155
302	100	100	250	300	A300SM1-84★◆◆	8850	A300SM3-84★◆◆	10,650
414	125	150	350	400	A400SM1-70★◆◆	12,450	A400SM3-70★◆◆	12,990
480	150	200	400	500	A460SM1-70★◆◆	19,350	A460SM3-70★◆◆	21,150
590	200	250	500	600	A580SM1-70★◆◆	22,650	A580SM3-70★◆◆	24,450
810	250	300	600	700	A750SM1-70★◆◆	24,150	A750SM3-70★◆◆	27,330

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

◆◆ MCP or breaker rating. See codes on page 3.48.

Example: A9SM1-84X★◆◆ \$ 930 List
 - 63 - OLR
 \$ 867 Net price

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 combination starter: A75SM1-80★◆◆

To select starter with control transformer, substitute the code from the Control transformer voltage selector chart for the two digits after the last dash in the catalog number.

Ex.: A 480V primary voltage with a 120V secondary voltage is required for an A75 starter: A75SM1-8F

Coil voltage selection – A9 - A300 ③

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ③

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ⑤
50	AF	68	69	70	71 ⑤
DC	AF	68	69	70	71 ⑤

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Factory modifications

See page 3.3

Maximum short circuit rating for UL listed combination starters

Contactor	Maximum MCP 480VAC	KA at 480VAC	MCP 600VAC	KA at 600VAC
A9	S3L050MW	35	S3L010MW	35
A12	S3L050MW	35	S3L010MW	35
A16	S3L050MW	35	—	—
A26	S3L100MW	35	S3L100MW	35
A30	S3L150MW	65	—	—
A40	S3L150MW	65	—	—
A50	S3L150MW	85	S3L150MW	35
A63	S4L250MW	85	—	—
A75	S4L250MW	85	—	—
A95	S4L250MW	85	S4L250MW	35
A110	S4L250MW	85	S4L250MW	35
A145	S5L400MW	65	S4L250MW	10
A185	S5L400MW	85	S4L250MW	10
A210	S6L800MW	85	S4L250MW	18
A260	S6L800MW	85	S5L400MW	18
A300	S6L800MW	85	S5L400MW	18
A400	S7H1200MW	85	Consult factory	
A460	S7H1200MW	85		
A580	S7H1200MW	85		
A750	S7H1200MW	85		

For thermal magnetic molded case breakers, consult factory.

Control transformer option

Contactor size	VA rating	List price adder
A9 - A40	45 ①	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95 - A110	100	560
A145 - A185	150	720
A210 - A300	250	795
A400 - A460	150	720 ④
A580 - A750	250	795 ④

① MCPs are supplied as standard. Thermal magnetic/electronic trip type breakers can be supplied by substituting the letter "B" in place of the "M". List price is the same.

Example: A9SB3-84★◆◆, \$ 1110.00.

② No primary fusing provided.

③ For AF50 - AF300 starters, consult factory.

④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

⑤ AF400 - AF750 only.

Circuit breaker type ①

A9 - A750

Non-reversing, three phase

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Combination starters

UL Listed 12 (Metal dusttight)		UL Listed 4 (Watertight)		UL Listed 4X (Stainless steel)		UL Listed 1, 3R, 4, 4X & 12 (Plastic)		UL Listed 7 & 9 non-reversing (Explosion proof)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated									
A9SM2-84★◆◆	\$ 1110	A9SM4-84★◆◆	\$ 1260	A9SMX-84★◆◆	\$ 1835	A9SMP-84★◆◆	\$ 1050	A9SM7-84★◆◆	\$ 2660
A12SM2-84★◆◆	1140	A12SM4-84★◆◆	1290	A12SMX-84★◆◆	1865	A12SMP-84★◆◆	1080	A12SM7-84★◆◆	2850
A16SM2-84★◆◆	1170	A16SM4-84★◆◆	1320	A16SMX-84★◆◆	1895	A16SMP-84★◆◆	1110	A16SM7-84★◆◆	3030
A26SM2-84★◆◆	1253	A26SM4-84★◆◆	1410	A26SMX-84★◆◆	2000	A26SMP-84★◆◆	1193	A26SM7-84★◆◆	3105
A30SM2-84★◆◆	1335	A30SM4-84★◆◆	1500	A30SMX-84★◆◆	2330	A30SMP-84★◆◆	1275	A30SM7-84★◆◆	3480
A40SM2-84★◆◆	1440	A40SM4-84★◆◆	1635	A40SMX-84★◆◆	2720	A40SMP-84★◆◆	1380	A40SM7-84★◆◆	3860
A50SM2-84★◆◆	1935	A50SM4-84★◆◆	2115	A50SMX-84★◆◆	3275	A50SMP-84★◆◆	1875	A50SM7-84★◆◆	4150
A63SM2-84★◆◆	2160	A63SM4-84★◆◆	2438	A63SMX-84★◆◆	3635	A63SMP-84★◆◆	2100	A63SM7-84★◆◆	5540
A75SM2-84★◆◆	2880	A75SM4-84★◆◆	3225	A75SMX-84★◆◆	4055	A75SMP-84★◆◆	2520	A75SM7-84★◆◆	6850
A95SM2-84★◆◆	3125	A95SM4-84★◆◆	3800	A95SMX-84★◆◆	5200	A95SMP-84★◆◆	3250	A95SM7-84★◆◆	7940
A110SM2-84★◆◆	3870	A110SM4-84★◆◆	4200	A110SMX-84★◆◆	6050	A110SMP-84★◆◆	3700	A110SM7-84★◆◆	11,370
A145SM2-84★◆◆	5235	A145SM4-84★◆◆	5588	A145SMX-84★◆◆	7650	A145SMP-84★◆◆	5400	A145SM7-84★◆◆	13,595
A185SM2-84★◆◆	5610	A185SM4-84★◆◆	6300	A185SMX-84★◆◆	9150	A185SMP-84★◆◆	6150	A185SM7-84★◆◆	14,475
A210SM2-84★◆◆	9045	A210SM4-84★◆◆	9713	A210SMX-84★◆◆	12,510	A210SMP-84★◆◆	9500	A210SM7-84★◆◆	17,775
A260SM2-84★◆◆	10,155	A260SM4-84★◆◆	10,950	A260SMX-84★◆◆	17,250	A260SMP-84★◆◆	10,650	—	—
A300SM2-84★◆◆	10,650	A300SM4-84★◆◆	12,000	A300SMX-84★◆◆	22,800	A300SMP-84★◆◆	11,500	—	—
A400SM2-70★◆◆	12,990	A400SM4-70★◆◆	13,800	A400SMX-70★◆◆	26,850	—	—	—	—
A460SM2-70★◆◆	21,150	A460SM4-70★◆◆	22,500	A460SMX-70★◆◆	28,995	—	—	—	—
A580SM2-70★◆◆	24,450	A580SM4-70★◆◆	26,850	A580SMX-70★◆◆	36,000	—	—	—	—
A750SM2-70★◆◆	27,330	A750SM4-70★◆◆	30,000	A750SMX-70★◆◆	37,650	—	—	—	—

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

◆◆ MCP or breaker rating. See codes on page 3.48.

Motor circuit protector data

Motor full load amperes	MCP continuous rating	Suffix code	Catalog number	Starter size	1.5X	2X	4X	5X	6X	7X	8X	9X	10X	11X	12X
					—	—	—	—	—	—	—	—	—	—	—
.92 - 2.76	3	A	S3L003MW	0	—	—	12	15	18	21	24	27	30	33	36
1.53 - 4.61	5	B	S3L005MW	0	—	—	20	25	30	35	40	45	50	55	60
3.07 - 9.23	10	C	S3L010MW	0	—	—	40	50	60	70	80	90	100	110	120
7.69 - 23.08	25	D	S3L025MW	1	—	—	100	125	150	175	200	225	250	275	300
15.38 - 46.15	50	E	S3L050MW	2	—	—	200	250	300	350	400	450	500	550	600
30.77 - 92.31	100	F	S3L100MW	3	—	—	400	500	600	700	800	900	1000	1100	1200
46.15 - 138.46	150	G	S3L150MW	4	—	—	600	750	900	1050	1200	1350	1500	1650	1800
28.85 - 230.77	250	H	S4L250MW	4	375	500	1000	—	1500	—	2000	—	2500	—	3000
46.15 - 369.23	400	J	S5L400MW	5	600	800	1600	—	2400	—	3200	—	4000	—	4800
69.23 - 553.85	600	K	S6L600MW	6	900	1200	2400	—	3600	—	4800	—	6000	—	7200
92.31 - 738.46	800	L	S6L800MW	7	1200	1600	3200	—	4800	—	6400	—	8000	—	9600
115.38 - 923.07	1000	M	S7H1000MW	7	1500	2000	4000	—	6000	—	8000	—	10,000	—	12,000
138.46 - 1107.69	1200	N	S7H1200MW	7	1800	2400	4800	—	7200	—	9600	—	12,000	—	14,400

Circuit breaker type ①

A9 - A750, NEMA rated

Non-reversing, three phase

3

NEMA size	Continuous current	Maximum ratings – UL Listed			UL Type 1 (Indoor metal)		UL Type 3R (Outdoor metal)	
		Maximum motor horsepower ratings ②			Catalog number	List price	Catalog number	List price
		200V	230V	460/575V				
NEMA rated								
00	9	1.5	1.5	2	A9NSM1-84★◆◆	\$ 930	A9NSM3-84★◆◆	\$ 1110
0	18	3	3	5	A16NSM1-84★◆◆	990	A16NSM3-84★◆◆	1170
1	27	7.5	7.5	10	A26NSM1-84★◆◆	1073	A26NSM3-84★◆◆	1253
2	45	10	15	25	A50NSM1-84★◆◆	1755	A50NSM3-84★◆◆	1935
3	90	25	30	50	A75NSM1-84★◆◆	2550	A75NSM3-84★◆◆	2880
4	135	40	50	100	A145NSM1-84★◆◆	4020	A145NSM3-84★◆◆	5235
5	270	75	100	200	A260NSM1-84★◆◆	8160	A260NSM3-84★◆◆	10,155
6	540	150	200	400	A460NSM1-70★◆◆	19,350	A460NSM3-70★◆◆	21,150
7	810	—	300	600	A750NSM1-70★◆◆	24,150	A750NSM3-70★◆◆	27,330

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

◆◆ MCP or breaker rating. See codes on page 3.48.

Example: A9NSM1-84X \$ 930 List
 - 63 - OLR
 \$ 867 Net price

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75NSM1-80★◆◆

To select starter with control transformer, substitute the code from the Control transformer voltage selector chart for the two digits after the last dash in the catalog number.

Ex.: A 480V primary voltage with a 120V secondary voltage is required for an A75 starter: A75SRF1-8F

Maximum short circuit rating for UL listed combination starters

Contactor	Maximum MCP 480VAC	KA at 480VAC	MCP 600VAC	KA at 600VAC
A9	S3L050MW	35	S3L010MW	35
A12	S3L050MW	35	S3L010MW	35
A16	S3L050MW	35	—	—
A26	S3L100MW	35	S3L100MW	35
A30	S3L150MW	65	—	—
A40	S3L150MW	65	—	—
A50	S3L150MW	85	S3L150MW	35
A63	S4L250MW	85	—	—
A75	S4L250MW	85	—	—
A95	S4L250MW	85	S4L250MW	35
A110	S4L250MW	85	S4L250MW	35
A145	S5L400MW	65	S4L250MW	10
A185	S5L400MW	85	S4L250MW	10
A210	S6L800MW	85	S4L250MW	18
A260	S6L800MW	85	S5L400MW	18
A300	S6L800MW	85	S5L400MW	18
A400	S7H1200MW	85	Consult factory	
A460	S7H1200MW	85		
A580	S7H1200MW	85		
A750	S7H1200MW	85		

For thermal magnetic molded case breakers, consult factory.

Factory modifications

See page 3.3

Coil voltage selection – A9 - A300 ③

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A	81	83	84	84		34	36	80	42		86	86	51	53	55	
50	A	81	83	84			80					85	86			55	

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ③

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ⑤
50	AF	68	69	70	71 ⑤
DC	AF	68	69	70	71 ⑤

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Control transformer option

Contact size	VA rating	List price adder
A9 - A40	45 ①	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95 - A110	100	560
A145 - A185	150	720
A210 - A300	250	795
A400 - A460	150	720 ②
A580 - A750	250	795 ②

① MCPs are supplied as standard. Thermal magnetic breakers can be supplied by substituting the letter "B" in place of the "M". List price is the same. Example: A9SB3-84★◆◆, \$ 1110.00.

② No primary fusing provided.

③ For AF50 - AF300 starters, consult factory.

④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

⑤ AF400 - AF750 only.

Circuit breaker type ①

A9 - A750, NEMA rated

Non-reversing, three phase

3

Combination starters

UL Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)		UL Type 7 & 9 non-reversing (Explosion proof)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price

NEMA rated

A9NSM2-84★◆◆	\$ 1110	A9NSM4-84★◆◆	\$ 1260	A9NSMX-84★◆◆	\$ 1835	A9NSMP-84★◆◆	\$ 1050	A9NSM7-84★◆◆	\$ 2660
A16NSM2-84★◆◆	1170	A16NSM4-84★◆◆	1320	A16NSMX-84★◆◆	1895	A16NSMP-84★◆◆	1110	A16NSM7-84★◆◆	3030
A26NSM2-84★◆◆	1253	A26NSM4-84★◆◆	1410	A26NSMX-84★◆◆	2000	A26NSMP-84★◆◆	1193	A26NSM7-84★◆◆	3105
A50NSM2-84★◆◆	1935	A50NSM4-84★◆◆	2115	A50NSMX-84★◆◆	3275	A50NSMP-84★◆◆	1875	A50NSM7-84★◆◆	4150
A75NSM2-84★◆◆	2880	A75NSM4-84★◆◆	3225	A75NSMX-84★◆◆	4055	A75NSMP-84★◆◆	2520	A75NSM7-84★◆◆	6850
A145NSM2-84★◆◆	5235	A145NSM4-84★◆◆	5588	A145NSMX-84★◆◆	7650	A145NSMP-84★◆◆	5400	A145NSM7-84★◆◆	13,595
A260NSM2-84★◆◆	10,155	A260NSM4-84★◆◆	10,950	A260NSMX-84★◆◆	17,250	A260NSMP-84★◆◆	18,650	—	—
A460NSM2-70★◆◆	21,150	A460NSM4-70★◆◆	22,500	A460NSMX-70★◆◆	28,995	—	—	—	—
A750NSM2-70★◆◆	27,330	A750NSM4-70★◆◆	30,000	A750NSMX-70★◆◆	37,650	—	—	—	—

- ★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.
- ◆ MCP or breaker rating. See MCP codes on page 3.50.

Motor circuit protector data

Motor full load amperes	MCP continuous rating	Suffix code ◆	Catalog number	Starter size	1.5X	2X	4X	5X	6X	7X	8X	9X	10X	11X	12X
.92 – 2.76	3	A	S3L003MW	0	—	—	12	15	18	21	24	27	30	33	36
1.53 – 4.61	5	B	S3L005MW	0	—	—	20	25	30	35	40	45	50	55	60
3.07 – 9.23	10	C	S3L010MW	0	—	—	40	50	60	70	80	90	100	110	120
7.69 – 23.08	25	D	S3L025MW	1	—	—	100	125	150	175	200	225	250	275	300
15.38 – 46.15	50	E	S3L050MW	2	—	—	200	250	300	350	400	450	500	550	600
30.77 – 92.31	100	F	S3L100MW	3	—	—	400	500	600	700	800	900	1000	1100	1200
46.15 – 138.46	150	G	S3L150MW	4	—	—	600	750	900	1050	1200	1350	1500	1650	1800
28.85 – 230.77	250	H	S4L250MW	4	375	500	1000	—	1500	—	2000	—	2500	—	3000
46.15 – 369.23	400	J	S5L400MW	5	600	800	1600	—	2400	—	3200	—	4000	—	4800
69.23 – 553.85	600	K	S6L600MW	6	900	1200	2400	—	3600	—	4800	—	6000	—	7200
92.31 – 738.46	800	L	S6L800MW	7	1200	1600	3200	—	4800	—	6400	—	8000	—	9600
115.38 – 923.07	1000	M	S7H1000MW	7	1500	2000	4000	—	6000	—	8000	—	10,000	—	12,000
138.46 – 1107.69	1200	N	S7H1200MW	7	1800	2400	4800	—	7200	—	9600	—	12,000	—	14,400

Circuit breaker type ①

A9 - A750

Reversing, three phase

3

UL motor switching current	Maximum ratings – UL Listed				UL Type 1 (Indoor metal)		UL Type 3R (Outdoor metal)	
	Maximum motor horsepower ratings ②				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
UL rated								
9	2	2	5	7.5	A9SRM1-84★◆◆	\$ 1185	A9SRM3-84★◆◆	\$ 1365
11	3	3	7.5	10	A12SRM1-84★◆◆	1275	A12SRM3-84★◆◆	1455
17	5	5	10	15	A16SRM1-84★◆◆	1335	A16SRM3-84★◆◆	1515
28	7.5	10	20	25	A26SRM1-84★◆◆	1478	A26SRM3-84★◆◆	1658
34	10	10	25	30	A30SRM1-84★◆◆	1703	A30SRM3-84★◆◆	1883
42	10	15	30	40	A40SRM1-84★◆◆	1935	A40SRM3-84★◆◆	2115
54	15	20	40	50	A50SRM1-84★◆◆	2468	A50SRM3-84★◆◆	2648
65	20	25	50	50	A63SRM1-84★◆◆	2899	A63SRM3-84★◆◆	3030
80	25	30	60	75	A75SRM1-84★◆◆	2940	A75SRM3-84★◆◆	4035
95	30	30	60	75	A95SRM1-84★◆◆	3705	A95SRM3-84★◆◆	5100
110	30	40	75	100	A110SRM1-84★◆◆	4200	A110SRM3-84★◆◆	5235
130	40	50	100	125	A145SRM1-84★◆◆	4335	A145SRM3-84★◆◆	7470
156	50	60	125	150	A185SRM1-84★◆◆	6285	A185SRM3-84★◆◆	8970
192	60	75	150	200	A210SRM1-84★◆◆	8310	A210SRM3-84★◆◆	13,080
248	75	100	200	250	A260SRM1-84★◆◆	8160	A260SRM3-84★◆◆	14,640
302	100	100	250	300	A300SRM1-84★◆◆	11,115	A300SRM3-84★◆◆	16,110
414	125	150	250	400	A400SRM1-70★◆◆	18,435	A400SRM3-70★◆◆	18,975
480	150	200	400	500	A460SRM1-70★◆◆	31,635	A460SRM3-70★◆◆	33,435
590	200	250	500	600	A580SRM1-70★◆◆	40,035	A580SRM3-70★◆◆	41,835
810	250	300	600	700	A750SRM1-70★◆◆	42,885	A750SRM3-70★◆◆	46,065

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

◆◆ MCP or breaker rating. See codes on page 3.48.

Example: A9SRM1-84X \$ 1185 List
 - 63 - OLR
 \$ 1122 Net price

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SRM1-80★◆◆

To select starter with control transformer, substitute the code from the Control transformer voltage selector chart for the two digits after the last dash in the catalog number.

Ex.: A 480V primary voltage with a 120V secondary voltage is required for an A75 starter: A75SRF1-8F

Factory modifications

See page 3.3

Coil voltage selection – A9 - A300 ③

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ③

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ⑤
50	AF	68	69	70	71 ⑤
DC	AF	68	69	70	71 ⑤

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Maximum short circuit rating for UL listed combination starters

Contactor	Maximum MCP 480VAC	KA at 480VAC	MCP 600VAC	KA at 600VAC
A9	S3L050MW	35	S3L010MW	35
A12	S3L050MW	35	S3L010MW	35
A16	S3L050MW	35	—	—
A26	S3L100MW	35	S3L100MW	35
A30	S3L150MW	65	—	—
A40	S3L150MW	65	—	—
A50	S3L150MW	85	S3L150MW	35
A63	S4L250MW	85	—	—
A75	S4L250MW	85	—	—
A95	S4L250MW	85	S4L250MW	35
A110	S4L250MW	85	S4L250MW	35
A145	S5L400MW	65	S4L250MW	10
A185	S5L400MW	85	S4L250MW	10
A210	S6L800MW	85	S4L250MW	18
A260	S6L800MW	85	S5L400MW	18
A300	S6L800MW	85	S5L400MW	18
A400	S7H1200MW	85	Consult factory	
A460	S7H1200MW	85		
A580	S7H1200MW	85		
A750	S7H1200MW	85		

For thermal magnetic molded case breakers, consult factory.

Control transformer option

Contactor size	VA rating	List price adder
A9 – A40	45 ①	\$ 300
A9 – A40	50	360
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ④
A580 – A750	250	795 ④

① MCPs are supplied as standard. Thermal magnetic/electronic trip type breakers can be supplied by substituting the letter "B" in place of the "M". List price is the same.

Example: A9SRB1-84★◆◆, \$ 740.00.

② No primary fusing provided.

③ For AF50 - AF300 starters, consult factory.

④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

⑤ AF400 - AF750 only.

Circuit breaker type ①

A9 - A750

Reversing, three phase

3

Combination starters

3

UL Type 12 (Metal dustight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)		UL Type 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated							
A9SRM2-84★◆◆	\$ 1365	A9SRM4-84★◆◆	\$ 1515	A9SRMX-84★◆◆	\$ 2090	A9SRMP-84★◆◆	\$ 1320
A12SRM2-84★◆◆	1455	A12SRM4-84★◆◆	1605	A12SRMX-84★◆◆	2180	A12SRMP-84★◆◆	1410
A16SRM2-84★◆◆	1515	A16SRM4-84★◆◆	1688	A16SRMX-84★◆◆	2240	A16SRMP-84★◆◆	1470
A26SRM2-84★◆◆	1658	A26SRM4-84★◆◆	1800	A26SRMX-84★◆◆	2405	A26SRMP-84★◆◆	1703
A30SRM2-84★◆◆	1883	A30SRM4-84★◆◆	2100	A30SRMX-84★◆◆	2878	A30SRMP-84★◆◆	1853
A40SRM2-84★◆◆	2115	A40SRM4-84★◆◆	2438	A40SRMX-84★◆◆	3395	A40SRMP-84★◆◆	2085
A50SRM2-84★◆◆	2648	A50SRM4-84★◆◆	2963	A50SRMX-84★◆◆	3988	A50SRMP-84★◆◆	2618
A63SRM2-84★◆◆	3030	A63SRM4-84★◆◆	3338	A63SRMX-84★◆◆	4505	A63SRMP-84★◆◆	3090
A75SRM2-84★◆◆	4035	A75SRM4-84★◆◆	4200	A75SRMX-84★◆◆	5210	A75SRMP-84★◆◆	3855
A95SRM2-84★◆◆	5100	A95SRM4-84★◆◆	5500	A95SRMX-84★◆◆	7200	A95SRMP-84★◆◆	4450
A110SRM2-84★◆◆	5235	A110SRM4-84★◆◆	5663	A110SRMX-84★◆◆	7415	A110SRMP-84★◆◆	4700
A145SRM2-84★◆◆	7470	A145SRM4-84★◆◆	7950	A145SRMX-84★◆◆	9885	A145SRMP-84★◆◆	7620
A185SRM2-84★◆◆	8970	A185SRM4-84★◆◆	9638	A185SRMX-84★◆◆	12,510	A185SRMP-84★◆◆	9250
A210SRM2-84★◆◆	13,080	A210SRM4-84★◆◆	13,650	A210SRMX-84★◆◆	16,545	A210SRMP-84★◆◆	13,300
A260SRM2-84★◆◆	14,640	A260SRM4-84★◆◆	15,450	A260SRMX-84★◆◆	21,735	A260SRMP-84★◆◆	15,000
A300SRM2-84★◆◆	16,110	A300SRM4-84★◆◆	18,150	A300SRMX-84★◆◆	28,260	A300SRMP-84★◆◆	17,600
A400SRM2-70★◆◆	18,975	A400SRM4-70★◆◆	21,000	A400SRMX-70★◆◆	32,835	-	-
A460SRM2-70★◆◆	33,435	A460SRM4-70★◆◆	35,850	A460SRMX-70★◆◆	41,280	-	-
A580SRM2-70★◆◆	41,835	A580SRM4-70★◆◆	45,000	A580SRMX-70★◆◆	53,385	-	-
A750SRM2-70★◆◆	46,065	A750SRM4-70★◆◆	48,338	A750SRMX-70★◆◆	56,385	-	-

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

◆◆ MCP or breaker rating. See codes on page 3.48.

Motor circuit protector data

Motor full load amperes	MCP continuous rating	Suffix code ◆	Catalog number	Starter size	1.5X	2X	4X	5X	6X	7X	8X	9X	10X	11X	12X
					—	—	—	—	—	—	—	—	—	—	—
.92 - 2.76	3	A	S3L003MW	0	—	—	12	15	18	21	24	27	30	33	36
1.53 - 4.61	5	B	S3L005MW	0	—	—	20	25	30	35	40	45	50	55	60
3.07 - 9.23	10	C	S3L010MW	0	—	—	40	50	60	70	80	90	100	110	120
7.69 - 23.08	25	D	S3L025MW	1	—	—	100	125	150	175	200	225	250	275	300
15.38 - 46.15	50	E	S3L050MW	2	—	—	200	250	300	350	400	450	500	550	600
30.77 - 92.31	100	F	S3L100MW	3	—	—	400	500	600	700	800	900	1000	1100	1200
46.15 - 138.46	150	G	S3L150MW	4	—	—	600	750	900	1050	1200	1350	1500	1650	1800
28.85 - 230.77	250	H	S4L250MW	4	375	500	1000	—	1500	—	2000	—	2500	—	3000
46.15 - 369.23	400	J	S5L400MW	5	600	800	1600	—	2400	—	3200	—	4000	—	4800
69.23 - 553.85	600	K	S6L600MW	6	900	1200	2400	—	3600	—	4800	—	6000	—	7200
92.31 - 738.46	800	L	S6L800MW	7	1200	1600	3200	—	4800	—	6400	—	8000	—	9600
115.38 - 923.07	1000	M	S7H1000MW	7	1500	2000	4000	—	6000	—	8000	—	10,000	—	12,000
138.46 - 1107.69	1200	N	S7H1200MW	7	1800	2400	4800	—	7200	—	9600	—	12,000	—	14,400

Circuit breaker type ①

A9 - A750, NEMA rated

Reversing, three phase

3

UL motor switching current		Maximum ratings – UL Listed			UL Type 1 (Indoor metal)		UL Type 3R (Outdoor metal)	
		Maximum motor horsepower ratings ④			Catalog number	List price	Catalog number	List price
		200V	230V	460/575V				
		NEMA rated						
NEMA size	Continuous current							
00	9	1.5	1.5	2	A9NSRM1-84★◆◆	\$ 1185	A9NSRM3-84★◆◆	\$ 1365
0	18	3	3	5	A16NSRM1-84★◆◆	1335	A16NSRM3-84★◆◆	1515
1	27	7.5	7.5	10	A26NSRM1-84★◆◆	1478	A26NSRM3-84★◆◆	1658
2	45	15	15	25	A50NSRM1-84★◆◆	2468	A50NSRM3-84★◆◆	2648
3	90	25	30	50	A75NSRM1-84★◆◆	3705	A75NSRM3-84★◆◆	4035
4	135	40	50	100	A145NSRM1-84★◆◆	6285	A145NSRM3-84★◆◆	7470
5	270	75	100	200	A260NSRM1-84★◆◆	12,645	A260NSRM3-84★◆◆	14,640
6	540	150	200	400	A460NSRM1-70★◆◆	31,635	A460NSRM3-70★◆◆	33,435
7	810	—	300	600	A750NSRM1-70★◆◆	42,885	A750NSRM3-70★◆◆	46,065

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.

◆◆ MCP or breaker rating. See codes on page 3.48.

Example: A9NSRM1-84X \$ 1185 List
 - 63 - OLR
 \$ 1122 Net price

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75NSRM1-80★◆◆

To select starter with control transformer, substitute the code from the Control transformer voltage selector chart for the two digits after the last dash in the catalog number.

Ex.: A 480V primary voltage with a 120V secondary voltage is required for an A75 starter: A75SRF1-8F

Coil voltage selection – A9 - A300 ③

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A	81	83	84	84		34	36	80	42		86	86	51	53	55	
50	A	81	83	84				80			85	86			55		

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ③

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ⑤
50	AF	68	69	70	71 ⑤
DC	AF	68	69	70	71 ⑤

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Maximum short circuit rating for UL listed combination starters

Contactor	Maximum MCP 480VAC	KA at 480VAC	MCP 600VAC	KA at 600VAC
A9	S3L050MW	35	S3L010MW	35
A12	S3L050MW	35	S3L010MW	35
A16	S3L050MW	35	—	—
A26	S3L100MW	35	S3L100MW	35
A30	S3L150MW	65	—	—
A40	S3L150MW	65	—	—
A50	S3L150MW	85	S3L150MW	35
A63	S4L250MW	85	—	—
A75	S4L250MW	85	—	—
A95	S4L250MW	85	S4L250MW	35
A110	S4L250MW	85	S4L250MW	35
A145	S5L400MW	65	S4L250MW	10
A185	S5L400MW	85	S4L250MW	10
A210	S6L800MW	85	S4L250MW	18
A260	S6L800MW	85	S5L400MW	18
A300	S6L800MW	85	S5L400MW	18
A400	S7H1200MW	85	Consult factory	
A460	S7H1200MW	85		
A580	S7H1200MW	85		
A750	S7H1200MW	85		

For thermal magnetic molded case breakers, consult factory.

Factory modifications

See page 3.3

Control transformer option

Contactor size	VA rating	List price adder
A9 - A40	45 ①	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95 - A110	100	560
A145 - A185	150	720
A210 - A300	250	795
A400 - A460	150	720 ②
A580 - A750	250	795 ②

① MCPs are supplied as standard. Thermal magnetic/electronic trip type breakers can be supplied by substituting the letter "B" in place of the "M". List price is the same.

Example: A9SRB1-84★◆◆, \$ 740.00.

② No primary fusing provided.

③ For AF50 - AF300 starters, consult factory.

④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

⑤ AF400 - AF750 only.

Circuit breaker type ①

A9 - A750, NEMA rated

Reversing, three phase

3

Combination starters

3

UL Listed 12 (Metal dustight)		UL Listed 4 (Watertight)		UL Listed 4X (Stainless steel)		UL Listed 1, 3R, 4, 4X & 12 (Plastic)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
NEMA rated							
A9NSRM2-84★◆◆	\$ 1365	A9NSRM4-84★◆◆	\$ 1515	A9NSRMX-84★◆◆	\$ 2090	A9NSRMP-84★◆◆	\$ 1320
A16NSRM2-84★◆◆	1515	A16NSRM4-84★◆◆	1688	A16NSRMX-84★◆◆	2240	A16NSRMP-84★◆◆	1470
A26NSRM2-84★◆◆	1658	A26NSRM4-84★◆◆	1800	A26NSRMX-84★◆◆	2405	A26NSRMP-84★◆◆	1703
A50NSRM2-84★◆◆	2648	A50NSRM4-84★◆◆	2963	A50NSRMX-84★◆◆	3988	A50NSRMP-84★◆◆	2618
A75NSRM2-84★◆◆	4035	A75NSRM4-84★◆◆	4200	A75NSRMX-84★◆◆	5210	A75NSRMP-84★◆◆	3855
A145NSRM2-84★◆◆	7470	A145NSRM4-84★◆◆	7950	A145NSRMX-84★◆◆	9885	A145NSRMP-84★◆◆	7620
A260NSRM2-84★◆◆	14,640	A260NSRM4-84★◆◆	15,450	A260NSRMX-84★◆◆	21,735	A260NSRMP-84★◆◆	15,000
A460NSRM2-70★◆◆	33,435	A460NSRM4-70★◆◆	35,850	A460NSRMX-70★◆◆	41,280	—	—
A750NSRM2-70★◆◆	46,065	A750NSRM4-70★◆◆	48,338	A750NSRMX-70★◆◆	56,385	—	—

- ★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6. Overload relays are required for all combination starters. If overload relay is provided by customer, substitute an "X" in place of the ★ and then subtract list price of overload relay from combination starter's list price.
- ◆◆ MCP or breaker rating. See codes on page 3.48.

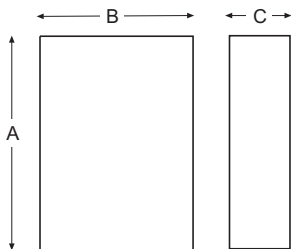
Motor circuit protector data

Motor full load amperes	MCP continuous rating	Suffix code ◆	Catalog number	Starter size	1.5X	2X	4X	5X	6X	7X	8X	9X	10X	11X	12X
					—	—	—	—	—	—	—	—	—	—	—
.92 – 2.76	3	A	S3L003MW	0	—	—	12	15	18	21	24	27	30	33	36
1.53 – 4.61	5	B	S3L005MW	0	—	—	20	25	30	35	40	45	50	55	60
3.07 – 9.23	10	C	S3L010MW	0	—	—	40	50	60	70	80	90	100	110	120
7.69 – 23.08	25	D	S3L025MW	1	—	—	100	125	150	175	200	225	250	275	300
15.38 – 46.15	50	E	S3L050MW	2	—	—	200	250	300	350	400	450	500	550	600
30.77 – 92.31	100	F	S3L100MW	3	—	—	400	500	600	700	800	900	1000	1100	1200
46.15 – 138.46	150	G	S3L150MW	4	—	—	600	750	900	1050	1200	1350	1500	1650	1800
28.85 – 230.77	250	H	S4L250MW	4	375	500	1000	—	1500	—	2000	—	2500	—	3000
46.15 – 369.23	400	J	S5L400MW	5	600	800	1600	—	2400	—	3200	—	4000	—	4800
69.23 – 553.85	600	K	S6L600MW	6	900	1200	2400	—	3600	—	4800	—	6000	—	7200
92.31 – 738.46	800	L	S6L800MW	7	1200	1600	3200	—	4800	—	6400	—	8000	—	9600
115.38 – 923.07	1000	M	S7H1000MW	7	1500	2000	4000	—	6000	—	8000	—	10,000	—	12,000
138.46 – 1107.69	1200	N	S7H1200MW	7	1800	2400	4800	—	7200	—	9600	—	12,000	—	14,400

Approximate dimensions

Non-fused, across the line
Fused, across the line

3



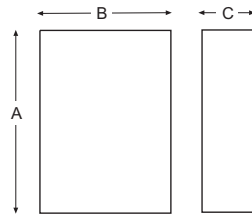
Non-fused, across the line w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	10	8	6
	3R	10	8	6
	4	10	8	6
	4X Stainless	10	8	6
	4X Plastic	10	8	7
A50 – A75	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A95 – A110	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A145 – A185	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
A210 – A300	1	30	24	12
	3R	30	20	10
	4	30	20	10
	4X Stainless	30	24	12
	4X Plastic	30	20	12
A400	1	36	30	12
	3R	36	30	10
	4	36	30	10
	4X Stainless	36	30	12
	4X Plastic	–	–	–
A460	1	42	30	12
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
A580	1	36	30	12
	3R	36	30	10
	4	36	30	10
	4X Stainless	36	30	12
	4X Plastic	–	–	–
A750	1	–	–	–
	3R	60	36	16
	4	60	36	16
	4X Stainless	60	36	16
	4X Plastic	–	–	–

Fused, across the line w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A95 – A110	1	24	20	10
	3R	24	20	10
	4	24	20	10
	4X Stainless	24	20	10
	4X Plastic	24	20	12
A145 – A185	1	30	24	12
	3R	30	20	10
	4	30	20	10
	4X Stainless	30	24	12
	4X Plastic	30	20	12
A210 – A400	1	36	30	12
	3R	30	30	10
	4	30	30	10
	4X Stainless	36	30	12
	4X Plastic	40	30	14
A460	1	42	30	12
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
A580 – A750	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	–	–	–
	4X Plastic	–	–	–

Approximate dimensions Circuit breaker, across the line Reversing, non-fused w/CCT



Circuit breaker, across the line

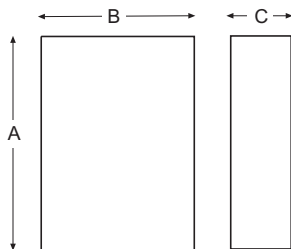
Starter size	Enclosure type	A	B	C
A9 – A40 (S3)	1	14	12	8
	3R	14	12	8
	4	16	12	8
	4X Stainless	16	12	8
	4X Plastic	14	12	7
	12	14	12	8
	7 ③	14	10	6
A50 – A75 (S3)	1	14	12	8
	3R	14	12	8
	4	16	12	8
	4X Stainless	16	12	8
	4X Plastic	14	12	7
	12	14	12	8
	7 ③	18	12	6
A95 – A110 (S3)	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
	12	20	16	8
	7 ③	24	16	6
A145 – A185 (S3, S4) ①	1	24	20	8
	3R	24	16	8
	4	24	16	8
	4X Stainless	24	16	8
	4X Plastic	30	20	12
	12	24	16	8
	7 ③	24	16	6
A210 – A300 (S4, S5) ①	1	30	24	12
	3R	30	20	10
	4	30	20	10
	4X Stainless	30	24	12
	4X Plastic	30	20	12
	12	30	20	10
	7 ③	30	18	8
A300 (S6) ②	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	33	25	12
	12	36	30	12
	7 ③	30	24	8
A400 (S6) ①	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	12
	4X Plastic	33	25	12
	12	30	24	10
A460 – A580 (S6) ①	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	–	–	–
	12	36	24	12
A580 (S7) ②	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
	12	42	36	12
A750 (S7) ②	1	48	36	13
	3R	48	36	13
	4	48	36	13
	4X Stainless	48	36	13
	4X Plastic	–	–	–
	12	48	36	13

Reversing, non-fused w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
	12	14	12	8
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
	12	20	16	8
A95 – A110	1	30	24	8
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	30	12
	12	30	24	8
A145 – A185	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	33	25	12
	12	30	24	8
A210	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	33	25	12
	12	30	24	10
A260 – A300	1	36	30	12
	3R	30	30	10
	4	30	30	10
	4X Stainless	36	30	12
	4X Plastic	40	30	12
	12	30	30	10
A400 – A460	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
	12	48	36	12
A580 – A750	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	–	–	–
	4X Plastic	–	–	–
	12	87	36	24

- ① Busbars breaker-starter, bottom entry
- ② Cable, breaker-starter.
- ③ Type 7, explosion-proof inside dimensions.

Approximate dimensions Reversing fused combination Reversing breaker combination w/CCT



Reversing, fused combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A50 – A75	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	24	16	8
12	24	20	8	
A95 – A110	1	30	24	10
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	30	30	12
12	30	24	10	
A145 – A210	1	36	30	12
	3R	30	30	12
	4	30	30	12
	4X Stainless	30	30	12
	4X Plastic	40	30	12
12	30	30	12	
A260 – A300	1	42	36	13
	3R	36	36	10
	4	36	36	10
	4X Stainless	36	36	12
	4X Plastic	40	30	12
12	36	36	10	
A400 – A460	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
12	48	36	12	
A580 – A750	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	87	36	24
	4X Plastic	–	–	–
12	87	36	24	

Reversing breaker combination w/CCT

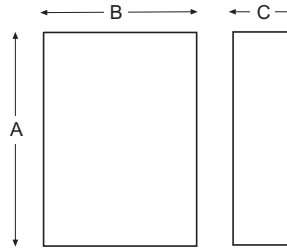
Starter size	Enclosure type	A	B	C
A9 – A40 (S3)	1	14	12	8
	3R	14	12	8
	4	16	12	8
	4X Stainless	16	12	8
	4X Plastic	14	12	7
12	14	12	8	
A50 – A75 (S3)	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	24	16	8
12	24	20	8	
A95 – A110 (S3)	1	30	24	8
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	30	12
12	30	24	8	
A145 (S3)	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	30	20	12
12	24	20	8	
A185 (S3, S4)	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
12	30	20	8	
A210 – A300 (S4, S5)	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	12
	4X Plastic	33	25	12
12	30	24	10	
A300 (S6)	1	36	30	12
	3R	30	30	10
	4	30	30	10
	4X Stainless	36	30	12
	4X Plastic	40	30	14
12	30	30	10	
A400 – A580 (S6, S7)	1	42	30	13
	3R	42	36	12
	4	42	30	12
	4X Stainless	42	30	12
	4X Plastic	–	–	–
12	42	36	12	
A750 (S7)	1	48	36	17
	3R	48	36	16
	4	48	36	16
	4X Stainless	48	36	16
	4X Plastic	–	–	–
12	48	36	16	

Approximate dimensions for combination starters

2 Speed, 1 winding, non-fused w/CCT
2 Speed, 1 winding, fused combination w/CCT

3

Combination starters



2 Speed - 1 Winding, non-fused w/CCT

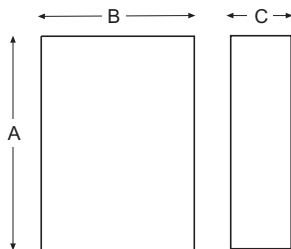
Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	4	14	12	8
	4X Stainless	14	12	6
	4X Plastic	14	12	7
	12	14	12	8
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A95 – A110	1	30	30	8
	3R	30	30	10
	4	30	30	10
	4X Stainless	30	30	10
	4X Plastic	30	30	12
A145 – A185 (NF200)	1	36	30	8
	3R	36	30	8
	4	36	30	8
	4X Stainless	36	30	8
	4X Plastic	–	–	–
A210 (NF200)	1	42	36	13
	3R	36	36	12
	4	36	36	12
	4X Stainless	36	36	12
	4X Plastic	–	–	–
A260 – A300 (NF400)	1	42	36	13
	3R	42	36	13
	4	42	36	13
	4X Stainless	42	36	13
	4X Plastic	–	–	–
A400 (NF600)	1	–	–	–
	3R	60	36	12
	4	60	36	12
	4X Stainless	60	36	12
	4X Plastic	–	–	–
A460 (NF600) A580 (NF800) A750 (NF1200)	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	87	36	24

2 Speed - 1 Winding, fused combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
	12	20	16	8
A50 – A75	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
	12	30	24	8
A95 – A110	1	42	30	12
	3R	42	30	12
	4	42	30	12
	4X Stainless	42	30	12
	4X Plastic	–	–	–
	12	42	30	12
A145 – A185 (F400)	1	42	36	13
	3R	36	36	12
	4	36	36	12
	4X Stainless	36	36	12
	4X Plastic	–	–	–
	12	36	36	12
A210 (F400)	1	42	36	13
	3R	36	36	12
	4	36	36	12
	4X Stainless	36	36	12
	4X Plastic	–	–	–
	12	36	36	12
A260 – A300 (F600)	1	42	36	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
	12	42	36	12
A400 (F800)	1	–	–	–
	3R	60	36	12
	4	60	36	12
	4X Stainless	60	36	12
	4X Plastic	–	–	–
	12	60	36	12
A460 (F800) A580 (NF1200 + fuse block) A750 (NF 1600 + fuse block)	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
	12	87	36	24

Approximate dimensions 2 Speed, 1 winding, breaker combination w/CCT

3



2 Speed - 1 Winding, breaker combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	8
	4X Stainless	16	12	8
	4X Plastic	14	12	7
	12	14	12	8
A50 – A75	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	30	20	12
	12	24	20	8
A95 – A110	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	40	30	14
	12	36	30	12
A145 (S3) A185 (S3, S4)	1	36	24	8
	3R	36	24	8
	4	36	24	8
	4X Stainless	36	24	8
	4X Plastic	40	30	14
	12	36	24	8
A210 – A300 (S4, S5)	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	40	30	14
	12	36	30	12
A300 (S6)	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
	12	42	36	12
A400 (S6)	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
	12	48	36	12
A460 (S6)	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
	12	48	36	12
A580 (S6)	1	–	–	–
	3R	60	36	12
	4	60	36	12
	4X Stainless	60	36	12
	4X Plastic	–	–	–
	12	60	36	12
A580 – A750 (S7)	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
	12	87	36	24

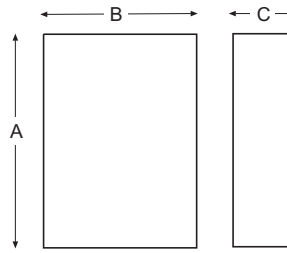
Approximate dimensions

2 Speed - 2 Winding, Non-fused w/CCT

2 Speed - 2 Winding, Fused combination w/CCT

Combination
starters

3



2 Speed - 2 Winding, non-fused w/CCT

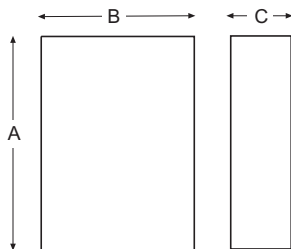
Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A95 – A110	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	30	12
A145 – A185	1	30	24	8
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	33	25	12
A210	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	33	25	12
A260 – A300	1	36	30	12
	3R	30	30	10
	4	30	30	10
	4X Stainless	36	30	12
	4X Plastic	40	30	12
A400 – A460	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
A580 – A750	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	–	–	–
	4X Plastic	–	–	–

2 Speed - 2 Winding, fused combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A50 – A75	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	24	16	8
A95 – A110	1	30	24	10
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	30	30	12
A145 – A210	1	36	30	12
	3R	30	30	12
	4	30	30	12
	4X Stainless	30	30	12
	4X Plastic	40	30	12
A260 – A300	1	42	36	13
	3R	36	36	10
	4	36	36	10
	4X Stainless	36	36	12
	4X Plastic	40	30	12
A400 – A460	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
A580 – A750	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	87	36	24
	4X Plastic	–	–	–

Approximate dimensions 2 Speed - 2 Winding, breaker combination w/CCT

3



2 Speed - 2 Winding, breaker combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40 (S3)	1	14	12	8
	3R	14	12	8
	4	16	12	8
	4X Stainless	16	12	8
	4X Plastic	14	12	7
	12	14	12	8
A50 – A75 (S3)	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	24	16	8
	12	24	20	8
A95 – A110 (S3)	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	30	12
	12	30	24	8
A145 (S3) ①	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	30	20	12
	12	24	20	8
A185 (S3, S4) ①	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
	12	30	20	8
A210 – A300 (S4, S5) ①	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	12
	4X Plastic	33	25	12
	12	30	24	10
A300 (S6) ②	1	36	30	12
	3R	30	30	10
	4	30	30	10
	4X Stainless	36	30	12
	4X Plastic	40	30	14
	12	30	30	10
A400 – A580 (S6) ① (S7) ②	1	42	30	13
	3R	42	36	12
	4	42	30	12
	4X Stainless	42	30	12
	4X Plastic	–	–	–
	12	42	36	12
A750 (S7) ②	1	48	36	17
	3R	48	36	16
	4	48	36	16
	4X Stainless	48	36	16
	4X Plastic	–	–	–
	12	48	36	16

① Busbars breaker-starter, bottom entry

② Cable, breaker-starter.

Reduced voltage Starters



Reduced voltage starters Open & enclosed

3

Description

- Compact, space saving design
- 8 starter frame sizes, A16 to A750
- Maximum U.L. horsepower ratings
- Mechanically interlocking as standard for wye-delta and autotransformer starters
- Incomplete sequence timer as standard for wye-delta and autotransformer starters
- Remote customer connection point at separate terminal blocks
- Double break contact design with magnetic arc chamber extinguishes arc in the shortest possible time
- NEMA sizes 0, 1, 2, 3, 4, 5, 6, 7

Overload relay protection

Starters, sizes A16 – A185, have Class 10 adjustable thermal bimetallic overload relay protection as standard.

Sizes A210 – A750, have selectable Class 10, 20, 30 adjustable electronic overload relay protection as standard.

Electronic overload relay protection is available for other starter sizes.

General information

Catalog numbering information

A110 SA F 1 - 84 C 6D 4 L A

3

Starter size

Starter type

SA - Autotransformer
SG - Wye-delta open transition
SY - Wye-delta closed transition
SH - Part winding
N - NEMA

Combination type

No digit - Non-combination
N - Non-Fusible disconnect
F - Fusible disconnect
B - Thermal magnetic or electronic trip type circuit breaker
M - Motor circuit protection (MCP)

Enclosure

No digit - Open
1 - UL Type 1
2 - UL Type 12
3 - UL Type 3R
4 - UL Type 4
X - UL Type 4X - stainless steel

Coil voltage

See voltage selection chart

Overload range

See overload relay selection chart, page 3.6.

Accessories

A - Start-stop pushbutton
C - 2 pos. sel. switch (off-on)
D - 3 pos. sel. switch (HOA)
E - Pilot light
F - Start-stop pushbutton & pilot light
H - 2 pos. sel. switch & pilot light
J - 3 pos. sel. switch & pilot light

Horsepower

A - 10 N - 200
B - 15 P - 250
C - 20 R - 300
D - 25 S - 350
E - 30 T - 400
F - 40 U - 500
G - 50 V - 600
H - 60 W - 700
J - 75 X - 800
K - 100 Y - 900
L - 125 Z - 1000
M - 150

Line voltage

1 - 200 - 208V
2 - 230 - 240V
3 - 380 - 415V
4 - 460 - 480V
6 - 575 - 600V

Fuse clip

6A- 30A, 600V, Class J
6B- 60A, 600V, Class J
6C- 100A, 600V, Class J
6D- 200A, 600V, Class J
6E- 400A, 600V, Class J
6F- 600A, 600V, Class J
6G- 800A, 600V, Class L
6H- 1200A, 600V, Class L

Circuit breaker amp rating (600V)

6D-15	6M-70	6W-225	6E-700
6E-20	6N-80	6X-250	6F-800
6F-25	6P-90	6Y-300	6G-900
6G-30	6R-100	6Z-350	6H-1000
6H-35	6S-125	6A-400	6J-1200
6J-40	6T-150	6B-450	
6K-50	6U-175	6C-500	
6L-60	6V-200	6D-600	

Circuit breaker amp rating (200V - 480V)

4D-15	4M-70	4W-225	4E-700
4E-20	4N-80	4X-250	4F-800
4F-25	4P-90	4Y-300	4G-900
4G-30	4R-100	4Z-350	4H-1000
4H-35	4S-125	4A-400	4J-1200
4J-40	4T-150	4B-450	
4K-50	4U-175	4C-500	
4L-60	4V-200	4D-600	

MCP amp rating (600V)

6A-3	6D-25	6G-	1506K	-600
6N-1200				
6B-5	6E-50	6H-	2506L	-800
6C-10	6F-100	6J-	4006M	-1000

MCP amp rating (200V - 480V)

4A-3	4D-25	4G-150	4K-600	
4N-1200				
4B-5	4E-50	4H-	2504L	-800
4C-10	4F-100	4J-	4004M	-1200

General information

Factory modifications

Reduced voltage
starters

Control cover accessories – A9-A750

Description	Control suffix ①	List price adder
		NEMA 1 3R 4, 4X & 12
Start-stop pushbutton	A	\$ 72
Fwd-rev-stop pushbutton	B	360
2 position selector switch (Std. ON-OFF)	C	72
3 position selector switch (Std. HAND-OFF-AUTO)	D	72
Pilot light, Red, RUN (Std.)	E	135
Pilot light, Green, RUN	R	135
Pilot light suffix + V= Neon bulb	V	–
Pilot light suffix + X= LED bulb	X	–
Start-stop pushbutton & pilot light	F	207
Fwd-rev-stop pushbutton & pilot light	G	496
2 position selector switch & pilot light	H	207
3 position selector switch & pilot light	J	207
Fast-slow-stop pushbuttons	K	360
Fast-slow-stop pushbuttons & pilot light	L	495
Fast-slow-off-auto selector switch	M	150
Emergency stop	P	100
F suffix + 1NO & 1NC auxiliary contact	T	237
J suffix + 1NO & 1NC auxiliary contact	U	237
Pushbutton (standard START)	Y	36

Special modifications

Contact configuration	Suffix code ①	List price adder
Contactor		
Coil surge suppressor	S	\$ 75
Auxiliary relays		
Type N control relay (4 pole)	CR	225
Electronic timer		
1.5 – 30, On Delay	TN30	300
5 – 100, On Delay	TN100	300
1.5 – 30, Off Delay	TF30	300
5 – 100, Off Delay	TF100	300
Phase failure phase reversal with over and undervoltage relays	PFPR	525
Ground fault protection	GFP	2250
For multi-speed controllers		
Compelling relay	CPR	600
Accelerating relay	ACR	600
Decelerating relay	DCR	600
Meters & metering		
Current transformer	CT	375
Ammeter (including C.T.)	AM	705
Ammeter & ammeter switch	AMS	1800
Voltmeter	VM	1200
Voltmeter & voltmeter switch	VMS	1800
Elapsed time meter	ETM	375
Operation counter	OC	560
Wattmeter	WM	3650
Miscellaneous		
Lightning arrester	LA	320
Space heater, 100W with thermostat	SH	600

Control circuit transformer (standard VA) – A9 - A750 ②

Standard size with fused secondary			Coil suffix	Starter size	CCT VA	List price
Primary	Secondary	Hz				
				A9 – A40	45 ③	\$ 300
				A9 – A40	50	360
200/208V	110V	50/60	0	A50 – A75	75	435
220/240V	110/120V	50/60	7	A95 – A110	100	560
440/480V	110/120V	50/60	8	A145 – A185	150	720
550/600V	110/120V	50/60	9	A210 – A300	250	795
				A400 – A460	150	720 ④
				A580 – A750	250	795 ④

Control circuit transformers do include two primary fuses and one secondary fuse.

- ① Add this suffix to the last digit of the catalog number.
- ② Consult factory if additional VA is required.
- ③ Does not include primary fusing.
- ④ A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Additional auxiliary contact blocks — A9 – A750

Contact configuration	Suffix code ①	A9 – A110 list price adder	A145 – A750 list price adder
1 N.O.	10	\$ 20	–
1 N.C.	01	20	–
2 N.O.	20	30	–
1 N.O. & 1 N.C.	11	30	\$ 30
2 N.C.	02	30	–
4 N.O.	40	60	–
3 N.O. & 1 N.C.	31	60	–
2 N.O. & 2 N.C.	22	60	60
1 N.O. & 3 N.C.	13	60	–
4 N.C.	04	60	–
3 N.O. & 3 N.C.	33	90	90

Reduced voltage & multi-speed starters — price adders

Starter size	Non-fusible switch price adder	Fusible switch price adder	MCCB or MCP price adder
A9	\$ 990	\$ 1008	\$ 1287
A12	990	1008	1287
A16	990	1008	1287
A26	990	1008	1287
A30	990	1224	1350
A40	990	1224	1350
A50	1152	1224	1350
A63	1230	1350	1785
A75	1494	1602	1809
A95 – A110	2310	2565	2982
A145	3042	3366	4158
A185	3300	3735	4533
A210	3450	3825	6000
A260	3744	4068	6849
A300	4200	6000	8750
A400	6600	9450	9030
A460	8200	11,100	9475
A580	8400	11,800	10,200
A750	9000	12,450	12,900

Hazardous location enclosure accessories, NEMA 7 & 9

Item	Catalog ① Suffix No.	List price
3R Breather/drain	A	\$ 80
Start PB green	B	180
Stop PB red	C	180
St/St dual PB	D	360
Em. Stop mush momentary	E	220
Em. Stop mush maintained	F	460
Black PB N.O. auxiliary	G	180
Black PB N.C. auxiliary	H	180
Pilot light	J	180
Illuminated PB	K	460
Push-to-test pilot light	L	450
Potentiometer	M	460
2-Pos Selector Maintained	N	260
2-Pos Selector spring L to R	P	280
2-Pos Selector spring R to L	Q	280
3-Pos Selector sw. main.	R	260
3-Pos Selector spring L to R	S	280
3-Pos Selector spring R to L	T	280
3-Pos Selector spring to C	U	280
2-Pos Selector key operated	V	450
3-Pos Selector key operated	W	450

Auto-transformer, non-combination type

A16 - A750

Three phase

3

UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type 1 (Indoor metal)	
	Maximum motor horsepower ratings ^①				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
UL rated								
17	5	5	10	15	A16SA-84★	\$ 3987	A16SA1-84★	\$ 5103
28	7.5	10	20	25	A26SA-84★	4341	A26SA1-84★	5457
42	10	15	30	40	A40SA-84★	4698	A40SA1-84★	5814
54	15	20	40	50	A50SA-84★	4887	A50SA1-84★	6003
65	20	25	50	50	A63SA-84★	5130	A63SA1-84★	6246
80	25	30	60	75	A75SA-84★	5787	A75SA1-84★	6471
95	30	30	60	75	A95SA-84★	9300	A95SA1-84★	9800
110	30	40	75	100	A110SA-84★	9972	A110SA1-84★	10,694
130	40	50	100	125	A145SA-84★	10,863	A145SA1-84★	11,853
156	50	60	125	150	A185SA-84★	14,334	A185SA1-84★	16,880
192	60	75	150	200	A210SA-84★	17,196	A210SA1-84★	19,781
248	75	100	200	250	A260SA-84★	19,670	A260SA1-84★	21,668
302	100	—	250	300	A300SA-84★	24,042	A300SA1-84★	26,034
414	125	150	350	400	A400SA-70★	30,996	A400SA1-70★	32,981
480	150	200	400	500	A460SA-70★	35,978	A460SA1-70★	39,182
590	200	250	500	600	A580SA-70★	52,562	A580SA1-70★	55,898
810	250	300	600	700	A750SA-70★	59,250	A750SA1-70★	62,618
NEMA rated								
NEMA size	Continuous current	200V	230V	460/575V				
0	18	3	3	5	A16N0SA-84★	\$ 3987	A16NSA1-84★	\$ 5103
1	27	7.5	7.5	10	A26N1SA-84★	4341	A26NSA1-84★	5457
2	45	10	15	25	A50N2SA-84★	4887	A50NSA1-84★	6003
3	90	25	30	50	A75N3SA-84★	5787	A75NSA1-84★	6471
4	135	40	50	100	A145N4SA-84★	10,863	A145NSA1-84★	11,853
5	270	75	100	200	A260N5SA-84★	19,670	A260NSA1-84★	21,668
6	540	150	200	400	A460N6SA-70★	35,978	A460NSA1-70★	39,182
7	810	—	300	600	A750N7SA-70★	59,250	A750NSA1-70★	62,618

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.

Description

An autotransformer starter reduces inrush current by using a transformer in the line just ahead of the motor to step down the voltage applied to the motor terminals. By reducing the voltage, the current drawn from the line is reduced during start-up.

When the setting time on the timer has expired, the autotransformer is bypassed. The 1S contactor drops out, the run contactor closes, and the 2S contactor opens, proving full voltage to the motor.

The ABB autotransformer starter is a closed transition type, meaning that the motor remains connected to the line during the entire acceleration period.

The transformer has three taps which provide 50%, 65% and 80% of full line voltage. At delivery, the transformer is connected to the 65% tap; the inrush current will be reduced to 42% of normal; and the starting torque will be reduced to 42%.

The autotransformer starter can be used for any squirrel-cage motor.

Factory modifications

See page 3.3

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SA-84★

Coil voltage selection – A9 - A300 ①

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ①

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ②
50	AF	68	69	70	71 ②
DC	AF	68	69	70	71 ②

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

① For AF50 – AF 300 starters, consult factory.

② AF400 - AF750 only.

Auto-transformer – non-combination type

A16 - A750

Three phase

Reduced voltage
starters

3

UL Type 3R (Outdoor metal)		UL Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated							
A16SA3-84★	\$ 5823	A16SA2-84★	\$ 5823	A16SA4-84★	\$ 6993	A16SAX-84★	\$ 8550
A26SA3-84★	6177	A26SA2-84★	6177	A26SA4-84★	7347	A26SAX-84★	8888
A40SA3-84★	6549	A40SA2-84★	6549	A40SA4-84★	7719	A40SAX-84★	9375
A50SA3-84★	6723	A50SA2-84★	6723	A50SA4-84★	7893	A50SAX-84★	9600
A63SA3-84★	7694	A63SA2-84★	7694	A63SA4-84★	9014	A63SAX-84★	10,725
A75SA3-84★	8181	A75SA2-84★	8181	A75SA4-84★	9261	A75SAX-84★	10,988
A95SA3-84★	11,200	A95SA2-84★	11,200	A95SA4-84★	12,400	A95SAX-84★	13,600
A110SA3-84★	12,323	A110SA2-84★	12,323	A110SA4-84★	13,388	A110SAX-84★	14,700
A145SA3-84★	14,013	A145SA2-84★	14,013	A145SA4-84★	16,983	A145SAX-84★	18,300
A185SA3-84★	18,972	A185SA2-84★	18,972	A185SA4-84★	21,951	A185SAX-84★	24,450
A210SA3-84★	21,842	A210SA2-84★	21,842	A210SA4-84★	24,812	A210SAX-84★	27,600
A260SA3-84★	24,098	A260SA2-84★	24,098	A260SA4-84★	26,798	A260SAX-84★	29,400
A300SA3-84★	28,391	A300SA2-84★	28,391	A300SA4-84★	31,184	A300SAX-84★	33,000
A400SA3-70★	35,247	A400SA2-70★	35,247	A400SA4-70★	38,807	A400SAX-70★	41,175
A460SA3-70★	42,557	A460SA2-70★	42,557	A460SA4-70★	45,932	A460SAX-70★	50,700
A580SA3-70★	59,997	A580SA2-70★	59,997	A580SA4-70★	62,324	A580SAX-70★	68,700
A750SA3-70★	65,993	A750SA2-70★	65,993	A750SA4-70★	69,368	A750SAX-70★	75,300
NEMA rated							
A16NSA3-84★	\$ 5823	A16NSA2-84★	\$ 5823	A16NSA4-84★	\$ 6993	A16NSAX-84★	\$ 8550
A26NSA3-84★	6117	A26NSA2-84★	6177	A26NSA4-84★	7347	A26NSAX-84★	8888
A50NSA3-84★	6723	A50NSA2-84★	6723	A50NSA4-84★	7893	A50NSAX-84★	9600
A75NSA3-84★	8181	A75NSA2-84★	8181	A75NSA4-84★	9261	A75NSAX-84★	10,988
A145NSA3-84★	14,013	A145NSA2-84★	14,013	A145NSA4-84★	16,983	A145NSAX-84★	18,300
A260NSA3-84★	24,098	A260NSA2-84★	24,098	A260NSA4-84★	26,798	A260NSAX-84★	29,400
A460NSA3-70★	42,557	A460NSA2-70★	42,557	A460NSA4-70★	45,932	A460NSAX-70★	50,700
A750NSA3-70★	65,993	A750NSA2-70★	65,993	A750NSA4-70★	69,368	A750NSAX-70★	75,300

★ Overload relay suffix code. Select from the overload relay selection chart on page 3.6.

Control transformer option

Contactor size	VA rating	List price adder
A9 – A40	45 ①	\$ 300
A9 – A40	50	360
A50 – A75	75	435
A95 – A110	100	560
A145 – A185	150	720
A210 – A300	250	795
A400 – A460	150	720 ②
A580 – A750	250	795 ②

① No primary fusing provided.

② A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Wye-delta, open transition

A26 - A750

Three phase

3

UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type 1 (Indoor metal)	
	Maximum motor horsepower ratings ^①				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
UL rated								
28	15	15	40	40	A26SG-84★◆	\$ 3038	A26SG1-84★◆	\$ 3092
34	15	20	40	50	A30SG-84★◆	3347	A30SG1-84★◆	3392
42	20	25	50	60	A40SG-84★◆	3450	A40SG1-84★◆	3494
54	25	30	60	75	A50SG-84★◆	3515	A50SG1-84★◆	3659
65	30	40	75	100	A63SG-84★◆	3615	A63SG1-84★◆	4704
80	40	50	100	125	A75SG-84★◆	4766	A75SG1-84★◆	5324
95	50	60	125	150	A95SG-84★◆	6600	A95SG1-84★◆	6900
110	60	60	150	150	A110SG-84★◆	8834	A110SG1-84★◆	9222
130	75	75	150	200	A145SG-84★◆	10,103	A145SG1-84★◆	11,333
156	75	100	200	250	A185SG-84★◆	13,133	A185SG1-84★◆	14,120
192	100	125	250	300	A210SG-84★◆	15,498	A210SG1-84★◆	16,500
248	125, 150	150	300, 350	350, 400	A260SG-84★◆	17,960	A260SG1-84★◆	19,958
302	150	200	400	500	A300SG-84★◆	25,950	A300SG1-84★◆	27,900
414	200, 250	250	500	700	A400SG-70★◆	36,000	A400SG1-70★◆	38,916
480	300	300	650	850	A460SG-70★◆	38,506	A460SG1-70★◆	42,710
590	350	400	800	1000	A580SG-70★◆	49,409	A580SG1-70★◆	51,018
810	450	500	1000	1250	A750SG-70★◆	54,401	A750SG1-70★◆	57,605

NEMA rated

NEMA size	Continuous current	200V	230V	460/575V				
1	27	10	10	15	A26N1SG-84★◆	\$ 3038	A26NSG1-84★◆	\$ 3092
2	45	20	25	40	A50N2SG-84★◆	3515	A50NSG1-84★◆	3659
3	90	40	50	75	A75N3SG-84★◆	4766	A75NSG1-84★◆	5324
4	135	60	75	150	A145N4SG-84★◆	10,103	A145NSG1-84★◆	11,333
5	270	150	150	300	A260N5SG-84★◆	17,960	A260NSG1-84★◆	19,958
6	540	300	350	700	A460N6SG-70★◆	39,506	A460NSG1-70★◆	42,710
7	810	500	500	1000	A750N7SG-70★◆	54,401	A750NSG1-70★◆	57,605

★ Overload Relay suffix code. Select from the overload relay selection chart on page 3.6.
◆ Horsepower and line voltage suffix code. Select from page 3.74.

Description

The wye-delta open transition starter starts the motor by closing the S and 1M contactors which energize the windings in wye. The inrush current in wye is reduced to 33% of what it would be if the motor was started with an across the line starter.

The starting time in wye is adjustable with a timer. After the elapsed time, the S contactor opens which closes the 2M contactor; there is a short period (about 50ms) when the motor is not energized; and then the motor runs full voltage in delta.

A wye-delta starter requires a wye-delta wound motor with all six leads terminated outside the motor housing.

Factory modifications

See page 3.3

Contactors and overload relays are sized at 58% of full load amps!

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SG1-80★

Coil voltage selection – A9 - A300 ①

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ①

Hz	type	CntrVolts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ②
50	AF	68	69	70	71 ②
DC	AF	68	69	70	71 ②

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

① For AF50 - AF300 starters, consult factory.
② For AF400 - AF750 only.

Wye-delta, open transition

A26 - A750

Three phase

3

Reduced voltage
starters

UL Type 3R (Outdoor Metal)		UL Type 12 (Metal Dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless Steel)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price

3

UL rated

A26SG3-84★◆	\$ 3992	A26SG2-84★◆	\$ 3992	A26SG4-84★◆	\$ 4172	A26SGX-84★◆	\$ 4800
A30SG3-84★◆	4335	A30SG2-84★◆	4335	A30SG4-84★◆	4485	A30SGX-84★◆	5138
A40SG3-84★◆	4425	A40SG2-84★◆	4425	A40SG4-84★◆	4575	A40SGX-84★◆	5400
A50SG3-84★◆	4784	A50SG2-84★◆	4784	A50SG4-84★◆	4874	A50SGX-84★◆	5738
A63SG3-84★◆	5847	A63SG2-84★◆	5847	A63SG4-84★◆	5850	A63SGX-84★◆	6750
A75SG3-84★◆	6674	A75SG2-84★◆	6674	A75SG4-84★◆	7079	A75SGX-84★◆	8438
A95SG3-84★◆	7875	A95SG2-84★◆	7875	A95SG4-84★◆	8205	A95SGX-84★◆	9625
A110SG3-84★◆	10,508	A110SG2-84★◆	10,508	A110SG4-84★◆	10,950	A110SGX-84★◆	13,125
A145SG3-84★◆	12,902	A145SG2-84★◆	12,902	A145SG4-84★◆	13,865	A145SGX-84★◆	16,238
A185SG3-84★◆	14,385	A185SG2-84★◆	14,385	A185SG4-84★◆	15,150	A185SGX-84★◆	18,150
A210SG3-84★◆	18,215	A210SG2-84★◆	18,215	A210SG4-84★◆	19,035	A210SGX-84★◆	21,450
A260SG3-84★◆	22,388	A260SG2-84★◆	22,388	A260SG4-84★◆	25,088	A260SGX-84★◆	27,338
A300SG3-84★◆	30,383	A300SG2-84★◆	30,383	A300SG4-84★◆	31,538	A300SGX-84★◆	35,475
A400SG3-84★◆	41,150	A400SG2-84★◆	41,150	A400SG4-84★◆	42,816	A400SGX-84★◆	46,575
A460SG3-70★◆	46,085	A460SG2-70★◆	46,085	A460SG4-70★◆	49,460	A460SGX-70★◆	51,900
A580SG3-70★◆	54,576	A580SG2-70★◆	54,576	A580SG4-70★◆	57,783	A580SGX-70★◆	61,425
A750SG3-70★◆	60,980	A750SG2-70★◆	60,980	A750SG4-70★◆	64,355	A750SGX-70★◆	70,125

NEMA rated

A26NSG3-84★◆	\$ 3992	A26NSG2-84★◆	\$ 3992	A26NSG4-84★◆	\$ 4172	A26NSGX-84★◆	\$ 4800
A50NSG3-84★◆	4784	A50NSG2-84★◆	4784	A50NSG4-84★◆	4874	A50NSGX-84★◆	5738
A75NSG3-84★◆	6674	A75NSG2-84★◆	6674	A75NSG4-84★◆	7079	A75NSGX-84★◆	8438
A145NSG3-84★◆	12,902	A145NSG2-84★◆	12,902	A145NSG4-84★◆	13,865	A145NSGX-84★◆	16,238
A260NSG3-84★◆	22,388	A260NSG2-84★◆	22,388	A260NSG4-84★◆	25,088	A260NSGX-84★◆	27,338
A460NSG3-70★◆	46,085	A460NSG2-70★◆	46,085	A460NSG4-70★◆	49,460	A460NSGX-70★◆	51,900
A750NSG3-70★◆	60,980	A750NSG2-70★◆	60,980	A750NSG4-70★◆	64,355	A750NSGX-70★◆	70,125

- ★ Overload Relay suffix code. Select from the overload relay selection chart on page 3.6.
- ◆ Horsepower and line voltage suffix code. Select from page 3.74.

Control transformer option

Contactor size	VA rating	List price adder
A9 - A40	45 ①	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95 - A110	100	560
A145 - A185	150	720
A210 - A300	250	795
A400 - A460	150	720 ②
A580 - A750	250	795 ②

① No primary fusing provided.
 ② A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Wye-delta, closed transition

A26 - A750

Three phase

3

UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type 1 (Indoor metal)	
	Maximum motor horsepower ratings [Ⓜ]							
	200/208V	230/240V	460/480V	575/600V	Catalog number	List price	Catalog number	List price
UL rated								
28	15	15	30	40	A26SY-84★◆	\$ 4667	A25SY1-84★◆	\$ 4721
34	15	20	40	50	A30SY-84★◆	4967	A30SY1-84★◆	5021
42	20	25	50	60	A40SY-84★◆	5198	A40SY1-84★◆	5342
54	25	30	60	75	A50SY-84★◆	5396	A50SY1-84★◆	5540
65	30	40	75	100	A63SY-84★◆	7034	A63SY1-84★◆	7592
80	40	50	100	125	A75SY-84★◆	7781	A75SY1-84★◆	8339
95	50	60	125	—	A95SY-84★◆	12,000	A95SY1-84★◆	13,000
110	60	60	150	150	A110SY-84★◆	13,108	A110SY1-84★◆	14,107
130	75	75	150	200	A145SY-84★◆	14,324	A145SY1-84★◆	15,323
156	75	100	200	250	A185SY-84★◆	20,174	A185SY1-84★◆	21,173
192	100	125	250	300	A210SY-84★◆	23,054	A210SY1-84★◆	25,052
248	125, 150	150	300, 350	350, 400	A260SY-84★◆	24,413	A260SY1-84★◆	26,411
302	150	200	400	500	A300SY-84★◆	32,063	A300SY1-84★◆	37,061
414	200, 250	250	500	700	A400SY-70★◆	39,863	A400SY1-70★◆	43,350
480	300	300	650	850	A460SY-70★◆	50,522	A460SY1-70★◆	53,726
590	350	400	800	1000	A580SY-70★◆	65,910	A580SY1-70★◆	68,132
810	450	500	1000	1250	A750SY-70★◆	71,492	A750SY1-70★◆	74,696
NEMA rated								
NEMA size	Continuous current	200V	230V	460/575V				
1	27	10	10	15	A26N1SY-84★◆	\$ 4667	A26NSY1-84★◆	\$ 4721
2	45	20	25	40	A50N2SY-84★◆	5396	A50NSY1-84★◆	5540
3	90	40	50	75	A75N3SY-84★◆	7781	A75NSY1-84★◆	8339
4	135	60	75	150	A145N4SY-84★◆	14,324	A145NSY1-84★◆	15,323
5	270	150	150	300	A260N5SY-84★◆	24,413	A260NSY1-84★◆	26,411
6	540	300	350	700	A460N6SY-70★◆	50,522	A460NSY1-70★◆	53,726
7	810	500	500	1000	A750N7SY-70★◆	71,492	A750NSY1-70★◆	74,696

★ Overload Relay suffix code. Select from the overload relay selection chart on page 3.6.
◆ Horsepower and line voltage suffix code. Select from page 3.74.

Description

The wye-delta closed transition starter works the same way as the open transition wye-delta starter except the closed transition version utilizes a set of resistors during the transition from start to run (wye to delta connection). These resistors eliminate the open circuit and prevent transient currents.

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SY1-80★

Factory modifications

See page 3.3

Coil voltage selection – A9 - A300 ①

Hz	Cntr. type	Volts																
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600	
60	A	81	83	84	84			34	36	80	42			86	86	51	53	55
50	A	81	83	84				80						85	86			55

For other voltages, see page 1.26.

Coil voltage selection – A400 - A750 ①

Hz	Cntr. type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ②
50	AF	68	69	70	71 ②
DC	AF	68	69	70	71 ②

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 – 240/120	460 – 480/120	575 – 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory.

Contactors and overload relays are sized at 58% of full load amps!

① For AF50 - AF300 starters, consult factory.
② AF400 - AF750 only.

Wye-delta, closed transition A26 - A750 Three phase

3

Reduced voltage
starters

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UL Type 3R (Outdoor metal)		Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price

UL rated

A26SY3-84★◆	\$ 5621	A26SY2-84★◆	\$ 5621	A26SY4-84★◆	\$ 5801	A26SYX-84★◆	\$ 6450
A30SY3-84★◆	5921	A30SY2-84★◆	5921	A30SY4-84★◆	6101	A30SYX-84★◆	6788
A40SY3-84★◆	6467	A40SY2-84★◆	6467	A40SY4-84★◆	6557	A40SYX-84★◆	7275
A50SY3-84★◆	6665	A50SY2-84★◆	6665	A50SY4-84★◆	6755	A50SYX-84★◆	7650
A63SY3-84★◆	8942	A63SY2-84★◆	8942	A63SY4-84★◆	9347	A63SYX-84★◆	10,163
A75SY3-84★◆	9689	A75SY2-84★◆	9689	A75SY4-84★◆	10,094	A75SYX-84★◆	11,138
A95SY3-84★◆	14,900	A95SY2-84★◆	14,900	A95SY4-84★◆	15,900	A95SYX-84★◆	17,000
A110SY3-84★◆	15,907	A110SY2-84★◆	15,907	A110SY4-84★◆	16,870	A110SYX-84★◆	18,350
A145SY3-84★◆	17,123	A145SY2-84★◆	17,023	A145SY4-84★◆	18,086	A145SYX-84★◆	19,950
A185SY3-84★◆	22,973	A185SY2-84★◆	22,973	A185SY4-84★◆	28,436	A185SYX-84★◆	30,225
A210SY3-84★◆	27,482	A210SY2-84★◆	27,482	A210SY4-84★◆	30,182	A210SYX-84★◆	32,400
A260SY3-84★◆	28,841	A260SY2-84★◆	28,841	A260SY4-84★◆	31,541	A260SYX-84★◆	33,450
A300SY3-84★◆	34,991	A300SY2-84★◆	34,991	A300SY4-84★◆	37,691	A300SYX-84★◆	40,688
A400SY3-70★◆	41,250	A400SY2-70★◆	41,250	A400SY4-70★◆	45,330	A400SYX-70★◆	48,675
A460SY3-70★◆	57,101	A460SY2-70★◆	57,101	A460SY4-70★◆	60,476	A460SYX-70★◆	66,900
A580SY3-70★◆	72,749	A580SY2-70★◆	72,749	A580SY4-70★◆	75,633	A580SYX-70★◆	83,625
A750SY3-70★◆	78,071	A750SY2-70★◆	78,071	A750SY4-70★◆	81,446	A750SYX-70★◆	88,725

NEMA rated

A26NSY3-84★◆	\$ 5621	A26NSY2-84★◆	\$ 5621	A26NSY4-84★◆	\$ 5801	A26NSYX-84★◆	\$ 6450
A50NSY3-84★◆	6665	A50NSY2-84★◆	6665	A50NSY4-84★◆	6755	A50NSYX-84★◆	7650
A75NSY3-84★◆	9689	A75NSY2-84★◆	9689	A75NSY4-84★◆	10,094	A75NSYX-84★◆	11,138
A145NSY3-84★◆	17,123	A145NSY2-84★◆	17,023	A145NSY4-84★◆	18,086	A145NSYX-84★◆	19,950
A260NSY3-84★◆	28,841	A260NSY2-84★◆	28,841	A260NSY4-84★◆	31,541	A260NSYX-84★◆	33,450
A460NSY3-70★◆	57,101	A460NSY2-70★◆	57,101	A460NSY4-70★◆	60,476	A460NSYX-70★◆	66,900
A750NSY3-70★◆	78,071	A750NSY2-70★◆	78,071	A750NSY4-70★◆	81,446	A750NSYX-70★◆	88,725

★ Overload Relay suffix code. Select from the overload relay selection chart on page 3.6.

◆ Horsepower and line voltage suffix code. Select from page 3.74.

Control transformer option

Contactor size	VA rating	List price adder
A9 - A40	45 ①	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95 - A110	100	560
A145 - A185	150	720
A210 - A300	250	795
A400 - A460	150	720 ②
A580 - A750	250	795 ②

① No primary fusing provided.

② A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Part winding, non-reversing A26 - A750 Three phase

3

UL motor switching current	Maximum ratings – UL Listed				Open type		UL Type 1 (Indoor metal)	
	Maximum motor horsepower ratings ^①				Catalog number	List price	Catalog number	List price
	200/208V	230/240V	460/480V	575/600V				
	UL rated							
28	15	15	40	40	A26SH-84★◆	\$ 1917	A26SH1-84★◆	\$ 1971
34	15	20	40	50	A30SH-84★◆	2097	A30SH1-84★◆	2151
42	20	25	50	60	A40SH-84★◆	2586	A40SH1-84★◆	2643
54	25	30	60	75	A50SH-84★◆	2664	A50SH1-84★◆	2808
65	30	40	75	100	A63SH-84★◆	3305	A63SH1-84★◆	3458
80	40	50	100	125	A75SH-84★◆	3708	A75SH1-84★◆	3960
95	50	60	125	150	A95SH-84★◆	6700	A95SH1-84★◆	6950
110	60	60	150	150	A110SH-84★◆	7142	A110SH1-84★◆	7395
130	75	75	150	200	A145SH-84★◆	8001	A145SH1-84★◆	8469
156	75	100	200	250	A185SH-84★◆	10,098	A185SH1-84★◆	10,569
192	100	125	250	300	A210SH-84★◆	14,310	A210SH1-84★◆	14,769
248	125, 150	150	300, 350	350, 400	A260SH-84★◆	16,749	A260SH1-84★◆	17,739
302	200, 250	200	400	500	A300SH-84★◆	30,591	A300SH1-84★◆	31,590
414	300	300	600	800	A400SH-70★◆	36,000	A400SH1-70★◆	37,089
480	300	350	700	900	A460SH-70★◆	39,885	A460SH1-70★◆	42,938
590	350	400	800	1000	A580SH-70★◆	42,158	A580SH1-70★◆	51,471
810	500	500	1100	1400	A750SH-70★◆	50,994	A750SH1-70★◆	56,664

NEMA rated

NEMA size	Continuous current	200V	230V	460/575V				
1	27	10	10	15	A26N1SH-84★◆	\$ 1917	A26NSH1-84★◆	\$ 1971
2	45	20	25	40	A50N2SH-84★◆	2664	A50NSH1-84★◆	2808
3	90	40	50	75	A75N3SH-84★◆	3708	A75NSH1-84★◆	3960
4	135	75	125	150	A145N4SH-84★◆	8001	A145NSH1-84★◆	8469
5	270	150	150	350	A260N5SH-84★◆	16,749	A260NSH1-84★◆	17,739
6	540	250	300	600	A460N6SH-70★◆	39,885	A460NSH1-70★◆	42,938
7	810	400	450	900	A750N7SH-70★◆	50,994	A750NSH1-70★◆	56,664

★ Overload Relay suffix code. Select from the overload relay selection chart on page 3.6.
◆ Horsepower and line voltage suffix code. Select from page 3.74.

Part winding

The part winding starter reduces inrush current by using two different sets of windings in the motor. Therefore, part winding starters can be used only with motors having stator windings divided into two equal parts with the terminals of each part available for external connection.

The part winding starter consists of two across the line starters and a timer. The first starter is used to connect one winding of the motor across the line. The starting current from one winding will be about 50% of the starting current if both windings were connected. The starting torque is correspondingly 50%.

Because the starting torque is so low and will not increase until the second winding is connected, the motor may not begin to accelerate. Therefore, the time delay for the second winding to be energized should not be more than 4 seconds.

When the second winding is energized, the inrush current will increase depending upon the speed of the motor when the second winding is energized.

Contactors and overload relays are sized at 50% of full load amps!

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 starter: A75SH1-80★

Factory modifications

See page 3.3

Coil voltage selection chart

Hz	Cntr type	Volts																	
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600		
60	A		81	83	84	84			34	36	80	42			86	86	51	53	55
50	A		81	83	84						80				85	86			55

For other voltages, see page 1.26.

Hz	Cntr type	Volts			
		24 - 60	48 - 130	100 - 250	250 - 500
60	AF	68	69	70	71 ②
50	AF	68	69	70	71 ②
DC	AF	68	69	70	71 ②

Control transformer voltage selection chart

Hz	Type	Volts			
		208/120	230 - 240/120	460 - 480/120	575 - 600/120
50/60	A/AF	0	7	8	9

For other voltages, consult factory

① No primary fusing provided.
② AF400 - AF750 only.

Part winding, non-reversing A26 - A750 Three phase

Reduced voltage
starters

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UL Type 3R (Outdoor metal)		UL Type 12 (Metal dusttight)		UL Type 4 (Watertight)		UL Type 4X (Stainless steel)	
Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price

UL rated

A26SH3-84★◆	\$ 2871	A26SH2-84★◆	\$ 2871	A26SH4-84★◆	\$ 3051	A26SHX-84★◆	\$ 3638
A30SH3-84★◆	3075	A30SH2-84★◆	3075	A30SH4-84★◆	3233	A30SHX-84★◆	3825
A40SH3-84★◆	3543	A40SH2-84★◆	3543	A40SH4-84★◆	3723	A40SHX-84★◆	4313
A50SH3-84★◆	3933	A50SH2-84★◆	3933	A50SH4-84★◆	4023	A50SHX-84★◆	4500
A63SH3-84★◆	4583	A63SH2-84★◆	4583	A63SH4-84★◆	4673	A63SHX-84★◆	5363
A75SH3-84★◆	5310	A75SH2-84★◆	5310	A75SH4-84★◆	5715	A75SHX-84★◆	6540
A95SH3-84★◆	8500	A95SH2-84★◆	8500	A95SH4-84★◆	8700	A95SHX-84★◆	9300
A110SH3-84★◆	8745	A110SH2-84★◆	8745	A110SH4-84★◆	9150	A110SHX-84★◆	9900
A145SH3-84★◆	10,269	A145SH2-84★◆	10,269	A145SH4-84★◆	11,232	A145SHX-84★◆	12,225
A185SH3-84★◆	12,369	A185SH2-84★◆	12,369	A185SH4-84★◆	13,332	A185SHX-84★◆	14,813
A210SH3-84★◆	16,569	A210SH2-84★◆	16,569	A210SH4-84★◆	17,532	A210SHX-84★◆	19,050
A260SH3-84★◆	20,169	A260SH2-84★◆	20,169	A260SH4-84★◆	22,869	A260SHX-84★◆	26,100
A300SH3-84★◆	34,020	A300SH2-84★◆	34,020	A300SH4-84★◆	36,720	A300SHX-84★◆	38,225
A400SH3-70★◆	41,589	A400SH2-70★◆	41,589	A400SH4-70★◆	42,552	A400SHX-70★◆	45,263
A460SH3-70★◆	47,438	A460SH2-70★◆	47,438	A460SH4-70★◆	48,401	A460SHX-70★◆	49,913
A580SH3-70★◆	55,971	A580SH2-70★◆	55,971	A580SH4-70★◆	56,934	A580SHX-70★◆	59,400
A750SH3-70★◆	62,064	A750SH2-70★◆	62,064	A750SH4-70★◆	62,541	A750SHX-70★◆	66,150

NEMA rated

A26NSH3-84★◆	\$ 2871	A26NSH2-84★◆	\$ 2871	A26NSH4-84★◆	\$ 3051	A26NSHX-84★◆	\$ 3638
A50NSH3-84★◆	3933	A50NSH2-84★◆	3933	A50NSH4-84★◆	4023	A50NSHX-84★◆	4500
A75NSH3-84★◆	5310	A75NSH2-84★◆	5310	A75NSH4-84★◆	5715	A75NSHX-84★◆	6540
A145NSH3-84★◆	10,269	A145NSH2-84★◆	10,269	A145NSH4-84★◆	11,232	A145NSHX-84★◆	12,225
A260NSH3-84★◆	20,169	A260NSH2-84★◆	20,169	A260NSH4-84★◆	22,869	A260NSHX-84★◆	26,100
A460NSH3-70★◆	47,438	A460NSH2-70★◆	47,438	A460NSH4-70★◆	48,401	A460NSHX-70★◆	49,913
A750NSH3-70★◆	62,064	A750NSH2-70★◆	62,064	A750NSH4-70★◆	62,541	A750NSHX-70★◆	66,150

- ★ Overload Relay suffix code. Select from the overload relay selection chart on page 3.6.
- ◆ Horsepower and line voltage suffix code. Select from page 3.74.

Control transformer option

Contactor size	VA rating	List price adder
A9 - A40	45 ①	\$ 300
A9 - A40	50	360
A50 - A75	75	435
A95 - A110	100	560
A145 - A185	150	720
A210 - A300	250	795
A400 - A460	150	720 ②
A580 - A750	250	795 ②

① No primary fusing provided.
 ② A400 - A750 utilizes the AF wide range coil with a lower coil consumption than A210 - A300.

Circuit diagrams Autotransformer & part winding

Autotransformer – HOA

3

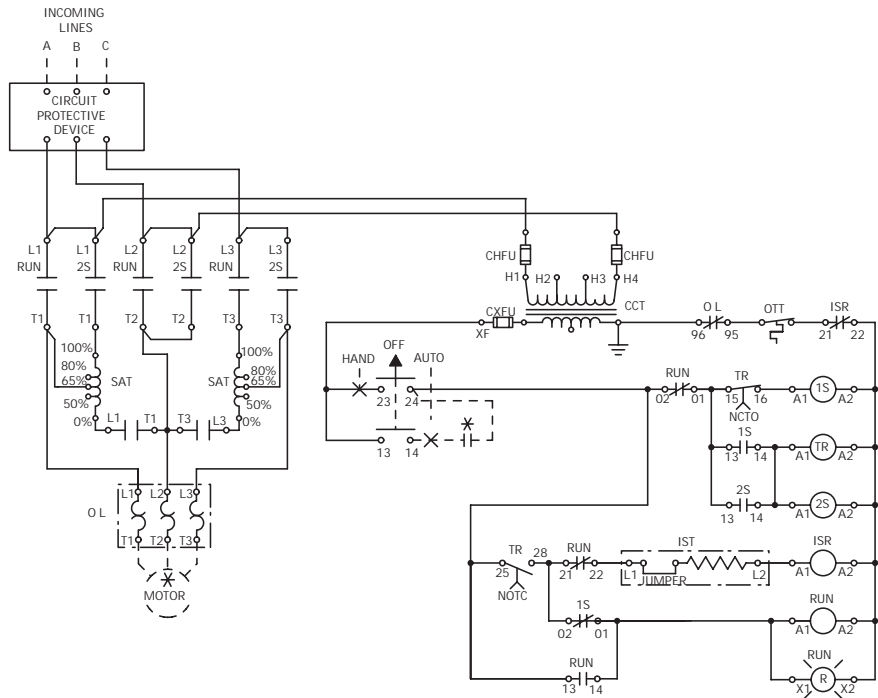
An autotransformer starter reduces inrush current by using a transformer in the line just ahead of the motor to step down the voltage applied to the motor terminals. By reducing the voltage, the current drawn from the line is reduced during start-up.

When the setting time on the timer has expired, the autotransformer is bypassed. The 1S contactor drops out, the run contactor closes, and the 2S contactor opens, providing full voltage to the motor.

The ABB autotransformer starter is a closed transition type, meaning that the motor remains connected to the line during the entire acceleration period.

The transformer has three taps which provide 50%, 65% and 80% of full line voltage. At delivery, the transformer is connected to the 65% tap; the inrush current will be reduced to 42% of normal; and the starting torque will be reduced to 42%.

The autotransformer starter can be used for any squirrel-cage motor.



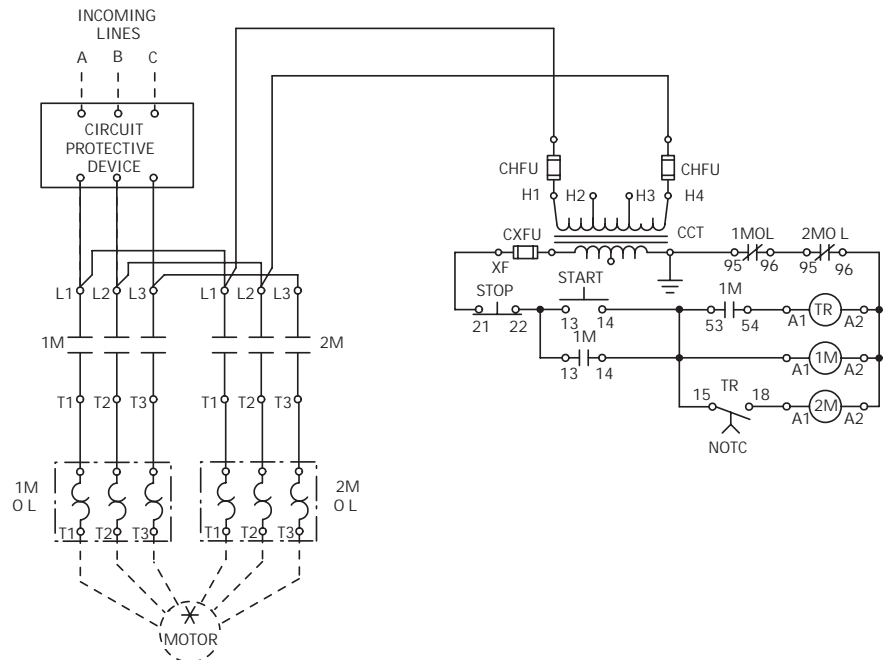
Part winding – STOP-START

The part winding starter reduces inrush current by using two different sets of windings in the motor. Therefore, part winding starters can be used only with motors having stator windings divided into two equal parts with the terminals of each part available for external connection.

The part winding starter consists of two across the line starters and a timer. The first starter is used to connect one winding of the motor across the line. The starting current from one winding will be about 50% of the starting current if both windings were connected. The starting torque is correspondingly 50%.

Because the starting torque is so low and will not increase until the second winding is connected, the motor may not begin to accelerate. Therefore, the time delay for the second winding to be energized should not be more than 4 seconds.

When the second winding is energized, the inrush current will increase depending upon the speed of the motor when the second winding is energized.



Circuit diagrams

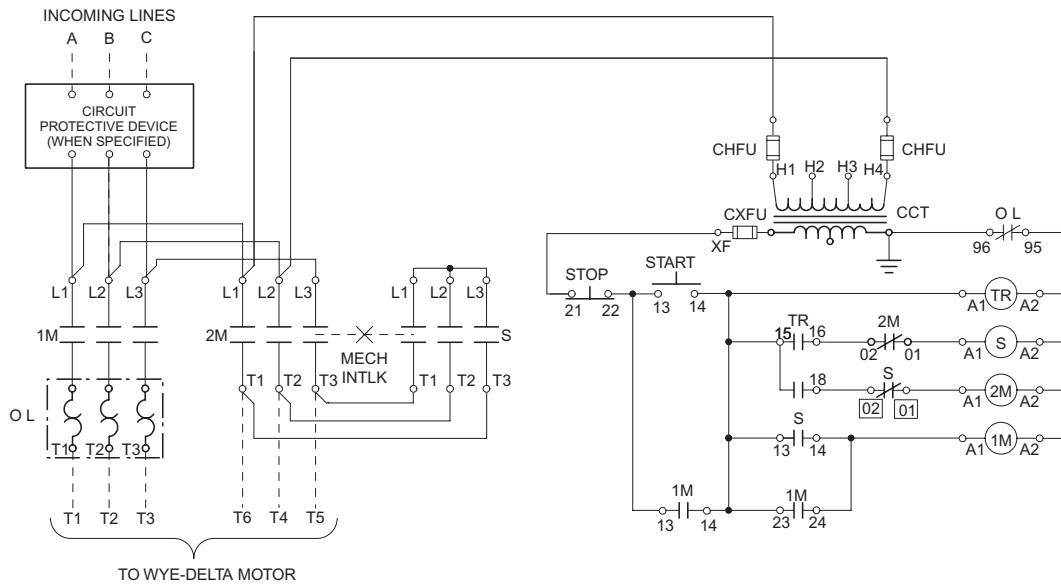
Wye-delta

Wye-delta, open transition – STOP-START

The wye-delta open transition starter starts the motor by closing the S and 1M contactors which energize the windings in wye. The inrush current in wye is reduced to 33% of what it would be if the motor was started with an across the line starter.

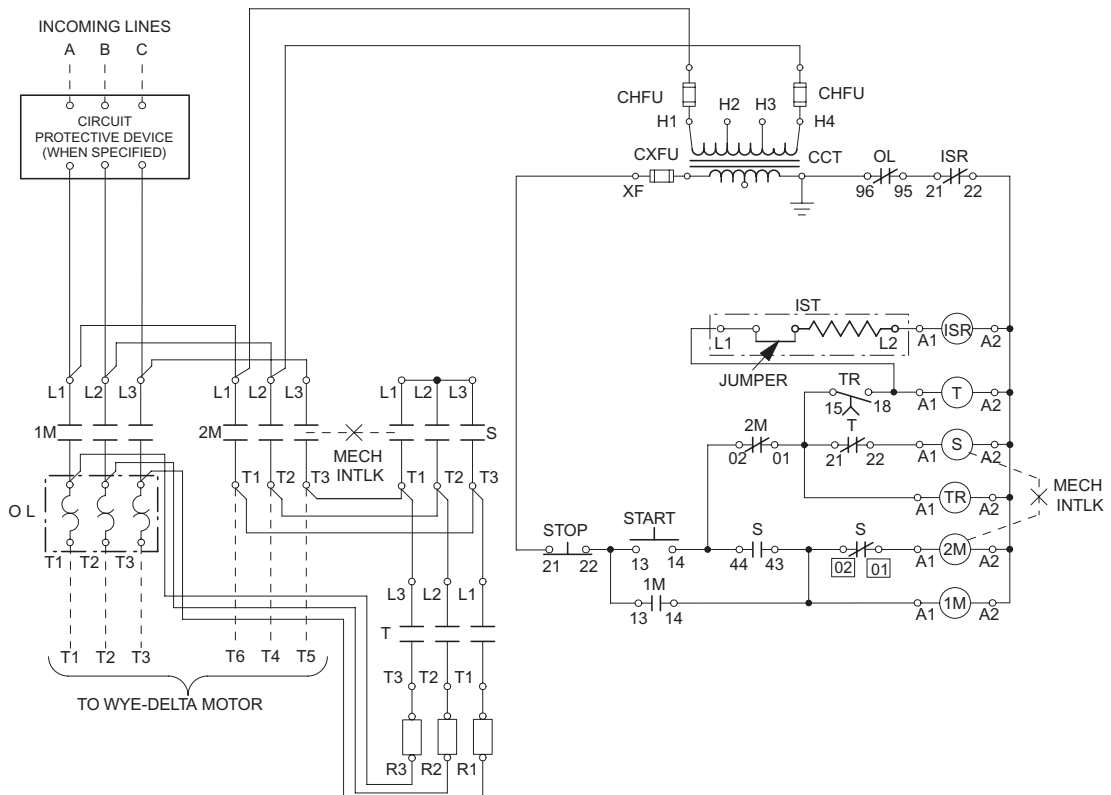
The starting time in wye is adjustable with a timer. After the elapsed time, the S contactor opens which closes the 2M contactor; there is a short period (about 50ms) when the motor is not energized; and then the motor runs full voltage in delta.

A wye-delta starter requires a wye-delta wound motor with all six leads terminated outside the motor housing.



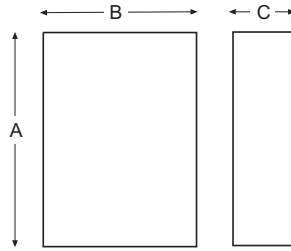
Wye-delta, closed transition – STOP-START

The wye-delta closed transition starter works the same way as the open transition wye-delta starter except the closed transition version utilizes a set of resistors during the transition from start to run (wye to delta connection). These resistors eliminate the open circuit and prevent transient currents.



Approximate dimensions Autotransformer w/CCT Autotransformer, non-fused combination w/CCT

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Autotransformer w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A50 – A75	1	24	20	10
	3R	24	20	10
	4	24	20	10
	4X Stainless	24	20	10
	4X Plastic	30	20	12
A95 – A110	1	30	24	12
	3R	30	30	12
	4	30	30	12
	4X Stainless	30	30	12
	4X Plastic	30	30	12
A145 – A260	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	36	30	12
A300	1	48	36	17
	3R	48	36	16
	4	-	-	-
	4X Stainless	-	-	-
	4X Plastic	48	36	16
A400 – A750	1	87	36	24
	3R	87	36	24
	4	-	-	-
	4X Stainless	-	-	-
	4X Plastic	87	36	24

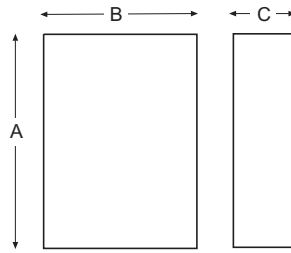
Autotransformer, non-fused combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A50 – A75	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
A95 – A110	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	-	-	-
A145 – A260	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	-	-	-
A300	1	48	36	17
	3R	48	36	16
	4	48	36	16
	4X Stainless	-	-	-
	4X Plastic	48	36	16
A400 – A750	1	87	36	24
	3R	87	36	24
	4	-	-	-
	4X Stainless	-	-	-
	4X Plastic	87	36	24

Approximate dimensions

Autotransformer fused combination w/CCT

Autotransformer, breaker combination w/CCT



Autotransformer, fused combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A50 – A75	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	30	20	12
12	30	24	10	
A95 – A110	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	–	–	–
12	36	30	12	
A145 – A260	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	–	–	–
12	36	30	12	
A300	1	48	36	17
	3R	48	36	16
	4	48	36	16
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	48	36	16	
A400 – A750	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	87	36	24	

Autotransformer, breaker combination w/CCT

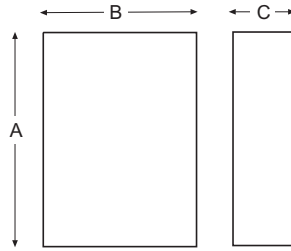
Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A50 – A75	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	30	20	12
12	30	24	10	
A95 – A110	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	–	–	–
12	36	30	12	
A145 – A260	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	–	–	–
12	36	30	12	
A300	1	48	36	17
	3R	48	36	16
	4	48	36	16
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	48	36	16	
A400 – A750	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	87	36	24	

Approximate dimensions

Wye-Delta, open transition w/CCT

Wye-Delta, open transition, combination, non-fused

3



Wye-Delta, open transition w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	8
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A95 – A110	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A145 – A185	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
A210 – A300	1	30	24	12
	3R	30	24	12
	4	30	24	12
	4X Stainless	30	24	12
	4X Plastic	30	20	12
A400	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	36	30	12
A460	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	42	36	12
A580 – A750	1	42	36	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	42	36	12

Wye-Delta, open transition, combination, non-fused

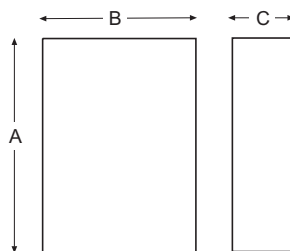
Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	8
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A95 – A110	1	36	30	8
	3R	36	30	8
	4	36	30	8
	4X Stainless	36	30	8
	4X Plastic	40	30	12
A145 – A185 (NF400)	1	42	36	9
	3R	36	36	8
	4	36	36	8
	4X Stainless	36	36	12
	4X Plastic	–	–	–
A210 (NF400)	1	42	36	9
	3R	36	36	12
	4	36	36	12
	4X Stainless	36	36	12
	4X Plastic	–	–	–
A260 – A300 (NF600)	1	–	–	–
	3R	60	36	10
	4	60	36	10
	4X Stainless	60	36	10
	4X Plastic	60	36	10
A400 (NF800) A460 (NF1200) A580 (NF1200) A750 (NF1600)	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	–	–	–
	4X Plastic	87	36	24

Approximate dimensions

Wye-Delta, open transition, combination, fused
Wye-Delta, open transition, combination, breaker

Reduced voltage
starters

3



Wye-Delta, open transition, combination, fused

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	8
	4X Stainless	14	12	6
	4X Plastic	14	12	7
	12	14	12	8
A50 – A75	1	24	16	8
	3R	24	16	8
	4	24	16	8
	4X Stainless	24	16	8
	4X Plastic	24	16	8
	12	24	16	8
A95 – A110	1	36	30	8
	3R	36	30	8
	4	36	30	8
	4X Stainless	36	30	8
	4X Plastic	40	30	12
	12	36	30	8
A145 (F400) A185 (F600)	1	42	36	9
	3R	36	36	8
	4	36	36	8
	4X Stainless	36	36	12
	4X Plastic	–	–	–
	12	36	36	8
A210 (F600) A260 (F800)	1	–	–	–
	3R	60	36	10
	4	60	36	10
	4X Stainless	60	36	10
	4X Plastic	–	–	–
	12	60	36	10
A300 (NF1200+FB) A400 (NF1600+FB) A460 (NF1600+FB) A580 (NF2000+FB) A750 (NF3150+FB)	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
	12	87	36	24

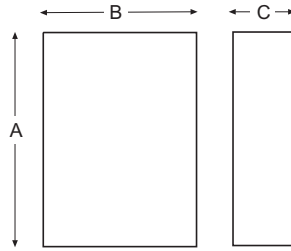
Wye-Delta, open transition, combination, breaker

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	8
	4X Stainless	16	12	6
	4X Plastic	14	12	7
	12	14	12	8
A50 – A75	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	30	20	12
	12	24	20	8
A95 – A110	1	36	30	8
	3R	36	30	8
	4	36	30	8
	4X Stainless	36	30	8
	4X Plastic	40	30	12
	12	36	30	8
A145 (S6) A185 (S6)	1	42	36	9
	3R	36	36	8
	4	36	36	8
	4X Stainless	36	36	12
	4X Plastic	–	–	–
	12	36	36	8
A210 (S7) A300 (S7)	1	42	36	13
	3R	36	36	12
	4	36	36	12
	4X Stainless	36	36	12
	4X Plastic	–	–	–
	12	36	36	12
A400 (S8) A750 (S8)	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
	12	87	36	24

Approximate dimensions

Wye-Delta, closed transition w/CCT
Wye-Delta, closed transition, combination, non-fused

3



Wye-Delta, closed transition w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A50 – A75	1	24	20	10
	3R	24	20	10
	4	24	20	10
	4X Stainless	24	20	10
	4X Plastic	30	20	12
12	24	20	10	
A95 – A110	1	30	24	10
	3R	30	30	12
	4	30	30	12
	4X Stainless	30	30	12
	4X Plastic	30	30	12
12	30	30	10	
A145 – A260	1	36	30	12
	3R	36	30	12
	4	36	30	12
	4X Stainless	36	30	12
	4X Plastic	–	–	–
12	36	30	12	
A300	1	48	36	17
	3R	48	36	16
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	48	36	16	
A400 – A750	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	87	36	24	

Wye-Delta, closed transition, combination, non-fused

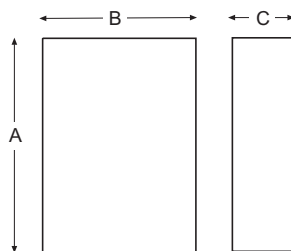
Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	8
	4X Stainless	14	12	6
	4X Plastic	14	12	7
12	14	12	8	
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A95 – A110	1	36	30	8
	3R	36	30	8
	4	36	30	8
	4X Stainless	36	30	8
	4X Plastic	40	30	12
12	36	30	8	
A145 – A185 (NF400)	1	42	36	9
	3R	36	36	8
	4	36	36	8
	4X Stainless	36	36	12
	4X Plastic	–	–	–
12	36	36	8	
A210 (NF400)	1	42	36	9
	3R	36	36	12
	4	36	36	12
	4X Stainless	36	36	12
	4X Plastic	–	–	–
12	36	36	12	
A260 – A300 (NF600)	1	–	–	–
	3R	60	36	10
	4	60	36	10
	4X Stainless	60	36	10
	4X Plastic	–	–	–
12	60	36	10	
A400 (NF800) A460 (NF1200) A580 (NF1200) A750 (NF1600)	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	87	36	24	

Approximate dimensions

Wye-Delta, closed transition, combination, fused
Wye-Delta, closed transition, combination, breaker

Reduced voltage
starters

3



Wye-Delta, closed transition, combination, fused

Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	8
	4X Stainless	14	12	6
	4X Plastic	14	12	7
A50 – A75	1	24	16	8
	3R	24	16	8
	4	24	16	8
	4X Stainless	24	16	8
	4X Plastic	24	16	8
A95 – A110	1	36	30	8
	3R	36	30	8
	4	36	30	8
	4X Stainless	36	30	8
	4X Plastic	40	30	12
A145 (F400) A185 (F600)	1	42	36	9
	3R	36	36	8
	4	36	36	8
	4X Stainless	36	36	12
	4X Plastic	–	–	–
A210 (F600) A260 (F800)	1	–	–	–
	3R	60	36	10
	4	60	36	10
	4X Stainless	60	36	10
	4X Plastic	–	–	–
A300 (NF1200+FB) A400 (NF1600+FB) A460 (NF1600+FB) A580 (NF2000+FB) A750 (NF3150+FB)	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
	12	87	36	24

Wye-Delta, closed transition, combination, breaker

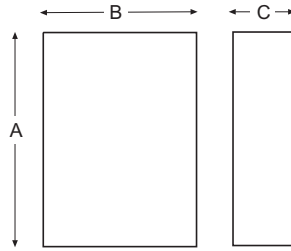
Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
A50 – A75	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
A95 – A110	1	36	30	8
	3R	36	30	8
	4	36	30	8
	4X Stainless	36	30	8
	4X Plastic	–	–	–
A145 (S6) A185 (S6)	1	42	36	9
	3R	36	36	8
	4	36	36	8
	4X Stainless	36	36	12
	4X Plastic	–	–	–
A210 (S7) A300 (S7)	1	42	36	13
	3R	36	36	12
	4	36	36	12
	4X Stainless	36	36	12
	4X Plastic	–	–	–
A400 (S8) A460 (S8) A580 (S8) A750 (S8)	1	87	36	24
	3R	87	36	24
	4	–	–	–
	4X Stainless	–	–	–
	4X Plastic	–	–	–
	12	87	36	24

Approximate dimensions

Part winding w/CCT

Part winding, non-fused combination w/CCT

3



Part winding w/CTT

Starter size	Enclosure type	A	B	C
A9 – A40	1	12	10	6
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
12	14	12	8	
A50 – A75	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
12	14	12	8	
A95 – A110	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A145 – A185	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
12	30	20	8	
A210 – A300	1	30	24	12
	3R	30	20	10
	4	30	20	10
	4X Stainless	30	24	12
	4X Plastic	30	20	12
12	30	20	10	
A400	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	–	–	–
12	36	24	12	
A460	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
12	42	36	12	
A580	1	36	30	12
	3R	36	24	12
	4	36	24	12
	4X Stainless	36	24	12
	4X Plastic	–	–	–
12	36	24	12	
A750	1	42	30	13
	3R	42	36	12
	4	42	36	12
	4X Stainless	42	36	12
	4X Plastic	–	–	–
12	42	36	12	

Part winding, non-fused combination w/CCT

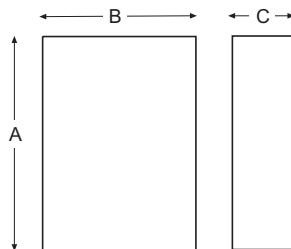
Starter size	Enclosure type	A	B	C
A9 – A40	1	14	12	8
	3R	14	12	8
	4	14	12	6
	4X Stainless	14	12	6
	4X Plastic	14	12	7
12	14	12	8	
A50 – A75	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A95 – A110	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	30	12
12	30	24	8	
A145 – A185	1	30	24	8
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	33	25	12
12	30	24	8	
A210	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	33	25	12
12	30	24	10	
A260 – A300	1	36	30	12
	3R	30	30	10
	4	30	30	10
	4X Stainless	36	30	12
	4X Plastic	40	30	12
12	30	30	10	
A400 – A460	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
12	48	36	12	
A580 – A750	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	–	–	–
	4X Plastic	–	–	–
12	87	36	24	

Approximate dimensions

Part winding, fused combination w/CCT
Part winding, breaker combination w/CCT

Reduced voltage
starters

3



Part winding, fused combination w/CCT

Starter size	Enclosure type	A	B	C
A9 – A40	1	20	16	8
	3R	20	16	8
	4	20	16	8
	4X Stainless	20	16	8
	4X Plastic	20	16	8
12	20	16	8	
A50 – A75	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	24	16	8
12	24	20	8	
A95 – A110	1	30	24	10
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	10
	4X Plastic	30	30	12
12	30	24	10	
A145 – A210	1	36	30	8
	3R	30	30	8
	4	30	30	8
	4X Stainless	30	30	8
	4X Plastic	40	30	12
12	30	30	8	
A260 – A300	1	42	36	13
	3R	36	36	10
	4	36	36	10
	4X Stainless	36	36	12
	4X Plastic	40	30	12
12	36	36	10	
A400 – A460	1	48	36	13
	3R	48	36	12
	4	48	36	12
	4X Stainless	48	36	12
	4X Plastic	–	–	–
12	48	36	12	
A580 – A750	1	87	36	24
	3R	87	36	24
	4	87	36	24
	4X Stainless	87	36	24
	4X Plastic	–	–	–
12	87	36	24	

Part winding, breaker combination w/CCT

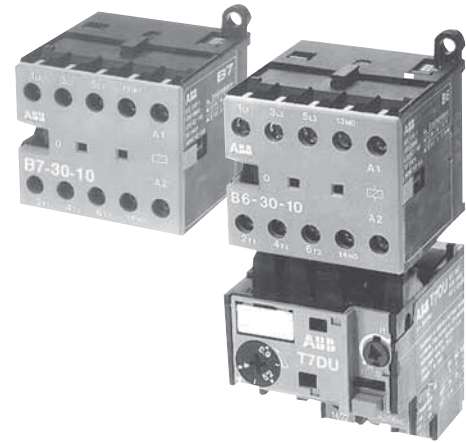
Starter size	Enclosure type	A	B	C
A9 – A40 (S3)	1	14	12	8
	3R	14	12	8
	4	16	12	8
	4X Stainless	16	12	8
	4X Plastic	14	12	7
12	14	12	8	
A50 – A75 (S3)	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	24	16	8
12	24	20	8	
A95 – A110 (S3)	1	30	24	12
	3R	30	24	8
	4	30	24	8
	4X Stainless	30	24	8
	4X Plastic	30	30	12
12	30	24	8	
A145 (S3)	1	24	20	8
	3R	24	20	8
	4	24	20	8
	4X Stainless	24	20	8
	4X Plastic	30	20	12
12	24	20	8	
A185 (S3, S4)	1	30	24	12
	3R	30	20	8
	4	30	20	8
	4X Stainless	30	24	8
	4X Plastic	30	20	12
12	30	20	8	
A210 – A300 (S4, S5)	1	30	24	12
	3R	30	24	10
	4	30	24	10
	4X Stainless	30	24	12
	4X Plastic	33	25	12
12	30	24	10	
A300 (S6)	1	36	30	12
	3R	30	30	10
	4	30	30	10
	4X Stainless	36	30	12
	4X Plastic	40	30	14
12	30	30	10	
A400 – A580 (S6, S7)	1	42	30	13
	3R	42	36	12
	4	42	30	12
	4X Stainless	42	30	12
	4X Plastic	–	–	–
12	42	36	12	
A750 (S7)	1	48	36	17
	3R	48	36	16
	4	48	36	16
	4X Stainless	48	36	16
	4X Plastic	–	–	–
12	48	36	16	

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Miniature controls

- Contactors
- Overload relays
- Starters
- Control relays



Description

General features

- Wiring terminations available include plug-on connectors, wire pins for PC board mounting and solder connections
- Low power consumption coils
- Touch safe design: All screw connection terminals are protected against accidental touch
- Slotted Pozidriv terminal screws
- Screwdriver guide holes
- Self-lifting cable clamps
- Panel or DIN rail mounting
- Terminals supplied in the open position
- Electrically noiseless operation
- Snap-on accessories
- UL Listed, file # E39231
- CSA approved, file #LR15332
- IEC, VDE & most international standards

Contactors

- B6 and BC6 miniature contactors can be used for small motors up to 1 HP, 460V
- B7 and BC7 miniature contactors can be used for small motors up to 5 HP, 460V
- Applications include use in machines, electrical appliances, building automation systems, heating systems, overhead door applications, etc.
- B6 and B7 miniature contactors are designed to be directly connected to a PLC transistor output

Interface contactors

- "Interface" mini-contactors are normally used to establish an isolation between the electronic part and the process in large automation systems

Mechanically interlocked contactors

- Compact, mechanically interlocked contactors are available
- Can be used for reversing applications

Control relays

- AC & DC operated

Overload relays

- 14 setting ranges from 0.11 to 10.5 amps
- Manual or automatic reset
- Phase failure compensation
- Ambient temperature compensation
- Stop and test button functions
- UL Listed, file #E149922
- CSA approved, file # LR98336

Contactor

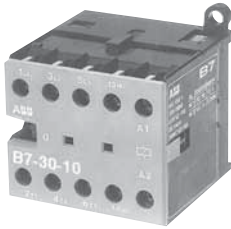
B6 & B7, non-reversing

3 Phase

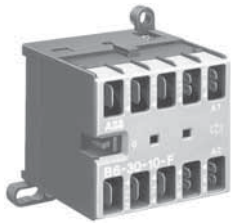
4



B6C-1



B7C-1



B6CFP-1



B7CSP-1

Non-reversing with screw connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3 3 4	1 N.O. 1 N.C. —	B6C-★ B6C-★01 B6C4P-★	\$ 51
16	9.6	2	3	5	5	1	2	3 3 4	1 N.O. 1 N.C. —	B7C-★ B7C-★01 B7C4P-★	72
DC operated											
12	6.8	1	2	3	1	1/2	1	3 3	1 N.O. 1 N.C.	BC6C-★ BC6C-★01	57
16	9.6	2	3	5	5	1	2	3 3	1 N.O. 1 N.C.	BC7C-★ BC7C-★01	78

Non-reversing with flat pin connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3 3 4	1 N.O. 1 N.C. —	B6CFP-★ B6CFP-★01 B6C4PFP-★	\$ 51
16	9.6	2	3	5	5	1	2	3 3 4	1 N.O. 1 N.C. —	B7CFP-★ B7CFP-★01 B7C4PFP-★	72
DC operated											
12	6.8	1	2	3	1	1/2	1	3 3	1 N.O. 1 N.C.	BC6CFP-★ BC6CFP-★01	57
16	9.6	2	3	5	5	1	2	3 3	1 N.O. 1 N.C.	BC7CFP-★ BC7CFP-★01	78

Non-reversing with soldering pin connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3 3 4	1 N.O. 1 N.C. —	B6CSP-★ B6CSP-★01 B6C4PSP-★	\$ 51
16	9.6	2	3	5	5	1	2	3 3 4	1 N.O. 1 N.C. —	B7CSP-★ B7CSP-★01 B7C4PSP-★	72
DC operated											
12	6.8	1	2	3	1	1/2	1	3 3	1 N.O. 1 N.C.	BC6CSP-★ BC6CSP-★01	57
16	9.6	2	3	5	5	1	2	3 3	1 N.O. 1 N.C.	BC7CSP-★ BC7CSP-★01	78

Coil voltage selection

★ Coil voltage suffix. Refer to Coil Voltage Selection Chart and substitute the desired coil voltage suffix for the ★.

Coil voltage selection chart

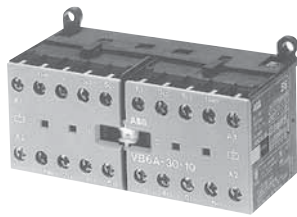
	Volts								
	12	24	42	48	110/125	110/120	220	220/240	380/415
AC 40-450 Hz		F	L	G		1		2	M
DC	U	Y	V	W	P		R		

Contactors

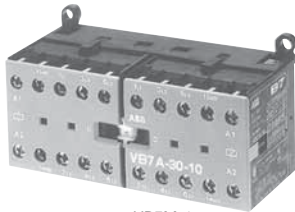
B6 & B7, mechanically interlocked

3 Phase

4



VB6M-1



VB7M-1

Mechanically interlocked with screw connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VB6M-★ VB6M-★01	\$ 104
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VB7M-★ VB7M-★01	143
DC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VBC6M-★ VBC6M-★01	105
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VBC7M-★ VBC7M-★01	156

Mechanically interlocked with flat pin connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VB6MFP-★ VB6MFP-★01	\$ 104
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VB7MFP-★ VB7MFP-★01	143
DC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VBC6MFP-★ VBC6MFP-★01	105
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VBC7MFP-★ VBC7MFP-★01	156

Mechanically interlocked with soldering pin connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VB6MSP-★ VB6MSP-★01	\$ 104
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VB7MSP-★ VB7MSP-★01	143
DC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VBC6MSP-★ VBC6MSP-★01	105
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VBC7MSP-★ VBC7MSP-★01	156

Coil voltage selection

★ Coil voltage suffix. Refer to Coil Voltage Selection Chart and substitute the desired coil voltage suffix for the ★.

Coil voltage selection chart

	Volts								
	12	24	42	48	110/125	110/120	220	220/240	380/415
AC 40-450 Hz		F	L	G		1		2	M
DC	U	Y	V	W	P		R		

Contactors ①

B6 & B7, Interface

3 Phase

4



BC6-2.4



BC7-2.4

Non-reversing with screw connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
DC operated — 24VDC (1.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6-1.4 BC6-01-1.4	\$ 57
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7-1.4 BC7-01-1.4	80
DC operated — 17 – 32VDC (2.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6-2.4 BC6-01-2.4	63
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7-2.4 BC7-01-2.4	80

Non-reversing with flat pin connections

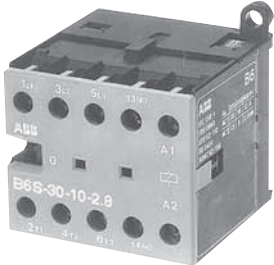
General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
DC operated — 24VDC (1.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6FP-1.4 BC6FP-01-1.4	\$ 57
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7FP-1.4 BC7FP-01-1.4	80
DC operated — 17 – 32VDC (2.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6FP-2.4 BC6FP-01-2.4	63
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7FP-2.4 BC7FP-01-2.4	80

Non-reversing with soldering pin connections

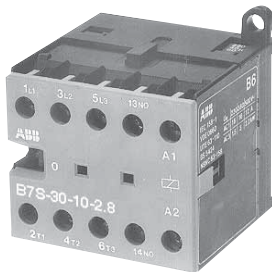
General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
DC operated — 24VDC (1.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6SP-1.4 BC6SP-01-1.4	\$ 57
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7SP-1.4 BC7SP-01-1.4	80
DC operated — 17 – 32VDC (2.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6SP-2.4 BC6SP-01-2.4	63
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7SP-2.4 BC7SP-01-2.4	80

① Interface contactors cannot utilize auxiliary contacts.

Contactors for connection to PLCs ① 3 Phase



B6S-2.8

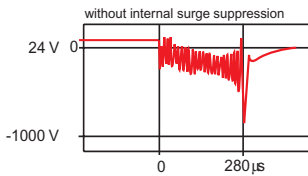


B7S-2.8

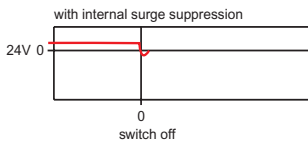
Non-reversing with screw connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
DC operated — 24VDC (1.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	B6SC-1.7 B6SC-01-1.7	\$ 65
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	B7SC-1.7 B7SC-01-1.7	69
DC operated — 17 – 32VDC (2.4W low power consumption)											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	B6SC-2.8 B6SC-01-2.8	65
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	B7SC-2.8 B7SC-01-2.8	69

Oscillograms typical operation



Switching off of interface contactors
BC6, BC7, coil voltage 24 VDC.

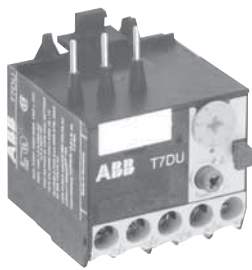


Switching off of B6S, B7S coil voltage
24VDC which provides electrically
noiseless operation

① Contactors for connection to PLCs cannot utilize auxiliary contacts.

Thermal overload relays T7DU

4



T7DU

Thermal overload relay — for contactors B6,B7, BC6, BC7, B6S, B7S, VB6(7), VBC6(7), VB6A(7A), VBC6A(7A)

Setting range Amps	Catalog number	List price
0.1 – 0.16 0.16 – 0.24 0.24 – 0.4	T7DU0.16 T7DU0.24 T7DU0.4	\$ 48
0.4 – 0.6 0.6 – 1.0 1.0 – 1.6	T7DU0.6 T7DU1.0 T7DU1.6	
1.6 – 2.4 2.4 – 4.0 4.0 – 6.0	T7DU2.4 T7DU4.0 T7DU6.0	
6.0 – 9.0 9.0 – 12.0	T7DU9.0 T7DU12.0	

Loading capacity of auxiliary switches

Type	T7DU			
	N.C. 95 – 96	N.O. 97 – 98		
Rated operating voltage U_e /V IEC / UL508	V	500 / 300	500 / 300	
Thermal current	A	6	6	
Rated operating current I_e	at AC-15 220/240 V	A	1.5	1.5
	at AC-15 380/415 V	A	0.7	0.5
	at AC-15 500 V	A	0.5	0.3
	at DC-15 220 V	A	0.2	0.2
Pilot duty rating	AC	A300	A300	
	DC	P300	P300	
General use	240V	1.5A	1.5A	
	600V	0.6A	0.6A	

Thermal overload relay T7DU

Setting range A – A	Short circuit protection (fuses, circuit breakers)				Resistance per phase W	Joule losses per phase at upper current setting W
	Coordination Type 2 (IEC) gL/gG A	Coordination Type 1(IEC) gL/gG A	600V, 5kA			
			Fuse	MCCB		
0.1 – 0.16	0.5	20	1	15A	62.3	1.6
0.16 – 0.24	1	20	1	15A	27	1.6
0.24 – 0.4	2	20	1	15A	11.7	1.9
0.4 – 0.6	2	20	1	15A	4.61	1.7
0.6 – 1.0	4	20	3	15A	1.66	1.7
1.0 – 1.6	6	20	6	15A	0.63	1.6
1.6 – 2.4	6	20	6	15A	0.27	1.6
2.4 – 4.0	10	20	15	15A	0.107	1.7
4.0 – 6.0	10	20	20	15A	0.049	1.8
6.0 – 9.0	10	20	35	15A	0.021	1.7
9.0 – 12.0	20	20	45	15A	0.010	1.4

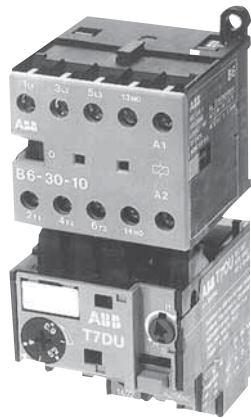
Electronic overload relays

See pages 2.19 to 2.30.

Starters ①

B6 & B7, non-reversing

3 Phase



B6S-★★

Non-Reversing, 3 phase – Screw connections only

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	B6S-★★ B6S-★01◆	\$ 108
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	B7S-★★ B7S-★01◆	132
DC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6S-★★ BC6S-★01◆	114
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7S-★★ BC7S-★01◆	138

★ Coil voltage suffix. Refer to Coil Voltage Selection chart and substitute the desired coil voltage suffix for the ★.
◆ Overload relay suffix. Refer to the Overload Relay Selection chart and substitute the desired starter suffix code for the ◆.

Reversing, 3 phase – Screw connections only

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	B6SR-★★ B6SR-★01◆	\$ 179
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	B7SR-★★ B7SR-★01◆	218
DC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6SR-★★ BC6SR-★01◆	180
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7SR-★★ BC7SR-★01◆	231

★ Coil voltage suffix. Refer to Coil Voltage Selection chart and substitute the desired coil voltage suffix for the ★.
◆ Overload relay suffix. Refer to the Overload Relay Selection chart and substitute the desired starter suffix code for the ◆.

Coil voltage selection

	Volts								
	12	24	42	48	110/125	110/120	220	220/240	380/415
AC 40-450 Hz	F	L	G			1		2	M
DC	U	Y	V	W	P		R		

Overload relay selection

T7DU – Thermal overload

Catalog number	Current setting range	Starter range code
T7DU0.16	0.1 – 0.16	A
T7DU0.24	0.16 – 0.24	B
T7DU0.4	0.24 – 0.4	C
T7DU0.6	0.4 – 0.6	D
T7DU1.0	0.6 – 1.0	E
T7DU1.6	1.0 – 1.6	F
T7DU2.4	1.6 – 2.4	G
T7DU4.0	2.4 – 4.0	H
T7DU6.0	4.0 – 6.0	J
T7DU9.0	6.0 – 9.0	K
T7DU12.0	9.0 – 12.0	L

E16DU – Electronic overload

Catalog number	Current setting range	Current tripping class	Starter range code
E16DU0.32-10	0.1 – 0.32	10	A1
E16DU1.0-10	0.3 – 1.0	10	B1
E16DU2.7-10	0.9 – 2.7	10	C1
E16DU6.3-10	2.0 – 6.3	10	D1
E16DU18.9-10	5.7 – 18.9	10	E1
E16DU0.32-20	0.1 – 0.32	20	A2
E16DU1.0-20	0.3 – 1.0	20	B2
E16DU2.7-20	0.9 – 2.7	20	C2
E16DU6.3-20	2.0 – 6.3	20	D2
E16DU18.9-20	5.7 – 18.9	20	E2
E16DU0.32-30	0.1 – 0.32	30	A3
E16DU1.0-30	0.3 – 1.0	30	B3
E16DU2.7-30	0.9 – 2.7	30	C3
E16DU6.3-30	2.0 – 6.3	30	D3
E16DU18.9-30	5.7 – 18.9	30	E3

① For enclosed miniature starters, please consult factory for catalog number and pricing.

Starters ①

B6 & B7, Non-reversing

Single phase

4

Non-Reversing, Single phase – Screw connections only

General purpose AC1	Maximum motor FLA AC3	Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		120V	230V				
AC operated							
12	6.8	1/2	1	3	1 N.O. 1 N.C.	B6SS-★◆ B6SS-★01◆	\$ 108
16	9.6	1	2	3	1 N.O. 1 N.C.	B7SS-★◆ B7SS-★01◆	132
DC operated							
12	6.8	1/2	1	3	1 N.O. 1 N.C.	BC6SS-★◆ BC6SS-★01◆	114
16	9.6	1	2	3	1 N.O. 1 N.C.	BC7SS-★◆ BC7SS-★01◆	138

★ Coil voltage suffix. Refer to Coil Voltage Selection chart and substitute the desired coil voltage suffix for the ★.
◆ Overload relay suffix. Refer to the Overload Relay Selection chart and substitute the desired starter suffix code for the ◆.

Coil voltage selection

	Volts								
	12	24	42	48	110/125	110/120	220	220/240	380/415
AC 40-450 Hz		F	L	G		1		2	M
DC	U	Y	V	W	P		R		

Overload relay selection

T7DU – Thermal overload

Catalog number	Current setting range	Starter range code
T7DU0.16	0.1 – 0.16	A
T7DU0.24	0.16 – 0.24	B
T7DU0.4	0.24 – 0.4	C
T7DU0.6	0.4 – 0.6	D
T7DU1.0	0.6 – 1.0	E
T7DU1.6	1.0 – 1.6	F
T7DU2.4	1.6 – 2.4	G
T7DU4.0	2.4 – 4.0	H
T7DU6.0	4.0 – 6.0	J
T7DU9.0	6.0 – 9.0	K
T7DU12.0	9.0 – 12.0	L

① For enclosed miniature starters, please consult factory for catalog number and pricing.

Control relays K622 - K640 AC & DC operated



K640-1



KC631-1

Control relays with screw connections

	Contact configuration		Catalog number	List price
	N.O.	N.C.		
AC Operated	4 3 2	0 1 2	K640-★ K631-★ K622-★	\$ 48
DC Operated	4 3 2	0 1 2	KC640-★ KC631-★ KC622-★	54

Control relays with flat pin connections

	Contact configuration		Catalog number	List price
	N.O.	N.C.		
AC Operated	4 3 2	0 1 2	K640FP-★ K631FP-★ K622FP-★	\$ 48
DC Operated	4 3 2	0 1 2	KC640FP-★ KC631FP-★ KC622FP-★	54

Control relays with soldering pin connections

	Contact configuration		Catalog number	List price
	N.O.	N.C.		
AC Operated	4 3 2	0 1 2	K640SP-★ K631SP-★ K622SP-★	\$ 48
DC Operated	4 3 2	0 1 2	KC640SP-★ KC631SP-★ KC622SP-★	54

Coil voltage selection

★ Coil voltage suffix. Refer to Coil Voltage Selection Chart and substitute the desired coil voltage suffix for the ★.

Coil voltage selection chart

	Volts								
	12	24	42	48	110/125	110/120	220	220/240	380/415
AC 40-450 Hz		F	L	G		1		2	M
DC	U	Y	V	W	P		R		

Interface relays ^① KC631 - KC640 DC operated

4



KC640-1.4



BC7-2.4

Interface relays with screw connections

	Contact configuration		Catalog number	List price
	N.O.	N.C.		
DC Operated — 24VDC (1.4W low power consumption)	4	0	KC640-1.4 KC631-1.4	\$ 59
	3	1		
DC Operated — 17 – 32VDC (2.4W low power consumption)	4	0	KC640-2.4 KC631-2.4	59
	3	1		

Interface relays with flat pin connections

	Contact configuration		Catalog number	List price
	N.O.	N.C.		
DC Operated — 24VDC (1.4W low power consumption)	4	0	KC640FP-1.4 KC631FP-1.4	\$ 59
	3	1		
DC Operated — 17 – 32VDC (2.4W low power consumption)	4	0	KC640FP-2.4 KC631FP-2.4	59
	3	1		

Interface relays with soldering pin connections

	Contact configuration		Catalog number	List price
	N.O.	N.C.		
DC Operated — 24VDC (1.4W low power consumption)	4	0	KC640SP-1.4 KC631SP-1.4	\$ 59
	3	1		
DC Operated — 17 – 32VDC (2.4W low power consumption)	4	0	KC640SP-2.4 KC631SP-2.4	59
	3	1		

^① Interface relays cannot utilize auxiliary contacts.

Accessories for B6 & B7 contactors



CA6-11K



CA6-11E-F



CA6-11K-P



CAF6- 11M



BA 50

Auxiliary contact blocks

Item description	Contact configuration	Catalog number ①	List price	
Side mounted auxiliary contact blocks, 1 N.O. & 1 N.C.				
Screw connection type				
• KC6 & K6 relay	1 N.O. & 1 N.C.	CA6-11K	\$ 15	
• B6 or BC6; B7 or BC7 4 pole contactor	1 N.O. & 1 N.C.	CA6-11E		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.O.	1 N.O. & 1 N.C.	CA6-11M		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.C.	1 N.O. & 1 N.C.	CA6-11N		
Flat pin connection type				
• KC6 & K6 relay	1 N.O. & 1 N.C.	CA6-11K-F		
• B6 or BC6; B7 or BC7 4 pole contactor	1 N.O. & 1 N.C.	CA6-11E-F		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.O.	1 N.O. & 1 N.C.	CA6-11M-F		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.C.	1 N.O. & 1 N.C.	CA6-11N-F		
Soldering pin connection type				
• KC6 & K6 relay	1 N.O. & 1 N.C.	CA6-11K-P		
• B6 or BC6; B7 or BC7 4 pole contactor	1 N.O. & 1 N.C.	CA6-11E-P		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.O.	1 N.O. & 1 N.C.	CA6-11M-P		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.C.	1 N.O. & 1 N.C.	CA6-11N-P		
Front mounted auxiliary contact blocks, 1 N.O. & 1 N.C.				
Screw connection type				
• KC6 & K6 relay	1 N.O. & 1 N.C.	CAF6-11K	\$ 15	
• KC6 & K6 relay	2 N.O. & 0 N.C.	CAF6-20K		
• KC6 & K6 relay	0 N.O. & 2 N.C.	CAF6-02K		
• B6 or BC6; B7 or BC7 4 pole contactor, VB(C)...	1 N.O. & 1 N.C.	CAF6-11E		
• B6 or BC6; B7 or BC7 4 pole contactor, VB(C)...	2 N.O. & 0 N.C.	CAF6-20E		
• B6 or BC6; B7 or BC7 4 pole contactor, VB(C)...	0 N.O. & 2 N.C.	CAF6-02E		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.O., VB(C)...	1 N.O. & 1 N.C.	CAF6-11M		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.O., VB(C)...	2 N.O. & 0 N.C.	CAF6-20M		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.O., VB(C)...	0 N.O. & 2 N.C.	CAF6-02M		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.C., VB(C)...	1 N.O. & 1 N.C.	CAF6-11N		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.C., VB(C)...	2 N.O. & 0 N.C.	CAF6-20N		
• B6 or BC6; B7 or BC7 3 pole contactor, 1 N.C., VB(C)...	0 N.O. & 2 N.C.	CAF6-02N		

Soldering connection

Item description	Catalog number	List price
For mini contactors, B, BC, K, & KC	LB6	\$ 15
For 2 pole auxiliary contacts	LB6-CA	8

Plunger

Item description	Catalog number	List price
For manual operation	BN6	\$ 15

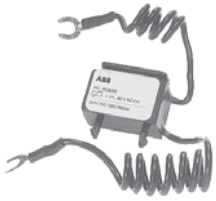
Identification labels

Item description	Catalog number	List price
50 clip-on label holders, 60 non-adhesive labels	BA50	\$ 30
50 transparent covers, 75 self adhesive labels		

① Miniature contactors and control relays can use either front or side mounted auxiliary blocks but not both.

Accessories for B6 & B7 contactors

4



RV-BC6/...



LT6-B



Load side (T)
BSM6-30

Surge suppressors

Item description	Voltage	Catalog number	List price
Varistor type surge suppressor for DC operated coils	24 - 60V 110 - 250V 200 - 420V	RV-BC6/60 RV-BC6/250 RV-BC6/380	\$ 24

Protective cover

Item description	Catalog number	List price
For contactors B, BC, K, & KC6 with screw connection	LT6-B	\$ 15

Reversing connection link

Item description	Catalog number	List price
For compact interlocking contactors with screw connection	BSM6-30	\$ 12

D.C. Power Circuit Switching

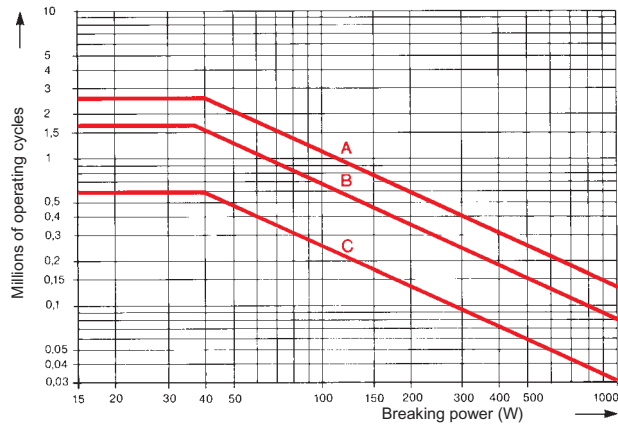
Utilization category			DC-1 L/R ≤ 1 ms	DC-3 L/R ≤ 2 ms	DC-5 L/R ≤ 7.5 ms
	24 V	A	16.0	16.0	16.0
	48 V	A	16.0	8.0	2.0
	60 V	A	16.0	4.0	1.25
	110 V	A	7.0	1.5	0.4
	220 V	A	0.8	0.25	0.2
	24 V	A	16.0	16.0	16.0
	48 V	A	16.0	16.0	16.0
	60 V	A	16.0	15.0	12.0
	110 V	A	16.0	7.0	2.0
	220 V	A	5.0	1.5	0.5
	24 V	A	16.0	16.0	16.0
	48 V	A	16.0	16.0	16.0
	60 V	A	16.0	16.0	16.0
	110 V	A	16.0	15.0	8.0
	220 V	A	14.0	4.0	2.0

Electrical Durability Curves for DC-1, DC-3 and DC-5

The curves below take into account the time constant L/R for each utilization category and show the electrical durability of the contactors during DC-1, DC-3 and DC-5 use for 3 poles connected in series.

If one single pole is used, the corresponding breaking capacity (W) is reduced to 1/3 and for 2 poles connected in series it is reduced to 2/3.

- A = DC-1 3 poles in series
- B = DC-3 3 poles in series
- C = DC-5 3 poles in series

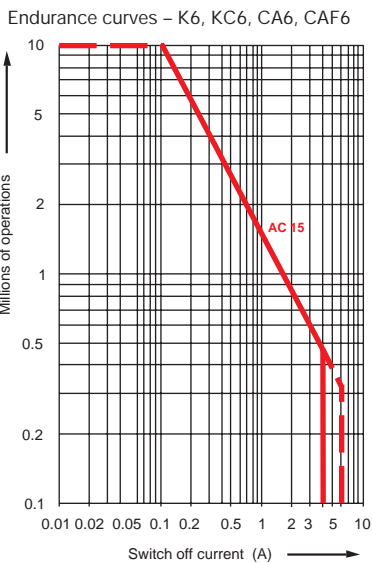
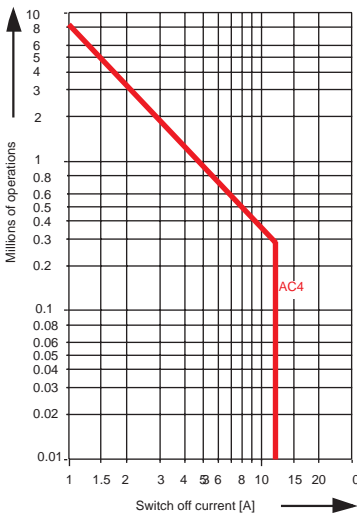
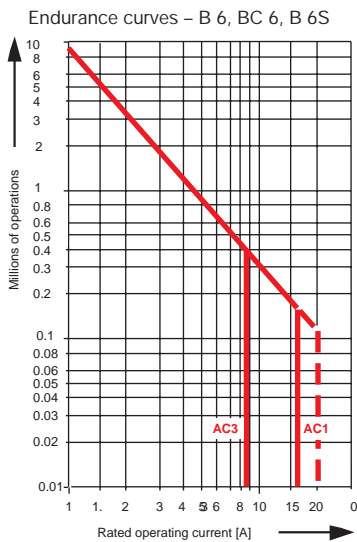


IEC Technical data

B6 Contactors & K6 control relays

Auxiliary contacts & magnetic coils

4



B6 contactors & K6 control relays

Rated insulating voltage	V_i	500			
Permissible ambient temperature					
Contactor without relay	°C	- 25 ... + 55			
Contactor with relay	°C	- 25 ... + 50			
Storage temperature	°C	- 40 ... + 80			
Climatic resistance	acc. to DIN 50 017 acc. to UTE C 63-100	alternating climate proof 30 cycles, version 1			
Mounting position		optional			
Mechanical endurance	10 million operations				
Max. switching frequency	AC 1 cyc./h AC 2/AC 3 cyc./h	300 600			
Rated operating voltage V_e	V AC	12 to 500			
Rated operating current I_e /AC 1, AC 3		AC 1/ I_e A		AC 2, AC 3	
Rated operating power		55 °C	40 °C	I_e A	P kW
	220/240 V	16	20	9	2.2
	380/440 V	16	20	9/8	4.0
	500 V	12	12	5.5	3.0
Switching times		B6	BC6	K6	KC6
Closing delay	NO ms	20 to 26		20 to 26	
Opening delay	NO ms	16 to 20	4 to 6	16 to 20	4 to 6
Closing delay	NC ms	16 to 20	4 to 6	16 to 20	4 to 6
Opening delay	NC ms	14 to 18		14 to 18	

Auxiliary Contacts and Magnetic Coils

Rated operating voltage V_e	VDC VAC	12 to 240 12 to 500				
Conventional rated thermal current I_{th}	A	6				
Rated operating current I_e / AC 15 at V_e						
	220/240 V	A				
	380/440 V	A				
	500 V	A				
Rated operating current I_e /DC 13 at V_e						
	24 V	A				
	60 V	A				
	110 V	A				
	220/240 V	A				
Rated power of magnetic coils		closing /holding				
Basic contactors						
B6 / K6, VB6	AC	VA				
BC6 / KC 6, VBC6	DC	W				
Interface contactors						
BC6 / KC6-1.4	DC	• 24 • V W				
BC6 / KC6-2.4	DC	17 ... 32 V W				
Mini contactor for connection to PLC's		cold		warm		
		I mA	P W	I mA	P W	
B6 S-1.7	DC	+ 24 + V W	77	1.75	60	1.35
B6 S-2.8	DC	+ 17 ... 32 + V W	125	2.80	94	2.10
Coil voltage range		0.8 ... 1.1x V_c				

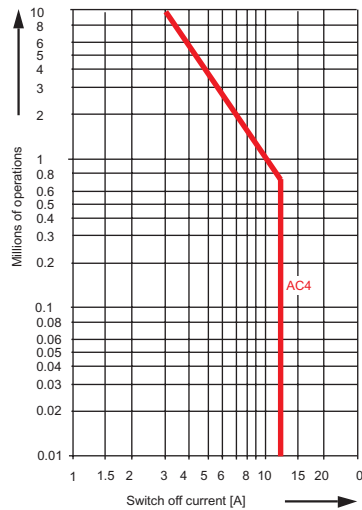
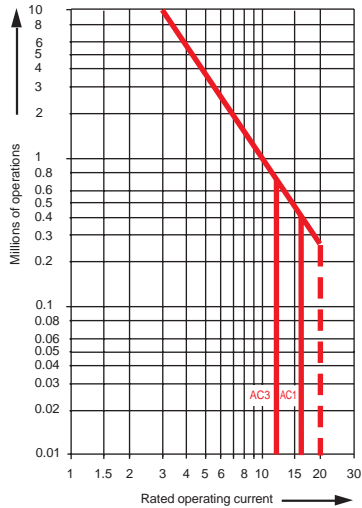
IEC Technical data

B7 contactors

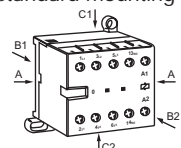
Magnetic coils



Endurance curves – B 7, BC 7, B 7S



B7 contactors

Rated insulating voltage	V_i	500			
Permissible ambient temperature					
Contactor without relay	°C	- 25 ... + 55			
Contactor with relay	°C	- 25 ... + 50			
Storage temperature	°C	- 40 ... + 80			
Climatic resistance	acc. to DIN 50 017 acc. to UTE C 63-100	alternating climate proof 30 cycles, version 1			
Mounting position		optional			
Mechanical endurance	10 million operations				
Max. switching frequency	AC 1 cyc./h AC 2/AC 3 cyc./h	300 600			
Rated operating voltage V_e	VAC	12 to 500			
Rated operating current I_e /AC 1, AC 3		AC 1/ I_e A		AC 2, AC 3	
Rated operating power		55 °C	40 °C	I_e A	P kW
	220/240 V	16	20	12/11	3
	380/440 V	16	20	12/11	5.5
	500 V	12	12	7	4
Switching times		B7	BC7		
Closing delay	NO	20 to 26			
Opening delay		16 to 20	4 to 6		
Closing delay	NC	16 to 20		4 to 6	
Opening delay		14 to 18			
Shock resistance B6, B7 standard mounting position		1/2 sinusoidal shock, 10 ms: no change in contact position			
	shock directions contactor switched on contactor switched off	A	B1	B2	C1 C2
		20 g 10 g	20 g 20 g	20 g 20 g	20 g 20 g

Magnetic Coils

Coil voltage range	0.8...1.1x U_c					
Rated power of magnetic coils						
Basic contactors	closing /holding					
B7 / VB7	AC	VA	3.5			
BC7 / VBC7	DC	W	3.5			
Interface contactors						
BC7-1.4	DC	+ 24 V	1.4			
BC7-2.4	DC	+17 ... 32 V	2.4			
Mini contactor for connection to PLC's	cold		warm			
	I (mA)	P (W)	I (mA)	P (W)		
B7 S-1.7	DC	+ 24 V	77	1.75	60	1.35
B7 S-2.8	DC	+17 ... 32 V	125	2.80	94	2.10

Switching of light fittings

The following tables show the number of lamps which can be connected per phase at 230 V/ 60 Hz. Note the following:

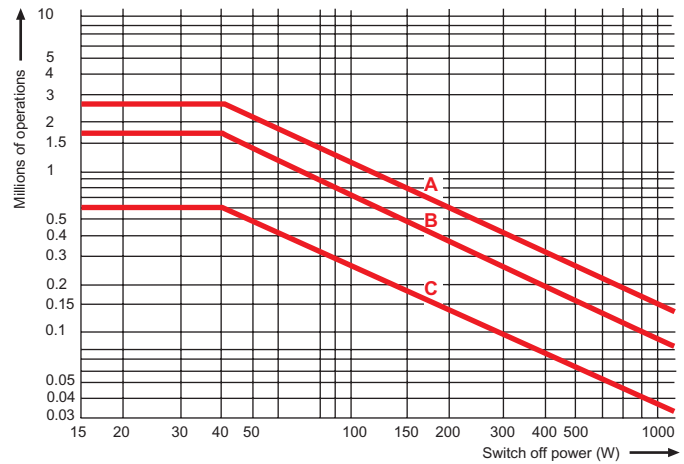
- 4 a) Increased current consumption for 1.1 times the rated voltage is considered.
- b) Failure of about 5% of the lamps is considered since not ignited lamps additionally charge the contactor with their preheating current.
- c) This data only apply to connection of the lamps at main pole terminals 1 ...8

Lamp type number phase (Hz) type BC6, BC7	Lamp data			Permissible of lamps per (230 V, 60 for contactor A B6, B7, cm
			Watt	
Incandescent lamps	60		0.27	20
	100		0.45	12
	200		0.91	6
	300		1.36	4
	500		2.27	2
	1000		4.5	1
Fluorescent lamps uncompensated	15	44	0.35	25
	20	59	0.37	23
	40	120	0.43	20
	42	105	0.54	16
	65	150	0.67	12
	115	120	1.5	5
	140	150	1.5	5
Fluorescent lamps in two-lamp circuit	2 x 20	59	2 x 0.13	2 x 26 lamp pairs
	2 x 40	120	2 x 0.22	2 x 20
	2 x 42	105	2 x 0.24	2 x 16
	2 x 65	150	2 x 0.34	2 x 12
	2 x 115	120	2 x 0.65	2 x 5
	2 x 140	150	2 x 0.75	2 x 5
Metal halogen lamps uncompensated	35		0.53	10
	70		1.0	5
	150		1.8	3
	250		3.0	2
	400		3.5	1
Low pressure sodium vapor lamps uncompensated	35		1.5	4
	55		1.5	4
	90		2.4	2
	135		3.5	2
	150		3.3	2
	180		3.3	2
	200		2.3	2
High pressure mercury vapor lamps uncompensated	150		1.8	3
	250		3.0	2
	330		3.7	2
	400		4.7	1
High pressure mercury vapor lamps uncompensated	50		0.61	10
	80		0.8	7
	125		1.15	5
	250		2.15	3
	400		3.25	2
	700		5.40	1

Endurance curves for DC1, DC3, DC5

The following shows endurance curves for DC1, DC3 and DC5 for 3 poles in series. If only one current path is used, the corresponding breaking capacity is multiplied by 0.33, for two current paths by 0.66.

Varying time constants L/R (ms) have been considered.

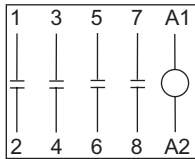


A = 3 poles in series DC 1
B = 3 poles in series DC 3
C = 3 poles in series DC 5

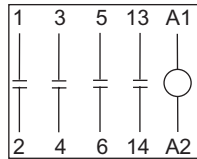
IEC Technical data

Pole configurations

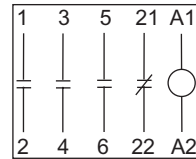
Miniature contactors



B6(7)-40-00 ...
BC6(7)-40-00 ...

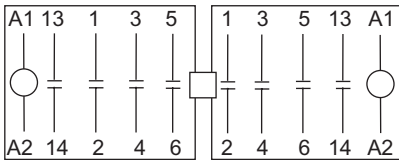


B6(7)-30-10 ...
BC6(7)-30-10 ...

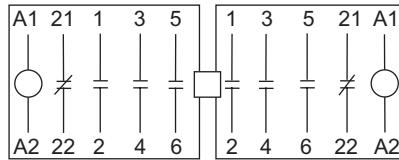


B6(7)-30-01 ...
BC6(7)-30-01 ...

Miniature mechanically interlocked contactors

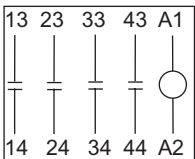


VB6(7)-30-10 ...
VBC6(7)-30-10 ...

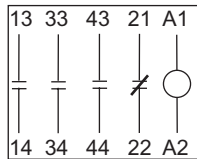


VB6(7)-30-01 ...
VBC6(7)-30-01 ...

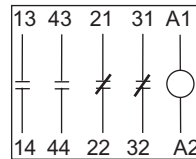
Miniature control relays



K6-40 E ...
KC6-40 E ...

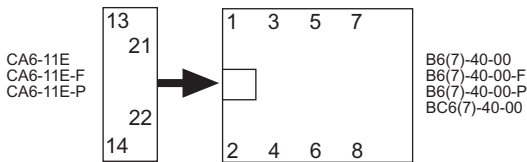


K6-31 Z ...
KC6-31 Z ...



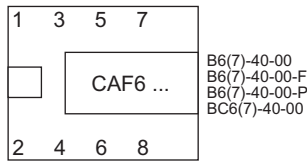
K6-22 Z ...
KC6-22 Z ...

Side mounted auxiliary contact blocks

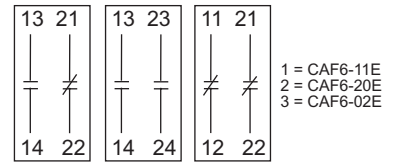


B6(7)-40-00
B6(7)-40-00-F
B6(7)-40-00-P
BC6(7)-40-00

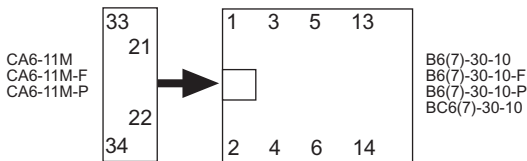
Front mounted auxiliary contact blocks



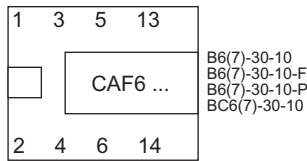
B6(7)-40-00
B6(7)-40-00-F
B6(7)-40-00-P
BC6(7)-40-00



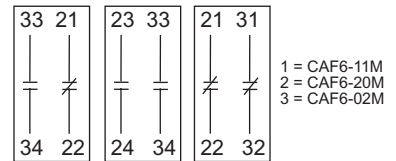
1 = CAF6-11E
2 = CAF6-20E
3 = CAF6-02E



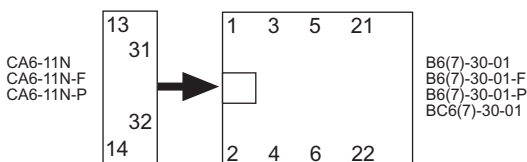
B6(7)-30-10
B6(7)-30-10-F
B6(7)-30-10-P
BC6(7)-30-10



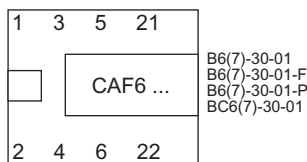
B6(7)-30-10
B6(7)-30-10-F
B6(7)-30-10-P
BC6(7)-30-10



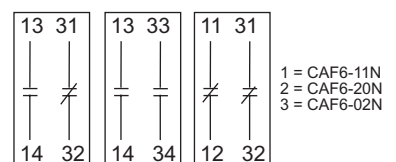
1 = CAF6-11M
2 = CAF6-20M
3 = CAF6-02M



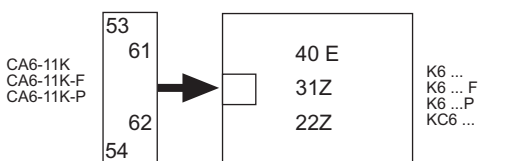
B6(7)-30-01
B6(7)-30-01-F
B6(7)-30-01-P
BC6(7)-30-01



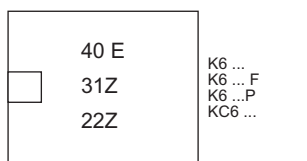
B6(7)-30-01
B6(7)-30-01-F
B6(7)-30-01-P
BC6(7)-30-01



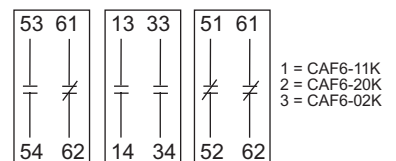
1 = CAF6-11N
2 = CAF6-20N
3 = CAF6-02N



K6 ...
K6 ... F
K6 ... P
KC6 ...



K6 ...
K6 ... F
K6 ... P
KC6 ...



1 = CAF6-11K
2 = CAF6-20K
3 = CAF6-02K

NOTE: Only side mounted type or front mounted type auxiliary contact blocks can be used at one time. Auxiliary contact blocks must not be mounted on Interface contactors, Interface control relays or contactors for connection to PLCs. Two CAF 6 front mounted auxiliary contact blocks can be installed on the mechanically interlocked contactors VB(C)6(7).

Type	T7DU	
Standards: (major international and European standards)	IEC 947-4-1, UL 508 EN 60 947-4-1	
Approvals, certificates	UL, CSA	
Rated insulation voltage U ^I acc. to IEC 158-1, IEC 947-4-1 acc. to IEC / UL 508UI/V660V / 600V	V	690V
Impulse withstand voltage U _{impkV6} acc. to IEC 947-4-1		
Permissible ambient temperature		
• for storage °C	-40 to 70	
• with compensated operation °C		
- open °C	-25° to + 50°C	
- enclosed °C	-25° to + 40°C	
Climatic resistance according to	IEC 68-2-3, IEC 68-2-30	
Mounting position	±30° from vertical position not horizontally, not upside down Side by side mounting distance, 5mm	
Resistance to shock *Critical shock direction A1, A2	Shock duration ms	10
	multiple of g	10
Resistance to vibrations (±1 mm, 50 Hz)	multiple of g	—
Mounting	• on contactor	Hooking underneath the contactor, screwing on its main terminal
Terminal types and connecting capacity of main conductors (on motor side)		
• Screw terminals (screw size)		M3.5
• with self-disengaging clamping piece		—
• with terminal block		—
• with busbar or cable lugs		—
• connection cross sections		
• single-core or stranded Awg/mm ²		2 x 18 – 14 / 2 x 0.75 – 2.5
• flexible with connector sleeve mm ²		2 x 0.5 – 1.5
Terminals and auxiliary conductors		
• Screw terminals (screw size)		M3.5
• with self-disengaging clamping piece		
• connection cross sections		
• single-core or stranded Awg/mm ²		2 x 18 – 14 / 2 x 0.75 – 2.5
• flexible with connector sleeve mm ²		2 x 0.5 – 1.5
Protection degree to IEC 947-1/EN 60 947-1	All terminals are safe from finger-touch and touch by the back of the hand in accordance with VDE 0106, Part 100	
Power pole technical data		
Number of poles	3	
Setting ranges	see order codes	
Tripping class acc. to IEC 947-4-1/EN 60 947-4-1	10A	
Frequency limit	Hz	0 – 400
Switching frequency up to 15 ops./h or 60 ops./h with 40% on load factor without early tripping if starting current not higher than 6 x I _n and starting time not longer than 1s.		

Approvals

UL USA	CSA Canada	EZU Czech. Republic	PTB Germany	GL Germany	LRS Great Britain
■	■	□	□	□	□

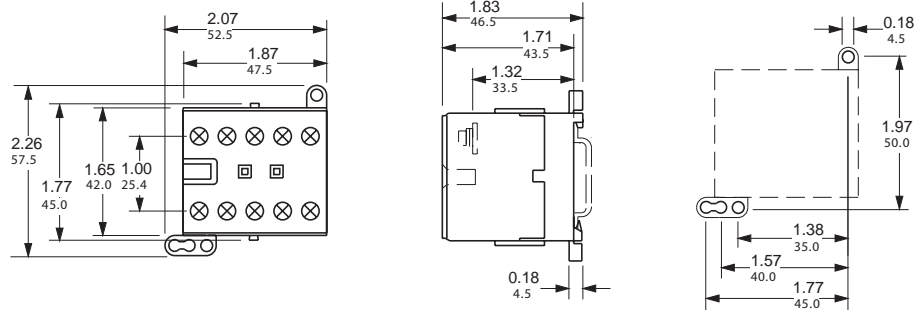
Legend:

- Standard design approved: identification plates bear the approval marks if it is mandatory
- Submitted for approval

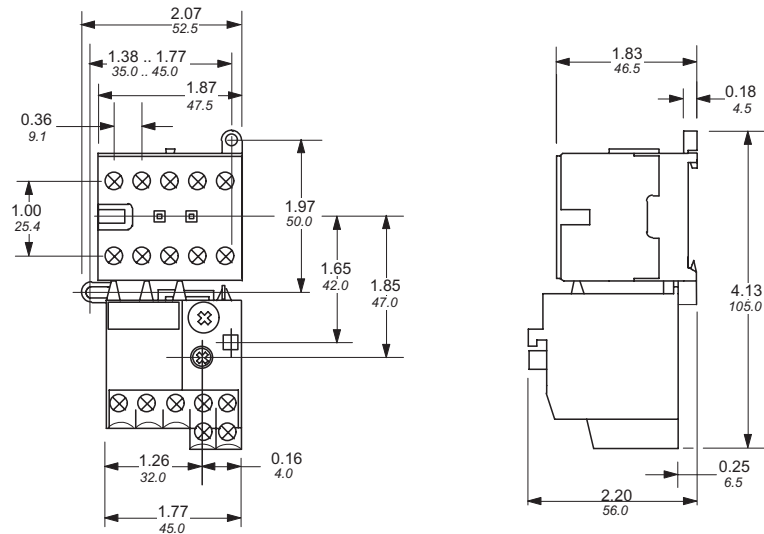
Approximate dimensions Mini contactors & overload relays

00.00 Inches
00.00 [Millimeters]

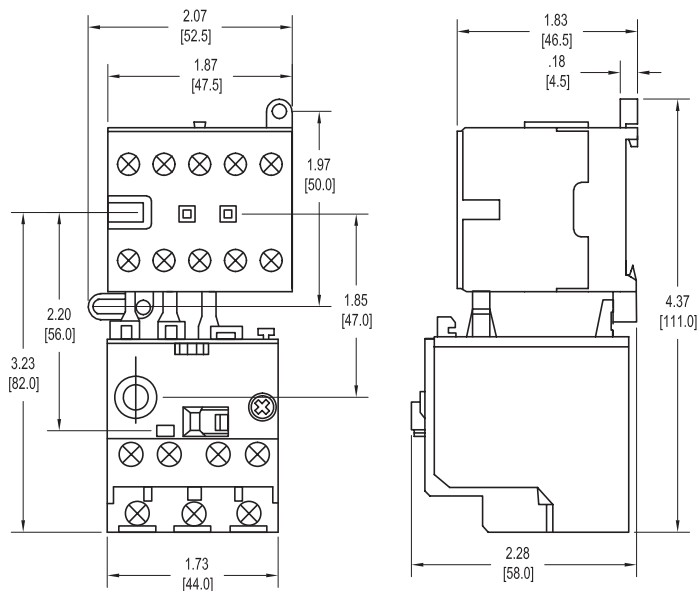
Mini contactors AC & DC Operated – B6, BC6, B7, BC7



Mini contactor with overload relay B6, B7 & T7DU



E16DU with B/BC6, B/BC7



Approximate dimensions

Mechanically interlocked contactors, control relays

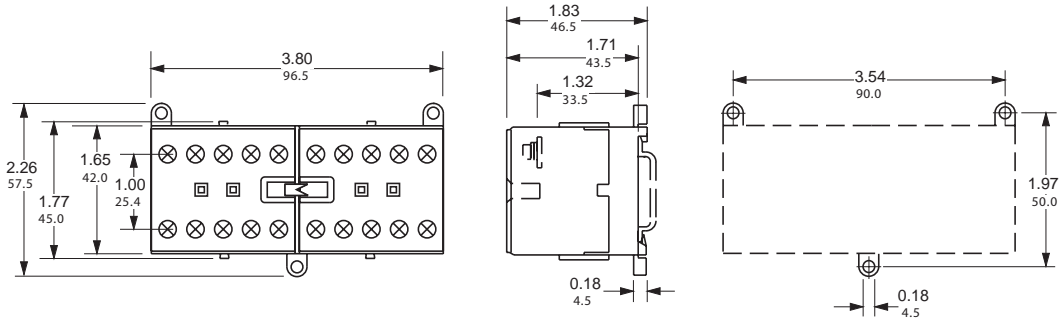
Auxiliary contact blocks

← 00.00 → Inches
00.00 → [Millimeters]

Mechanically interlocked – AC & DC Operated

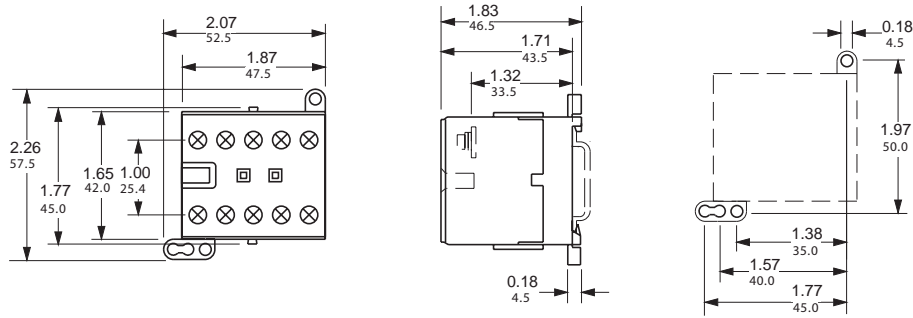
VB6M, VBC6M, VB7M, VBC7M

4



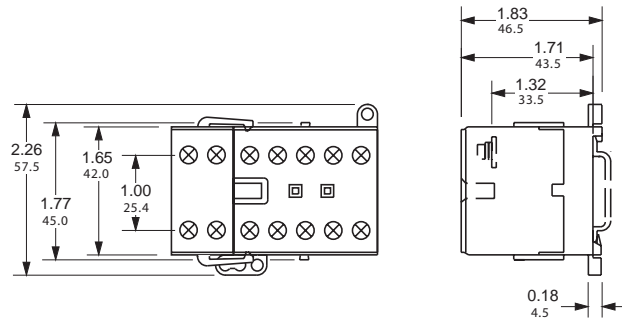
Mini control relays

AC & DC Operated – K6, KC6



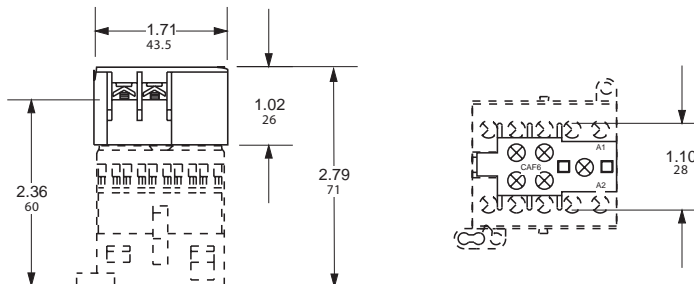
Mini contactor with side mounted auxiliary contact block

B6, B7 & CA6



Mini contactor with front mounted auxiliary contact block

B6, B7 & CA6





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Manual motor Protectors



Manual motor protectors

Type MS116

Type MS325

Type MS45X

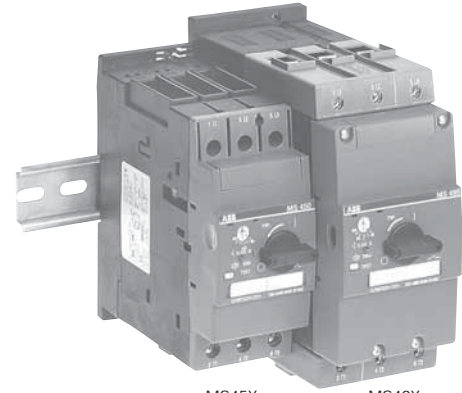
Type MS49X



MS116



MS325



MS45X

MS49X

Description

Type MS116

- Suitable for use with 3-phase motors up to 10 HP @ 480V
- UL Listed and CSA certified for Group Motor Installations
- 12 Setting ranges from 0.1 to 16 amps.
- Up to 30kA or 50kA with no back up fuse required
- 35mm DIN rail snap-on mounting
- Wide range of accessories

Type MS325

- Suitable for use with 3-phase motors up to 15 HP @ 480V
- UL Listed and CSA certified for Group Motor Installations
- 12 Setting ranges from 0.1 to 25 amps.
- Up to 50kA or 100kA with no back up fuse required
- 35mm DIN rail snap-on mounting
- Wide range of accessories

Type MS45x

- Suitable for use with 3-phase motors up to 40 HP @ 480V
- UL Listed and CSA certified for Group Motor Installations
- 14 Setting ranges from 11 to 50 amps
- Up to 100kA with no back up fuse required
- 35mm DIN rail snap-on mounting
- Wide range of accessories

Type MS49x

- Suitable for use with 3-phase motors up to 75 HP @ 480V
- UL Listed and CSA certified for Group Motor Installations
- 22 Setting ranges from 11 to 100 amps
- Up to 100kA with no back up fuse required
- 35mm DIN rail snap-on mounting
- Wide range of accessories

Single motor applications

Single motor applications employing a manual motor protector (MMP) result in a simple, compact and economical alternative to conventional magnetic motor controllers for manual operation of a single motor. Upstream short circuit and overcurrent protection in the form of fuses or a circuit breaker is required but the MMP can replace the overload relay, contactor and associated electrical components and wiring for controlling the contactor.

Group motor applications

Group motor installations offer several advantages when controlling two or more motors or other loads over conventional single motor starters. Several MMPs can be grouped together and fed from a single set of fuses or a circuit breaker. These devices can be installed together on a single DIN rail and fed power through three phase insulated busbars and a power feed terminal. Protecting this group of MMPs is a single circuit breaker or fusible switch, sized specifically for the load. Excellent coordination and short circuit protection can be achieved, as high as 50kAIC, when using the MS325 product in this manner. Close coupling adapters are offered to connect contactors to the load side of each MMP for automatic operation of each motor. If a single motor experiences an overload, the associated MMP trips and allows the other motors to continue running. Numerous accessories are available for signaling in the event of a trip, to indicate status, to provide shunt trip and for undervoltage release. The main benefits of group installation are quick, fool proof assembly, minimal wiring and a reduction of the necessary enclosure size. The only constraint is that the upstream circuit protective device must be sized specifically for the load – a highly desirable feature in order to provide the closest coordination and the greatest level of circuit protection. Article 430.53(C) of the *NEC*[®] specifies the requirements for group motor installations; all ABB MMPs meet these requirements.

General information

Selection

Group installation is an approach to building multi-motor control systems in accordance with Section 430-53 of the National Electrical Code. The selection of components used in group installations is a simple process which consists of several steps.

- First is the selection of the appropriate fuse as Branch Circuit Protective Device (BCPD).
- Second is the selection of the appropriate motor starter and protector.
- Third, the selected MMP must be checked for UL listing with the selected BCPD and the available short circuit current at the application location.

5

1. Fused disconnect

Calculate maximum fuse size according to NEC 430-53 (c). I_{max} (fuse size) = 175% x FLC (full load current for largest motor) + the sum of FLC (full load current for largest motor) + the sum of FLC values for other motors on that branch using NEC Table 430-150 on the right. Select fuse from NEC Table 240-6 below. Where I_{max} falls between two fuse ampere ratings NEC 430-53 (c) permits going to the next high ampere rating.

2. Motor protector selection

Select the proper MMP catalog number for each motor load from the following pages based on the actual motor full load current (FLA) using the "Thermal setting range" column for reference.

3. MMP Interruption ratings

Using the interruption ratings table on the next page, identify the system application voltage and interrupting capacity for the type of fuse selected in step 1 above.

NEC 240-6 Standard fuse amperes

15, 20, 25, 30, 40, 45, 50, 60, 70, 80, 90, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800, 1000, 1200, 1600

Examples: Select components for protecting the following 3-phase, 460VAC, squirrel cage induction motors. The nameplate data are:
1/2 HP, 1.0 FLA; 3 HP, 4.8 FLA; 5 HP, 7.6 FLA; 7.5 HP, 11 FLA; 10 HP, 14 FLA.

Example: using fused disconnect

- $I_{max} = 175\% \times 14 + (11 + 7.6 + 4.8 + 1) = 48.9A$
 - Fuse rating using Table NEC 240-6 = 50A
 - Minimum disconnect size = 115% x Total FLA
 - NEC 430-150 table = 115% x (14 + 11 + 7.6 + 4.8 + 1) = 44.16
- Disconnect for 50A fuses is ok.

NEC Table 430-150 full load current, 3ph AC motor

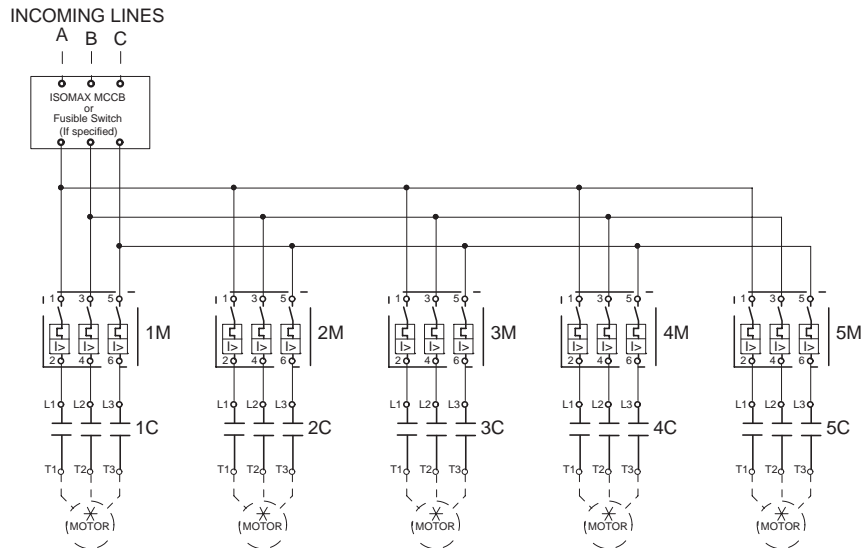
Horsepower	Induction type squirrel cage & wound rotor ①		
	230V amps	460V amps	575V amps
1/2	2	1	.8
3/4	2.8	1.4	1.1
1	3.6	1.8	1.4
1.5	5.2	2.6	2.1
2	6.8	3.4	2.7
3	9.6	4.8	3.9
5	15.2	7.6	6.1
7.5	22	11	9
10	28	14	11
15	42	21	17
20	54	27	22
25	68	34	27

Note: Refer to NEC 310-1 and NEC 430-53(d) for cable sizing.

For full load currents of 208 and 200 volt motors, increase the corresponding 230 volt motor full-load current by 10% and 15%, respectively.

MS325 data

Motor rating at 460V		MS325	Contactor
Horsepower	FLA, AC3		
1/2	1.0	MS325-1.0	A9C
3	4.8	MS325-6.3	A9C
5	7.6	MS325-9.0	A9C
7.5	11	MS325-12.5	A12C
10	14	MS325-16	A16C



① These values of full-load current are for motors running at speeds usual for belted motors and motors with normal torque characteristics. Motors built for especially low speeds or high torques may require more running current, and multispeed motors will have full-load current varying with speed, in which case the nameplate current rating shall be used.

The voltage listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110 to 120, 220 to 240, 440 to 480, and 550 to 600 volts.

Type MS116



MS116

Manual motor protectors

Thermal setting range (Amps)	Single-phase horsepower ratings ①		3-phase horsepower ratings			Catalog number	List price
	120V	240V	240V	480V	600V		
MS116							
0.10 - 0.16	—	—	—	—	—	MS116-0.16	\$ 129
0.16 - 0.25	—	—	—	—	—	MS116-0.25	
0.25 - 0.40	—	—	—	—	—	MS116-0.40	
0.40 - 0.63	—	—	—	—	—	MS116-0.63	
0.63 - 1.0	—	—	—	1/2	1/2	MS116-1.0	148.50
1.0 - 1.6	—	1/10	—	3/4	3/4	MS116-1.6	
1.6 - 2.5	—	1/6	1/2	1	1.5	MS116-2.5	
2.5 - 4.0	1/8	1/3	1	2	3	MS116-4.0	
4.0 - 6.3	1/4	1/2	1.5	3	5	MS116-6.3	
6.3 - 10	1/2	1.5	3	5	7.5	MS116-10	172.50
8.0 - 12	1/2	2	3	7.5	10	MS116-12	
10.0 - 16	1	2	5	10	10	MS116-16	

UL File # E137861

① Single phase motor ratings are based upon wiring all three poles in series.

Type MS116 Accessories

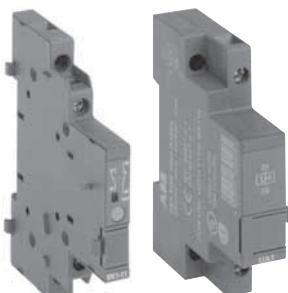
5



HK1-11



HKF1-11



SK1-11

UA1-120



OTPA116



12644

Auxiliary contact blocks for Type MS116 (side mount)

Contact configuration	Catalog number	List price
1 NO & 1 NC	HK1-11	\$ 33
2 NO	HK1-20	
2 NC	HK1-02	

Auxiliary contact blocks for Type MS116 (front mount)

Contact configuration	Catalog number	List price
1 NO & 1 NC	HKF1-11	\$ 33

Bell alarm contact blocks for Type MS116

Contact configuration	Catalog number	List price
1 NO & 1 NC	SK1-11	\$ 33
2 NO	SK1-20	
2 NC	SK1-02	

Undervoltage trip for Type MS116

Voltage (VAC)	Catalog number	List price
24	UA1-24	\$ 82.50
48	UA1-48	
60	UA1-60	
120	UA1-120	
230	UA1-230	
400	UA1-400	
415	UA1-415	

Undervoltage trip with 1NO & 1NC auxiliary contact for Type MS116

Voltage (VAC)	Catalog number	List price
24	UA1-HK-24	\$ 97.50
48	UA1-HK-48	
60	UA1-HK-60	
120	UA1-HK-120	
230	UA1-HK-230	
400	UA1-HK-400	
415	UA1-HK-415	

Locking device for Type MS116

Description	Catalog number	List price
Adaptor for padlock Type SA1	MS325-SA1	\$ 15.00
Complete padlock locking kit (adaptor, padlock & 3 keys)	MS325-SA3	37.50

Molded plastic enclosures for Type MS116

Item description	Protection level	Catalog number	List price
Gray enclosure with black handle	IP64	OTPA116L2P1	\$ 75
Yellow enclosure with red handle	IP64	OTPA116A2P1	75
Gray enclosure with clear cover, 4 module	IP55	12644	84
Gray enclosure with clear cover, 6 module	IP55	12646	98
Gray enclosure with black handle	IP65	IB116-G	75
Yellow enclosure with red handle	IP65	IB116-Y	75

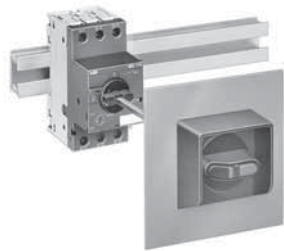
Plastic adaptors for enclosures for Type MS116

Description	Catalog number	List price
PG16 to 1/2NPT	PG16-1/2NPT	\$ 10

Shunt trip for Type MS116

Voltage (VAC)	Catalog number	List price
24V	AA1-24	\$ 75
110V	AA1-110	
200 – 240V	AA1-230	
350 – 415V	AA1-400	

Type MS116 Accessories



OHB2AJ



S1-M1

S1-M2



PS1-2-1



Door mounting hardware for for Type MS116 ①

Description	Catalog number	List price
Shaft coupler	MSMN	\$ 15
NEMA 1, 3R, 12 Black selector handle	OHB2AJ	30
NEMA 1, 3R, 12 Red, yellow selector handle	OHY2AJ	30
4.1" length shaft	OXS5X105	4
7.1" length shaft	OXS5X180	6

Power feed terminal blocks for Type MS116

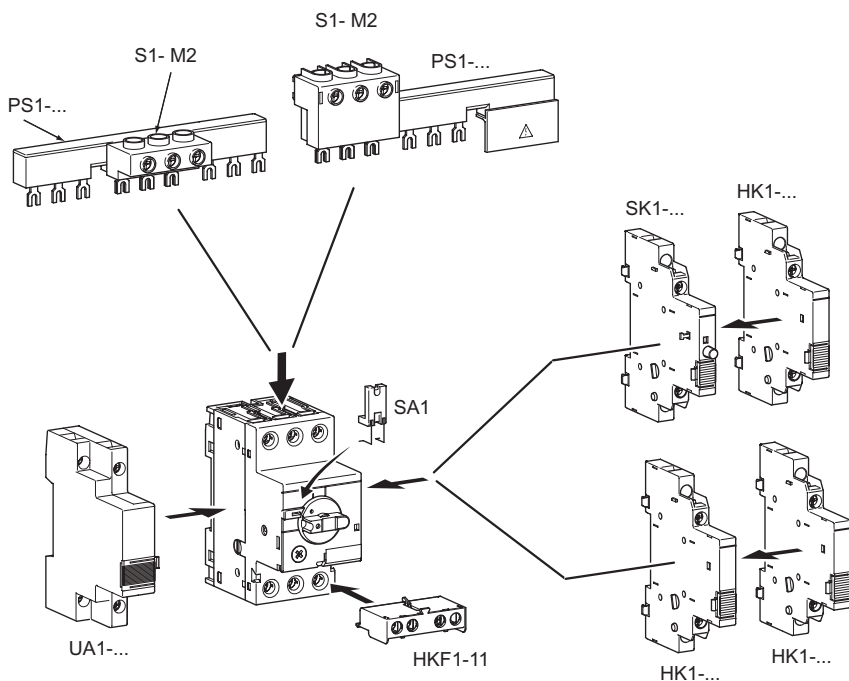
Description	Catalog number	List price
for 4 AWG wire	S1-M1	\$ 24
for busbar	S1-M2	

Busbars for Type MS116

Description	Catalog number	List price
for 2 devices without auxiliary contacts	PS1-2-0	\$ 24
for 3 devices without auxiliary contacts	PS1-3-0	30
for 4 devices without auxiliary contacts	PS1-4-0	36
for 5 devices without auxiliary contacts	PS1-5-0	42
for 2 devices with 1 auxiliary contact	PS1-2-1	24
for 3 devices with 1 auxiliary contact	PS1-3-1	30
for 4 devices with 1 auxiliary contact	PS1-4-1	36
for 5 devices with 1 auxiliary contact	PS1-5-1	42
for 2 devices with 2 auxiliary contacts	PS1-2-2	24
for 3 devices with 2 auxiliary contacts	PS1-3-2	30
for 4 devices with 2 auxiliary contacts	PS1-4-2	36
for 5 devices with 2 auxiliary contacts	PS1-5-2	42

Busbar for direct mounting of contactors

Description	Catalog number	List price
B6/B7	BEA7/116	\$ 12.00
A9/A12/A16	BEA16/116	13.50
A26	BEA26/116	15.00
AL9 - AL16	BEA16/116AL	14.50



① Must have shaft coupler, handle and shaft for through-the-door operation.

Type MS116

Technical data

5

Softstarter type		MS116
Standards, approvals		UL, CSA, CE
Rated operating current	A	16
Current range	A	0.16 – 16
Number of poles		3
Frequency	Hz	50 / 60
Tripping class	A	10
Max. kAIC & 600V	kAIC	30
Mechanical life	Operations	100,000
Wire range	AWG	12 – 18
Terminal torque	in. lbs.	14
Terminal tool options		Flat screwdriver PZ2
Permissible attitude without derating	m	3000
Degree of protection		IP20
UL Listed for group installation		Yes
Self-protected Type E manual combination starter		No
Accessories		
Terminal shroud		No
Auxiliary contacts		Yes
Shunt trip		No
Trip signal contacts		Yes
UV release		Yes
Busbar		Yes
Through the door handle		Yes
Minimum enclosure size		H x W x D
Loads for accessories		
Auxiliary contact for front mounting, HKF	AC15	24 V, 3.0 A 230 V, 1.5 A
Auxiliary contact for front mounting, HKF	DC13	24 V, 1.0 A 48 / 60V, 0.7 A 110 V, 0.27 A
Auxiliary and signal contact, HK + SK	AC15	24 V, 6 A 230 V, 4 A 400 V, 3 A
Auxiliary and signal contact, HK + SK	DC13	24 V, 2 A 110 V, 0.5 A 220 V, 0.25 A 440 V, 0.1 A
Electromagnet trips		
Response value set ex-works		9.6 – 14.4 x I _n
Undervoltage release		
Pick-up value	% of U _C	85
Drop-out value	% of U _C	35 – 75
Power consumption		
Pick-up VA		Consult factory
Hold VA		Consult factory

Short-circuit protection MS 116 – Setting ranges, short-circuit strength and max. back-up fuses

Maximum rated current of the short-circuit fuses if I_{cc} > I_{cs}

from	to	at 230 V AC			at 400 V AC			at 440 V AC			at 500 V AC			at 690 V AC					
		I _{cu} , kA	I _{cs} , kA	gL, gG, A	I _{cu} , kA	I _{cs} , kA	gL, gG, A	I _{cu} , kA	I _{cs} , kA	gL, gG, A	I _{cu} , kA	I _{cs} , kA	gL, gG, A	I _{cu} , kA	I _{cs} , kA	gL, gG, A			
0.1	... 0.16	Short-circuit proof up to I _{cc} = 50 kA									Short-circuit proof up to I _{cc} = 30 kA								
1.0	... 1.6																		
1.6	... 2.5										10	10	25	10	10	25	5	5	25
2.5	... 4.0										6	6	25	6	6	25	2	2	25
4.0	... 6.3										6	6	63	6	6	63	2	2	40
6.3	... 10.0										6	6	63	6	6	63	2	2	50
8.0	... 12.0	25	25	80	25	25	80	6	6	63	6	6	63	2	2	50			
10.0	... 16.0	16	16	80	16	16	80	4	4	63	4	4	63	2	2	63			

Type MS116

Technical data

General purpose

MS116 range	Maximum current (600 VAC Max.)
0.1 – 0.16	0.16
0.16 – 0.25	0.25
0.25 – 0.40	0.40
0.04 – 0.63	0.63
0.63 – 1.0	1.0
1.0 – 1.6	1.6
1.6 – 2.5	2.5
2.5 – 4.0	4.0
4 – 6.3	6.3
6.3 – 10	10
8 – 12	12
10 – 16	16

Short circuit ratings

18,000 RMS symmetrical 480 VAC
5,000 RMS symmetrical 600 VAC

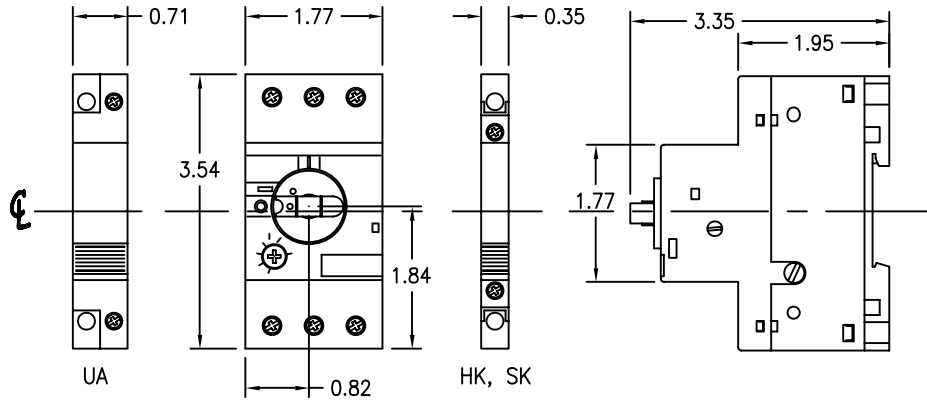
Maximum ratings

MS116 Range	Horsepower, HP, Breaking-All-Lines				
	Single phase 50/60 Hz		Three phase 50/60 Hz		
	120 VAC	240 VAC	240 VAC	480 VAC	600 VAC
0.1 – 0.16	—	—	—	—	—
0.16 – 0.25	—	—	—	—	—
0.25 – 0.40	—	—	—	—	—
0.40 – 0.63	—	—	—	—	—
0.63 – 1.0	—	—	—	1/2	1/2
1.0 – 1.6	—	1/10	—	3/4	3/4
1.6 – 2.5	—	1/6	1/2	1	1 1/2
2.5 – 4.0	1/8	1/3	1	2	3
4.0 – 6.3	1/4	1/2	1 1/2	3	5
6.3 – 10	1/2	1 1/2	3	5	7 1/2
8 – 12	1/2	2	3	7 1/2	10
10 – 16	1	2	5	10	10

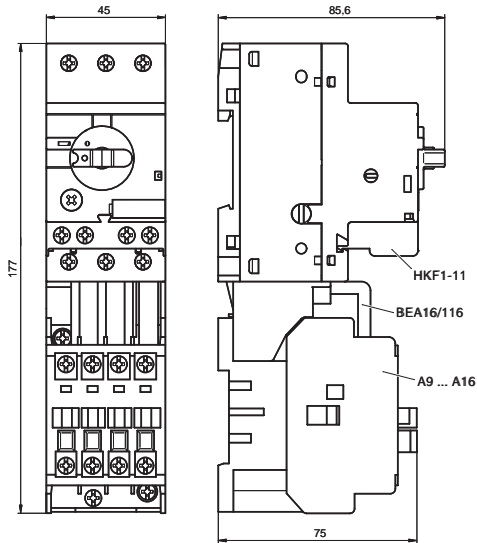
Type MS116

Approximate dimensions

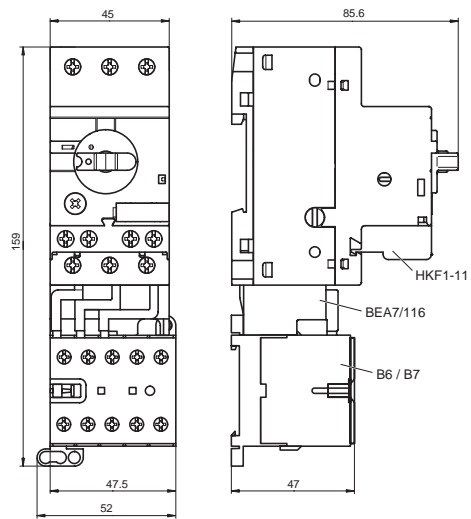
MS116



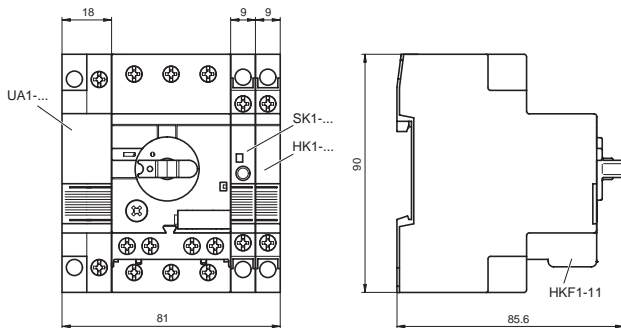
MS116 — mounted with A9 - A16 contactor



MS116 — mounted with B6/B7 minicontactor



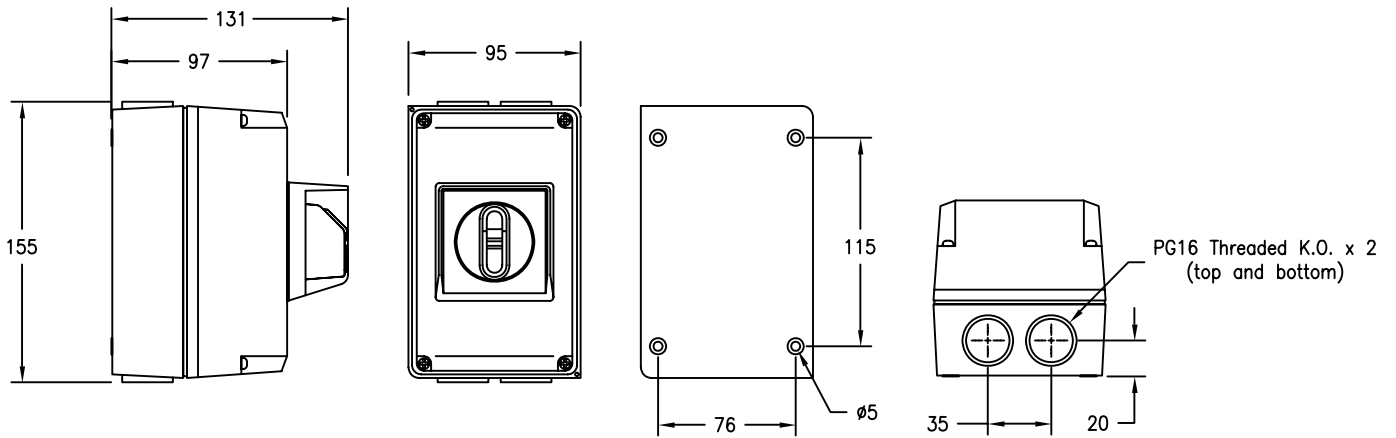
MS116 — mounted with UA1..., SK1..., HK1..., HKF1-11



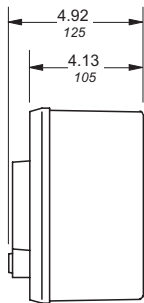
Type MS116

Approximate dimensions

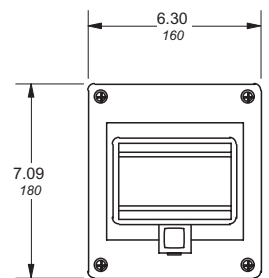
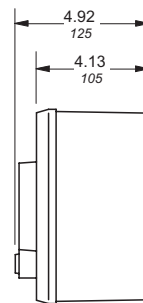
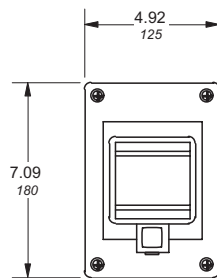
Molded plastic enclosures for MS116
OTPA116L2P1 and OTPA116A2P1



12644



12646



Type MS325

5



MS325-1.0

Manual motor protectors — Type MS325

Thermal setting range (Amps)	Single-phase horsepower ratings ①		3-phase horsepower ratings			Catalog number	List price
	120V	240V	240V	480V	600V		
0.10 – 0.16	—	—	—	—	—	MS325-0.16 MS325-0.25 MS325-0.40 MS325-0.63	\$ 144
0.16 – 0.25	—	—	—	—	—		
0.25 – 0.40	—	—	—	—	—		
0.40 – 0.63	—	—	—	—	—		
0.63 – 1.0	—	—	—	1/2	1/2	MS325-1.0 MS325-1.6 MS325-2.5 MS325-4.0 MS325-6.3	165
1.0 – 1.6	—	1/10	—	3/4	3/4		
1.6 – 2.5	—	1/6	1/2	1	1.5		
2.5 – 4.0	1/8	1/3	1	2	3		
4.0 – 6.3	1/4	1/2	1.5	3	5		
6.3 – 9.0	1/3	1	2.5	5	7.5	MS325-9.0 MS325-12.5 MS325-16	192
9.0 – 12.5	1/2	2	3	7.5	10		
12.5 – 16	1	2.5	5	10	10		
16 – 20	1.5	3	5	10	15	MS325-20	211.50
20 – 25	2	3	7.5	15	20	MS325-25	223.50

MS325 UL File #E137861

Accessories UL File #E90353

① Single phase motor ratings are based upon wiring all three poles in series.

Type MS325 UL 508E

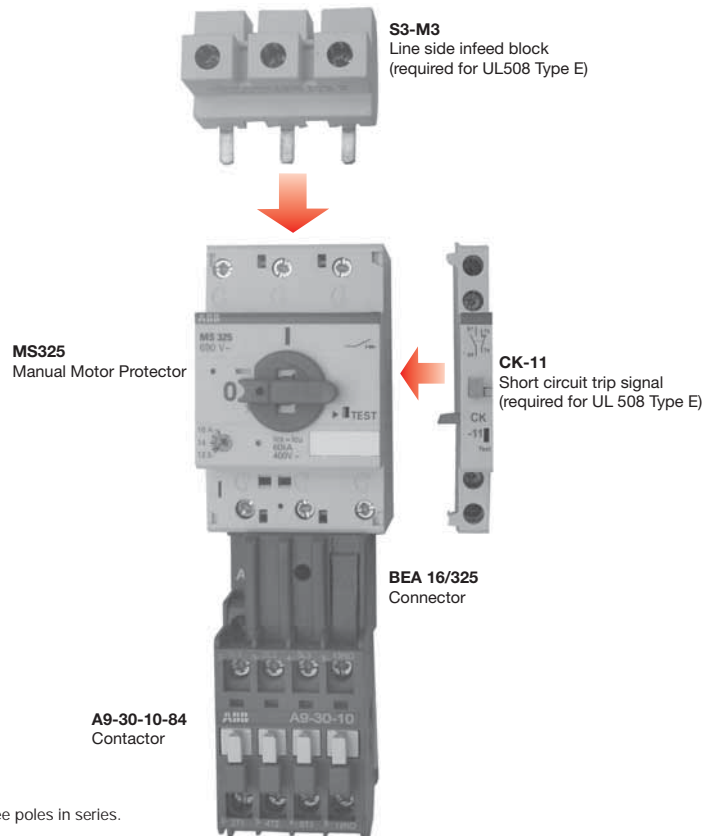


MS325-1.0

Manual motor protectors — Type MS325

Thermal setting range (Amps)	Single-phase horsepower ratings ①		3-phase horsepower ratings			Catalog number ②	List price
	120V	240V	240V	480V	600V		
0.10 – 0.16	—	—	—	—	—	MS325-0.16E MS325-0.25E MS325-0.40E MS325-0.63E	\$ 223
0.16 – 0.25	—	—	—	—	—		
0.25 – 0.40	—	—	—	—	—		
0.40 – 0.63	—	—	—	—	—		
0.63 – 1.0	—	—	—	1/2	1/2	MS325-1.0E MS325-1.6E MS325-2.5E MS325-4.0E MS325-6.3E	244
1.0 – 1.6	—	1/10	—	3/4	3/4		
1.6 – 2.5	—	1/6	1/2	1	1.5		
2.5 – 4.0	1/8	1/3	1	2	3		
4.0 – 6.3	1/4	1/2	1.5	3	5		
6.3 – 9.0	1/3	1	2.5	5	7.5		
9.0 – 12.5	1/2	2	3	7.5	10	MS325-9.0E MS325-12.5E MS325-16E	271
12.5 – 16	1	2.5	5	10	10		
16 – 20	1.5	3	5	10	15		
20 – 25	2	3	7.5	15	20	MS325-20E	290
						MS325-25E	302

MS325 UL File #E137861
Accessories UL File #E90353
Class 10 overload
Short circuit rating of 18kA



① Single phase motor ratings are based upon wiring all three poles in series.
② Part includes MMP, barrier and trip signal.

Type MS325 Accessories

5



MS325-HK11



MS325-HKF11



MS325-UA24



MS325-AS



MS325-SA1



MS325-SA3

Auxiliary contact blocks for Type MS325 (side mount)

Item description	Catalog number	List price
1 NO & 1 NC 2 NO 2 NC	MS325-HK11 MS325-HK20 MS325-HK02	\$ 33

Auxiliary contact blocks for Type MS325 (front mount)

Item description	Catalog number	List price
1 NO & 1 NC 2 NO	MS325-HKF11 MS325-HKF20	\$ 33

Bell alarm contact blocks for Type MS325

Item description	Catalog number	List price
1 NO 1 NC	MS325-SK10 MS325-SK01	\$ 33

Shunt trips for Type MS325

Item description	Catalog number	List price
110 – 240 VAC/VDC, 60 Hz 24 – 60 VAC/DC, 60 Hz	MS325-ST110 MS325-ST24	\$ 82.50

Undervoltage trip for Type MS325

Item description	Catalog number	List price
24V 48V 60V 110V 230V 400V 415V 480V	MS325-UA24 MS325-UA48 MS325-UA60 MS325-UA110 MS325-UA230 MS325-UA400 MS325-UA415 MS325-UA480	\$ 82.50

Remote control unit

Item description	Catalog number	List price
Electrically operated remote control unit for MS325. For use up to MS325-16 and below. Not for use with MS325-20 & MS325-25. Provided with 1 NO & 1 NC auxiliary contacts and 1NO trip signal contacts	24V AC/DC 48V AC/DC 60V AC/DC 110V AC/DC 230V AC/DC RC325-24V RC325-48V RC325-60V RC325-110V RC325-230V	\$ 165

NOTE: May not be used with HFK, SK, ST or UV accessories

Supporting terminal for Type MS325

Item description	Catalog number	List price
for UA or as N/LS clamp	MS325-AS	\$ 15

Padlocking devices for Type MS325

Item description	Catalog number	List price
Adapter for padlock type SA1 Complete padlock kit (includes adaptor, padlock & 3 keys)	MS325-SA1 MS325-SA3	\$ 15.00 37.50

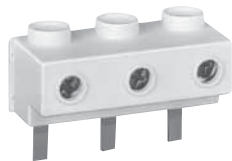
Type MS325 Accessories



Switch cubicle mounting kit



MS325-BB1



MS325-SM1



PS3-2-0



PS3-4-0



MS325 coupled to mini-contactor

Molded plastic enclosures for Type MS325

Item description	Protection level	Catalog number	List price
Light gray enclosure with black handle	IP64	OTPA325B2P1	\$ 75
Light gray enclosure with red/yellow handle	IP64	OTPA325A2P1	75
Gray enclosure w/clear lid, 4 module	IP55	12644	84
Gray enclosure w/clear lid, 6 module	IP55	12646	98
Gray enclosure with black handle	IP65	IB325-G	75
Yellow enclosure with red handle	IP65	IB325-Y	75

NOTE: Use Discount schedule MA for IP64 & IP65 enclosures; use Discount schedule CB8 for IP55 enclosures.

Plastic adaptors for enclosures for Type MS325

Item description	Catalog number	List price
PG16 TO 1/2 NPT	PG16-1/2 NPT	\$ 10

Selector handles for through-the-door operation for Type MS325 ①

Item description	Catalog number	List price
Shaft coupler	MSMN	\$ 15
NEMA 1, 3R, 12 black selector handle	OHB2AJ	30
NEMA 1, 3R, 12 red/yellow selector handle	OHY2AJ	30
4.1" length shaft	OXS5X105	4
7.1" length shaft	OXS5X180	6

NOTE: Use Discount schedule MA for shaft coupler; use Discount schedule H6 for handles and shafts.

Power feed terminal blocks for Type MS325

Item description	Catalog number	List price
Standard, accepts 4 AWG wire	MS325-SM1	\$ 24
Low profile, accepts 4 AWG wire	MS325-BB1	25.50

Busbars for Type MS325 ②

Item description	Catalog number	List price
for 2 devices; without auxiliary switch	PS3-2-0	\$ 24
for 3 devices; without auxiliary switch	PS3-3-0	30
for 4 devices; without auxiliary switch	PS3-4-0	33
for 5 devices; without auxiliary switch	PS3-5-0	39
for 2 devices; with 1 auxiliary switch	PS3-2-1	30
for 3 devices; with 1 auxiliary switch	PS3-3-1	34.50
for 4 devices; with 1 auxiliary switch	PS3-4-1	37.50
for 5 devices; with 1 auxiliary switch	PS3-5-1	42
for 2 devices; with 2 auxiliary switches	PS3-2-2	30
for 4 devices; with 2 auxiliary switches	PS3-4-2	37.50

Busbars can be daisy chained to connect additional MS325s.

Close coupling adapters

Device	Catalog number	List price
MS325 + B6/B7 contactor	BEA7/325	\$ 12.00
MS325 + VB6/VB7 reversing contactor	MS325-VB7	
MS325 + A9, A12, A16 contactor	BEA16/325	13.50
MS325 + A26 contactor	BEA26/325	15.00
AL9 - AL16	BEA16/325AL	14.50
AL26	BEA26/325AL	16.00

UL 508 Type E Accessories – Required

Device	Catalog number	List price
Line side infeed block	S3-M3	\$ 30
Short circuit trip signal	CK-11	49

① Must have shaft coupler, handle and shaft for through-the-door operation.
② UL file # E167205; CSA file# LR98427M7-11

Type MS450 – MS497



MS450



MS497

Manual motor starters

FLA adjustment range	Horsepower ratings						Weight (lbs)	Availability code	Catalog number	List price
	Single-phase ^①		Three-phase							
	115V	230V	200V – 208V	230V	460V	575V				
MS450										
11 – 16	1	3	5	5	10	15	2.12	A	MS450-16	\$ 450
14 – 20	1.5	3	5	7.5	15	20	2.12	A	MS450-20	450
18 – 25	2	5	7.5	10	20	25	2.12	A	MS450-25	450
22 – 32	3	5	10	10	25	30	2.12	A	MS450-32	450
28 – 40	3	7.5	15	15	30	40	2.12	A	MS450-40	510
36 – 45	5	7.5	15	15	30	40	2.12	A	MS450-45	510
40 – 50	5	10	15	20	40	50	2.12	A	MS450-50	510
MS495										
28 – 40	3	7.5	15	15	30	40	4.63	A	MS495-40	562.50
36 – 50	5	10	15	20	40	50	4.63	A	MS495-50	562.50
45 – 63	5	15	20	25	50	60	4.63	A	MS495-63	562.50
57 – 75	7.5	15	25	25	60	75	4.63	A	MS495-75	600
70 – 90	10	20	30	30	75	100	4.63	A	MS495-90	615
80 – 100	10	25	40	40	75	100	4.63	A	MS495-100	690
MS497										
11 – 16	1	3	5	5	10	15	2.12	B	MS497-16	450
14 – 20	1.5	3	5	7.5	15	20	2.12	B	MS497-20	450
18 – 25	2	5	7.5	10	20	25	2.12	B	MS497-25	450
22 – 32	3	5	10	10	25	30	2.12	B	MS497-32	450
28 – 40	3	7.5	15	15	30	40	4.63	B	MS497-40	562.50
36 – 50	5	10	15	20	40	50	4.63	B	MS497-50	562.50
45 – 63	5	—	20	25	50	60	4.63	B	MS497-63	562.50
57 – 75	7.5	—	25	25	60	75	4.63	B	MS497-75	600
70 – 90	10	—	30	30	75	100	4.63	B	MS497-90	615
80 – 100	10	—	30	40	75	100	4.63	B	MS497-100	690
MS451										
11 – 16	1	3	5	5	10	15	2.12	B	MS451-16	450
14 – 20	1.5	3	5	7.5	15	20	2.12	B	MS451-20	450
18 – 25	2	5	7.5	10	20	25	2.12	B	MS451-25	450
22 – 32	3	5	10	10	25	30	2.12	B	MS451-32	450
28 – 40	3	7.5	15	15	30	40	2.12	B	MS451-40	510
36 – 45	5	7.5	15	15	30	40	2.12	B	MS451-45	510
40 – 50	5	10	15	20	40	50	2.12	B	MS451-50	510
MS496										
28 – 40	3	7.5	15	15	30	40	4.63	B	MS496-40	562.50
36 – 50	5	10	15	20	40	50	4.63	B	MS496-50	562.50
45 – 63	5	15	20	25	50	60	4.63	B	MS496-63	562.50
57 – 75	7.5	15	25	25	60	75	4.63	B	MS496-75	600
70 – 90	10	20	30	30	75	100	4.63	B	MS496-90	615
80 – 100 ^②	10	25	40	40	75	100	4.63	B	MS496-100	690

Availability code

- A – Standard item, stock to two weeks lead time
- B – Stock to four weeks lead time
- C – 4 to 6 weeks lead time

UL File # E167205

① Single phase motor ratings are based upon wiring all three poles in series.
 ② Maximum motor current 95A.

Type MS450 – MS497 for UL 508 Type E Applications



MS450-16E



MS497-16E

Manual motor starters

FLA adjustment range	Horsepower ratings						Weight (lbs)	Availability code	Catalog ③ number	List price	
	Single-phase①		Three-phase								
	115V	230V	200V – 208V	230V	460V	575V					
Overload tripping class 10	MS450										
	11 – 16	1	3	5	5	10	15	2.12	A	MS450-16E	\$ 525
	14 – 20	1.5	3	5	7.5	15	20	2.12	A	MS450-20E	525
	18 – 25	2	5	7.5	10	20	25	2.12	A	MS450-25E	525
	22 – 32	3	5	10	10	25	30	2.12	A	MS450-32E	525
	28 – 40	3	7.5	15	15	30	40	2.12	A	MS450-40E	585
	36 – 45	5	7.5	15	15	30	40	2.12	A	MS450-45E	585
	40 – 50	5	10	15	20	40	50	2.12	A	MS450-50E	585
	MS495										
	28 – 40	3	7.5	15	15	30	40	4.63	A	MS495-40E	622.50
	36 – 50	5	10	15	20	40	50	4.63	A	MS495-50E	622.50
	45 – 63	5	15	20	25	50	60	4.63	A	MS495-63E	622.50
57 – 75	7.5	15	25	25	60	75	4.63	A	MS495-75E	720	
70 – 90	10	20	30	30	75	100	4.63	A	MS495-90E	735	
80 – 100	10	25	40	40	75	100	4.63	A	MS495-100E	810	
Overload tripping class 20	MS497										
	11 – 16	1	3	5	5	10	15	2.12	B	MS497-16E	570
	14 – 20	1.5	3	5	7.5	15	20	2.12	B	MS497-20E	570
	18 – 25	2	5	7.5	10	20	25	2.12	B	MS497-25E	570
	22 – 32	3	5	10	10	25	30	2.12	B	MS497-32E	570
	28 – 40	3	7.5	15	15	30	40	4.63	B	MS497-40E	622.50
	36 – 50	5	10	15	20	40	50	4.63	B	MS497-50E	622.50
	45 – 63	5	—	20	25	50	60	4.63	B	MS497-63E	622.50
	57 – 75	7.5	—	25	25	60	75	4.63	B	MS497-75E	720
	70 – 90	10	—	30	30	75	100	4.63	B	MS497-90E	735
	80 – 100	10	—	30	40	75	100	4.63	B	MS497-100E	810
	Overload tripping class 20	MS451									
11 – 16		1	3	5	5	10	15	2.12	B	MS451-16E	525
14 – 20		1.5	3	5	7.5	15	20	2.12	B	MS451-20E	525
18 – 25		2	5	7.5	10	20	25	2.12	B	MS451-25E	525
22 – 32		3	5	10	10	25	30	2.12	B	MS451-32E	525
28 – 40		3	7.5	15	15	30	40	2.12	B	MS451-40E	585
36 – 45		5	7.5	15	15	30	40	2.12	B	MS451-45E	585
40 – 50		5	10	15	20	40	50	2.12	B	MS451-50E	585
MS496											
28 – 40		3	7.5	15	15	30	40	4.63	B	MS496-40E	622.50
36 – 50		5	10	15	20	40	50	4.63	B	MS496-50E	622.50
45 – 63		5	15	20	25	50	60	4.63	B	MS496-63E	622.50
57 – 75	7.5	15	25	25	60	75	4.63	B	MS496-75E	720	
70 – 90	10	20	30	30	75	100	4.63	B	MS496-90E	735	
80 – 100②	10	25	40	40	75	100	4.63	B	MS496-100E	810	

Availability code

- A – Standard item, stock to two weeks lead time
- B – Stock to four weeks lead time
- C – 4 to 6 weeks lead time

① Single phase motor ratings are based upon wiring all three poles in series.
 ② Maximum motor current 95A.
 ③ Catalog number includes all parts required for UL508/E applications.

Type MS450 – MS497 Accessories

5



HK4-11



HKS4-02



UA4-HK-220



AA4-24

Auxiliary contacts — top mount

Item description	Weight (lbs)	Packaged in quantity of	Availability code	Catalog number	List price
1 N.O. + 1 N.C. 1 changeover	.044 .044	10 10	A B	HK4-11 HK-W	\$ 36

Auxiliary contacts — mounts on left side, max. 1

Item description	Weight (lbs)	Packaged in quantity of	Availability code	Catalog number	List price
1 N.O. + 1 N.C.	.066	2	A	HKS4-11	\$ 36
2 N.O.	.066	2	B	HKS4-20	
2 N.C.	.066	2	B	HKS4-02	

Auxiliary release

- Only one auxiliary release per manual motor protector
- Mounts on right side of manual motor protector

Item description	Rating	Weight (lbs)	Pkg. qty.	Avail. code	Catalog number	List price	
Undervoltage release	110–120V, 50–60Hz	.264	1	A	UA4-120	\$ 93	
	208V, 60Hz	.264	1	A	UA4-208		
	230–240V, 50–60Hz	.264	1	A	UA4-240		
	400V, 50Hz	.264	1	B	UA4-400		
	480V, 60Hz	.264	1	A	UA4-480		
Undervoltage release with early make contacts 2 N.O.	230V, 50Hz	.286	1	B	UA4-HK-230	117	
	400V, 50Hz	.286	1	B	UA4-HK-400		
	480V, 60Hz	.286	1	A	UA4-HK-480		
Shunt trip	Voltage continuous 50 – 60Hz					93	
	20 – 24	20 – 70V	.242	1	B		AA4-24
	30 – 110	70 – 190V	.242	1	A		AA4-110
	210 – 240	190 – 330V	.242	1	B		AA4-240
	350 – 415	330 – 500V	.242	1	B		AA4-415

Power feed terminal blocks — for MS45X

Item description	Catalog number	List price
For feeding power to multiple MS45Xs when using busbar Accepts 10 - 1/0 AWG, 108A	S4-M1	\$ 81

Busbars – for MS45X

Item description	Catalog number	List price
Without side mounted auxiliary devices	PS4-2-0	\$ 51
	PS4-3-0	60
	PS4-4-0	76.50
With one side mounted auxiliary device	PS4-2-2	58.50
	PS4-3-2	60
	PS4-4-2	84

Close coupling adapters

Item description	Catalog number	List price
MS45X + A30, A40	BEA40/450	\$ 54
MS45X + A50	BEA50/450	63
MS49X + A50, A63, A75	BEA75/495	120
MS495 + A95, A110	BEA110/495	180

① Mounting sequence: motor protection switch, pilot switch, auxiliary switch.

Type MS450 – MS497 Accessories



KA450



SA450



DX495



SK4-11

Terminal shrouds

Item description	Weight (lbs)	Packaged in quantity of	Availability code	Catalog number	List price
for MS45x	.022	1	A	KA450 ①	\$ 15
for MX49x	.022	1	A	KA495 ①	18
for MS49x	.066	1	A	KA495C ②	21

FLA adjustment cover

Item description	Weight (lbs)	Packaged in quantity of	Availability code	Catalog number	List price
for MS45x	.015	10	A	SA450 ③	\$ 30

Type E Terminal — Required for UL 508 Type E Applications

Item description	Weight (lbs)	Packaged in quantity of	Availability code	Catalog number	List price
for MS49x	.550	1	B	DX495	\$ 45

Signalling contact — indication of short-circuit trip (required for UL508 Type E applications)

Item description	Weight (lbs)	Packaged in quantity of	Availability code	Catalog number	List price
Short circuit trip 1 N.O. + 1 N.C.	.154	1	A	SK4-11	\$ 60

Selector handles — for thru the door operation for Types MS450 & MS451^④

Item description	Catalog number	List price
Shaft coupler	MSMN	\$ 15
NEMA 1, 3R, 12 black selector handle	OHB2AJ	30
NEMA 1, 3R, 12 red/yellow selector handle	OHY2AJ	30
4.1" length shaft	OXS5X105	4
7.1" length shaft	OXS5X180	6

- ① Plug onto box terminals in each case.
- ② Plug onto housing after removing box terminals, if using cable lugs or buses.
- ③ Supplied only as a set of 10 scale covers.
- ④ Must have shaft coupler, handle and shaft for through-the-door operation.

Technical data

Type MS325

Short circuit ratings

Short circuit ratings – MS325

Range	Short Circuit rating kA, 600VAC	Maximum Fuse size A
0.1 - 0.16	5	15
0.16 - 0.25	5	15
0.25 - 0.40	5	15
0.40 - 0.63	5	15
0.63 - 1.0	5	15
1.0 - 1.6	5	15
1.6 - 2.5	5	15
2.5 - 4.0	5	15
4.0 - 6.3	5	25
6.3 - 9.0	5	35
9.0 - 12.5	5	50
12.5 - 16	5	60
16 - 20	5	80
20 - 25	5	100

Group installation short circuit ratings

MS325 Current range	5 kA		30 kA		50 kA		85kA
	Fuse A	MCCB	Fuse A	MCCB	Fuse A	MCCB	Fuse A
0.1 - 0.16	1600	S7H1200	1600	S7H1200	1600	S7H1200	1600
0.25 - 0.40	1600	S7H1200	1600	S7H1200	1600	S7H1200	1600
0.40 - 0.63	1600	S7H1200	1600	S7H1200	1600	S7H1200	1600
0.63 - 1.0	1600	S7H1200	1600	S7H1200	1600	S7H1200	1600
1.0 - 1.6	1600	S7H1200	1600	S7H1200	1600	S7H1200	1600
1.6 - 2.5	1600	S7H1200	1600	S7H1200	1600	S7H1200	1600
2.5 - 4.0	1600	S7H1200	1600	S7H1200	1600	S7H1200	1600
4.0 - 6.3	1600	S7H1200	1600	S7H1200	600	S7H1200	—
6.3 - 9.0	1600	S7H1200	1600	S7H1200	600	S7H1200	—
9.0 - 12.5	1600	S7H1200	1600	S7H1200	400	S4H250	—
12.5 - 16	1600	S7H1200	1600	S7H1200	400	S4H250	—
16 - 20	1600	S7H1200	1600	S7H1200	400	S4H250	—
20 - 25	1600	S7H1200	1600	S7H1200	400	S4H250	—

0.1 - 0.16	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
0.25 - 0.40	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
0.40 - 0.63	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
0.63 - 1.0	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
1.0 - 1.6	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
1.6 - 2.5	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
2.5 - 4.0	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
4.0 - 6.3	1200	S7H1200	1200	S7H1200	1200	S7H1200	—
6.3 - 9.0	1200	S7H1200	1200	S7H1200	250	S4H250	—
9.0 - 12.5	1200	S7H1200	1200	S7H1200	—	—	—
12.5 - 16	1200	S7H1200	1200	S7H1200	—	—	—
16 - 20	1200	S7H1200	250	S4H250	—	—	—
20 - 25	1200	S7H1200	250	S4H250	—	—	—

① Fuse: Rated 1600A, Listed Class L. All others, listed RK5. Both time delay fuses.

② Fuse: Rated 1600A, Listed Class L. All others, listed K5. Both time delay fuses.

Technical data

Short circuit protection

Type MS325

Short-circuit protection MS325 — Setting ranges, short-circuit strength and max. back-up fuses

		Maximum rated current of the short-circuit fuses if $I_{cc} > I_{cs}$																																																																																																																					
		at 230 V AC		at 400 V AC		at 440 V AC		at 500 V AC		at 690 V AC																																																																																																													
from	to	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A																																																																																																												
A	A	Fuse types: Diazed, I.v.h.b.c., utilisation categories: gL, aM (VDE), gL/gG (IEC)																																																																																																																					
Setting ranges	0.1 ... 0.16 to 1.0 ... 1.6	<p>Short-circuit proof</p> <p>No back-up fuse required up to $I_{cc} = 100$ kA</p> <table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>60</td><td>35 / 40</td><td>40</td><td>25</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td>70</td><td>50</td><td>40</td><td>50</td><td>7</td><td>40</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td>50</td><td>80</td><td>30</td><td>80</td><td>5</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td>45</td><td>80</td><td>27</td><td>80</td><td>4.5</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td>75</td><td>80</td><td>40</td><td>100</td><td>25</td><td>100</td><td>4</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td>60</td><td>100</td><td>35</td><td>100</td><td>22</td><td>100</td><td>3.5</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td>55</td><td>100</td><td>30</td><td>125</td><td>20</td><td>125</td><td>3</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td>50</td><td>125</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>																												60	35 / 40	40	25							70	50	40	50	7	40							50	80	30	80	5	50							45	80	27	80	4.5	50					75	80	40	100	25	100	4	50					60	100	35	100	22	100	3.5	50					55	100	30	125	20	125	3	50					50	125								
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Short-circuit protection MS325 — Setting ranges, short-circuit strength and max. back-up fuses

		Maximum rated current of the short-circuit fuses if $I_{cc} > I_{cs}$																																																																																																									
		at 230 V AC		at 400 V AC		at 440 V AC		at 500 V AC		at 690 V AC																																																																																																	
from	to	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A																																																																																																
A	A	Fuse types: Diazed, I.v.h.b.c., utilisation categories: gL, aM (VDE), gL/gG (IEC)																																																																																																									
Setting ranges	0.1 ... 0.16 to 1.0 ... 1.6	<p>Short-circuit proof</p> <p>No back-up fuse required up to $I_{cc} = 50$ kA</p> <table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>60</td><td>35 / 40</td><td>10</td><td>40</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>40</td><td>50</td><td>7</td><td>40</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td>30</td><td>80</td><td>5</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td>45</td><td>80</td><td>27</td><td>80</td><td>4.5</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td>40</td><td>100</td><td>25</td><td>100</td><td>25</td><td>100</td><td>4</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td>35</td><td>100</td><td>22</td><td>100</td><td>22</td><td>100</td><td>3.5</td><td>50</td><td></td><td></td> </tr> <tr> <td></td><td></td><td>30</td><td>125</td><td>20</td><td>125</td><td>20</td><td>125</td><td>3</td><td>50</td><td></td><td></td> </tr> </table>																												60	35 / 40	10	40									40	50	7	40									30	80	5	50							45	80	27	80	4.5	50					40	100	25	100	25	100	4	50					35	100	22	100	22	100	3.5	50					30	125	20	125	20	125	3	50		
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I_{cs} = Rated service short-circuit breaking capacity, I_{cu} = Rated ultimate short-circuit capacity, I_{cc} = Prospective short-circuit current at installation location.
 $I_{cs} = I_{cu}$ in the case of MS 325 and MS 116!

Technical data

Type MS325, MS45x, MS49x

Device type		MS325	MS450	MS451	MS495	MS496	MS497
Standards, approvals		UL, CSA, CE	UL, CSA, CE	UL, CSA, CE	UL, CSA, CE	UL, CSA, CE	UL, CSA, CE
Rated operating current	A	25	50	50	100	100	100
Current range	A	0.10 - 25	11 - 50	11 - 50	40 - 100	28 - 100	11 - 100
Number of poles		3	3	3	3	3	3
Frequency	Hz	50/60	50/60	50/60	50/60	50/60	50/60
Tripping class	A	10	10	20	10	20	10
Max. kAIC & 600V	kAIC	50	50	50	50	100	100
Mechanical life	Operations	100,000	50,000	50,000	50,000	50,000	50,000
Wire range	AWG	14-8	2x18-3x18-2	2x18-3x18.2	2x10-1/0; 1x10-2/0	2x10-1/0; 1x10-2/0	2x10-1/0; 1x10-2/0
Terminal torque	in. lbs	14	27 - 40	27 - 40	35 - 53	35 - 53	35 - 53
Terminal tool options		flat screwdriver PZ2	flat screwdriver PZ2	flat screwdriver PZ2	hex allen 4mm	hex allen 4mm	hex allen 4mm
Permissible altitude without derating	m	3000	2000	2000	2000	2000	2000
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
UL Listed for group installation		Yes	Yes	Yes	Yes	Yes	Yes
Self-protected Type E manual combination starter		No	Yes	Yes	Yes	Yes	Yes
Accessories							
Terminal shroud		No	Yes	Yes	Yes	Yes	Yes
Auxiliary contacts		Yes	Yes	Yes	Yes	Yes	Yes
Shunt trip		Yes	Yes	Yes	Yes	Yes	Yes
Trip signal contacts		Yes	Yes	Yes	Yes	Yes	Yes
UV release		Yes	Yes	Yes	Yes	Yes	Yes
Busbar		Yes	Yes	Yes	No	No	No
Through door handle		Yes	Yes	Yes	No	No	No

Technical data

Type MS325, MS45x, MS49x

Manual motor starter type	MS325	MS450/451	MS495/496/497
Auxiliary circuits			
Load rating of the auxiliary circuits			
Minimum load at:			5 mA at 17 VDC
24 VDC mA	5		—
12 VDC mA	10		—
Rated operating at AC 15 to 24 VAC A	2.5		—
current I_e			3 / 0.5 / 6
230 VAC A	2		1.5 / — / 3
400 VAC A	1		①②
Rated operating at DC 13 to 24 VDC A	2.5		— / — / —
current I_e			— / 0.15 / —
60 VDC A	2.5		0.22 / — / 0.5
110 VDC A	0.6		0.1 / — / 0.25
220 VDC A	0.25		— / — 0.1
440 VDC A	—		—
Short circuit protection			
back up fuse			
gL A	10		gL / gG 10 A
aM A	6		—
Release			
Device for phase failure protection	With		With
Electromagnetic trips			
Response value set ex-works	7.5 – 12 I_n ① 9 – 14 I_n ② 10 – 15 I_n ③ 12.5 – 17.5 I_n ④		10.4 I_n – 15.6 I_n
Undervoltage release			
Pick-up value	% of U_c	≥ 85	≥ 85
Drop-out value	% of U_c	35 – 75	35 – 70
Power consumption - Pick-up	VA	0.9	20.2
Power consumption - Hold	VA	0.9	7.2
Open circuit shunt release			
Pick-up value	% of U_c	≥ 85	≥ 70
Relative duty consumption	% ED	—	100 at voltages 50 / 60 Hz to Power
Pick-up	VA	110 - 240V: 13 - 61 ③	Consult factory
Hold	VA	—	Consult factory

① Correction factors for other frequencies on request.

② On front side 1 chageover contact / on front side 1 NO + 1 NC / at side, 1 NO + 1 NC, 2 NO, 2 NC

③ 24 - 60V: 14.4 - 90vA

Technical data

Short circuit protection

Type MS450/451, MS495,6,7

Short-circuit protection MS450 / MS451 — Setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
11 ... 16	Short-circuit-proof No back-up fuse required up to $I_{cc} = 100kA$			25	50	100	25	50	100	6	12	63	3	5	63
14 ... 20				25	50	125	25	50	100	6	12	80	3	5	63
18 ... 25				25	50	125	15	30	100	6	12	80	3	5	63
22 ... 32				25	50	125	15	30	125	5	10	100	2	4	63
28 ... 40				25	50	160	15	30	125	5	10	100	2	4	63
36 ... 45				25	50	160	15	30	125	5	10	100	2	4	63
36 ... 50				25	50	160	15	30	125	5	10	100	2	4	80

Short-circuit protection MS495 — Setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
28 ... 40	Short-circuit-proof No back-up fuse required up to $I_{cc} = 100kA$			25	50	125	20	40	125	6	12	100	6	3	63
36 ... 50				25	50	125	20	40	125	6	12	100	6	3	80
45 ... 63				25	50	160	20	40	160	6	12	100	6	3	80
57 ... 75				25	50	160	20	40	160	4	8	125	5	3	100
70 ... 90				25	50	160	20	40	160	4	8	125	5	3	125
80 ... 100				25	50	160	20	40	160	4	8	125	5	3	125

Short-circuit protection MS496 — Setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
28 ... 40	Short-circuit-proof No back-up fuse required up to $I_{cc} = 100kA$						25	50	160	9	18	160	6	12	80
36 ... 50				25	50	160	7.5	15	160	5	10	100			
45 ... 63				25	50	200	7.5	15	160	4	7.5	100			
57 ... 75				25	50	200	5	10	160	3	6	125			
70 ... 90				25	50	200	5	10	160	3	6	160			
80 ... 100				25	50	200	5	10	160	3	6	160			

Short-circuit protection MS497 — Setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
11 .. 16	Short-circuit-proof No back-up fuse required up to $I_{cc} = 100kA$						25	50	100	15	30	80	7	15	63
14 ... 20				25	50	100	15	30	80	7	15	63			
18 ... 25				25	50	100	15	30	80	7	15	63			
22 ... 32				25	50	125	11	22	100	7	15	63			
28 ... 40				25	50	160	9	18	160	6	12	80			
36 ... 50				25	50	160	7.5	15	160	5	10	100			
45 ... 63				25	50	200	7.5	15	160	4	7.5	100			
57 ... 75				25	50	200	5	10	160	3	6	125			
70 ... 90				25	50	200	5	10	160	3	6	160			
80 .. 100				25	50	200	5	10	160	3	6	160			

I_{cs} = Rated service short-circuit breaking capacity, I_{cu} = Rated ultimate short-circuit breaking capacity I_{cc} = pProspective short-circuit current at installation location.

Technical data

IEC coordination tables

Coordination tables

The tables below show the MS 325 manual motor starter and DLA starter combinations according to the type of coordination and motor current.

Motor power AC-3 and rated current three-phase cage motor, 1500 rpm		MS 325 manual motor starter		DLA starter type (120V coil shown)	WLA starter type (120V coil shown)	Copper cable	Max. authorized current for combination
380 V 400 V kW	A	Type	Setting range			Minimum cross- section mm ²	A
Coordination type I, 400 V – 50 Hz, 50 kA, normal starting							
0.37	1.2	MS 325 – 1.6	1.0 – 1.6	DLA9-30-84	WLA9-30-84	1.5	1.6
0.55	1.5	MS 325 – 1.6	1.0 – 1.6	DLA9-30-84	WLA9-30-84	1.5	1.6
0.75	2	MS 325 – 2.5	1.6 – 2.5	DLA9-30-84	WLA9-30-84	1.5	2.5
1.1	2.6	MS 325 – 4	2.5 – 4.0	DLA9-30-84	WLA9-30-84	1.5	4
1.5	3.5	MS 325 – 4	2.5 – 4.0	DLA9-30-84	WLA9-30-84	1.5	4
2.2	5	MS 325 – 6.3	4.0 – 6.3	DLA9-30-84	WLA9-30-84	1.5	6.3
3	6.6	MS 325 – 9	6.3 – 9.0	DLA9-30-84	WLA9-30-84	1.5	9
4	8.5	MS 325 – 9	6.3 – 9.0	DLA9-30-84	WLA9-30-84	1.5	9
5.5	11.5	MS 325 – 12.5	9.0 – 12.5	DLA12-30-84	WLA12-30-84	1.5	12
7.5	15.2	MS 325 – 16	12.5 – 16.0	DLA16-30-84	WLA16-30-84	2.5	16
11	22	MS 325 – 25	16.0 – 25.0	DLA26-30-84	WLA26-30-84	2.5	25

* Ambient temperature ≤ 30 °C

Coordination type II, 400 V – 50 Hz, 25 kA, normal starting

0.37	1.2	MS 325 – 1.6	1.0 – 1.6	DLA9-30-84	WLA9-30-84	1.5	1.6
0.55	1.5	MS 325 – 1.6	1.0 – 1.6	DLA9-30-84	WLA9-30-84	1.5	1.6
0.75	2	MS 325 – 2.5	1.6 – 2.5	DLA9-30-84	WLA9-30-84	1.5	2.5
1.1	2.6	MS 325 – 4	2.5 – 4.0	DLA12-30-84	WLA12-30-84	1.5	4
1.5	3.5	MS 325 – 4	2.5 – 4.0	DLA26-30-84	WLA26-30-84	1.5	4
2.2	5	MS 325 – 6.3	4.0 – 6.3	DLA26-30-84	WLA26-30-84	1.5	6.3
3	6.6	MS 325 – 9	6.3 – 9.0	DLA26-30-84	WLA26-30-84	1.5	9
4	8.5	MS 325 – 9	6.3 – 9.0	DLA26-30-84	WLA26-30-84	1.5	9
5.5	11.5	MS 325 – 12.5	9.0 – 12.5	DLA26-30-84	WLA26-30-84	1.5	12.5
7.5	15.2	MS 325 – 16	12.5 – 16.0	DLA26-30-84	WLA26-30-84	2.5	16
11	22	MS 325 – 25	16.0 – 25.0	DLA26-30-84	WLA26-30-84	2.5	25

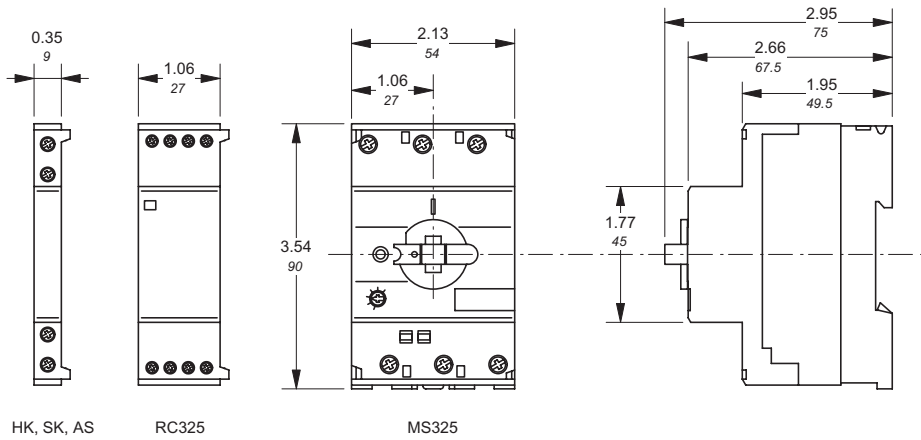
* Ambient temperature ≤ 30 °C

Approximate dimensions MS325

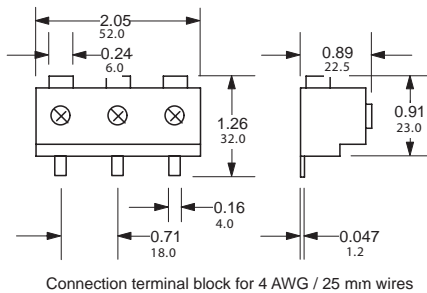
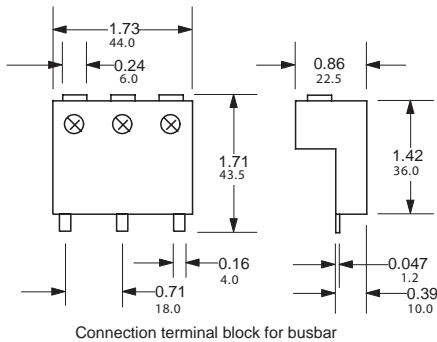
00.00 Inches
00.00 [Millimeters]

MS325

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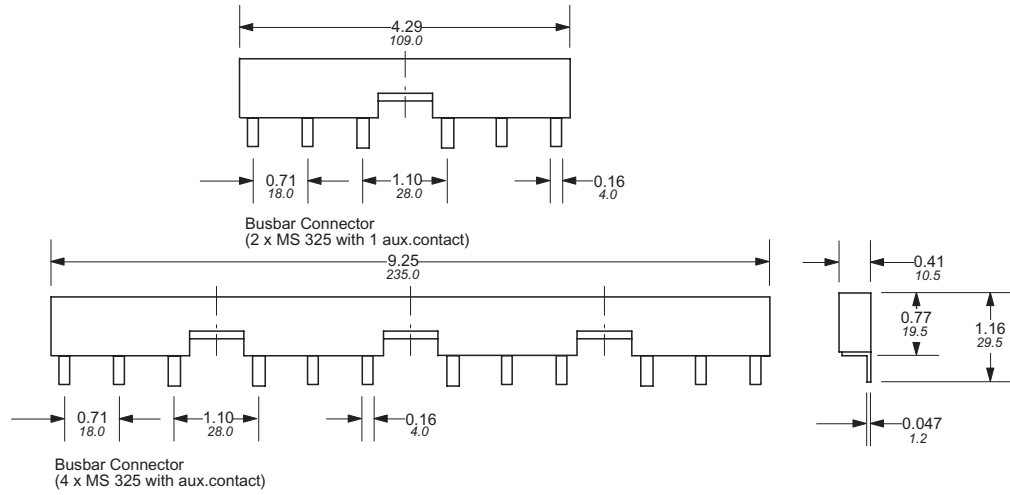
Power feed terminal blocks for MS325



Approximate dimensions Accessories for MS325

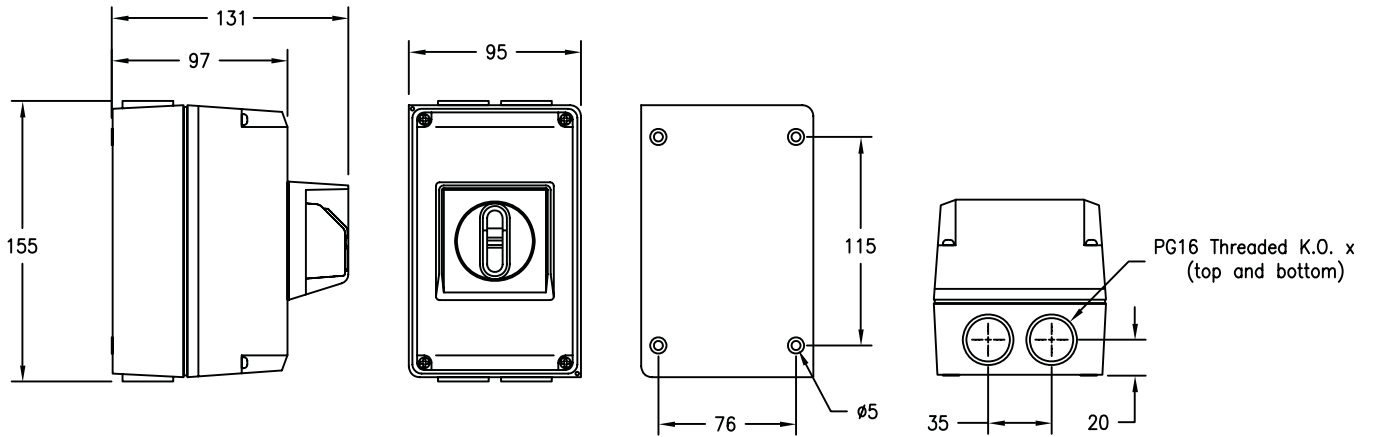
00.00 Inches
00.00 [Millimeters]

Busbar connectors for MS325

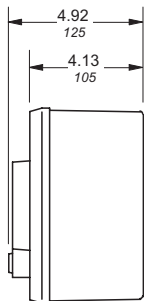


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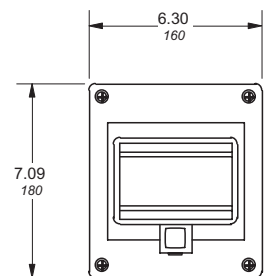
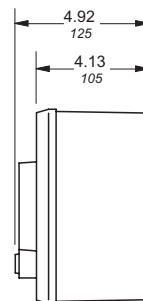
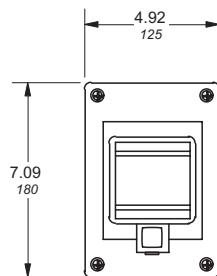
Molded plastic enclosures for MS325 OTPA325B2P1 and OTPA325A2P1



12644



12646

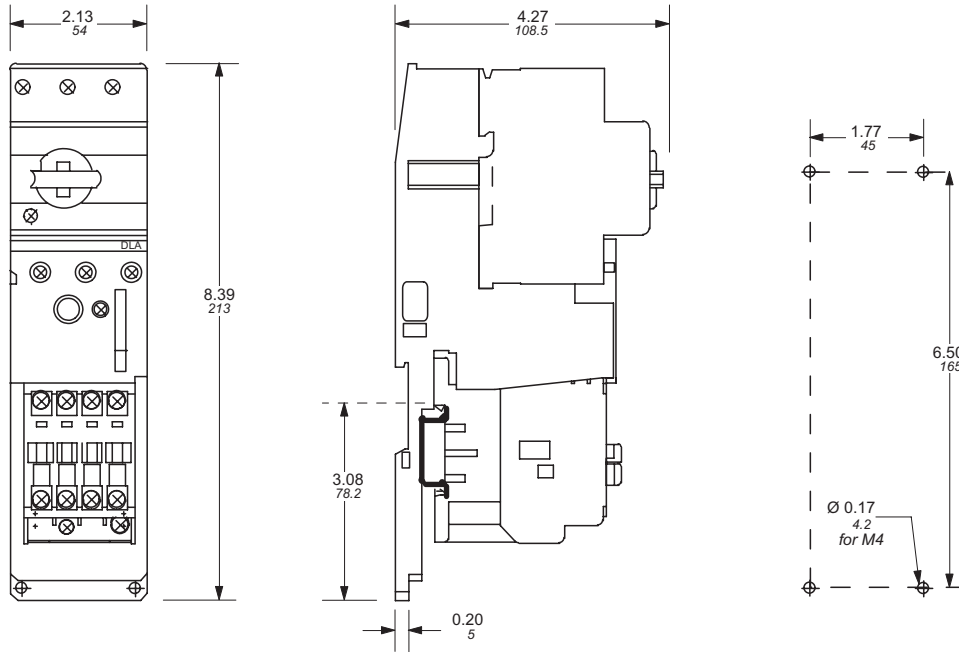


Approximate dimensions Accessories for MS325 DLA9 – DLA26

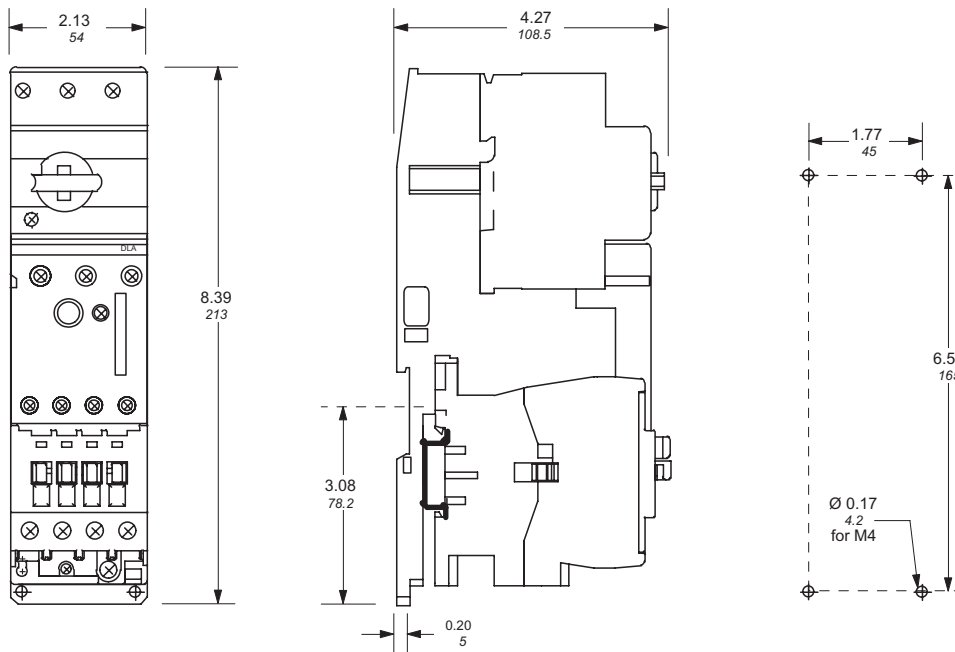
← 00.00 → Inches
00.00 → [Millimeters]

DLA9 – DLA16

5



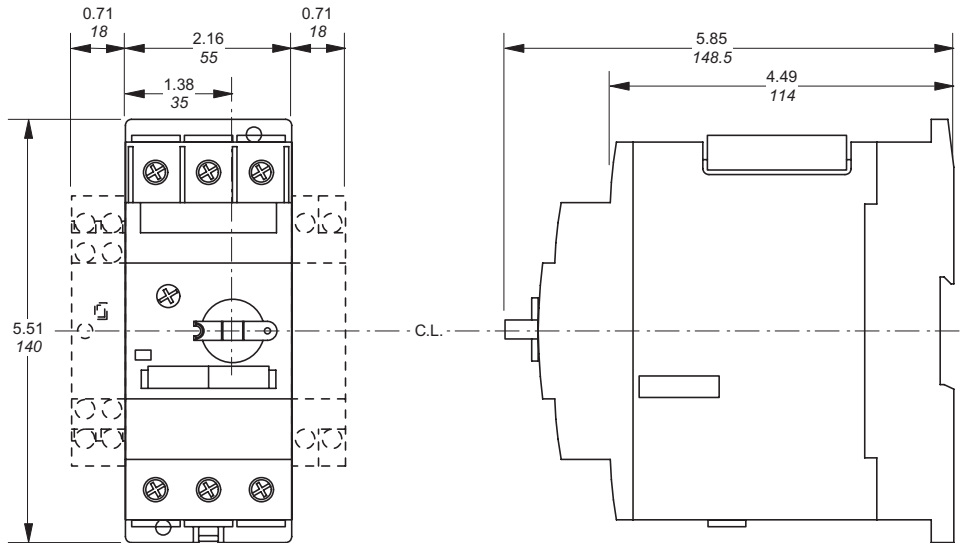
DLA26



Approximate dimensions MS450 & MS490

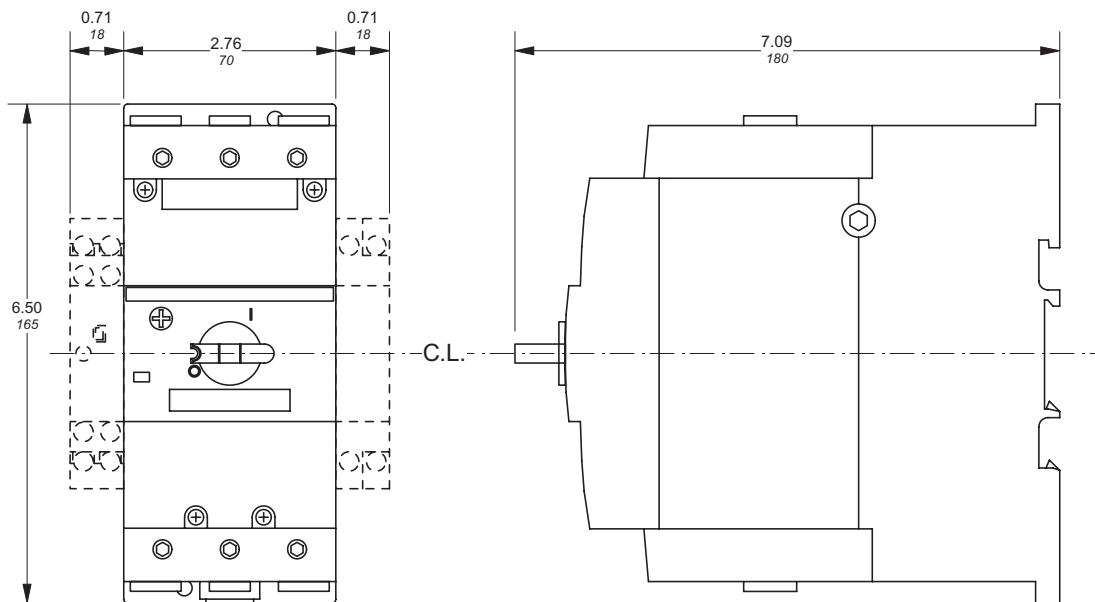
00.00 Inches
00.00 [Millimeters]

MS450



5

MS490



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Application and description

Softstarters... the complete range



ABB offers three types of softstarters to cover every customer need from 3 A to 1800 A. The overview table at the bottom of this page shows the main characteristics of the different types. For more specific technical details and ordering data, see the following pages.

PSS03 – 25

The compact range covers motor currents from 3 to 25 A and has the following advantages:

- **Compact:** As a result of the built in bypass contacts, the softstarter becomes small. There is room for more products on a given mounting surface.
- **Easy to install:** DIN rail mounting. With clear marking for connections and set up on the front.

PSS18 – 300

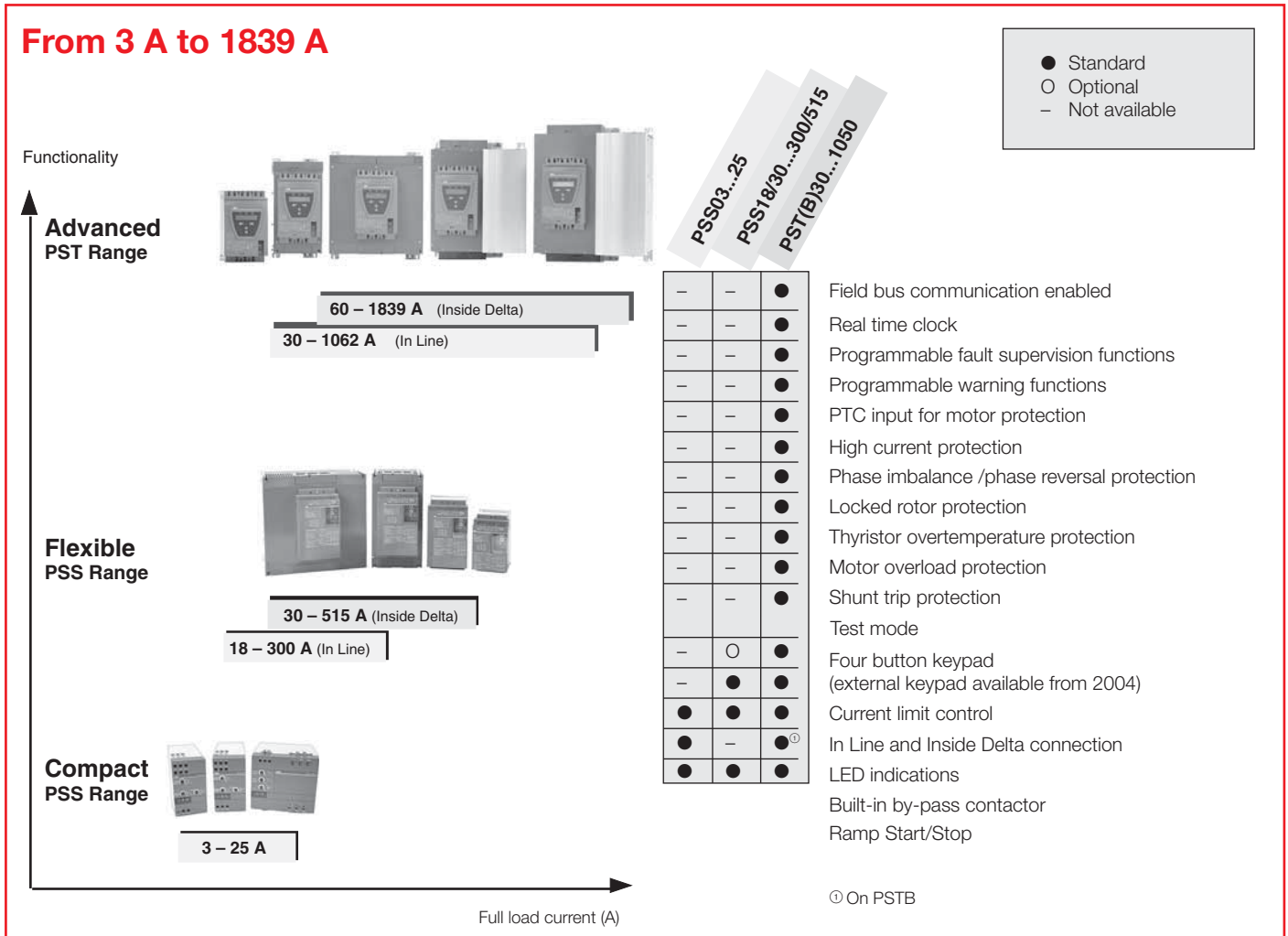
The flexible range for motor currents from 18 to 515 A offers a solution possible to adapt to almost any application:

- **Flexible:** It is possible to wire both in line with the motor or inside the motor delta. Can also be equipped with current limit.
- **Easy to set up:** With three rotary switches clearly labelled.
- **Solid state electrical circuit:** This ensures the highest reliability and reduces maintenance to a minimum, even in applications with frequent starts and stops.

PST(B)30 – 1800

The new PST Softstarter range covers motor currents from 30 to 1800 A and offers a long list of integrated functionalities:

- **Advanced integrated protections:** For the motor; integrated electronic overload relay, phase monitoring relays, high current and PTC protection. For the Softstarter; advanced thyristor protection.
- **Flexible bus communication system:** By using the ABB FieldBusPlug (FBP), you can decide at any time which bus system to select. The softstarter has a field-bus neutral interface and the ABB Field-BusPlug is the central communication element.
- **Digital text display:** With 10 languages, a menu system similar to your mobile phone, pre-programmed application settings and automatic status and event logging, it couldn't be easier to set up and operate!
- **Programmable signal relays:** gives you several possibilities for signalling warnings, faults and other events.





Notes

Type PSS Softstarters

ABB Softstarters
Type PSS



General information

ABB low voltage softstarters now cover the whole range from 3A to 1250A. The new PSS line brings a wide array of benefits for smaller motors in a flexible, compact form.

Compact line

PSS03 to PSS25 softstarters are a very compact solution for starting small motors with rated current from 3 to 25A. They are suitable for 230, 400, 500 and 600V and designed for DIN rail mounting.

The built-in bypass contacts allow you to build space-saving, compact designs.

Adjustable parameters include acceleration time and initial voltage for starting and deceleration time for stopping. In addition, these units cover a control voltage range of 24 – 110 VAC/DC and 100V – 277 VAC.

UL File # E161428

Flexible line

PSS18/30 to PSS300/515 softstarters provide a flexible solution for motor starting. Rated motor currents are covered from 18A to 300A when connected in line like a traditional full voltage starter. These units can also be wired inside the motor-delta, like a wye-delta starter, covering motors up to 515A. This flexibility makes it easier than ever before to replace wye-delta starters.

The total solid state solution — with no moving contacts in the power circuit — is an attractive solution for applications with many starts per hour. Adjustable parameters include acceleration time, initial voltage and optional current limit for starting and deceleration time for stopping.

Class 10 overload protection is standard for Type PSS enclosed softstarters.

UL File # E161428

General information Catalog number explanation

PSS Open type

PSS - 18/30 - 500 - F ^③

Maximum motor current
when connected in-line

Maximum motor current
when connected inside delta

Control voltage

F - 100V – 120V, 50/60Hz
L - 220V – 240V, 50/60Hz

Line voltage

500: 208V – 500V
690: 575V – 690V

6

PSS Enclosed type

P 18 D F 1 - 48 A A

Soft starter
PSS enclosed

Softstarter amps
18 60 175
30 72 250
37 85 300
44 105
50 142

Connection type
L: Inline
D: Inside delta

Combination type
No digit – non-combination
F – fusible disconnect
B – thermal magnetic circuit breaker
M – magnetic only breaker
N – non-fusible disconnect

Enclosure
1 – NEMA 1
2 – NEMA 12 ^②
3 – NEMA 3R ^②
4 – NEMA 4 ^②
X – NEMA 4x stainless steel ^②

Options ^①

A – Start-stop pushbutton
B – Across the line rated (AC3) contactor with emergency bypass control
C – 2 position selector switch
D – 3 position selector switch
E – Pilot light
F – Start-stop pushbutton and pilot light
H – 2 position selector switch and pilot light
J – 3 position selector switch and pilot light
M – Shunt rated (AC1) bypass contactor
W – Isolation contactor

Fuse clip

A – 30A, 600V, Class J
B – 60A, 600V, Class J
C – 100A, 600V, Class J
D – 200A, 600V, Class J
E – 400A, 600V, Class J
F – 600A, 600V, Class J
G – 800A, 600V, Class L

Circuit breaker amp ratings

D – 15 M – 70 W – 225 E – 700
E – 20 N – 80 X – 250
F – 25 P – 90 Y – 300
G – 30 R – 100 Z – 350
H – 35 S – 125 A – 400
J – 40 T – 150 B – 450
K – 50 U – 175 C – 500
L – 60 V – 200 D – 600

MCP/MAG only rating

A – 3 E – 50 J – 400
B – 5 F – 100 K – 600
C – 10 G – 150 L – 800
D – 25 H – 225

Line voltage

20: 208V 120V control voltage
23: 230V 120V control voltage
38: 380V 220V control voltage
41: 415V 220V control voltage
48: 480V 120V control voltage
60: 600V 120V control voltage

^① For more options, see page 6.8
^② Bypass contactor required.
^③ See page 6.3 for the PSS03, PSS12 & PSS25 softstarters.

Open 3A – 25A



Type PSS03-480B



Type PSS25-480B

PSS Open type ①②

Operating voltage 50Hz – 60Hz	Maximum HP rating three phase	Maximum current amperes	Catalog number	List price
220 – 240V	0.5	3	PSS03-220B	\$ 270
	3	12	PSS12-220B	345
	7.5	25	PSS25-220B	405
380 – 415V	1	3	PSS03-400B	270
	5	12	PSS12-400B	345
	10	25	PSS25-400B	405
440 – 480V	1.5	3	PSS03-480B	270
	7.5	12	PSS12-480B	345
	15	25	PSS25-480B	405
550 – 600V	10	12	PSS12-600B	375
	20	25	PSS25-600B	445

6

① Overload protection not included; external overload relay must be in power circuit. Use ABB TA series overload.
② See page 6.12 for single phase wiring schematic.



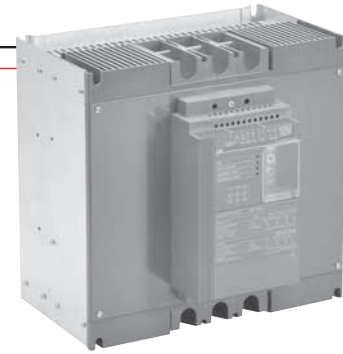
PSS18/30



PSS50/85



PSS85/147



PSS300/515

6

Connected inline ①②③

Maximum motor current		Maximum horsepower					Weight (lbs.)	Catalog number	List price
UL	IEC	208V	240V	380V	480V	600V			
18	18	5	5	10	10	—	PSS18/30-500F PSS18/30-690F	\$ 620 744	
28	30	7.5	10	15	20	—	PSS30/52-500F PSS30/52-690F	680 820	
34	37	10	10	20	25	—	PSS37/64-500F PSS37/64-690F	750 900	
40	44	10	10	25	30	—	PSS44/76-500F PSS44/76-690F	900 1080	
47	50	15	15	25	30	—	PSS50/85-500F PSS50/85-690F	1120 1345	
56	60	15	20	30	40	—	PSS60/105-500F PSS60/105-690F	1325 1590	
67	72	20	20	40	50	—	PSS72/124-500F PSS72/124-690F	1460 1750	
85	85	25	30	50	60	—	PSS85/147-500F PSS85/147-690F	1650 1980	
105	105	30	40	60	75	—	PSS105/181-500F PSS105/181-690F	1700 2040	
125	142	40	40	75	100	—	PSS142/245-500F PSS142/245-690F	2250 2700	
156	175	50	60	100	125	—	PSS175/300-500F PSS175/300-690F	2900 3395	
225	250	75	75	150	150	—	PSS250/430-500F PSS250/430-690F	3400 3965	
248	300	75	100	150	200	—	PSS300/515-500F PSS300/515-690F	3950 4530	

Connected inside delta ①②③

30	30	7.5	10	15	20	—	PSS18/30-500F PSS18/30-690F	\$ 620 744
48	52	15	15	30	30	—	PSS30/52-500F PSS30/52-690F	680 820
58	64	20	20	30	40	—	PSS37/64-500F PSS37/64-690F	750 900
69	76	20	25	40	50	—	PSS44/76-500F PSS44/76-690F	900 1080
81	85	25	30	50	60	—	PSS50/85-500F PSS50/85-690F	1120 1345
96	105	30	30	60	75	—	PSS60/105-500F PSS60/105-690F	1325 1590
116	124	40	40	60	75	—	PSS72/124-500F PSS72/124-690F	1460 1750
147	147	50	50	75	100	—	PSS85/147-500F PSS85/147-690F	1650 1980
181	181	60	60	100	150	—	PSS105/181-500F PSS105/181-690F	1700 2040
215	245	75	75	150	150	—	PSS142/245-500F PSS142/245-690F	2250 2700
270	300	75	100	150	200	—	PSS175/300-500F PSS175/300-690F	2900 3395
389	430	125	150	250	300	—	PSS250/430-500F PSS250/430-690F	3400 3965
429	515	150	150	300	350	—	PSS300/515-500F PSS300/515-690F	3950 4530

NOTE: Open softstarters are converted from connected inline to connected inside delta by means of a DIP switch. See circuit diagram on pages 6.13 - 6.15 for information.

① Catalog numbers are shown with 120V control. For 240V control, replace "F" with "L" in catalog number.

② Overload protection not included; external overload relay must be in power circuit. Use ABB TA series overload.

③ Current transformer not included. See page 6.8 for current transformers.

Enclosed ① NEMA 1, 12

Softstarters
Type PSS

Connected inline

Maximum motor current		Maximum horsepower					NEMA 1, 480V		NEMA 1, 600V		NEMA 12, 480V ②		NEMA 12, 600V ②	
UL	IEC	208V	240V	380V	480V	600V	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
18	18	5	5	10	10	15	P18L1-48	\$ 1095	—	—	P18L2-48M	\$ 1395	—	—
		—	—	—	—	—	—	—	P18L1-60	\$ 1219	—	—	P18L2-60M	\$ 1519
25	—	—	7.5	—	15	20	P22L1-48	1155	—	—	P22L2-48M	1480	—	—
		—	—	—	—	—	—	—	P22L1-60	1295	—	—	P22L2-60M	1620
28	30	7.5	10	15	20	25	P30L1-48	1155	—	—	P30L2-48M	1480	—	—
		—	—	—	—	—	—	—	P30L1-60	1295	—	—	P30L2-60M	1620
34	37	10	10	20	25	30	P37L1-48	1325	—	—	P37L2-48M	1725	—	—
		—	—	—	—	—	—	—	P37L1-60	1475	—	—	P37L2-60M	1875
40	44	10	10	25	30	30	P44L1-48	1475	—	—	P44L2-48M	1925	—	—
		—	—	—	—	—	—	—	P44L1-60	1755	—	—	P44L2-60M	2205
47	50	15	15	25	30	40	P50L1-48	1595	—	—	P50L2-48M	2045	—	—
		—	—	—	—	—	—	—	P50L1-60	1820	—	—	P50L2-60M	2270
56	60	15	20	30	40	50	P60L1-48	1860	—	—	P60L2-48M	2360	—	—
		—	—	—	—	—	—	—	P60L1-60	2135	—	—	P60L2-60M	2635
67	72	20	20	40	50	60	P72L1-48	1935	—	—	P72L2-48M	2485	—	—
		—	—	—	—	—	—	—	P72L1-60	2225	—	—	P72L2-60M	2775
85	85	25	30	50	60	75	P85L1-48	2475	—	—	P85L2-48M	3250	—	—
		—	—	—	—	—	—	—	P85L1-60	2805	—	—	P85L2-60M	3580
105	105	30	40	60	75	100	P105L1-48	2600	—	—	P105L2-48M	3375	—	—
		—	—	—	—	—	—	—	P105L1-60	2940	—	—	P105L2-60M	3715
125	142	40	40	75	100	125	P142L1-48	3350	—	—	P142L2-48M	4225	—	—
		—	—	—	—	—	—	—	P142L1-60	3800	—	—	P142L2-60M	4675
156	175	50	60	100	125	150	P175L1-48	3780	—	—	P175L2-48M	5180	—	—
		—	—	—	—	—	—	—	P175L1-60	4150	—	—	P175L2-60M	5550
225	250	75	75	150	150	200	P250L1-48	4300	—	—	P250L2-48M	5700	—	—
		—	—	—	—	—	—	—	P250L1-60	4750	—	—	P250L2-60M	6140
248	300	75	100	150	200	250	P300L1-48	4760	—	—	P300L2-48M	6460	—	—
		—	—	—	—	—	—	—	P300L1-60	5215	—	—	P300L2-60M	6915

Connected inside delta

30	30	7.5	10	15	20	25	P18D1-48	\$ 1095	—	—	P18D2-48M	\$ 1395	—	—
		—	—	—	—	—	—	—	P18D1-60	\$ 1219	—	—	P18D2-60M	\$ 1519
37	—	10	—	—	25	30	P22D1-48	1155	—	—	P22D2-48M	1480	—	—
		—	—	—	—	—	—	—	P22D1-60	1295	—	—	P22D2-60M	1620
48	52	15	15	30	30	40	P30D1-48	1155	—	—	P30D2-48M	1480	—	—
		—	—	—	—	—	—	—	P30D1-60	1295	—	—	P30D2-60M	1620
58	64	20	20	30	40	50	P37D1-48	1325	—	—	P37D2-48M	1725	—	—
		—	—	—	—	—	—	—	P37D1-60	1475	—	—	P37D2-60M	1875
69	76	20	25	40	50	60	P44D1-48	1475	—	—	P44D2-48M	1925	—	—
		—	—	—	—	—	—	—	P44D1-60	1755	—	—	P44D2-60M	2205
81	85	25	30	50	60	75	P50D1-48	1595	—	—	P50D2-48M	2045	—	—
		—	—	—	—	—	—	—	P50D1-60	1820	—	—	P50D2-60M	2270
96	105	30	30	60	75	75	P60D1-48	1860	—	—	P60D2-48M	2360	—	—
		—	—	—	—	—	—	—	P60D1-60	2135	—	—	P60D2-60M	2635
116	124	40	40	60	75	100	P72D1-48	1935	—	—	P72D2-48M	2485	—	—
		—	—	—	—	—	—	—	P72D1-60	2225	—	—	P72D2-60M	2775
147	147	50	50	75	100	150	P85D1-48	2475	—	—	P85D2-48M	3250	—	—
		—	—	—	—	—	—	—	P85D1-60	2805	—	—	P85D2-60M	3580
181	181	60	60	100	150	150	P105D1-48	2600	—	—	P105D2-48M	3375	—	—
		—	—	—	—	—	—	—	P105D1-60	2940	—	—	P105D2-60M	3715
215	245	75	75	150	150	200	P142D1-48	3350	—	—	P142D2-48M	4225	—	—
		—	—	—	—	—	—	—	P142D1-60	3800	—	—	P142D2-60M	4675
270	300	75	100	150	200	250	P175D1-48	3780	—	—	P175D2-48M	5180	—	—
		—	—	—	—	—	—	—	P175D1-60	4150	—	—	P175D2-60M	5550
389	430	125	150	250	300	400	P250D1-48	4300	—	—	P250D2-48M	5700	—	—
		—	—	—	—	—	—	—	P250D1-60	4750	—	—	P250D2-60M	6140
429	515	150	150	300	350	400	P300D1-48	4760	—	—	P300D2-48M	6460	—	—
		—	—	—	—	—	—	—	P300D1-60	5215	—	—	P300D2-60M	6915

① All enclosed softstarters include a control power transformer and Class 10 overload.
② Includes shunt rated (AC1) bypass contactor.

Enclosed ① NEMA 1 Combination

Connected inline

Maximum motor current		Maximum horsepower					480V with fusible disconnect switch NEMA 1		600V with fusible disconnect switch NEMA 1		480V with circuit breaker NEMA 1		600V with circuit breaker NEMA 1	
UL	IEC	208V	240V	380V	480V	600V	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
18	18	5	5	10	10	15	P18LF1-48A	\$ 1370	—	—	P18LB1-48E	\$ 1370	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	7.5	—	15	20	P22LF1-48B	1580	—	—	P22LB1-48G	1580	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
28	30	7.5	10	15	20	25	P30LF1-48B	1580	—	—	P30LB1-48J	1580	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
34	37	10	10	20	25	30	P37LF1-48B	1750	—	—	P37LB1-48K	1750	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
40	44	10	10	25	30	30	P44LF1-48C	2075	—	—	P44LB1-48L	2075	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
47	50	15	15	25	30	40	P50LF1-48C	2195	—	—	P50LB1-48N	2195	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
56	60	15	20	30	40	50	P60LF1-48C	2460	—	—	P60LB1-48N	2460	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
67	72	20	20	40	50	60	P72LF1-48C	2535	—	—	P72LB1-48R	2535	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
85	85	25	30	50	60	75	P85LF1-48D	3475	—	—	P85LB1-48S	3475	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
105	105	30	40	60	75	100	P105LF1-48D	3600	—	—	P105LB1-48T	3600	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
125	142	40	40	75	100	125	P142LF1-48D	4550	—	—	P142LB1-48V	4550	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
156	175	50	60	100	125	150	P175LF1-48E	5580	—	—	P175LB1-48X	5580	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
225	250	75	75	150	150	200	P250LF1-48E	6100	—	—	P250LB1-48Y	6100	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
248	300	75	100	150	200	250	P300LF1-48E	6560	—	—	P300LB1-48A	6560	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—

Connected inside delta

30	30	7.5	10	15	20	25	P18DF1-48B	\$ 1370	—	—	P18DB1-48J	\$ 1370	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
37	—	10	—	—	25	30	P22DF1-48B	1580	—	—	P22DB1-48K	1580	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
48	52	15	15	30	30	40	P30DF1-48C	1580	—	—	P30DB1-48L	1580	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
58	64	20	20	30	40	50	P37DF1-48C	1750	—	—	P37DB1-48N	1750	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
69	76	20	25	40	50	60	P44DF1-48C	2075	—	—	P44DB1-48R	2075	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
81	85	25	30	50	60	75	P50DF1-48D	2195	—	—	P50DB1-48S	2195	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
96	105	30	30	60	75	75	P60DF1-48D	2460	—	—	P60DB1-48T	2460	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
116	124	40	40	60	75	100	P72DF1-48D	2535	—	—	P72DB1-48T	2535	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
147	147	50	50	75	100	150	P85DF1-48D	3475	—	—	P85DB1-48V	3475	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
181	181	60	60	100	150	150	P105DF1-48E	3600	—	—	P105DB1-48Y	3600	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
215	245	75	75	150	150	200	P142DF1-48E	4550	—	—	P142DB1-48Y	4550	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
270	300	75	100	150	200	250	P175DF1-48E	5580	—	—	P175DB1-48A	5580	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
389	430	125	150	250	300	400	P250DF1-48F	6100	—	—	P250DB1-48D	6100	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
429	515	150	150	300	350	400	P300DF1-48F	6560	—	—	P300DB1-48E	6560	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—

① All enclosed softstarters include control power transformer and Class 10 overload.

Enclosed Options



Connected inline

Maximum motor current		Maximum horsepower					Shunt rated (AC1) bypass or isolation contactor	Across the line rated (AC3) bypass contactor ②③	Electronic brake std. duty	Electronic brake hvy. duty	Start/Stop pushbuttons	HOA selector switch	Run pilot light	NEMA 12 adder ①	NEMA 3R adder ①	NEMA 4 adder ①	NEMA 4X adder ①
UL	IEC	208V	240V	380V	480V	600V	List price	List price	List price	List price	List price	List price	List price	List price	List price	List price	List price
18	30	5	5	10	10	— 15	\$ 150	\$ 775	\$ 1445	\$ 1445	\$ 72	\$ 72	\$ 135	\$ 150	\$ 150	\$ 225	\$ 675
25	—	—	7.5	—	15	— 20	175	850	1445	2175	72	72	135	150	150	225	675
28	30	7.5	10	15	20	— 25	175	850	1445	2175	72	72	135	150	150	225	675
34	37	10	10	20	25	— 30	250	900	2175	2175	72	72	135	150	150	225	675
40	44	10	10	25	30	— 30	300	950	2175	2975	72	72	135	150	150	225	675
47	50	15	15	25	30	— 40	300	950	2175	2975	72	72	135	150	150	225	675
56	60	15	20	30	40	— 50	350	1000	2175	2975	72	72	135	150	150	225	675
67	72	20	20	40	50	— 60	400	1100	2975	2975	72	72	135	150	150	225	675
85	85	25	30	50	60	— 75	500	1150	2975	5800	72	72	135	275	275	350	1150
105	105	30	40	60	75	— 100	500	1150	2975	5800	72	72	135	275	275	350	1150
125	142	40	40	75	100	— 125	600	1550	5800	5800	72	72	135	275	275	350	1150
156	175	50	60	100	125	— 150	950	1850	5800	6500	72	72	135	450	450	525	1575
225	250	75	75	150	150	— 200	950	2100	5800	6500	72	72	135	450	450	525	1575
248	300	75	100	150	200	— 250	1250	2700	6500	7000	72	72	135	450	450	525	1575

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Connected inside delta

Maximum motor current		Maximum horsepower					Shunt rated (AC1) bypass or isolation contactor	Across the line rated (AC3) bypass contactor	Electronic brake std. duty	Electronic brake hvy. duty	Start/Stop pushbuttons	HOA selector switch	Run pilot light	NEMA 12 adder ①	NEMA 3R adder ①	NEMA 4 adder ①	NEMA 4X adder ①
UL	IEC	208V	240V	380V	480V	600V	List price	List price	List price	List price	List price	List price	List price	List price	List price	List price	List price
30	30	7.5	10	15	20	— 25	\$ 150	\$ 775	\$ 1445	\$ 1445	\$ 72	\$ 72	\$ 135	\$ 150	\$ 150	\$ 225	\$ 675
37	—	10	—	—	25	— 30	175	850	1445	2175	72	72	135	150	150	225	675
48	52	15	15	30	30	— 40	175	850	1445	2175	72	72	135	150	150	225	675
58	64	20	20	30	40	— 50	250	900	2175	2175	72	72	135	150	150	225	675
69	76	20	25	40	50	— 60	300	950	2175	2975	72	72	135	150	150	225	675
81	85	25	30	50	60	— 75	300	950	2175	2975	72	72	135	150	150	225	675
96	105	30	30	60	75	— 75	350	1000	2175	2975	72	72	135	150	150	225	675
116	124	40	40	60	75	— 100	400	1100	2975	2975	72	72	135	150	150	225	675
147	147	50	50	75	100	— 155	500	1150	2975	5800	72	72	135	275	275	350	1150
181	181	60	60	100	150	— 150	500	1150	2975	5800	72	72	135	275	275	350	1150
215	245	75	75	150	150	— 200	600	1550	5800	5800	72	72	135	275	275	350	1150
270	300	75	100	150	200	— 250	950	1850	5800	6500	72	72	135	450	450	525	1575
389	430	125	150	250	300	— 400	950	2100	5800	6500	72	72	135	450	450	525	1575
429	515	150	150	300	350	— 400	1250	2700	6500	7000	72	72	135	450	450	525	1575

① Bypass contactor required.
 ② Includes emergency bypass control.
 ③ Subtract AC1 List price when AC1 rating ("M" suffix) is included in the catalog numbers shown on page 6.5.

Accessories

Item	Suffix code ①	List price adder
Softstarters		
Door mounted reset	K	\$ 72
E-Stop	T	72
Start-stop pushbutton	A	72
2 position selector switch	C	72
3 position selector switch	D	72
Pilot light run	E	135
Start-stop pushbutton & pilot light	F	207
2 position selector switch & pilot light	H	207
3 position selector switch & pilot light	J	207
Shunt rated (AC1) bypass contactor	M	see pg 6.7
Across the line rated (AC3) contactor with emergency bypass control ②	B	see pg 6.7
Isolation contactor	W	see pg 6.7
Electronic brake (standard duty)	Y	see pg 6.7
Electronic brake (heavy duty)	Z	see pg 6.7
Service entrance, 3-wire	SE3	100
Service entrance, 4-wire	SE4	300
Lightning arrester	LA	320
Space heater, 100W with thermostat	SH	600
Auxiliary relays		
Type N control relay (4 pole)	CR	150
Electronic timer		
1.5 – 30s On Delay	TN30	125
5 – 100s On Delay	TN100	125
1.5 – 30s Off Delay	TF30	125
5 – 100s Off Delay	TF100	125
Phase failure phase reversal	PFPR	375
Undervoltage relay	UV	150
Overvoltage relay	OV	180
Ground fault protection	GFP	1500
Meters & metering		
Current transformer	CT	250
Ammeter (including C.T.)	AM	470
Ammeter & ammeter switch	AMS	1800
Voltmeter	VM	1200
Voltmeter & voltmeter switch	VMS	1800
Elapsed time meter	ETM	350
Operation counter	OC	375
Wattmeter	WM	2450

Control transformers

Size	Standard VA	Price adder for extra VA	
		100VA	250VA
PSS18/30 – PSS 142/245	75	\$ 175	—
PSS175/300 – PSS300/515	150	225	\$ 300

Current transformers for current limit function ②

Technical data	For softstarter	Catalog number	List price
60/1 – 2 turns	PSS18/30	PSCT-60	\$ 70
40/1 – 1 turn	PSS30/52	PSCT-40	
50/1 – 1 turn	PSS37/64	PSCT-50	
60/1 – 1 turn	PSS44/76	PSCT-60	
75/1 – 1 turn	PSS50/85	PSCT-75	130
75/1 – 1 turn	PSS60/105	PSCT-75	
100/1 – 1 turn	PSS72/124	PSCT-100	
125/1 – 1 turn	PSS85/147	PSCT-125	
150/1 – 1 turn	PSS105/181	PSCT-150	
200/1 – 1 turn	PSS142/245	PSCT-200	
250/1 – 1 turn	PSS175/300	PSCT-250	
400/1 – 1 turn	PSS250/430	PSCT-400	
400/1 – 1 turn	PSS300/515	PSCT-400	

① Add the suffix code after the last digit of the catalog number.

② 1 VA minimum.

③ Stranded conductors.

④ Includes line/load lugs and hardware.

⑤ Softstarters listed are provided with terminating bus tabs as standard.

⑥ Discount schedule SA.

Additional auxiliary contact blocks for bypass or isolation contactors

Contact configuration	Suffix code	List Price adder
1 N.O. & 1 N.C.	11	\$ 54
2 N.O. & 2 N.C.	22	98
3 N.O. & 3 N.C.	33	142

Terminal block to increase connection capacity ③

Wire range	For softstarter	Catalog number	List price
#8 - #1 (1 per phase)	PSS18 – PSS44	PSLW-44	\$ 65
#6 - 2/0 (1 per phase) or #4 - 1/0 (2 per phase)	PSS50 – PSS72	PSLW-72	70

Terminal lug kits ④

Wire range	For softstarter ⑤	Catalog number	List price
#6 - 250 MCM (1 per phase)	PSS85 – PSS142	PSLK-185	\$ 150
#4 - 400 MCM (1 per phase)	PSS175 – PSS300	PSLK-300	195
#4 - 500 MCM (2 per phase)	PSS175 – PSS300	PSLK-300/2	280

Terminal covers (Includes line & load covers)

For softstarter	Catalog ⑥	List price
PSS85 – PSS142	K4LCH	\$ 16
PSS175 – PSS300	K5LCH	24

Technical data

Softstarters
Type PSS

PSS03 – PSS25 and PSS18/30 – PSS300/515

		PSS03 – PSS12	PSS25	PSS18/30 – PSS300/515
Rated insulation voltage U_z	V	630	630	690
Rated operational Voltage U_e	V	220 – 600	220 – 600	200 – 690
SCR PIV ratings				
up to 500V		1200	1200	1600
up to 600V		1600	1600	1800
Starting capacity at max. rated current I_e		5 x I_e for 5 sec	5 x I_e for 5 sec	500% for 30 sec
Number of starts per hour \uparrow		6	6	30 ^①
Overload class	A	10	10	10
Service factor	%	100	100	115 110 (PSS300/515)
Ambient temperature				
During operation	°C	-20 to +50	-20 to +50	-20 to +60 ^②
During storage	°C	-40 to +70	-40 to +70	-40 to +70
Degree of protection				
Main circuit		IP20	IP20	IP20 (PSS18/30-500 – PSS44/76-500) IP10 (PSS50/85-500 – PSS72/124/-500) IP10 (PSS18/30-690 – PSS72/124-690) IP00 (PSS85/147 – PSS300/515)
Supply and control circuit		IP20	IP20	IP20
Settings				
Ramp time during start	s	0.5 – 6.5	0.5 – 10	1 – 30
Ramp time during stop	s	0.5 – 8	0.5 – 20	0 – 30
Initial voltage during start	%	0 – 85	5 – 50	30 – 70
Current limit function	xI_e	No	No	1.5 – 4 ^③
Switch for				
Inside delta connection ON/OFF		No	No	Yes
Signal relay				
Bypass signal		No ^④	No ^④	Yes
Fault signal		No	No	Yes
Rated operational voltage U_e	V	—	—	250
Rated thermal current I_{th}	A	—	—	5
Rated operational current I_e at AC 15 ($U_e=250V$)	A	—	—	1.5
Signal indication LED				
Ready to start/stand by	ON	Green	Green	Green
Ramping up/down		Yellow	Yellow (flashing)	No
Completed start ramp	T.O.R.	Yellow	Yellow	Green
General fault (internal)	F1	—	Red	Red
External fault (phase loss)	F2	—	—	Red

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Size related data

Size	Type	A	Max. power loss at max I_e W	Max. SCR fuse rating (optional)	Bussman fuses	Power requirements of supply circuit VA
PSS03	TA25DU	2.2 – 3.1	—	16A	170M1359	2
PSS12	TA25DU	10 – 14	—	40A	170M1363	2
PSS25	TA25DU	18 – 25	—	50A	170M1364	5
PSS18/30	TA25DU	6 – 18	⑤	50A	170M1364	9
PSS30/52	TA25DU	10 – 30	⑤	80A	170M1366	9
PSS37/64	TA42DU	22 – 37	⑤	125A	170M1368	9
PSS44/76	TA75DU	29 – 44	⑤	160A	170M1369	9
PSS50/85	TA75DU	29 – 50	⑤	160A	170M1369	10
PSS60/105	TA75DU	29 – 60	⑤	200A	170M1370	10
PSS72/124	TA75DU	45 – 72	⑤	250A	170M1371	10
PSS85/147	TA110DU	65 – 85	⑤	315A	170M1372	36
PSS105/181	TA110DU	65 – 105	⑤	400A	170M3019	36
PSS142/245	TA200DU	100 – 142	⑤	450A	170M3020	36
PSS175/300	TA200DU	100 – 175	⑤	500A	170M3021	65
PSS250/430	TA450DU	130 – 250	⑤	700A	170M4017	65
PSS300/515	TA450DU	130 – 300	⑤	900A	170M5015	65

① When more than six starts per hour are required, contact your sales office.

② Above 40°C, up to max 60°C, reduce the rated current with 0.8% per °C.

③ Only if current transformer is connected (accessory).

④ The unit has built-in bypass contacts (AC-53b).

⑤ Total power loss: $P_{Tot} = [3 \times I_e \times 1.0] + 50$ (W), reduced to 50W only when using by-pass.

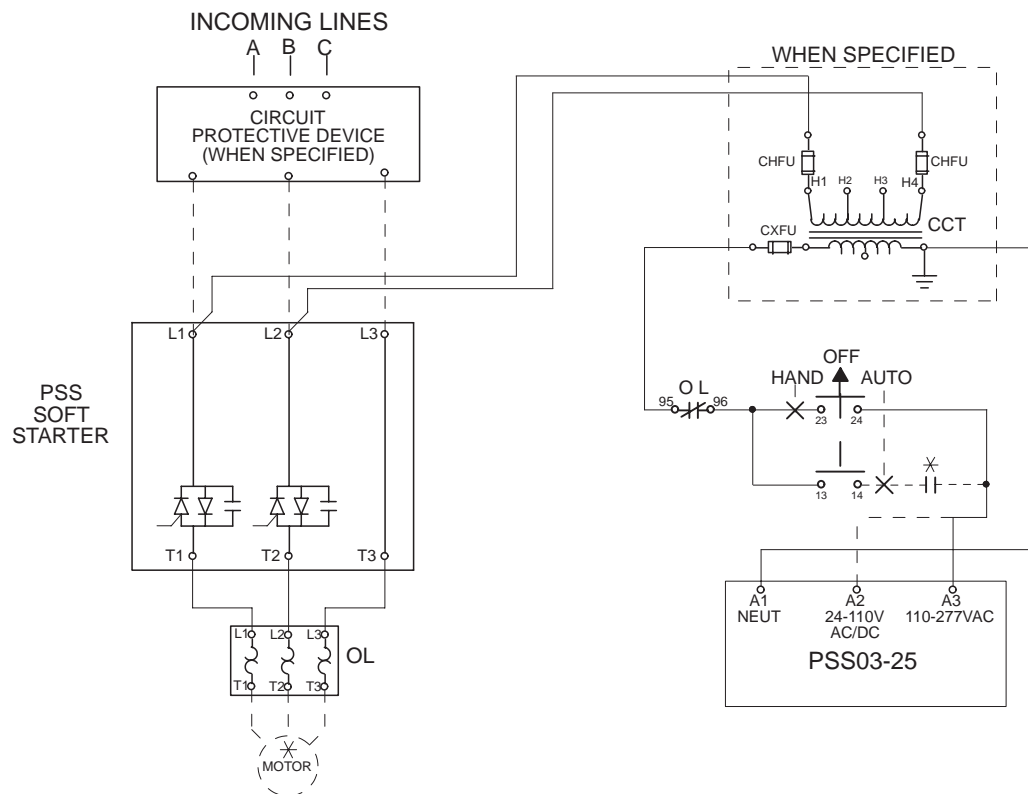
⑥ 50% on and 50% off, 3.5 times rated current and 7 second starting time.

Cross section of connection cables PSS03 – PSS25 and PSS18/30 – PSS300/515

Type PSS		PSS03 – PSS12	PSS25	PSS18/30-500 – PSS44/76-500	PSS50/85-500 – PSS72/124-500 & PSS18/30-690 – PSS72/124-690	PSS85/147-500 – PSS142/245-500 & PSS85/147-690 – PSS142/245-690	PSS175/300-500 – PSS300/515-500 & PSS175/300-690 – PSS300/515-690
Main circuit							
Connection clamp							
	Rigid solid/rigid stranded	1x AWG 12	AWG 6	AWG 4 - 8	AWG 1 - 8	—	—
	Rigid solid/rigid stranded	2x AWG 12	AWG 8	AWG 4 - 8	AWG 4 - 8	—	—
	Tightening torque (for guidance only) max. lb./in	4.3	17.5	23	40	—	—
6	Terminal lugs ①						
		Rigid solid / rigid stranded	1x —	—	—	#6 - 250 MCM	#4 - 400 MCM
		Rigid solid / rigid stranded	2x —	—	—	—	#4 - 500 MCM
	Tightening torque (for guidance only) max. lb./in	—	—	—	—	300	375
Connection bar							
	Width and thickness	mm —	—	—	—	17.5 x 5	20 x 5
	Hole diameter	mm —	—	—	—	8.5	10.2
	Tightening torque (for guidance only) max. lb./in	—	—	—	—	79	155
Supply and control circuit							
Connection clamp							
	Rigid solid/rigid stranded	1x AWG 12	AWG 12	AWG 12	AWG 12	AWG 12	AWG 12
	Rigid solid/rigid stranded	2x AWG 12	—	—	—	—	—
	Tightening torque (for guidance only) max. lb./in	4.3	4.3	4.3	4.3	4.3	4.3

① See accessories on page 6.8.

Circuit diagrams PSS03 – PSS25



NOTES

1. ALL CONTROL WIRING TO BE 18GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE OF CONTACTOR COILS:
RED - ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.
BLUE - ALL DC VOLTAGES
2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

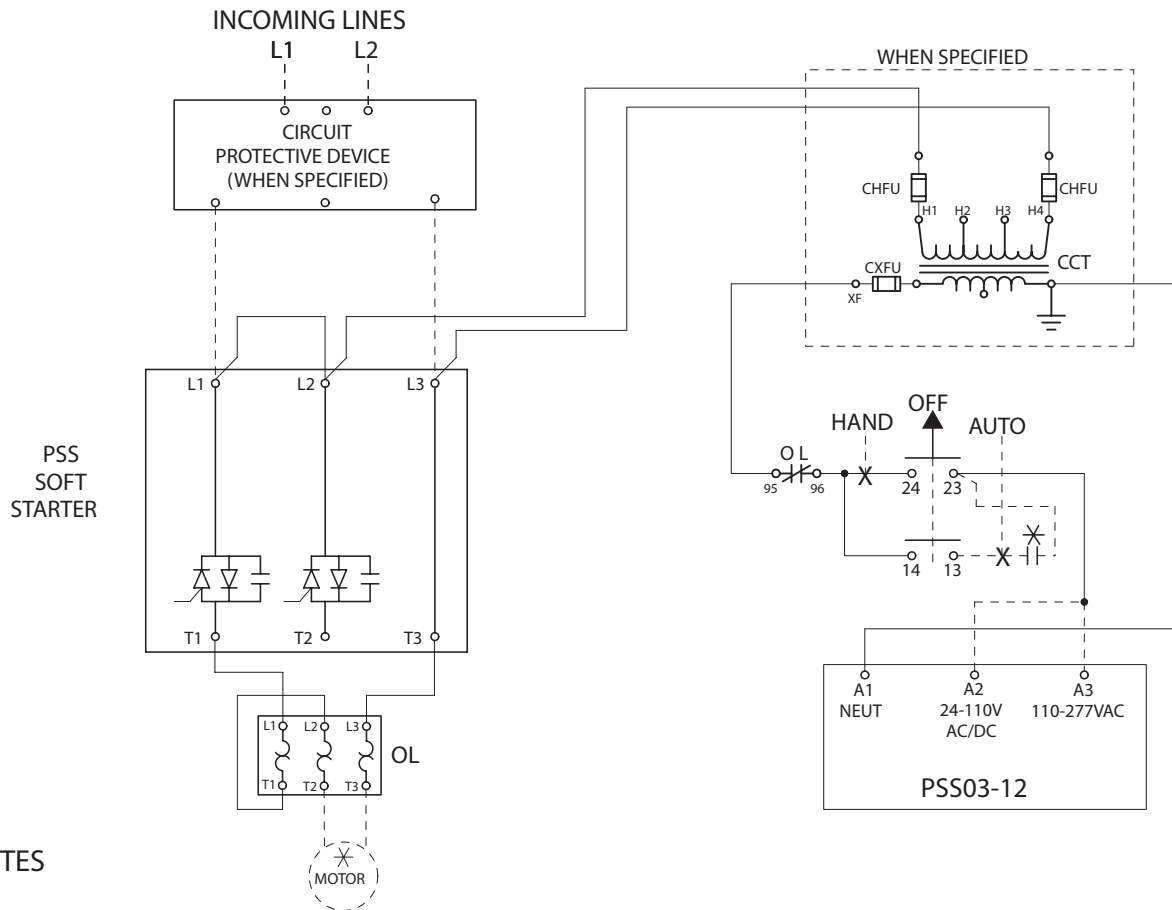
LEGEND	
CCT	CONTROL CIRCUIT TRANSFORMER
CHFU	CCT PRIMARY FUSE
CXFU	CCT SECONDARY FUSE
B	BYPASS CONTACTOR
OL	OVERLOAD RELAY
○ ₁₃	CONN POINT ON DEVICE WITH NUMBER
⊗	REMOTE DEVICE
∅	CONN POINT AT TERMINAL BLOCK

Circuit diagrams

Single-Phase ①②

PSS03 – PSS12

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NOTES

1. ALL CONTROL WIRING TO BE 18GA.
COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE OF CONTACTOR COILS:
RED - ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.
BLUE - ALL DC VOLTAGES
2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

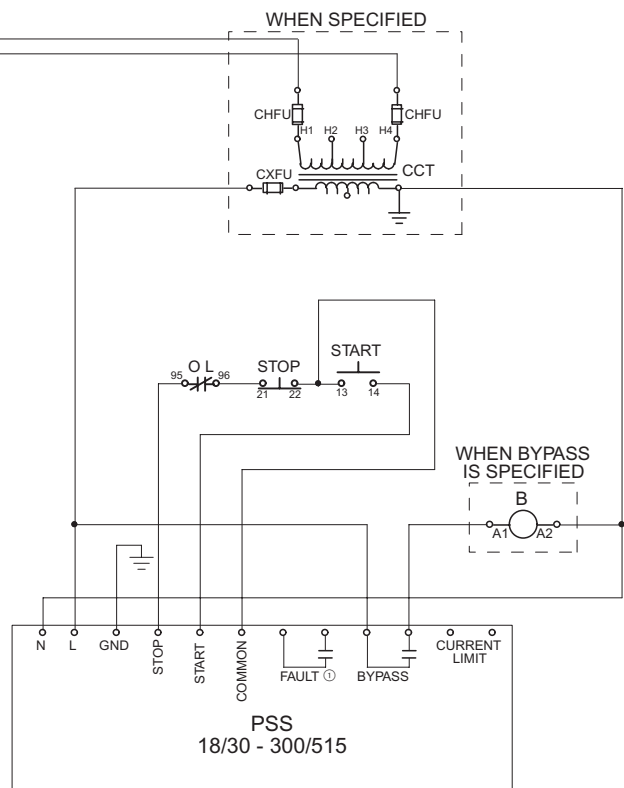
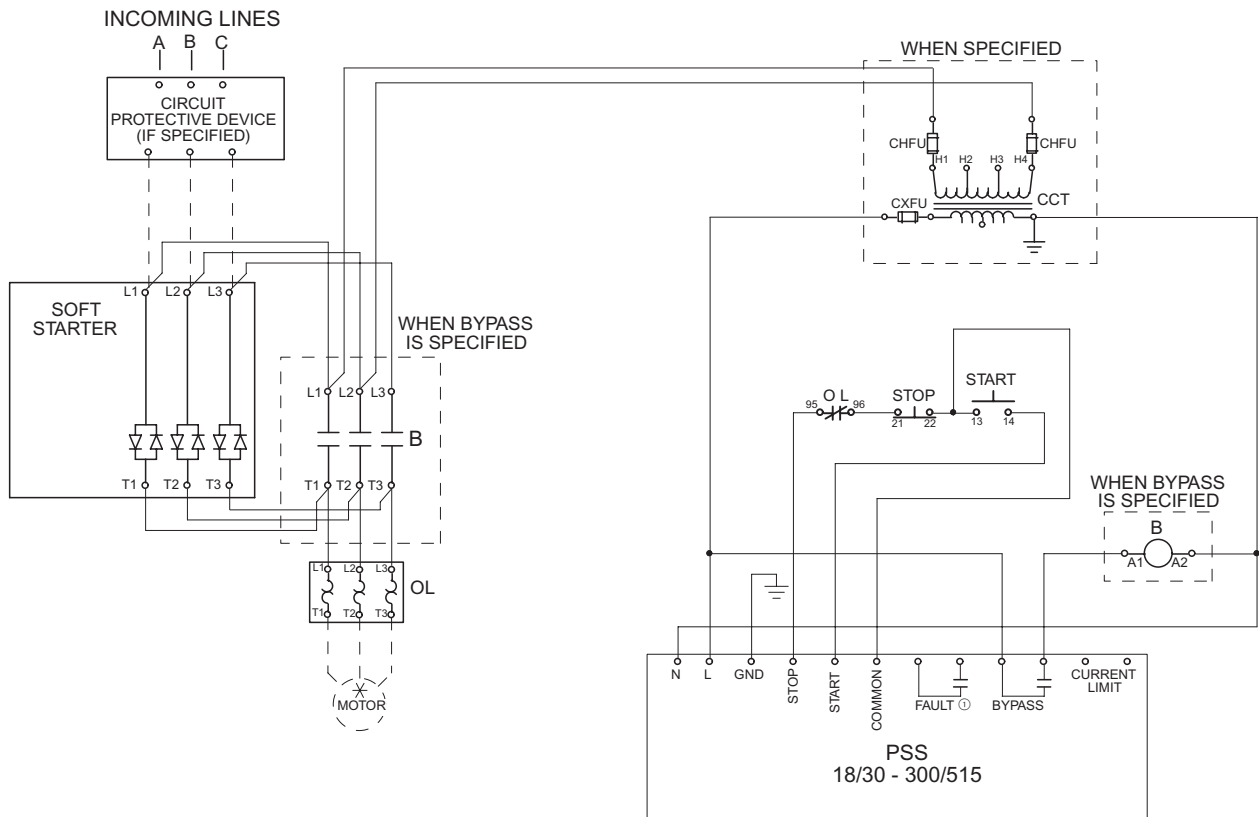
LEGEND

CCT	CONTROL CIRCUIT TRANSFORMER
CHFU	CCT PRIMARY FUSE
CXFU	CCT SECONDARY FUSE
OL	OVERLOAD RELAY
○ ₁₃	CONN POINT ON DEVICE WITH NUMBER
✕	REMOTE DEVICE
∅	CONN POINT AT TERMINAL BLOCK

① Softstarter voltage rating must be the same as the network voltage.
② PSS25 cannot be used for single phase applications.

Circuit diagrams

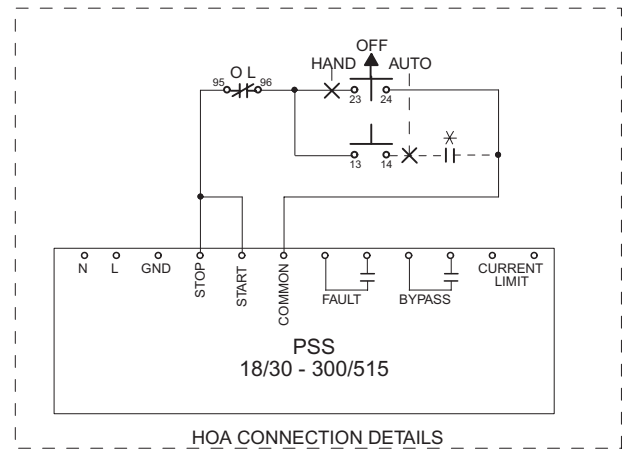
PSS18/30 – PSS300/515, In-line motor configuration



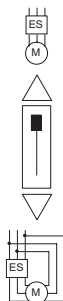
NOTES

1. ALL CONTROL WIRING TO BE 18GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE OF CONTACTOR COILS:
RED - ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.
BLUE - ALL DC VOLTAGES
2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

LEGEND	
CCT	CONTROL CIRCUIT TRANSFORMER
CHFV	CCT PRIMARY FUSE
CXFU	CCT SECONDARY FUSE
B	BYPASS CONTACTOR
OL	OVERLOAD RELAY
13	CONN POINT ON DEVICE WITH NUMBER
X	REMOTE DEVICE
∅	CONN POINT AT TERMINAL BLOCK



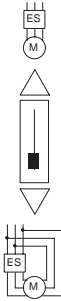
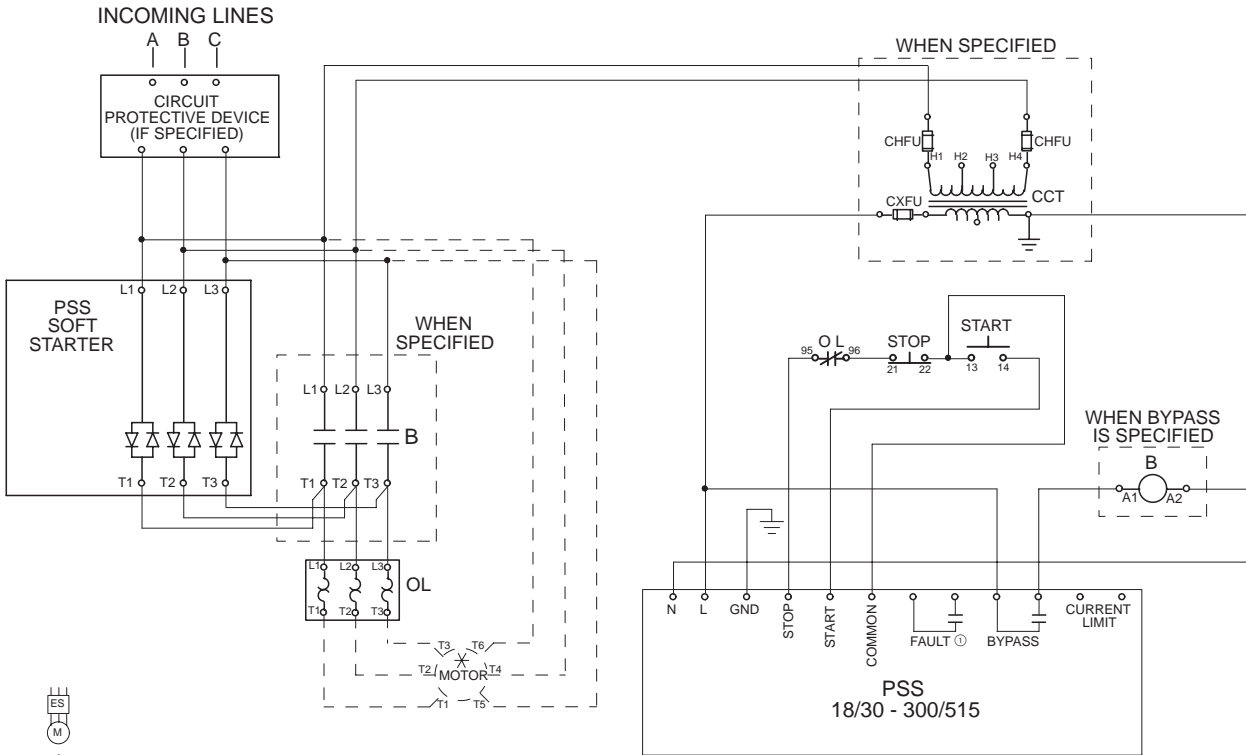
SET DIP SWITCH S1 AS SHOWN



Circuit diagrams

PSS18/30 – PSS300/515, Delta motor configuration

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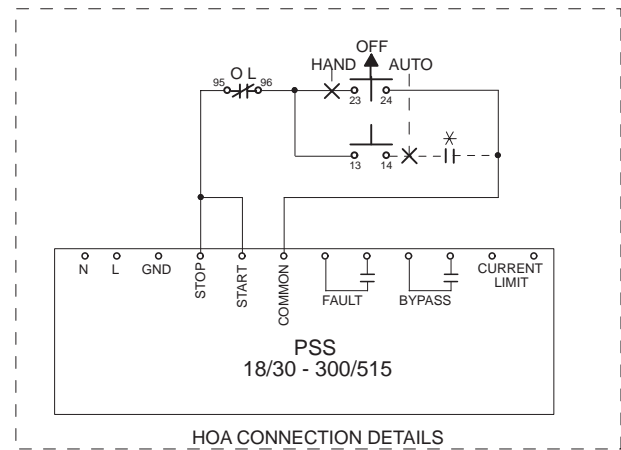
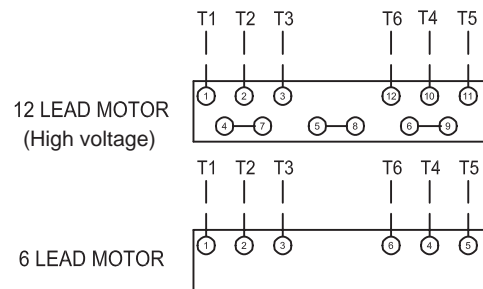


NOTES

- ALL CONTROL WIRING TO BE 18GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE OF CONTACTOR COILS:
RED - ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.
BLUE - ALL DC VOLTAGES
- ALL DEVICES ARE SHOWN DE-ENERGIZED.
- DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

LEGEND	
CCT	CONTROL CIRCUIT TRANSFORMER
CHFV	CCT PRIMARY FUSE
CXFU	CCT SECONDARY FUSE
B	BYPASS CONTACTOR
OL	OVERLOAD RELAY
° ₁₃	CONN POINT ON DEVICE WITH NUMBER
✱	REMOTE DEVICE
∅	CONN POINT AT TERMINAL BLOCK

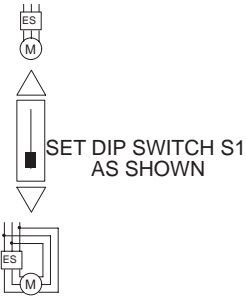
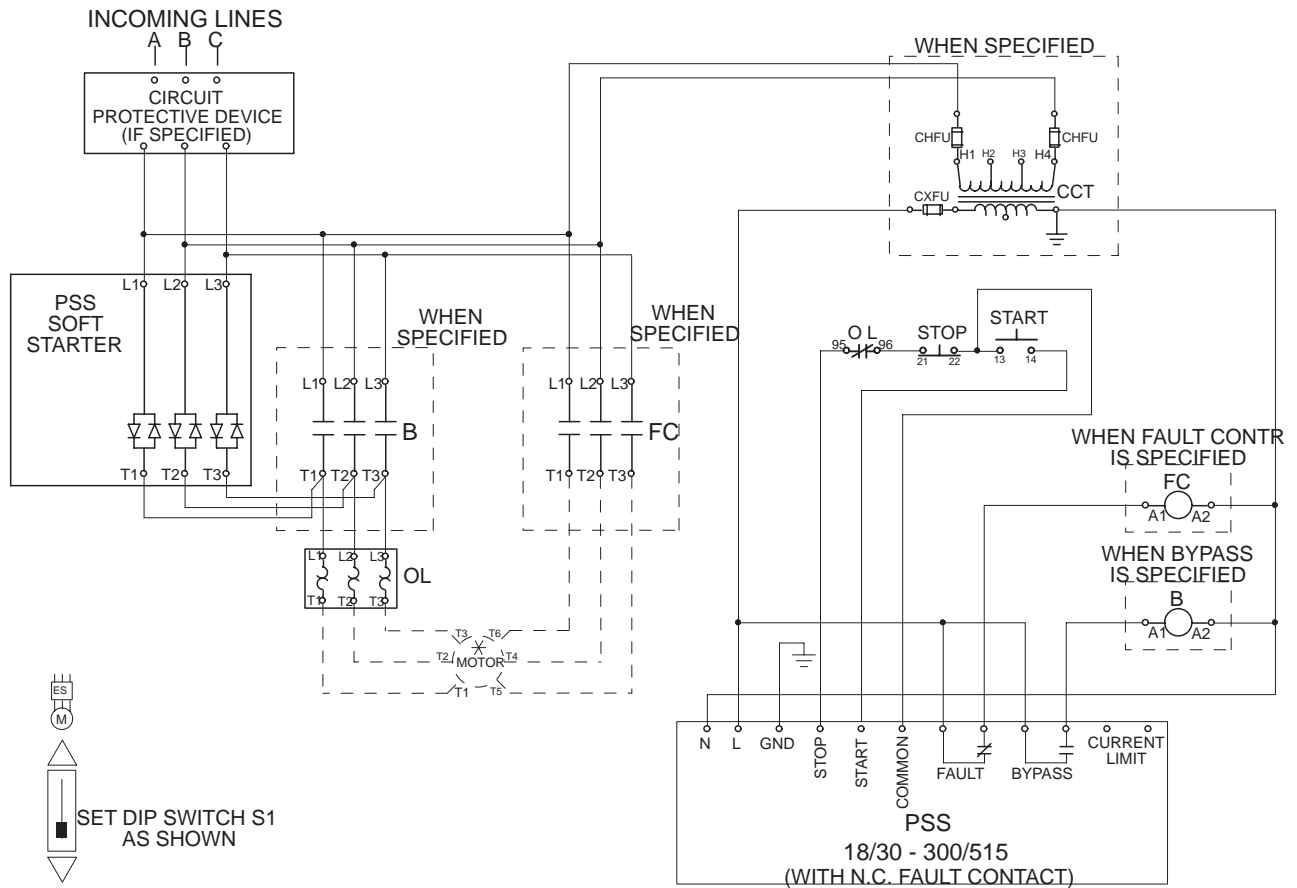
MOTOR MARKINGS ARE AS DEFINED BY NEMA MG1-2.62 FOR 12 LEAD WYE START, DELTA RUN MOTOR CONNECTIONS. ALWAYS CONFIRM CORRECT LEAD MARKINGS WITH NAMEPLATE DIAGRAMS.



Circuit diagrams

PSS18/30 – PSS300/515, Delta motor configuration

Fault contactor

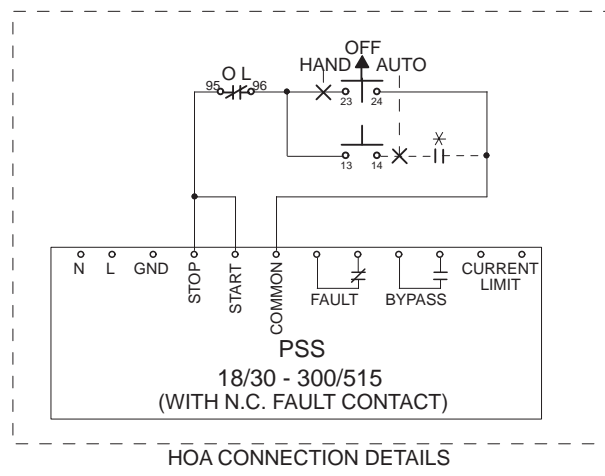
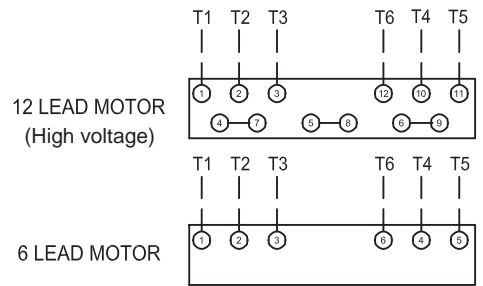


NOTES

1. ALL CONTROL WIRING TO BE 18GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE OF CONTACTOR COILS:
 RED - ALL AC VOLTAGES
 WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.
 BLUE - ALL DC VOLTAGES
2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

LEGEND	
CCT	CONTROL CIRCUIT TRANSFORMER
CHFV	CCT PRIMARY FUSE
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B	BYPASS CONTACTOR
OL	OVERLOAD RELAY
° ₁₃	CONN POINT ON DEVICE WITH NUMBER
*	REMOTE DEVICE
∅	CONN POINT AT TERMINAL BLOCK

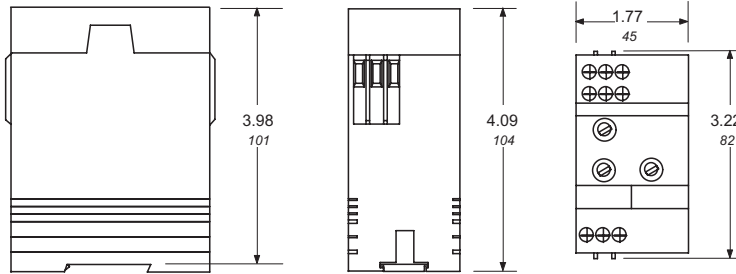
MOTOR MARKINGS ARE AS DEFINED BY NEMA MG1-2.62 FOR 12 LEAD WYE START, DELTA RUN MOTOR CONNECTIONS. ALWAYS CONFIRM CORRECT LEAD MARKINGS WITH NAMEPLATE DIAGRAMS.



Approximate dimensions Open, PSS03 – PSS18-72

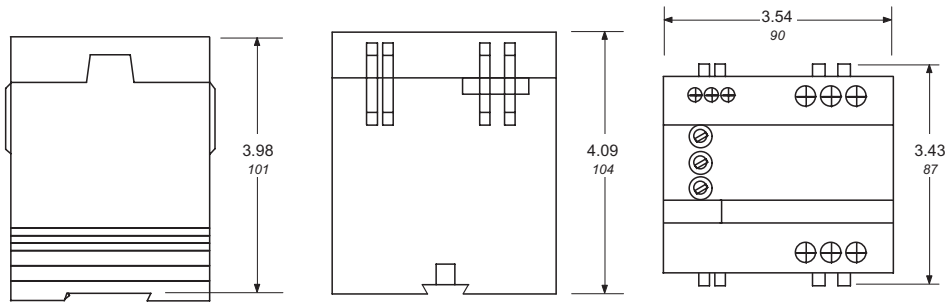
← 00.00 → Inches
00.00 [Millimeters]

PSS03, PSS12



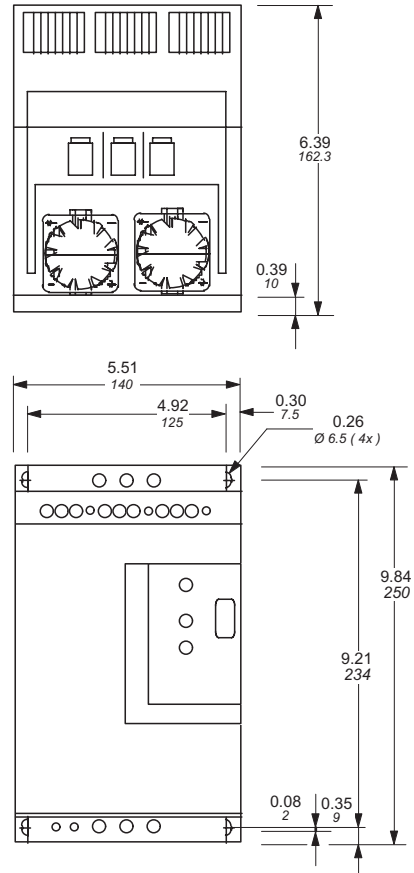
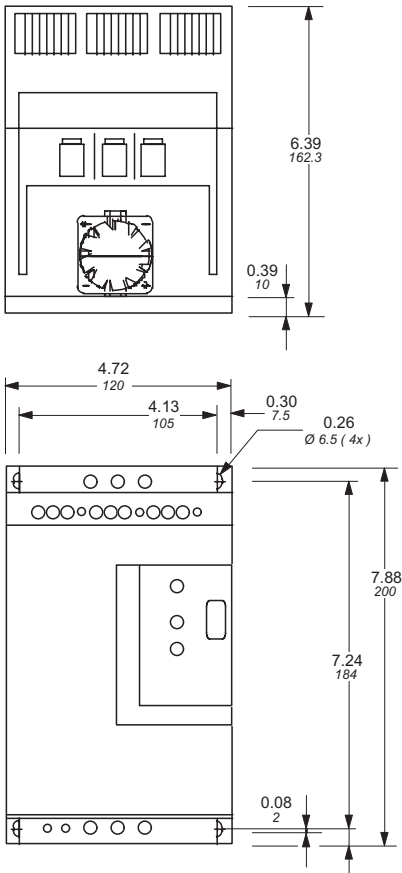
6

PSS25



PSS18 to PSS44 (208V – 480V)

PSS18 to PSS72 (690V) PSS50 to PSS72 (208 – 480V)

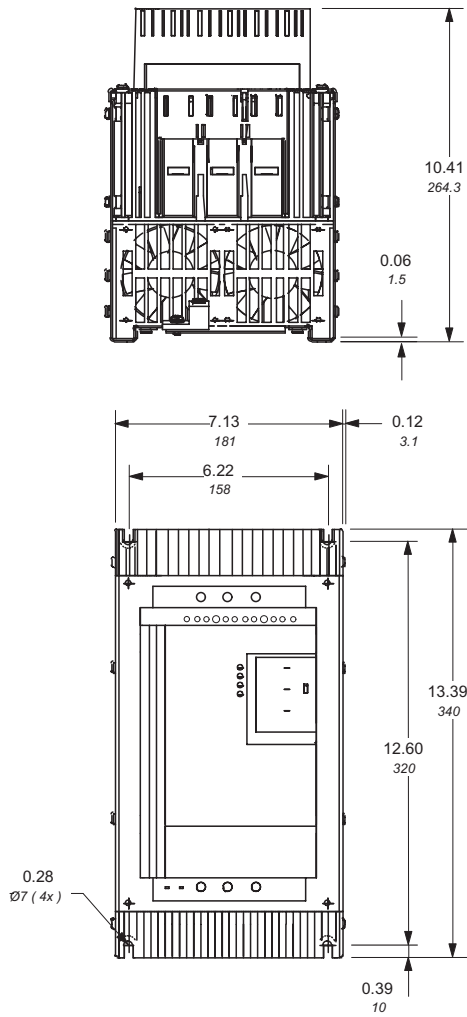


Approximate dimensions Open, PSS85 – PSS300

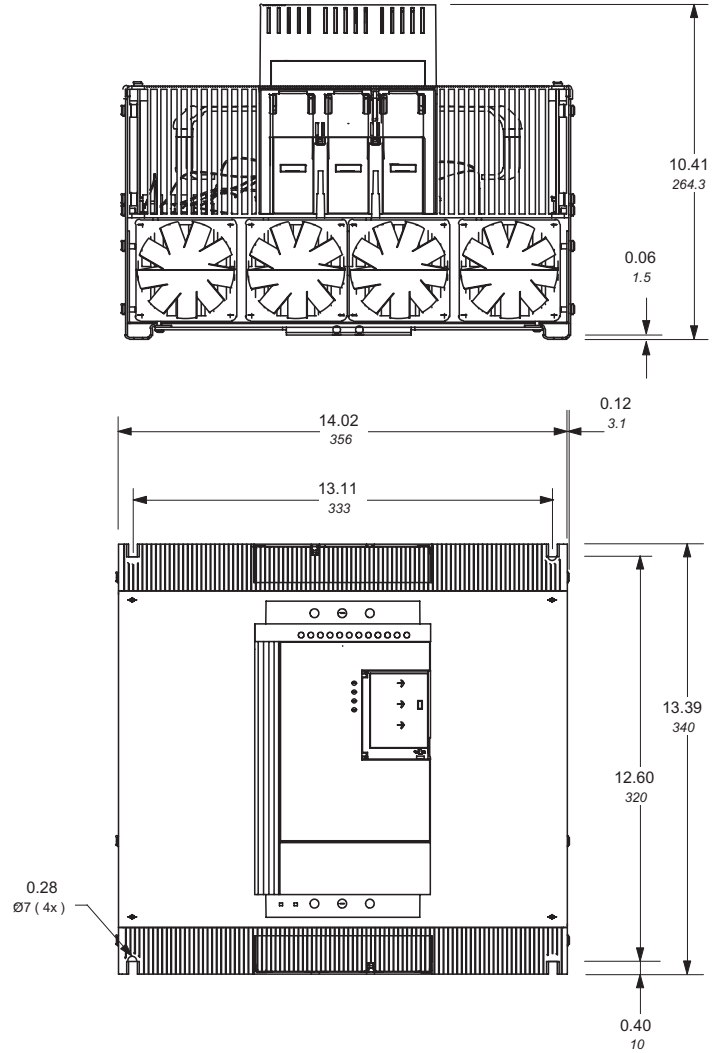
Softstarters
Type PSS

00.00 Inches
00.00 [Millimeters]

PSS85 to PSS142 (208V – 690V)

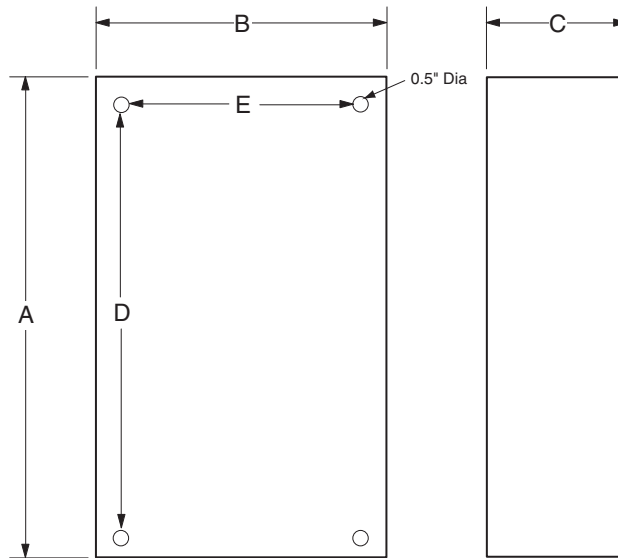


PSS175 to PSS300 (208V – 690V)



6

Approximate dimensions Enclosed



208V – 500V

Softstarter type	Softstarter combination	Dimensions In-line (in.)					Dimensions Inside delta (in.)				
		A	B	C	D	E	A	B	C	D	E
PSS18/30-500 thru PSS44/76-500	Softstarter only	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with bypass	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with fused disconnect ①	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with circuit breaker ①	20	20	12	18.50	18.50	20	20	12	18.50	18.50
PSS50/85-500 thru PSS72/124-500	Softstarter only	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with bypass	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with fused disconnect ①	20	20	12	18.50	18.50	24	20	12	22.50	18.50
	Softstarter with circuit breaker ①	20	20	12	18.50	18.50	20	20	12	18.50	18.50
PSS85/147-500 thru PSS142/245-500	Softstarter only	24	24	12	22.50	22.50	24	24	12	22.50	22.50
	Softstarter with bypass	24	24	12	22.50	22.50	24	24	12	22.50	22.50
	Softstarter with fused disconnect ①	36	30	12	34.50	28.50	36	30	12	34.50	28.50
	Softstarter with circuit breaker ①	30	24	12	28.50	22.50	30	24	12	28.50	22.50
PSS175/300-500 thru PSS300/515-500	Softstarter only	36	30	12	34.50	28.50	42	36	12	40.50	34.50
	Softstarter with bypass	36	30	12	34.50	28.50	42	36	12	40.50	34.50
	Softstarter with fused disconnect ①	48	36	16	46.50	34.50	48	36	16	46.50	34.50
	Softstarter with circuit breaker ①	42	36	12	40.50	34.50	48	36	16	46.50	34.50

575V – 690V

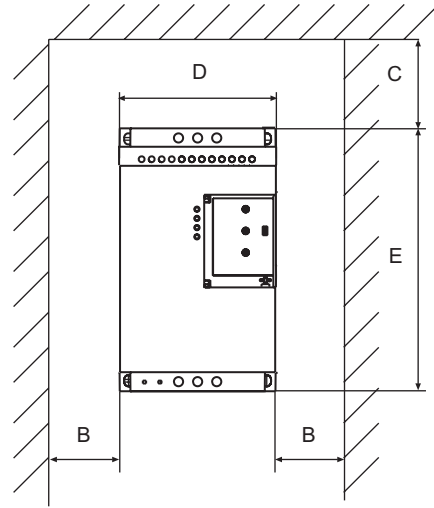
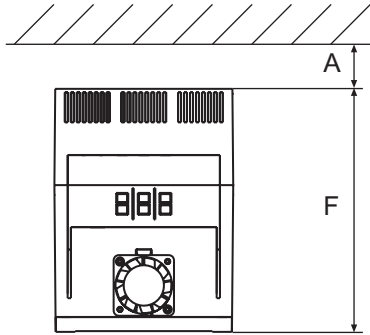
PSS18/30-690 thru PSS72/124-690	Softstarter only	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with bypass	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with fused disconnect ①	20	20	12	18.50	18.50	20	20	12	18.50	18.50
	Softstarter with circuit breaker ①	20	20	12	18.50	18.50	20	20	12	18.50	18.50
PSS85/147-690 thru PSS142/245-690	Softstarter only	24	24	12	22.50	22.50	24	24	12	22.50	22.50
	Softstarter with bypass	24	24	12	22.50	22.50	24	24	12	22.50	22.50
	Softstarter with fused disconnect ①	36	30	12	34.50	28.50	36	30	12	34.50	28.50
	Softstarter with circuit breaker ①	30	24	12	28.50	22.50	30	24	12	28.50	22.50
PSS175/300-690 thru PSS300/575-690	Softstarter only	36	30	12	34.50	28.50	42	36	12	40.50	34.50
	Softstarter with bypass	36	30	12	34.50	28.50	42	36	12	40.50	34.50
	Softstarter with fused disconnect ①	48	36	16	46.50	34.50	48	36	16	46.50	34.50
	Softstarter with circuit breaker ①	42	36	12	40.50	34.50	48	36	16	46.50	34.50

① Dimensions remain the same if bypass contactor is added.

Approximate dimensions Mounting information



Minimum distance to wall / front



Approximate dimensions (in./mm)

Catalog number	Dimensions		
	D	E	F
PSS18/30-500 – 44/76-500	4.7/120	7.9/200	6.4/163
PSS50/85-500 – 72/124-500 PSS18/30-690 – 72/124-690	5.5/140	9.8/250	6.4/163
PSS85/147-500 – 142/245-500 PSS85/147-690 – 142/245-690	7.1/181	13.4/340	10.4/265
PSS175/300-500 – 300/515-500 PSS175/300-690 – 300/515-690	14/356	13.4/340	10.4/265

Minimum distance to wall / front (in./mm)

A = .79/20
 B = .39/10
 C = 3.9/100 – both top and bottom



Notes

Type PST Softstarters

ABB Softstarters
Type PST



6

Description

- Wide main voltage range, 200 - 690 VAC
- Wide control voltage range, 100 - 250 V, 50/60 Hz
- Current ratings 30 to 1050 A (In Line) and 52 - 1800 A (Inside Delta)
- Same unit can be used for both In Line and Inside Delta connection
- Premium adjustable Softstarter functions like start/stop ramp, kick start, jog, step down voltage and sequential starts
- Current limit adjustable between 200% to 500% of motor FLA
- Thermistor (PTC) supervision of motor winding
- Real time clock
- Logging of last 20 events with time stamp
- Prepared for Field-bus communication
- Programmable electronic overloads: Classes 10A, 10, 20 & 30
- Locked rotor protection
- Motor underload protection
- Phase imbalance protection
- Phase reversal protection

General information

Catalog number explanation

Open & enclosed

Open

PST B 370 600 - 70

Softstarter
Type PST

Bypass
No digit – No integrated bypass
B – Integrated bypass

Current rating

UL / IEC	UL / IEC
30 – 28/30	210 – 192/210
37 – 34/37	250 – 248/250
44 – 42/44	300 – 302/300
50 – 54/50	370 – 361/370
72 – 68/72	470 – 480/470
85 – 80/85	570 – 590/570
105 – 104/105	720 – 720/720
142 – 130/142	840 – 840/840
175 – 156/175	1050 – 1062/1050

Control voltage
70 – 100 - 250 V, 50/60 Hz

Line voltage
600 – 208/230/480/600 V
690 – 690 V ③

Enclosed

T 100 D F 1 - 48 D A

Soft starter settings
T – Type PST Enclosed

Horsepower

010 – 10	125 – 125	800 – 800
015 – 15	150 – 150	900 – 900
020 – 20	200 – 200	1000 – 1000
025 – 25	250 – 250	1200 – 1200
030 – 30	300 – 300	1400 – 1400
040 – 40	350 – 350	1500 – 1500
050 – 50	400 – 400	1600 – 1600
060 – 60	450 – 450	1700 – 1700
075 – 75	500 – 500	1800 – 1800
100 – 100	600 – 600	

Connection type
L – Inline
D – Inside Delta

Combination type
No digit – non-combination
F – fusible disconnect
B – thermal magnetic circuit breaker
M – magnetic only breaker
N – non-fusible disconnect

Enclosure
1 – NEMA 1
2 – NEMA 12 ②
3 – NEMA 3R ②
4 – NEMA 4 ②
X – NEMA 4x stainless steel ②

Options ①

A – Start-stop pushbutton
B – Across the line rated (AC3) contactor with emergency bypass control
C – 2 position selector switch
D – 3 position selector switch
E – Pilot light
F – Start-stop pushbutton and pilot light
H – 2 position selector switch and pilot light
J – 3 position selector switch and pilot light
M – Shunt rated (AC1) bypass contactor
W – Isolation contactor

Fuse clip

A – 30A, 600V, Class J	H – 1200A, 600V, Class L
B – 60A, 600V, Class J	J – 1600A, 600V, Class L
C – 100A, 600V, Class J	K – 2000A, 600V, Class L
D – 200A, 600V, Class J	L – 2500A, 600V, Class L
E – 400A, 600V, Class J	M – 3000A, 600V, Class L
F – 600A, 600V, Class J	N – 4000A, 600V, Class L
G – 800A, 600V, Class L	

Circuit Breaker Amp Ratings

D – 15	M – 70	W – 225	E – 700	N – 3000
E – 20	N – 80	X – 250	F – 800	
F – 25	P – 90	Y – 300	G – 900	
G – 30	R – 100	Z – 350	H – 1000	
H – 35	S – 125	A – 400	J – 1200	
J – 40	T – 150	B – 450	K – 1600	
K – 50	U – 175	C – 500	L – 2000	
L – 60	V – 200	D – 600	M – 2500	

MCP/MAG Only Rating

A – 3	E – 50	J – 400
B – 5	F – 100	K – 600
C – 10	G – 150	L – 800
D – 25	H – 225	M – 1200

Line voltage

20: 208V 120V control voltage
23: 230V 120V control voltage
38: 380V 220V control voltage
41: 415V 220V control voltage
48: 480V 120V control voltage
60: 600V 120V control voltage

① For more options, see page 6.27

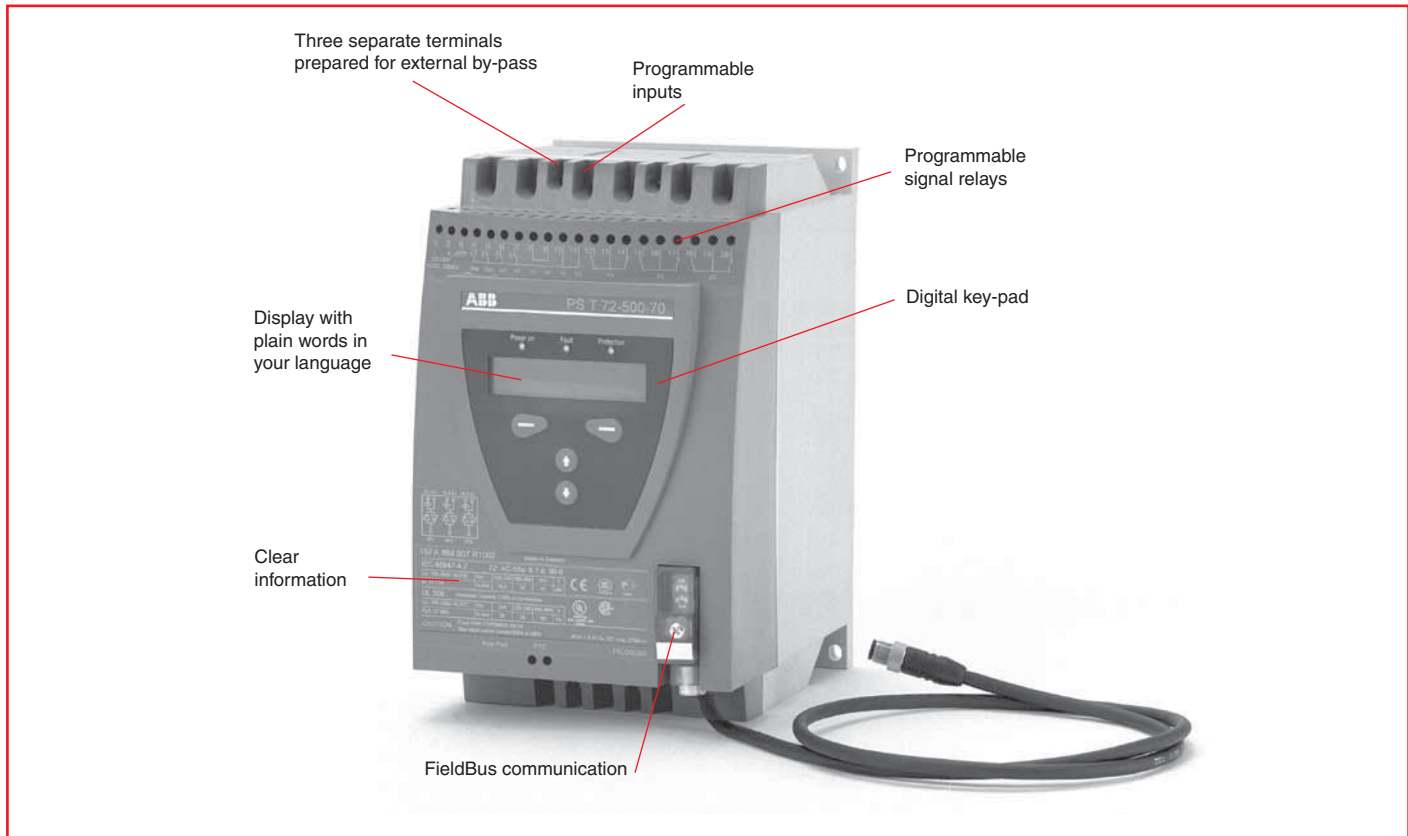
② Bypass contactor required when integrated bypass is not included.

③ Add 30% to the list price.

General information

Application and description

Softstarters
Type PST



6

Application

The PST range is a microprocessor based softstarter designed with the latest technology for soft start and soft stop of motors. The PST Softstarter has several advanced motor protection features as standard. The four button key pad and the logic structure of the menu makes the installation, commissioning and operation easy. It is possible to choose between 12 different languages.

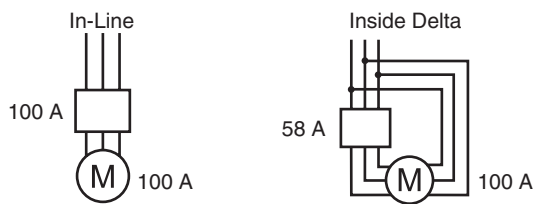
The PST Softstarter can be used with or without a by-pass contactor. The larger sizes, PSTB370 – PSTB1050, include a built-in by-pass contactor.

The PST Softstarter can be selected according to the rated motor power in normal duty applications like pumps, compressors, elevators, escalators, short conveyor belts and bow thrusters.

Digital display

Your business is going global. Shouldn't your motor control go global, too? The PST display gives you information presented in plain words — in your language. You can choose between almost a dozen languages including English, German, Italian, Chinese, Finnish, Swedish, French, Spanish, Dutch, Russian, Turkish and Portuguese. On the PST display, you get all the information you need to set up, adjust and trouble-shoot. This makes the PST extremely easy to handle and reduces the risk of misinterpretations.

At any time, you can read output current, output voltage, number of starts, total run time and motor temperature on the display. If a fault should occur, this is also indicated on the display. The fault messages are presented in clear text in the selected language.



In-Line and Inside Delta connection of PST30 - 1050



General information

Application and description

Four button keypad

The PST employs the same basic user concept as today's advanced mobile telephones. Using the four buttons on the keypad, you can easily adjust your own start and stop profile and motor protection functions for any type of application. There are standard settings for many common applications including pumps, conveyors, fans, mixers and compressors for quick and easy set up.

You can also set the advanced warning parameters to allow potential problems to be identified before real problems occur. A password protection function is available to prevent unauthorized changes to the programming.

Remote four button keypad

6 This optional remote keypad is an extended HMI (human-machine interface) for all PST(B) softstarters. The remote keypad allows you to access all functions from the PST(B) on the outside of the enclosure door.

The interface/display is exactly the same as the one on the softstarter (working in parallel with the one on the product). Used as a handheld device, it is easy to set up parallel softstarter units as you can copy data from one softstarter unit and download to another.

The keypad kit includes all necessary details for assembling: 3 screws, 10 ft. communication cable, installation instructions and a drilling plan.

The keypad has the following approvals: UL Type 1, 12, Indoor 4/4X.

Starting several motors

You can store as many as three different starting parameter sets for optimal sequence start of three different motors. You can use this function for two or three speed motors as well.

Integrated advanced motor protection

Inside the PST Softstarter, you will find useful features for advanced motor and softstarter protection, including: programmable overload protection, high current, underload, phase imbalance, phase reversal, thyristor overload protection, and bypass monitoring to ensure proper by-pass operation.

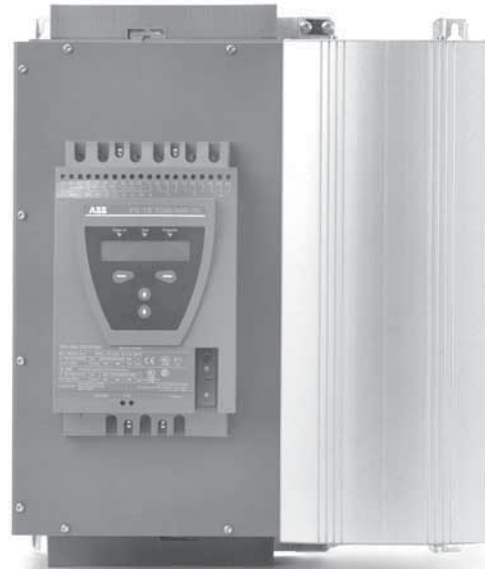
Programmable signal relays

All PST units have three programmable signal relays where each relay can signal Run, Top of Ramp or Event. The Event setting can be used to signal fault protections or warnings. The supervisory functions monitor not only software and critical softstarter functionality but also phase loss and out of frequency range.

Integrated by-pass contactor

On the larger sizes (PSTB370 – PSTB1050), there is an integrated ABB AF contactor. This gives you advantages in terms of cost-saving, (less investment in fans, cables, time), space saving (more compact soft starter; no fan that takes up space), and last but not least, energy saving. With a by-pass contactor you can reduce the power losses during normal run by 90% or more.

For the smaller PST below 370A, which are not equipped with built-in contactors, the units have double connections for the main terminals on the line side. The extra terminals are used to connect an external by-pass contactor in order to enable the integrated protection functions.



PSTB1050 with integrated by-pass contactor.

Fieldbus communication

The PST Softstarter has a built-in interface on the front for connection of the ABB FieldBusPlug used for fieldbus communication. Through this interface, it is possible to control the softstarter, achieve status information, upload and download parameters. The interface between the softstarter and the FieldBusPlug is always the same. Independently of PST Softstarter size or delivery date, it is possible to connect to any fieldbus protocol later on since this is defined in the FieldBusPlug itself. The following protocols are currently available: AS-I, DeviceNet and Profibus DP. To connect the PST Softstarter to a fieldbus system, you need the accessories described on pages 6.33 to 6.34 as well as specific software for PLC set-up, which is available on the ABB web site; see the Resources section at the bottom of the Softstarter product page at www.abb-control.com/products/softstarters.htm.

Open In-Line, Inside Delta 7.5 – 1800 HP

Softstarters
Type PST



PST72-600-70



PST142-600-70



PST175-600-70



PSTB370-600-70



PSTB570-600-70

Connected In-Line

Maximum motor current		Maximum horsepower					Weight (lbs.)	Catalog number	List price
UL	IEC	208V	240V	380V	480V	600V			
28	30	7.5	10	15	20	25	9	PST30-600-70	\$ 1330
34	37	10	10	20	25	30	9	PST37-600-70	1360
42	44	10	15	25	30	40	11	PST44-600-70	1390
54	50	15	20	30	40	50	11	PST50-600-70	1730
68	72	20	25	40	50	60	22	PST72-600-70	1755
80	85	25	30	50	60	75	22	PST85-600-70	2380
104	105	30	40	60	75	100	27	PST105-600-70	2410
130	142	40	50	75	100	125	33	PST142-600-70	3375
156	175	50	60	100	125	150	44	PST175-600-70	3420
192	210	60	75	125	150	200	49	PST210-600-70	3870
248	250	75	100	150	200	250	49	PST250-600-70	4350
302	300	100	100	150	250	300	53	PST300-600-70	4480
361	370	125	150	200	300	350	84	PSTB370-600-70	5660
480	470	150	200	300	400	500	93	PSTB470-600-70	7000
590	570	200	250	350	500	600	97	PSTB570-600-70	8550
720	720	250	300	450	600	700	119	PSTB720-600-70	9630
840	840	300	350	500	700	800	124	PSTB840-600-70	10,900
1062	1050	400	450	600	900	1000	137	PSTB1050-600-70	18,000

Connected Inside Delta

Maximum motor current		Maximum horsepower					Weight (lbs.)	Catalog number	List price
UL	IEC	208V	240V	380V	480V	600V			
42	51	10	15	30	30	40	9	PST30-600-70	\$ 1330
54	64	15	20	40	40	50	9	PST37-600-70	1360
72	76	20	25	50	50	60	11	PST44-600-70	1390
80	86	25	30	50	60	75	11	PST50-600-70	1730
104	124	30	40	75	75	100	22	PST72-600-70	1755
130	148	40	50	75	100	125	22	PST85-600-70	2380
156	181	50	60	100	125	150	27	PST105-600-70	2410
192	245	60	75	150	150	200	33	PST142-600-70	3375
248	303	75	100	200	200	250	44	PST175-600-70	3420
302	363	100	100	200	250	300	49	PST210-600-70	3870
361	433	125	150	250	300	350	49	PST250-600-70	4350
480	519	150	200	300	400	500	53	PST300-600-70	4480
590	640	200	250	400	500	600	84	PSTB370-600-70	5660
720	814	250	300	500	600	700	93	PSTB470-600-70	7000
840	987	300	350	600	700	800	97	PSTB570-600-70	8550
1247	1247	400	500	800	1000	1200	119	PSTB720-600-70	9630
1454	1454	500	600	900	1200	1500	124	PSTB840-600-70	10,900
1839	1818	600	700	1000	1500	1800	137	PSTB1050-600-70	18,000

① Different frame sizes are separated by rules.



Enclosed NEMA 1, 12 In-Line, 5 – 1000 HP

Connected In-Line



Max. motor current		Maximum horsepower					NEMA1, 480V	NEMA1, 600V		NEMA12, 480V	NEMA12, 600V	
UL	IEC	208V	240V	380V	480V	600V	Catalog Number	Catalog Number	List Price	Catalog Number	Catalog Number	List Price
18	18	5	5	10	10	—	T010L1-48	—	\$ 1655	T010L2-48M	—	\$ 1905
		—	—	—	—	15	—	T015L1-60		—	T015L2-60M	
28	30	7.5	10	15	20	—	T020L1-48	—	1655	T020L2-48M	—	1930
		—	—	—	—	25	—	T025L1-60			T025L2-60M	
34	37	10	10	20	25	—	T025L1-48	—	1685	T025L2-48M	—	2085
		—	—	—	—	30	—	T030L1-60			T030L2-60M	
42	44	10	15	25	30	—	T030L1-48	—	1715	T030L2-48M	—	2165
		—	—	—	—	40	—	T040L1-60			T040L2-60M	
54	50	15	20	30	40	—	T040L1-48	—	2055	T040L2-48M	—	2555
		—	—	—	—	50	—	T050L1-60			T050L2-60M	
68	72	20	25	40	50	—	T050L1-48	—	2080	T050L2-48M	—	2630
		—	—	—	—	60	—	T060L1-60			T060L2-60M	
80	85	25	30	50	60	—	T060L1-48	—	2705	T060L2-48M	—	3355
		—	—	—	—	75	—	T075L1-60			T075L2-60M	
104	105	30	40	60	75	—	T075L1-48	—	2735	T075L2-48M	—	3460
		—	—	—	—	100	—	T100L1-60			T100L2-60M	
130	142	40	50	75	100	—	T100L1-48	—	3875	T100L2-48M	—	4775
		—	—	—	—	125	—	T125L1-60			T125L2-60M	
156	175	50	60	100	125	—	T125L1-48	—	3920	T125L2-48M	—	5170
		—	—	—	—	150	—	T150L1-60			T150L2-60M	
192	210	60	75	125	150	—	T150L1-48	—	4370	T150L2-48M	—	5770
		—	—	—	—	200	—	T200L1-60			T200L2-60M	
248	250	75	100	150	200	—	T200L1-48	—	4850	T200L2-48M	—	6550
		—	—	—	—	250	—	T250L1-60			T250L2-60M	
302	300	100	100	150	250	—	T250L1-48	—	5080	T250L2-48M	—	7830
		—	—	—	—	300	—	T300L1-60			T300L2-60M	
361	370	125	150	200	300	—	T300L1-48M ^①	—	6260	T300L2-48M ^①	—	6910
		—	—	—	—	350	—	T350L1-60M ^①			T350L2-60M ^①	
414	400	—	—	250	350	—	T350L1-48M ^①	—	7700	T350L2-48M ^①	—	8450
		—	—	—	—	400	—	T400L1-60M ^①			T400L2-60M ^①	
480	470	150	200	300	400	—	T400L1-48M ^①	—	7700	T400L2-48M ^①	—	8550
		—	—	—	—	500	—	T500L1-60M ^①			T500L2-60M ^①	
590	570	200	250	350	500	—	T500L1-48M ^①	—	9350	T500L2-48M ^①	—	10,350
		—	—	—	—	600	—	T600L1-60M ^①			T600L2-60M ^①	
720	720	250	300	450	600	—	T600L1-48M ^①	—	10,830	T600L2-48M ^①	—	11,830
		—	—	—	—	700	—	T700L1-60M ^①			T700L2-60M ^①	
840	840	300	350	500	700	—	T700L1-48M ^①	—	12,900	T700L2-48M ^①	—	14,000
		—	—	—	—	800	—	T800L1-60M ^①			T800L2-60M ^①	
960	—	350	400	—	800	—	T800L1-48M ^①	—	21,000	T800L2-48M ^①	—	22,300
		—	—	—	—	900	—	T900L1-60M ^①			T900L2-60M ^①	
1062	1050	400	450	600	900	—	T900L1-48M ^①	—	21,000	T900L2-48M ^①	—	22,300
		—	—	—	—	1000	—	T1000L1-60M ^①			T1000L2-60M ^①	

① Includes integrated shunt rated (AC1) bypass contactor as standard. For across the line rated (AC3) bypass contactors, see page 6.30.

Enclosed NEMA 1, 12 Inside Delta, 7.5 – 1800 HP



Connected Inside Delta

Max. motor current		Maximum horsepower					NEMA1, 480V	NEMA1, 600V		NEMA12, 480V	NEMA12, 600V	
UL	IEC	208V	240V	380V	480V	600V	Catalog Number	Catalog Number	List Price	Catalog Number	Catalog Number	List Price
28	30	7.5	10	15	20	—	T020D1-48	—	\$ 1655	T020D2-48M	—	\$ 1905
		—	—	—	—	25	—	T025D1-60		—	T025D2-60M	
34	37	10	10	20	25	—	T025D1-48	—	1655	T025D2-48M	—	1905
		—	—	—	—	30	—	T030D1-60		—	T030D2-60M	
42	44	10	15	25	30	—	T030D1-48	—	1655	T030D2-48M	—	1930
		—	—	—	—	40	—	T040D1-60		—	T040D2-60M	
54	50	15	20	30	40	—	T040D1-48	—	1685	T040D2-48M	—	2085
		—	—	—	—	50	—	T050D1-60		—	T050D2-60M	
68	72	20	25	40	50	—	T050D1-48	—	1715	T050D2-48M	—	2165
		—	—	—	—	60	—	T060D1-60		—	T060D2-60M	
80	85	25	30	50	60	—	T060D1-48	—	2055	T060D2-48M	—	2555
		—	—	—	—	75	—	T075D1-60		—	T075D2-60M	
104	105	30	40	60	75	—	T075D1-48	—	2080	T075D2-48M	—	2630
		—	—	—	—	100	—	T100D1-60		—	T100D2-60M	
130	142	40	50	75	100	—	T100D1-48	—	2705	T100D2-48M	—	3355
		—	—	—	—	125	—	T125D1-60		—	T125D2-60M	
156	175	50	60	100	125	—	T125D1-48	—	2735	T125D2-48M	—	3460
		—	—	—	—	150	—	T150D1-60		—	T150D2-60M	
192	210	60	75	125	150	—	T150D1-48	—	3875	T150D2-48M	—	4775
		—	—	—	—	200	—	T200D1-60		—	T200D2-60M	
248	250	75	100	150	200	—	T200D1-48	—	3920	T200D2-48M	—	5120
		—	—	—	—	250	—	T250D1-60		—	T250D2-60M	
302	300	100	100	150	250	—	T250D1-48	—	4370	T250D2-48M	—	5770
		—	—	—	—	300	—	T300D1-60		—	T300D2-60M	
361	370	125	150	200	300	—	T300D1-48	—	4850	T300D2-48M	—	6550
		—	—	—	—	350	—	T350D1-60		—	T350D2-60M	
414	400	—	—	250	350	—	T350D1-48	—	5080	T350D2-48M	—	7830
		—	—	—	—	400	—	T400D1-60		—	T400D2-60M	
480	470	150	200	300	400	—	T400D1-48	—	5080	T400D2-48M	—	7830
		—	—	—	—	500	—	T500D1-60		—	T500D2-60M	
590	570	200	250	350	500	—	T500D1-48M ^①	—	6260	T500D2-48M ^①	—	6910
		—	—	—	—	600	—	T600D1-60M ^①		—	T600D2-60M ^①	
720	720	250	300	450	600	—	T600D1-48M ^①	—	7700	T600D2-48M ^①	—	8550
		—	—	—	—	700	—	T700D1-60M ^①		—	T700D2-60M ^①	
840	840	300	350	500	700	—	T700D1-48M ^①	—	9350	T700D2-48M ^①	—	10,350
		—	—	—	—	800	—	T800D1-60M ^①		—	T800D2-60M ^①	
960	—	350	400	—	800	—	T800D1-48M ^①	—	10,830	T800D2-48M ^①	—	12,130
		—	—	—	—	900	—	T900D1-60M ^①		—	T900D2-60M ^①	
1062	1050	400	450	600	900	—	T900D1-48M ^①	—	10,830	T900D2-48M ^①	—	12,130
		—	—	—	—	1000	—	T1000D1-60M ^①		—	T1000D2-60M ^①	
1247	1215	400	500	800	1000	—	T1000D1-48M ^①	—	10,830	T1000D2-48M ^①	—	12,130
		—	—	—	—	1200	—	T1200D1-60M ^①		—	T1200D2-60M ^①	
1454	1370	500	600	900	1200	—	T1200D1-48M ^①	—	12,900	T1200D2-48M ^①	—	14,650
		—	—	—	—	1500	—	T1500D1-60M ^①		—	T1500D2-60M ^①	
1839	1823	600	700	1200	1500	—	T1500D1-48M ^①	—	21,000	T1500D2-48M ^①	—	22,750
		—	—	—	—	1800	—	T1800D1-60M ^①		—	T1800D2-60M ^①	

① Includes integrated shunt rated (AC1) bypass contactor as standard. For across the line rated (AC3) bypass contactors, see page 6.30.



Enclosed NEMA 1, Combination In-Line, 5 – 1000 HP

Connected In-Line



Max. motor current		Maximum horsepower					NEMA1, 480V Circuit breaker	NEMA1, 600V Circuit breaker	List Price	NEMA1, 480V Fused disconnect	NEMA 1, 600V Fused disconnect	List Price
UL	IEC	208V	240V	380V	480V	600V	Catalog Number	Catalog Number		Catalog Number	Catalog Number	
18	18	5	5	10	10	—	T010LB1-48E	—	\$ 2055	T010LF1-48A	—	\$ 2055
		—	—	—	—	15	—	T015LB1-60E		—	T015LF1-60A	
28	30	7.5	10	15	20	—	T020LB1-48J	—	2065	T020LF1-48B	—	2065
		—	—	—	—	25	—	T025LB1-60J		—	T025LF1-60B	
34	37	10	10	20	25	—	T025LB1-48K	—	2110	T025LF1-48B	—	2110
		—	—	—	—	30	—	T030LB1-60K		—	T030LF1-60B	
42	44	10	15	25	30	—	T030LB1-48L	—	2315	T030LF1-48C	—	2315
		—	—	—	—	40	—	T040LB1-60L		—	T040LF1-60C	
54	50	15	20	30	40	—	T040LB1-48N	—	2655	T040LF1-48C	—	2655
		—	—	—	—	50	—	T050LB1-60N		—	T050LF1-60C	
68	72	20	25	40	50	—	T050LB1-48R	—	2680	T050LF1-48C	—	2680
		—	—	—	—	60	—	T060LB1-60R		—	T060LF1-60C	
80	85	25	30	50	60	—	T060LB1-48S	—	3705	T060LF1-48D	—	3705
		—	—	—	—	75	—	T075LB1-60S		—	T075LF1-60D	
104	105	30	40	60	75	—	T075LB1-48T	—	3735	T075LF1-48D	—	3735
		—	—	—	—	100	—	T100LB1-60T		—	T100LF1-60D	
130	142	40	50	75	100	—	T100LB1-48V	—	5075	T100LF1-48D	—	5075
		—	—	—	—	125	—	T125LB1-60V		—	T125LF1-60D	
156	175	50	60	100	125	—	T125LB1-48X	—	5720	T125LF1-48E	—	5720
		—	—	—	—	150	—	T150LB1-60X		—	T150LF1-60E	
192	210	60	75	125	150	—	T150LB1-48Y	—	6170	T150LF1-48E	—	6170
		—	—	—	—	200	—	T200LB1-60Y		—	T200LF1-60E	
248	250	75	100	150	200	—	T200LB1-48A	—	6650	T200LF1-48E	—	6650
		—	—	—	—	250	—	T250LB1-60Z		—	T250LF1-60E	
302	300	100	100	150	250	—	T250LB1-48B	—	7580	T250LF1-48F	—	7580
		—	—	—	—	300	—	T300LB1-60B		—	T300LF1-60F	
361	370	125	150	200	300	—	T300LB1-48DM ^⓪	—	8860	T300LF1-48FM ^⓪	—	8860
		—	—	—	—	350	—	T350LB1-60CM ^⓪		—	T350LF1-60FM ^⓪	
414	400	—	—	250	350	—	T350LB1-48EM ^⓪	—	11,300	T350LF1-48FM ^⓪	—	11,300
		—	—	—	—	400	—	T400LB1-60DM ^⓪		—	T400LF1-60FM ^⓪	
480	470	150	200	300	400	—	T400LB1-48FM ^⓪	—	11,800	T400LF1-48GM ^⓪	—	11,800
		—	—	—	—	500	—	T500LB1-60EM ^⓪		—	T500LF1-60GM ^⓪	
590	570	200	250	350	500	—	T500LB1-48GM ^⓪	—	14,550	T500LF1-48HM ^⓪	—	14,550
		—	—	—	—	600	—	T600LB1-60GM ^⓪		—	T600LF1-60H ^⓪	
720	720	250	300	450	600	—	T600LB1-48JM ^⓪	—	16,030	T600LF1-48HM ^⓪	—	16,030
		—	—	—	—	700	—	T700LB1-60JM ^⓪		—	T700LF1-60H ^⓪	
840	840	300	350	500	700	—	T700LB1-48KM ^⓪	—	19,400	T700LF1-48JM ^⓪	—	19,400
		—	—	—	—	800	—	T800LB1-60JM ^⓪		—	T800LF1-60J ^⓪	
960	—	350	400	—	800	—	T800LB1-48KM ^⓪	—	27,500	T800LF1-48JM ^⓪	—	27,500
		—	—	—	—	900	—	T900LB1-60KM ^⓪		—	T900LF1-60J ^⓪	
1062	1050	400	450	600	900	—	T900LB1-48KM ^⓪	—	28,200	T900LF1-48KM ^⓪	—	28,200
		—	—	—	—	1000	—	T1000LB1-60KM ^⓪		—	T1000LF1-60K ^⓪	

^⓪ Includes integrated shunt rated (AC1) bypass contactor as standard. For across the line rated (AC3) bypass contactors, see page 6.30.

Enclosed NEMA 1, Combination Inside Delta, 7.5 – 1900 HP

Softstarters
Type PST

Connected Inside Delta

Max. motor current		Maximum horsepower					NEMA1, 480V Circuit breaker	NEMA1, 600V Circuit breaker	List Price	NEMA1, 480V Fused disconnect	NEMA 1, 600V Fused disconnect	List Price
UL	IEC	208V	240V	380V	480V	600V	Catalog Number	Catalog Number		Catalog Number	Catalog Number	
28	30	7.5	10	15	20	—	T020DB1-48J	—	\$ 2065	T020DF1-48B	—	\$ 2065
		—	—	—	—	25	—	T025DB1-60J		—	T025DF1-60B	
34	37	10	10	20	25	—	T025DB1-48K	—	2080	T025DF1-48B	—	2080
		—	—	—	—	30	—	T030DB1-60K		—	T030DF1-60B	
42	44	10	15	25	30	—	T030DB1-48L	—	2255	T030DF1-48C	—	2255
		—	—	—	—	40	—	T040DB1-60L		—	T040DF1-60C	
54	50	15	20	30	40	—	T040DB1-48N	—	2285	T040DF1-48C	—	2285
		—	—	—	—	50	—	T050DB1-60N		—	T050DF1-60C	
68	72	20	25	40	50	—	T050DB1-48R	—	2315	T050DF1-48C	—	2315
		—	—	—	—	60	—	T060DB1-60R		—	T060DF1-60C	
80	85	25	30	50	60	—	T060DB1-48S	—	3055	T060DF1-48D	—	3055
		—	—	—	—	75	—	T075DB1-60S		—	T075DF1-60D	
104	105	30	40	60	75	—	T075DB1-48T	—	3080	T075DF1-48D	—	3080
		—	—	—	—	100	—	T100DB1-60T		—	T100DF1-60D	
130	142	40	50	75	100	—	T100DB1-48V	—	3905	T100DF1-48D	—	3905
		—	—	—	—	125	—	T125DB1-60V		—	T125DF1-60D	
156	175	50	60	100	125	—	T125DB1-48X	—	4535	T125DF1-48E	—	4535
		—	—	—	—	150	—	T150DB1-60X		—	T150DF1-60E	
192	210	60	75	125	150	—	T150DB1-48Y	—	5675	T150DF1-48E	—	5675
		—	—	—	—	200	—	T200DB1-60Y		—	T200DF1-60E	
248	250	75	100	150	200	—	T200DB1-48A	—	5720	T200DF1-48E	—	5720
		—	—	—	—	250	—	T250DB1-60Z		—	T250DF1-60E	
302	300	100	100	150	250	—	T250DB1-48B	—	6870	T250DF1-48F	—	6870
		—	—	—	—	300	—	T300DB1-60B		—	T300DF1-60F	
361	370	125	150	200	300	—	T300DB1-48D	—	7450	T300DF1-48F	—	7450
		—	—	—	—	350	—	T350DB1-60C		—	T350DF1-60F	
414	400	—	—	250	350	—	T350DB1-48E	—	8680	T350DF1-48F	—	8680
		—	—	—	—	400	—	T400DB1-60D		—	T400DF1-60F	
480	470	150	200	300	400	—	T400DB1-48F	—	9180	T400DF1-48G	—	9180
		—	—	—	—	500	—	T500DB1-60E		—	T500DF1-60G	
590	570	200	250	350	500	—	T500DB1-48GM ^①	—	11,460	T500DF1-48HM ^①	—	11,460
		—	—	—	—	600	—	T600DB1-60GM ^①		—	T600DF1-60HM ^①	
720	720	250	300	450	600	—	T600DB1-48JM ^①	—	12,900	T600DF1-48HM ^①	—	12,900
		—	—	—	—	700	—	T700DB1-60JM ^①		—	T700DF1-60HM ^①	
840	840	300	350	500	700	—	T700DB1-48KM ^①	—	15,850	T700DF1-48JM ^①	—	15,850
		—	—	—	—	800	—	T800DB1-60JM ^①		—	T800DF1-60JM ^①	
960	—	350	400	—	800	—	T800DB1-48KM ^①	—	17,330	T800DF1-48JM ^①	—	17,330
		—	—	—	—	900	—	T900DB1-60KM ^①		—	T900DF1-60JM ^①	
1062	1050	400	450	600	900	—	T900DB1-48KM ^①	—	18,030	T900DF1-48KM ^①	—	18,030
		—	—	—	—	1000	—	T1000DB1-60KM ^①		—	T1000DF1-60KM ^①	
1247	1215	400	500	800	1000	—	T1000DB1-48LM ^①	—	20,830	T1000DF1-48KM ^①	—	20,830
		—	—	—	—	1200	—	T1200DB1-60LM ^①		—	T1200DF1-60KM ^①	
1454	1370	500	600	900	1200	—	T1200DB1-48MM ^①	—	22,900	T1200DF1-48LM ^①	—	22,900
		—	—	—	—	1500	—	T1500DB1-60MM ^①		—	T1500DF1-60LM ^①	
1839	1823	600	700	1200	1500	—	T1500DB1-48NM ^①	—	33,500	T1500DF1-48NM ^①	—	33,500
		—	—	—	—	1800	—	T1800DB1-60NM ^①		—	T1800DF1-60NM ^①	

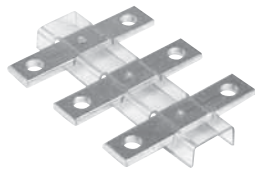
① Includes integrated shunt rated (AC1) bypass contactor as standard. For across the line rated (AC3) bypass contactors, see page 6.30.

Max FLA		Shunt rated (AC1) bypass or isolation contactor	Across the line rated (AC3) ^④ bypass contactor	Start/Stop pushbuttons	HOA Selector Switch	Run pilot Light	NEMA 12 adder	NEMA 3R adder	NEMA 4 adder	NEMA 4X adder
UL	IEC	List price	List price ^③	List price	List price	List price	List price	List price	List price	List price
18	18	\$ 150	\$ 775	\$ 72	\$ 72	\$ 135	\$ 100 ^①	\$ 100 ^①	\$ 150 ^①	\$ 450 ^①
28	30	175	850	72	72	135	100 ^①	100 ^①	150 ^①	450 ^①
34	37	250	900	72	72	135	150 ^①	150 ^①	200 ^①	600 ^①
42	44	300	950	72	72	135	150 ^①	150 ^①	200 ^①	600 ^①
54	50	350	1000	72	72	135	150 ^①	150 ^①	200 ^①	600 ^①
68	72	400	1100	72	72	135	150 ^①	150 ^①	200 ^①	600 ^①
80	85	500	1150	72	72	135	150 ^①	150 ^①	225 ^①	775 ^①
104	105	550	1200	72	72	135	175 ^①	175 ^①	225 ^①	775 ^①
130	142	600	1550	72	72	135	300 ^①	300 ^①	350 ^①	1050 ^①
156	150	950	1850	72	72	135	300 ^①	300 ^①	350 ^①	1050 ^①
192	210	950	2100	72	72	135	450 ^①	450 ^①	525 ^①	1575 ^①
248	250	1250	2700	72	72	135	450 ^①	450 ^①	525 ^①	1575 ^①
302	300	2100	3500	72	72	135	650 ^①	650 ^①	775 ^①	2325 ^①
361	370	— ^②	4800	72	72	135	650	650	775	2325
414	400	— ^②	4800	72	72	135	750	750	950	2850
480	470	— ^②	4800	72	72	135	850	850	1025	3075
590	570	— ^②	6800	72	72	135	1000	1000	1300	3900
720	720	— ^②	7100	72	72	135	1000	1000	1300	3900
840	840	— ^②	10,100	72	72	135	1100	1100	1425	4275
960	—	— ^②	10,100	72	72	135	1300	1300	1700	5100
1062	1050	— ^②	14,600	72	72	135	1300	1300	1700	5100
1247	1215	— ^②	14,600	72	72	135	1300	1300	1700	5100
1454	1370	— ^②	14,600	72	72	135	1750	1750	2200	7000
1839	1823	— ^②	14,600	72	72	135	1750	1750	2200	7000

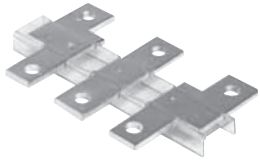
① Must add bypass contactor.
 ② PSTB includes an integrated shunt rated (AC1) bypass contactor.
 ③ Includes emergency bypass control.
 ④ Subtract AC1 List price when AC1 rating ("M" code) is included in catalog numbers shown on page 6.26.

Accessories

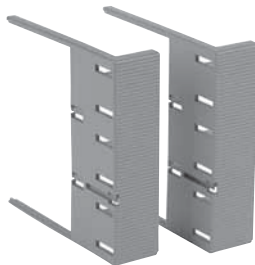
Softstarters
Type PST



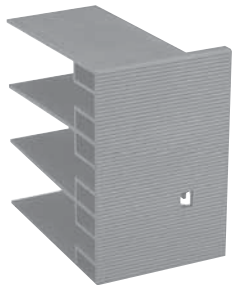
LX400



LW185



LT185-AC



LT460-AC



PSTEK

Terminal extension pieces (set of 3) ③

Softstarter Type	Dimensions		Weight lbs.	Catalog number	List price
	Hole (mm)	Bar (mm)			
PST85 – 142	8.5	17.5 x 5	0.55	LX185	\$ 90
PST175 – 300	10.5	20 x 5	0.77	LX300	140
PST370 – 470	10.5	25 x 5	1.1	LX460	195
PST570 – 1050	13	40 x 6	1.9	LX750	225

Delivered with straps to prevent them from rotating.

Terminal enlargement pieces (set of 3) ③

Softstarter Type	Dimensions		Weight lbs.	Catalog number	List price
	Hole (mm)	Bar (mm)			
PST30 – 72	6.5	15 x 3	0.22	LW110	\$ 15
PST85 – 142	10.5	17.5 x 5	0.55	LW185	120
PST175 – 300	10.5	20 x 5	0.99	LW300	130
PST370 – 470	10.5	25 x 5	1.6	LW460	295
PST570 – 1050	13	40 x 6	2.7	LW750	355

Delivered with straps to prevent them from rotating.

Terminal shrouds ③⑦

Softstarter Type	Required quantity	Weight lbs.	Catalog number	List price
PST85 – 142	(1) - LT185-AC & (1) LT460-AC	0.11	LT185-AC	\$ 10
		0.22	LT460-AC	20
PST85 – 142	(1) - LT185-AL & (1) LT460-AL	0.48	LT185-AL	10
		1.8	LT460-AL	20
PST175 – 300	LT300-AC ⑤	0.15	LT300-AC	10
		0.62	LT300-AL	10
PSTB370 – 470	LT460-AC	0.22	LT460-AC	20
		1.8	LT460-AL	20
PSTB570 – 1050	LT750-AC	0.26	LT750-AC	20
		1.8	LT750-AL	20

Control transformers

PST Amp ratings	Standard VA	Price adder for extra VA			
		100VA	250VA	500VA	750VA
9 – 68	50	\$ 175	—	—	—
69 – 130	75	225	\$ 300	—	—
131 – 480	250	360	400	\$ 500	\$ 625
481 – 1050	750	—	725	—	975

Terminal lug kits ④

Wire range	For softstarter ②	Catalog number	List price
#6 - 250 MCM (1 per phase)	PST85 – PST142	PSLK-185 ④⑥	\$ 150
#4 - 400 MCM (1 per phase)	PST175 – PST300	PSLK-300 ④⑥	195
#4 - 500 MCM (2 per phase)	PST175 – PST300	PSLK-300/2 ④⑥	280
2/0 - 500 MCM (2 per phase)	PSTB370 – PSTB470	PSLK-580/2	350
2/0 - 500 MCM (3 per phase)	PSTB570 – PSTB1050	PSLK-750/3	525

Remote key pad (HMI) – 10 ft. cable included

Softstarter type	Dimensions H x W x D (inches)	Weight (lbs.)	Catalog number	List price
All PST(B)	5.43 x 5.3 x 0.9	1	PSTEK	\$ 385

- ① Includes line/load lugs and hardware.
- ② Softstarters listed are provided with terminating bus tabs as standard.
- ③ Use Discount Schedule ABA.
- ④ Must order two sets if using bypass contactor.
- ⑤ Requires two sets.
- ⑥ Discount schedule PSS
- ⑦ All shrouds come in quantities of 2.



Accessories

Accessories

Item	Suffix code ①	List price adder
Softstarters		
Door mounted reset	K	\$ 72
E-Stop	T	72
Start-stop pushbutton	A	72
2 position selector switch	C	72
3 position selector switch	D	72
Pilot light run	E	135
Start-stop pushbutton & pilot light	F	207
2 position selector switch & pilot light	H	207
3 position selector switch & pilot light	J	207
Shunt rated (AC1) bypass contactor	M	see pg 6.30
Isolation contactor	W	see pg 6.30
Across the line rated (AC3) contactor with emergency bypass control ③	B	see pg 6.30
Remote keypad	R	485
Service entrance, 3-wire	SE3	100
Service entrance, 4-wire	SE4	300
Lightning arrester	LA	320
Space heater, 100W with thermostat	SH	600
Emergency bypass control for PSTB ③	X	600
Auxiliary relays		
Type N control relay (4 pole)	CR	150
Electronic timer		
1.5 – 30s On Delay	TN30	125
5 – 100s On Delay	TN100	125
1.5 – 30s Off Delay	TF30	125
5 – 100s Off Delay	TF100	125
Phase failure phase reversal ②	PFPR	375
Undervoltage relay	UV	150
Overvoltage relay	OV	180
Ground fault protection	GFP	1000
Meters & metering		
Current transformer	CT	250
Ammeter (including C.T.)	AM	470
Ammeter & ammeter switch	AMS	1800
Voltmeter	VM	1200
Voltmeter & voltmeter switch	VMS	1800
Elapsed time meter	ETM	350
Operation counter	OC	375
Wattmeter	WM	2450

Additional auxiliary contact blocks for bypass or isolation contactors

Contact configuration	Suffix code	List price adder
1 N.O. & 1 N.C.	11	\$ 54
2 N.O. & 2 N.C.	22	98
3 N.O. & 3 N.C.	33	142

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① Add the suffix code after the last digit of the catalog number.

② Included as standard in the PST.

③ Control includes panel mounted Norm/E-Bypass switch, START/STOP pushbutton & Class 10 external overload, unless otherwise specified.

Accessories

Communications

DeviceNet Fieldbus connectors & accessories

Softstarters
Type PST

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DeviceNet FieldBusPlug

Designation FieldBusPlug	Cable length	Weight lbs	Type	Catalog number	List price
DeviceNet	0.25 m	.20	DNP21-FBP.025	1SAJ230000R0003	\$ 286.47
DeviceNet	0.50 m	.22	DNP21-FBP.050	1SAJ230000R0005	286.47
DeviceNet	1.00 m	.29	DNP21-FBP.100	1SAJ230000R0010	286.47
DeviceNet	5.00 m	.79	DNP21-FBP.500	1SAJ230000R0050	304.83

Ready-made DeviceNet fieldbus interface with various cable lengths

- Applicable on all FBP motor starters and other devices
- Degree of protection IP65, diagnostic LED

DeviceNet round cable for bus junctions

Designation	Cable length	Weight lbs	Type	Catalog number	List price
DeviceNet round cable with female connector	0.50 m	.09	DNF11-FBP.050	1SAJ923002R0005	\$ 48.21
DeviceNet round cable with male connector	0.50 m	.09	DNM11-FBP.050	1SAJ923003R0005	49.96

Ready made bus cable with an M12 connector and an open cable end.

- Applicable on all bus junctions such as DeviceNet couplers or devices with an integrated DeviceNet interface.

DeviceNet round cable for bus extension

Designation	Cable length	Weight lbs	Type	Catalog number	List price
DeviceNet extension cable	1 m	0.18	DNX11-FBP.100 ②	1SAJ923001R0010	\$ 70.93
	3 m	0.44	DNX11-FBP.300 ②	1SAJ923001R0030	114.96
	5 m	0.68	DNX11-FBP.500 ③	1SAJ923001R0050	148.74
	100 m	12.30	DNC11-FBP.999 ③	1SAJ923004R1000	1517.12

DeviceNet round cable and accessories for bus extension – Bus cable & coupling accessories

Designation	Weight lbs	Type	Catalog number	List price
DeviceNet round cable male connector	.33	DNM11-FBP.0 ①	1SAJ923005R0001	\$ 108.56
DeviceNet round cable female connector	.33	DNF11-FBP.0 ①	1SAJ923006R0001	

DeviceNet termination resistor

Designation	Weight lbs	Type	Catalog number	List price
DeviceNet termination resistor, 120 Ohm	.05	DNR11-FBP.120	1SAJ923007R0001	\$ 37.22

To connect the PST Softstarter to a fieldbus system

You need specific software for PLC setup which is available free from the ABB Inc. web site; see the Resources section at the bottom of the Softstarter product page at www.abb-control.com/products/softstarters.htm. If you need help or advice, please contact your local ABB office.

- ① Includes five connectors.
- ② Ready made bus cable with M12 male and female connectors.
- ③ Cable only. Connectors not provided.

Accessories

Communications

Profibus DP Fieldbus connectors & accessories

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PDP21-FBP



PDF11-FBP:050



PDM11-FBP:050



PDX11-FBP



PDM11-FBP:0



PDF11-FBP:0

Profibus DP FieldBusPlug

Designation FieldBusPlug	Cable length	Weight lbs	Type	Catalog number	List price
Profibus DP-FBP	0.25 m	.20	PDP21-FBP:025	1SAJ240000R0003	\$ 390.39
Profibus DP-FBP	0.50 m	.22	PDP21-FBP:050	1SAJ240000R0005	390.39
Profibus DP-FBP	1.00 m	.29	PDP21-FBP:100	1SAJ240000R0010	390.39
Profibus DP-FBP	5.00 m	.79	PDP21-FBP:500	1SAJ240000R0050	409.43

Ready-made Profibus DP fieldbus interface with various cable lengths.

- Applicable on all FBP motor starters and other devices.
- Degree of protection IP65, diagnostic LED.

Profibus DP round cable for bus junctions

Designation	Cable length	Weight lbs	Type	Catalog number	List price
Profibus DP round cable with female connector	0.50 m	.09	PDF11-FBP:050	1SAJ924002R0005	\$ 45.70
Profibus DP round cable with male connector	0.50 m	.09	PDM11-FBP:050	1SAJ924003R0005	

Ready made bus cable with an M12 connector on an open cable end.

- Applicable on all bus junctions such as Profibus DB couplers or devices with an integrated Profibus DB interface.

Profibus DP round cable for bus extension

Designation	Cable length	Weight lbs	Type	Catalog number	List price
Profibus DP extension cable	1 m	0.18	PDX11-FBP:100 ①	1SAJ924001R0010	\$ 64.75
	3 m	0.44	PDX11-FBP:300 ①	1SAJ924001R0030	99.03
	5 m	0.68	PDX11-FBP:500 ①	1SAJ924001R0050	133.30
	100 m	12.30	PDC11-FBP:999 ②	1SAJ924004R1000	1416.82

Profibus DP accessories for bus extension

Designation	Weight lbs	Type	Catalog number	List price
Profibus DP male connector	.07	PDM11-FBP:0	1SAJ924005R0001	\$ 38.09
Profibus DP female connector	.07	PDF11-FBP:0	1SAJ924006R0001	

Profibus DP termination resistor

Designation	Weight lbs	Type	Catalog number	List price
Profibus DP termination resistor, 150 Ohm	.02	PDR11-FBP:150	1SAJ924007R0001	\$ 251.16

To connect the PST Softstarter to a fieldbus system

You need specific software for PLC setup which is available free from the ABB Inc. web site; see the Resources section at the bottom of the Softstarter product page at www.abb-control.com/products/softstarters.htm. If you need help or advice, please contact your local ABB office.

① Ready made bus cable with M12 male and female connectors.
② Cable only. Connectors not provided.

Accessories

Communications

Modbus RTU Fieldbus connectors & accessories



Modbus FieldBusPlug

Designation FieldBusPlug	Cable length	Weight lbs	Type	Catalog number	List price
Modbus RTU-FBP	0.25 m	.20	MPR21-FBP.025	1SAJ250000R0003	\$ 333.44
Modbus RTU-FBP	0.50 m	.22	MPR21-FBP.050	1SAJ250000R0005	338.25
Modbus RTU-FBP	1.00 m	.29	MPR21-FBP.100	1SAJ250000R0010	343.32
Modbus RTU-FBP	5.00 m	.79	MPR21-FBP.500	1SAJ250000R0050	355.11

Ready-made Modbus fieldbus interface with various cable lengths

- Applicable on all FBP motor starters and other devices
- Degree of protection IP65, diagnostic LED

Modbus round cable for bus junctions ②

Designation	Cable length	Weight lbs	Type	Catalog number	List price
Modbus round cable with female connector	0.50 m	.09	DNF11-FBP.050	1SAJ923002R0005	\$ 48.21
Modbus round cable with male connector	0.50 m	.09	DNM11-FBP.050	1SAJ923003R0005	49.96

Ready made bus cable with an M12 connector and an open cable end.

- Applicable on all bus junctions such as Modbus couplers or devices with an integrated Modbus interface.

Modbus round cable for bus extension ②

Designation	Cable length	Weight lbs	Type	Catalog number	List price
Modbus extension cable	1 m	0.18	DNX11-FBP.100 ③	1SAJ923001R0010	\$ 70.93
	3 m	0.44	DNX11-FBP.300 ③	1SAJ923001R0030	114.96
	5 m	0.68	DNX11-FBP.500 ③	1SAJ923001R0050	148.74
	100 m	12.30	DNC11-FBP.999 ④	1SAJ923004R1000	1517.12

Modbus round cable and accessories for bus extension ② – Bus cable & coupling accessories

Designation	Weight lbs	Type	Catalog number	List price
Modbus round cable male connector	.33	DNM11-FBP.0 ①	1SAJ923005R0001	\$ 108.56
Modbus round cable female connector	.33	DNF11-FBP.0 ①	1SAJ923006R0001	

Modbus termination resistor ②

Designation	Weight lbs	Type	Catalog number	List price
Modbus termination resistor, 120 Ohm	.05	DNR11-FBP.120	1SAJ923007R0001	\$ 37.22

To connect the PST Softstarter to a fieldbus system

You need specific software for PLC setup which is available free from the ABB Inc. web site; see the Resources section at the bottom of the Softstarter product page at www.abb-control.com/products/softstarters.htm. If you need help or advice, please contact your local ABB office.

① Includes five connectors.
 ② Modbus accessories are the same as DeviceNet accessories.
 ③ Ready made bus cable with M12 male and female connectors.
 ④ Cable only. Connectors not provided.

Technical data

PST30 – 300

PSTB370 – 1050

	PST30 – 300	PSTB370 – 1050		PST30 – 300	PSTB370 – 1050	
Rated insulation voltage U_i	690 V	690 V	Signal relays Number of programmable signal relays (Each relay can be programmed to be Run, By-pass or Event signal) K4 – Default as Run signal K5 – Default as By-pass signal K6 – Default as Event signal Rated operational voltage U_e Rated thermal current I_{th} Rated operational current I_e at AC-15 ($U_e = 250 V$)	3	3	
Rated operational voltage U_e	208 – 690 V	208 – 690 V		Yes	Yes	
Starting capacity at max rated current I_r	500% for 30 sec	500% for 30 sec		Yes	Yes	
Number of starts per hour	30 ①	10 ①		Yes	Yes	
Overload capability Overload Class	10 – 30	10 – 30		250 V	250 V	
Service factor	115 %	115 % (PSTB370 – PSTB840) 100 % (PSTB1050)		5 A	5 A	
Ambient temperature				1.5 A	1.5 A	
During operation	$\pm 0 \dots +50 \text{ }^\circ\text{C}$ ②	$\pm 0 \dots +50 \text{ }^\circ\text{C}$ ②		Control circuit /Hardware inputs Internal 24 V DC (10 mA closed)	Yes	Yes
During storage	$-25 \dots +70 \text{ }^\circ\text{C}$	$-25 \dots +70 \text{ }^\circ\text{C}$		Start / Stop inputs	Yes	Yes
Altitudes Maximum altitude	4000 m ③	4000 m ③		Two extra programmable inputs (Each input can be programmed to be None, Reset, Enable, Jog, DOL or Start motor 2 (or 3)).	Yes	Yes
Degree of protection			Signal indication LED's Run power on – Green	Yes	Yes	
Main circuit	IP10 (PST30 ... 72) IP00 (PST85 ... 300)	IP00 (all)	Fault - Red	Yes	Yes	
Supply and Control circuit	IP20	IP20	Protection - Yellow	Yes	Yes	
Main circuit			Protections			
Built in By-pass contactor	No	Yes	Electronic overload	Yes	Yes	
Cooling system - Fan cooled (thermostat controlled)	Yes	Yes	Adjustable tripping classes - Class 10 A, 10, 20 and 30	Yes	Yes	
Supply circuit			Dual ramp (separate overload function for start and run)	Yes	Yes	
Control voltage – one range	100 ... 250 V, +10% / -15% 50/60 Hz $\pm 5\%$	100 ... 250 V +10% / -15% 50/60 Hz $\pm 5\%$	PTC connection	Yes	Yes	
HMI for settings (Human Machine Interface)			Locked rotor protection	Yes	Yes	
20 segment display	Yes	Yes	Underload protection	Yes	Yes	
Keypad with two selection keys and two navigating keys	Yes	Yes	Phase imbalance	Yes	Yes	
Plain text in 12 languages (English, German, Italian, Chinese, Finnish, Swedish, French, Spanish, Dutch, Russian, Turkish & Portuguese)	Yes	Yes	High current ($8 \times I_e$)	Yes	Yes	
Remote HMI for settings (PSTEK) (Human Machine Interface)			Phase reversal protection	Yes	Yes	
20 segment display	Yes	Yes	Warnings (pre-warning)			
Keypad with two selection keys and two navigating keys	Yes	Yes	High current	Yes	Yes	
Plain text in 12 languages (English, German, Italian, Chinese, Finnish, Swedish, French, Spanish, Dutch, Russian, Turkish & Portuguese)	Yes	Yes	Low current (underload)	Yes	Yes	
Approvals: UL, Type 1, 12, 4/4X	Yes	Yes	Overload trip	Yes	Yes	
Upload Parameters	Yes	Yes	Overtemp. thyristors (SCR)	Yes	Yes	
			Start of several motors			
			Possible to set up and start three different motors	Yes	Yes	
			Field bus connection			
			Connection for ABB FielBusPlug	Yes	Yes	
			AS-I (option cable)	Yes	Yes	
			DeviceNet (option cable)	Yes	Yes	
			Profibus DP (option cable)	Yes	Yes	

PSTB Integrated bypass ratings

	PSTB370	PSTB470	PSTB570	PSTB720	PSTB840	PSTB1050
Contactor type	AF260	AF300	AF400	AF580	AF750	AF750
AC3 Rating @ 480V HP	200	250	350	500	600	600
AC3 Rating A	248	302	414	590	720	720

① Valid for 50 % on time and 50 % off time, with $3.5 \times I_e$ for 7 seconds. If other data is required, please contact your sales office

② Above $40 \text{ }^\circ\text{C}$ up to max. $50 \text{ }^\circ\text{C}$ reduce the rated current by 0.8% per $^\circ\text{C}$.

③ When used at high altitudes above 1000 meters, consult factory.

Technical data

Display settings

Major possible settings and the displayed text and the set default values

Description	Text on display (Eng)	Values on display	Default value
Motor FLA	Setting I _e	9.0 ... 1380 A divided into 19 overlapping ranges.	See table, page 6.38
Time for start ramp	Start Ramp	1 ... 30 s, 1 ... 120 s (Range depends on Start Range)	10 s
Time for stop ramp	Stop Ramp	0 ... 30 s, 0 ... 120 s (Range depends on Stop Range)	0 s
Initial voltage for start ramp	Init Volt	30 ... 70 %	30 %
End voltage for stop ramp	End Volt	30 ... 70 %	30 %
Step down voltage	Step Down	30 ... 100 %	100 %
Level of the current limit.	Current Lim	2.0 ... 5.0 x I _e	4.0 x I _e
Selection of Kick start	Kick Start	Yes, No	No
Level of Kick start if selected	Kick Level	50 ... 100 %	50 %
Time for Kick start if selected	Kick Time	0.1 ... 1.5 s	0.2
Selectable range for start ramp	Start Range	1 ... 30 s, 1...120 s	1 ... 30 s
Selectable range for stop ramp	Stop Range	0 ... 30 s, 0 ... 120 s	0 ... 30 s
Overload protection	Overload	No, Normal, Dual	Normal
Overload Class	OL Class	10A, 10, 20, 30	10
Overload Class, Dual type, Start Class	OL Class S	10A, 10, 20, 30	10
Overload Class, Dual type, Run Class	OL Class R	10A, 10, 20, 30	10
Type of operation for overload protection	OL Op	Stop-M, Stop-A, Ind	Stop-M
Locked rotor protection	Locked Rotor	Yes, No	No
Trip level for locked rotor protection	Lock R Lev	3.0 ... 8.0 x I _e	4.0 x I _e
Trip time for locked rotor protection	Lock R Time	0.2 ... 10 s	1.0 s
Type of operation for locked rotor protection	Lock R Op	Stop-M, Stop-A, Ind	Stop-M
Underload protection	Underload	Yes, No	No
Trip level for Underload protection	Underl Lev	0.4 ... 0.8 x I _e	0.8 x I _e
Trip time for Underload protection	Underl Time	1...30 s	10 s
Type of operation for Underload protection	Underl Op	Stop-M, Stop-A, Ind	Stop-M
Phase imbalance protection	Phase Imb	Yes, No	No
Trip level for phase imbalance protection	Ph Imb Lev	10...80 %	80 %
Type of operation for phase imbalance protection	Ph Imb Op	Stop-M, Stop-A, Ind	Stop-M
High current protection	High I	Yes, No	No
Type of operation for high current protection	High I Op	Stop-M, Stop-A, Ind	Stop-M
Phase reversal protection	Phase Rev	Yes, No	No
Type of operation for phase reversal protection	Ph Rev Op	Stop-M, Stop-A, Ind	Stop-M
PTC protection	PTC	Yes, No	No
Type of operation for PTC protection	PTC Op	Stop-M, Stop-A	Stop-M
An external Bypass contactor is used	Ext ByPass	Yes, No	No
High current warning	Warn I=High	Yes, No	No
Trip level for high current warning	Wa I=H Lev	0.5 ... 5.0 x I _e	1.2 x I _e
Low current warning	Warn I=Low	Yes, No	No
Trip level for low current warning	Wa I=L Lev	0.4 ... 1.0 x I _e	0.5 x I _e
Overload warning	Warn OL	Yes, No	No
Trip level for overload warning	Wa OL Lev	40...99 %	90 %
Thyristor overload warning	Warn SCR OL	Yes, No	Yes
Type of operation for phase loss fault	Ph Loss Op	Stop-M, Stop-A	Stop-M
Type of operation for by-pass fault	BP Fault Op	Stop-M, Stop-A, Ind	Stop-M
Type of operation for fieldbus fault	FB Fault Op	Stop-M, Stop-A	Stop-M
Type of operation for frequency fault	Freq F Op	Stop-M, Stop-A	Stop-M
Type of operation for heat sink over temperature fault	HS Temp Op	Stop-M, Stop-A	Stop-M
Type of operation for thyristor short circuit fault	SCR SC Op	Stop-M, Stop-A	Stop-M
Function of programmable input In_0	In0	None, Reset, Enable, Jog, DOL, Start 2	Reset
Function of programmable input In_1	In1	None, Reset, Enable, Jog, DOL, Start 3	Reset
Function of programmable relay output K4	Relay K4	Run, TOR, Event	Run
Function of programmable relay output K5	Relay K5	Run, TOR, Event	TOR
Function of programmable relay output K6	Relay K6	Run, TOR, Event	Event
Control of the softstarter with fieldbus	Fieldb Ctrl	Yes, No	No
Number of sequences for sequence start.	No of Seq	No, 2, 3	No
1 st sequence, time for start ramp	Start Ramp1	1...30 s, 1...120 s (Range depends on Start Range)	10 s
1 st sequence, initial voltage for start ramp	Init Volt1	30...70 %	30 %
1 st sequence, current limit	Curr Lim1	2.0 ... 5.0 x I _e	4.0 x I _e
1 st sequence, setting current	1st Set I _e	9.0 ... 1380 A divided into 19 overlapping ranges	See table, page 6.38
2 nd sequence, time for start ramp	Start Ramp2	1...30 s, 1...120 s (Range depends on Start Range)	10 s
2 nd sequence, initial voltage for start ramp	Init Volt2	30...70 %	30 %
2 nd sequence, current limit	Curr Lim2	2.0 ... 5.0 x I _e	4.0 x I _e
2 nd sequence, setting current	2nd Set I _e	9.0 ... 1380 A divided into 19 overlapping ranges	See table, page 6.38

Technical data

Display settings

Tripping curves

Major possible settings and the displayed text and the set default values

Description	Text on display (Eng)	Values on display	Default value
Time for start ramp	Start Ramp	1...30 s, 1...120 s (Range depends on Start Range)	10 s
Initial voltage for start ramp	Init Volt	30 ... 70 %	30 %
Current limit	Curr Lim	2.0 ... 5.0 x I _e	4.0 x I _e
Motor FLA	Set Ie	9.0 ... 1380 A divided into 19 overlapping ranges	See table, page 6.38
Language to use on display	Language	US/UK, FI, SE, PT, NL, IT, FR, ES, DE, CN	US/UK
Time for display automatic turn off	LCD Auto Off	1 ... 255 min	15 min
Password for display	Password	No, 1 ... 255	1
Type of date presentation	Date Type	ISO, CE, US	ISO
Year	Date Year	2001...2060	Individual
Month	Date Month	1 ... 12	Individual
Day	Date Day	1 ... 31	Individual
Hour	Time Hour	0 ... 23	Individual
Minutes	Time Min	0 ... 59	Individual

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Tripping curves for the integrated electronic overload

All units have an integrated electronic overload possible to set on four different tripping classes. Below, you will find a curve for each tripping class in cold state.

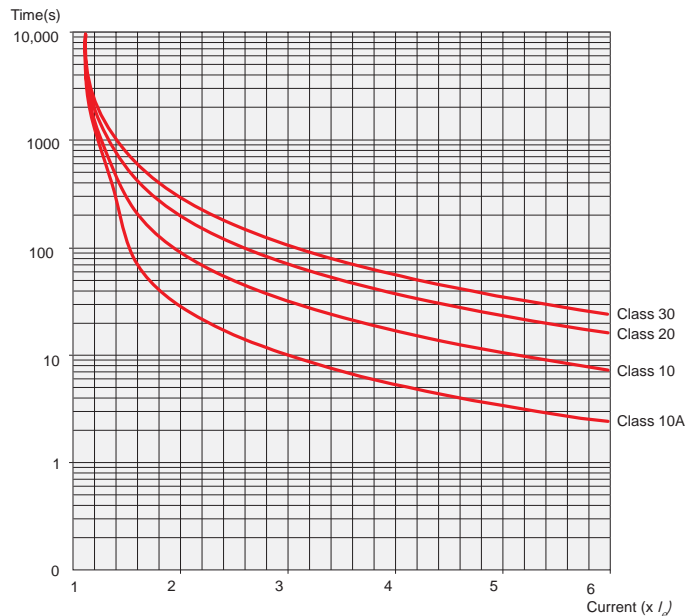


ABB FieldBusPlug

Controlling possibilities when using different field buses

Item	ASI	DeviceNet	Profibus DP
Simple control (start/stop etc)	X	X	X
Complete control	—	X	X
Simple status information	X	X	X
Detailed status information	—	X	X
Possibilities to write parameters	—	X	X
Possibilities to read parameters	—	X	—

For more detailed information, please refer to the LV021 (1SXU 132 021 M0201) Installation and Maintenance manual, available at ABB Inc. web site. See the Resources section at the bottom of the Softstarters product page at www.abb-control.com/products/softstarters.htm. Click on the Literature Library File Downloads link which will take you to the Softstarters section of the Literature Library. Right click on AC1006.9 to download the manual. If you need help or advice, please contact your local ABB office.

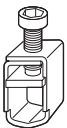
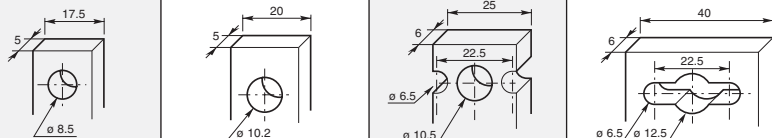
Technical data

PST30 – 300

PSTB370 – 1050

Softstarters
Type PST

Cross section of connectable cables

		Type of softstarter				
		PST30 ... 72	PST85 ... 142	PST175 ... 300	PSTB370 ... 470	PSTB570 ... 1050
Main circuit						
Available terminals:	L1, L2, L3 T1, T2, T3	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
(For external by-pass):	B1, B2, B3	Yes	Yes	Yes	No	No
Connection clamp						
Solid/Stranded	1 x mm ²	10 ... 95	See page 6.31	See page 6.31	See page 6.31	See page 6.31
Solid/Stranded	1 x mm ²	6 ... 35	See page 6.31	See page 6.31	See page 6.31	See page 6.31
Tightening torque (recommended), Nm		6.0	See page 6.31	See page 6.31	See page 6.31	See page 6.31
Connection bar		No				
Width and thickness	mm	–				
Hole diameter	mm	–				
Tightening torque (recommended), Nm		–	9	18	40	49
Supply and control circuit						
Connection clamp		Yes	Yes	Yes	Yes	Yes
Solid/Stranded	1 x mm ²	2.5	2.5	2.5	2.5	2.5
Solid/Stranded	1 x mm ²	1.5	1.5	1.5	1.5	1.5
Tightening torque (recommended), Nm		0.5	0.5	0.5	0.5	0.5

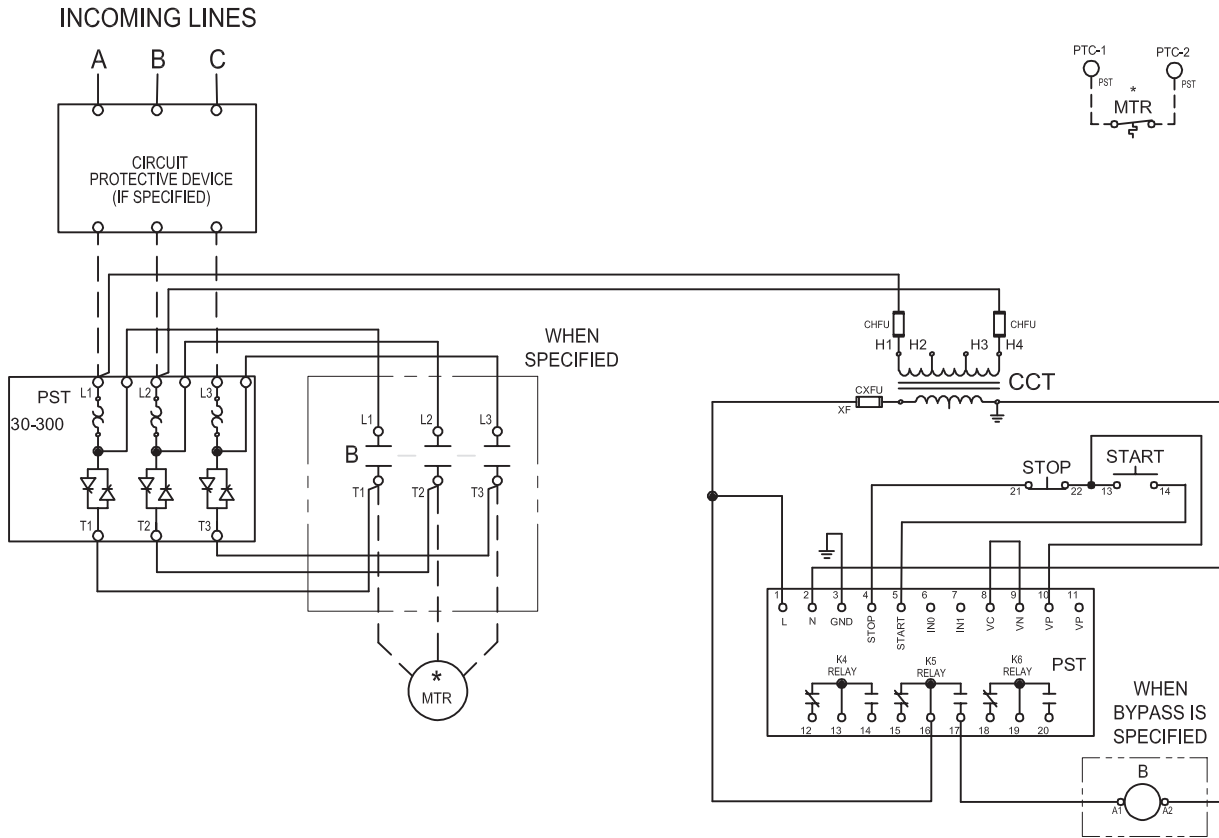
6

Fuse ratings and power losses

For softstarter	Recommended ABB Overload protection		Max power loss at rated I _e W	Maximum fuse ratings - main circuit			Ferraz fuses		Power requirements supply circuit VA/VA pull in
	Type	Current range A		A	Type	Holder	A	Type	
PST									
PST30	Integrated	9... 35	100	80	170M1366	170H1007	100	6.6 URB 000 D08V 0100	5
PST37	Integrated	12...46	120	125	170M1368	170H1007	160	6.6 URB 000 D08V 0160	5
PST44	Integrated	15...58	140	160	170M1369	170H1007	200	6.6 URD 30 D08A 0200	5
PST50	Integrated	15...58	160	160	170M1369	170H1007	200	6.6 URD 30 D08A 0200	5
PST72	Integrated	23...86	230	250	170M1371	170H1007	315	6.6 URD 30 D08A 0315	5
PST85	Integrated	30...115	270	315	170M1372	170H1007	400	6.6 URD 30 D08A 0400	10
PST105	Integrated	38...144	325	400	170M3019	170H3004	400	6.6 URD 30 D08A 0400	10
PST142	Integrated	45...173	435	450	170M3020	170H3004	500	6.6 URD 30 D08A 0500	10
PST175	Integrated	60...230	540	500	170M3021	170H3004	550	6.6 URD 30 D08A 0550	15
PST210	Integrated	75...288	645	630	170M5012	170H3004	630	6.6 URD 31 D08A 0630	15
PST250	Integrated	75...288	765	700	170M5013	170H3004	630	6.6 URD 31 D08A 0630	15
PST300	Integrated	90...345	920	900	170M5015	170H3004	900	6.6 URD 31 D11A 0900	15
PSTB – 600V									
PSTB370	Integrated	120...460	90	700	170M5013	170H3004	630	6.6 URD 31 D08A 0630	20/480
PSTB470	Integrated	150...575	110	900	170M5015	170H3004	900	6.6 URD 31 D11A 0900	20/480
PSTB570	Integrated	180...690	105	900	170M5015	170H3004	900	6.6 URD 31 D11A 0900	25/900
PSTB720	Integrated	225...863	110	1250	170M5018	170H3004	1250	6.6 URD 33 D11A 1250	25/860
PSTB840	Integrated	300...1160	170	1500	170M5018	170H3004	1600	6.6 URD 33 D11A 1250	25/860
PSTB1050	Integrated	360...1380	170	1800	170M6020	170H3004	2000	6.6 URD 233 PLAF 2000	25/860
PSTB – 690V									
PSTB370	Integrated	120...460	90	700	170M5013	170H3004	630	6.6 URD 31 D08A 0630	20/480
PSTB470	Integrated	150...575	110	900	170M5015	170H3004	900	6.6 URD 31 D11A 0900	20/480
PSTB570	Integrated	180...690	105	900	170M5015	170H3004	900	6.6 URD 31 D11A 0900	25/900
PSTB720	Integrated	225...863	110	1250	170M6018	170H3004	1250	6.6 URD 33 D11A 1250	25/860
PSTB840	Integrated	300...1150	170	1500	170M6018	170H3004	1600	6.6 URD 33 TTFA 1600	25/860
PSTB1050	Integrated	360...1380	170	1600	170M6019	170H3004	1600	6.6 URD 33 TTFA 1600	25/860

PST30 – PST300

6



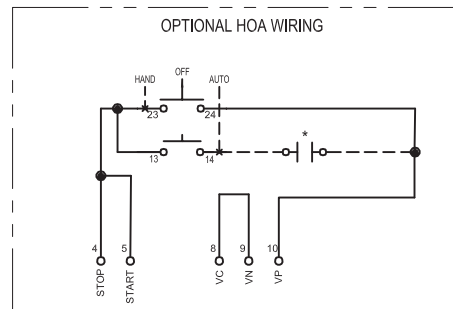
CONNECTION TORQUE: CONSULT SOFT STARTER MANUAL FOR WIRE TORQUE SPECIFICATIONS.

PST NOTES:

1. PROG. INPUT In0 FACTORY SET FOR RESET FAULT/OL.
2. PROG. RELAY K4 FACTORY SET FOR RUN.
3. PROG. RELAY K5 FACTORY SET FOR AT SPEED.
4. PROG. RELAY K6 FACTORY SET FOR EVENT.
5. FUNCTION MOT 1 Ie MUST BE SET TO MOTOR FLA.

LEGEND

CCT	CONTROL CIRCUIT TRANSFORMER
CHFUs	CCT PRIMARY FUSE
CXFUs	CCT SECONDARY FUSE
B	BYPASS CONTACTOR
PTC	THERMAL COUPLE
o 13	CONN POINT ON DEVICE WITH NUMBER
*	REMOTE DEVICE
Ø	CONNECTION POINT AT TERMINAL BLOCK



NOTES

1. ALL CONTROL WIRING TO BE 14 GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE ON CONTACTOR COILS:

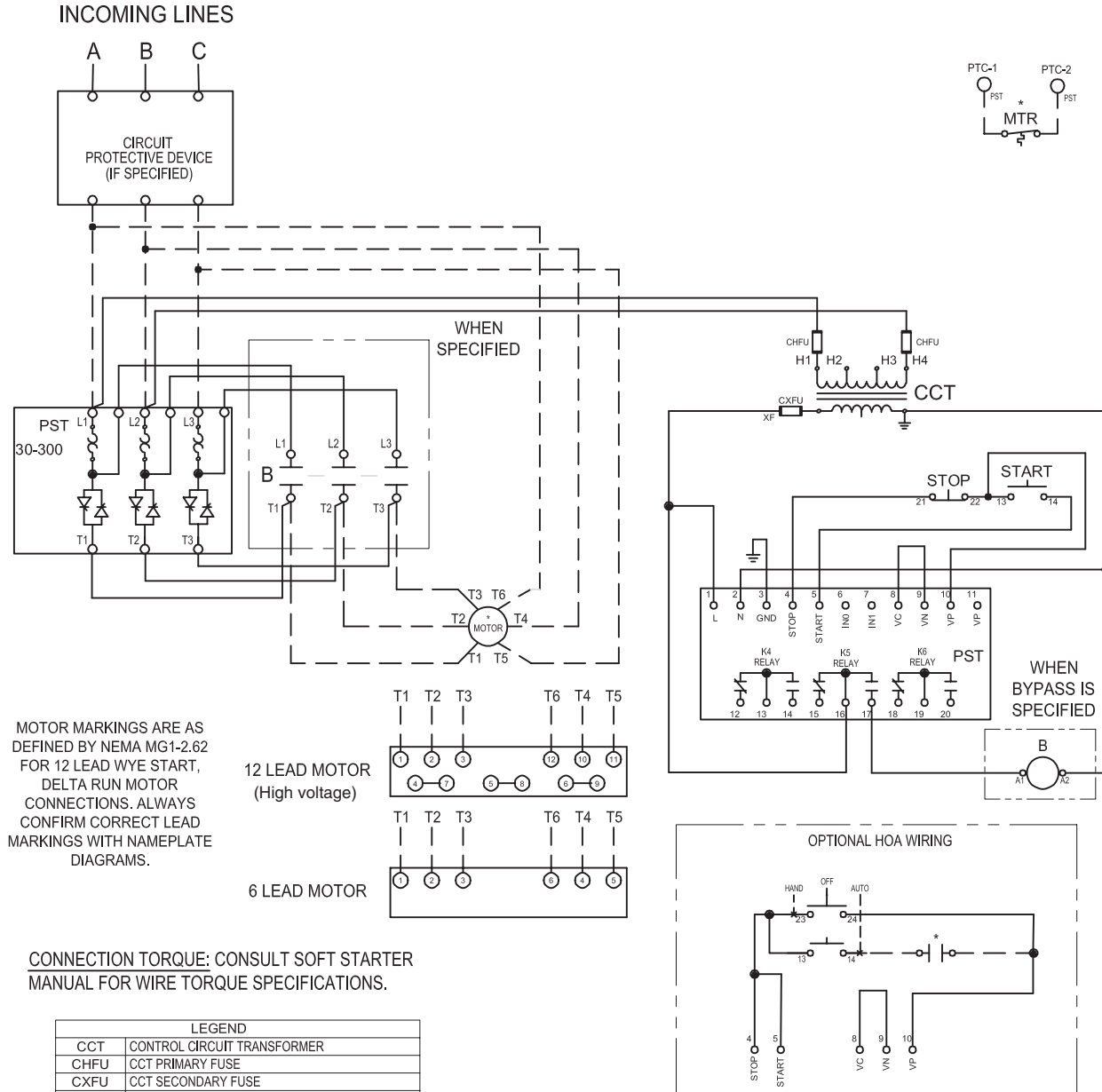
RED-ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.

BLUE-ALL DC VOLTAGES

2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

Circuit diagrams PST30 – PST300 Inside Delta

PST30 – PST300



CONNECTION TORQUE: CONSULT SOFT STARTER MANUAL FOR WIRE TORQUE SPECIFICATIONS.

LEGEND	
CCT	CONTROL CIRCUIT TRANSFORMER
CHFU	CCT PRIMARY FUSE
CXFU	CCT SECONDARY FUSE
B	BYPASS CONTACTOR
PTC	THERMAL COUPLE
o 13	CONN POINT ON DEVICE WITH NUMBER
*	REMOTE DEVICE
Ø	CONNECTION POINT AT TERMINAL BLOCK

PST NOTES:

1. PROG. INPUT In0 FACTORY SET FOR RESET FAULT/OL.
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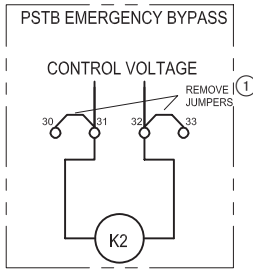
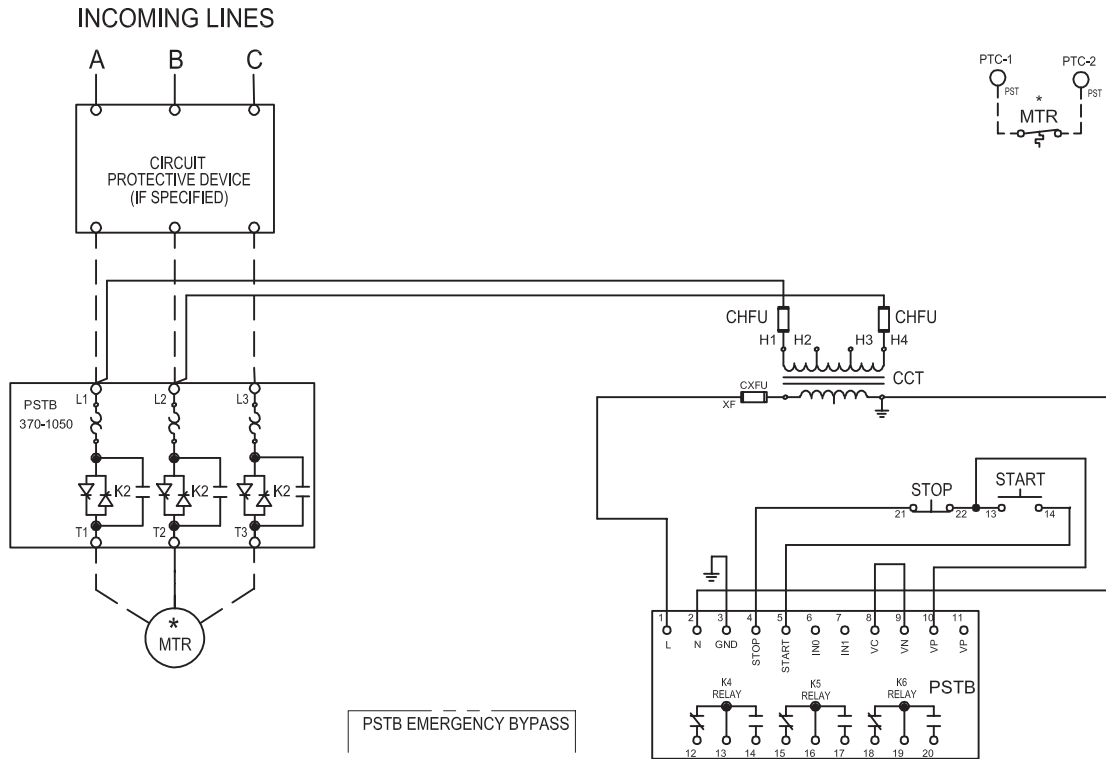
- NOTES**
1. ALL CONTROL WIRING TO BE 14 GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE ON CONTACTOR COILS:
RED-ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.
BLUE-ALL DC VOLTAGES
 2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
 3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

Circuit diagrams

PSTB370 – PSTB1050

In-Line

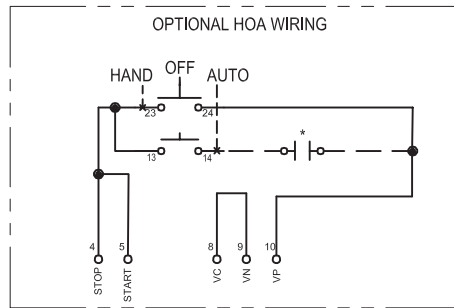
6



CONNECTION TORQUE: CONSULT SOFT STARTER MANUAL FOR WIRE TORQUE SPECIFICATIONS.

PST NOTES:

1. PROG. INPUT In0 FACTORY SET FOR RESET FAULT/OL.
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4. PROG. RELAY K6 FACTORY SET FOR EVENT.
5. FUNCTION MOT 1 Ie MUST BE SET TO MOTOR FLA.



NOTES

1. ALL CONTROL WIRING TO BE 14 GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE ON CONTACTOR COILS:

RED-ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.

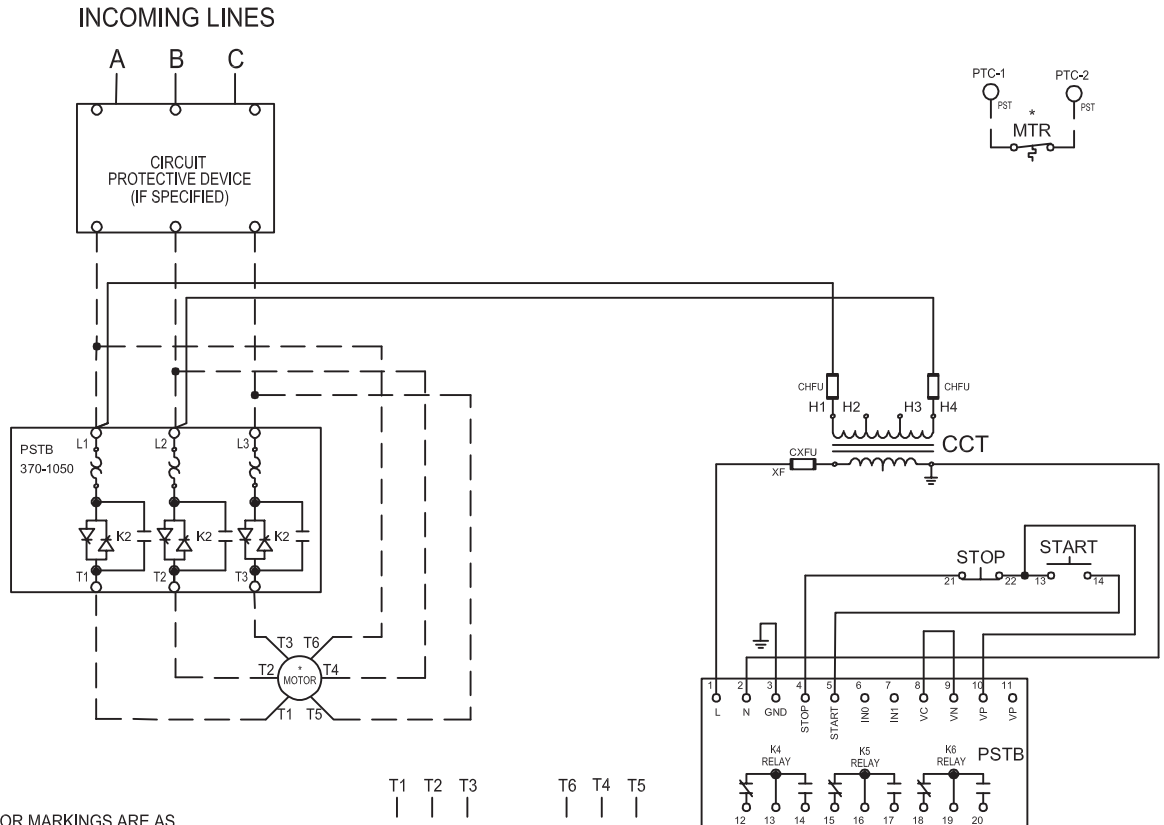
BLUE-ALL DC VOLTAGES

2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

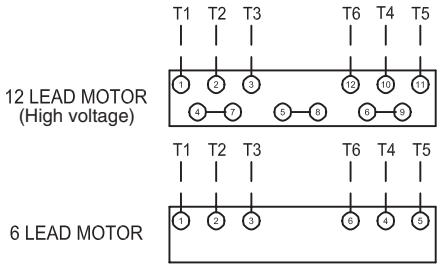
LEGEND	
CCT	CONTROL CIRCUIT TRANSFORMER
CHF1	CCT PRIMARY FUSE
CXFU	CCT SECONDARY FUSE
B	BYPASS CONTACTOR
PTC	THERMAL COUPLE
o 13	CONN POINT ON DEVICE WITH NUMBER
*	REMOTE DEVICE
⊗	CONNECTION POINT AT TERMINAL BLOCK

① See page 6.35 for across the line rated (AC3) contactor ratings.

Circuit diagrams PSTB370 – PSTB1050 Inside Delta

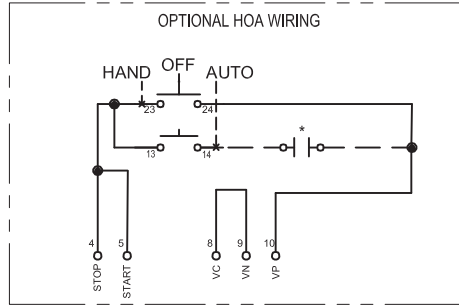
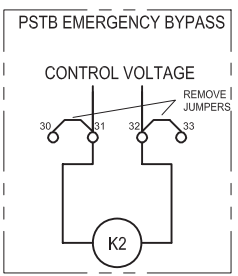


MOTOR MARKINGS ARE AS DEFINED BY NEMA MG1-2.62 FOR 12 LEAD WYE START, DELTA RUN MOTOR CONNECTIONS. ALWAYS CONFIRM CORRECT LEAD MARKINGS WITH NAMEPLATE DIAGRAMS.



CONNECTION TORQUE: CONSULT SOFT STARTER MANUAL FOR WIRE TORQUE SPECIFICATIONS.

LEGEND	
CCT	CONTROL CIRCUIT TRANSFORMER
CHF1	CCT PRIMARY FUSE
CXF1	CCT SECONDARY FUSE
B	BYPASS CONTACTOR
PTC	THERMAL COUPLE
o 13	CONN POINT ON DEVICE WITH NUMBER
*	REMOTE DEVICE
Ø	CONNECTION POINT AT TERMINAL BLOCK



- PST NOTES:**
1. PROG. INPUT In0 FACTORY SET FOR RESET FAULT/OL.
 2. PROG. RELAY K4 FACTORY SET FOR RUN.
 3. PROG. RELAY K5 FACTORY SET FOR AT SPEED.
 4. PROG. RELAY K6 FACTORY SET FOR EVENT.
 5. FUNCTION MOT 1 le MUST BE SET TO MOTOR FLA.

- NOTES**
1. ALL CONTROL WIRING TO BE 14 GA. COLOR OF CONTROL WIRE SHALL BE PER VOLTAGE ON CONTACTOR COILS:
RED-ALL AC VOLTAGES
WHITE MAY BE USED ON THE GROUNDED SIDE OF THE AC CIRCUIT IF SPECIFIED.
BLUE-ALL DC VOLTAGES
 2. ALL DEVICES ARE SHOWN DE-ENERGIZED.
 3. DO NOT USE SELECTOR SWITCHES WITH AUTO-RESET OVERLOAD RELAYS.

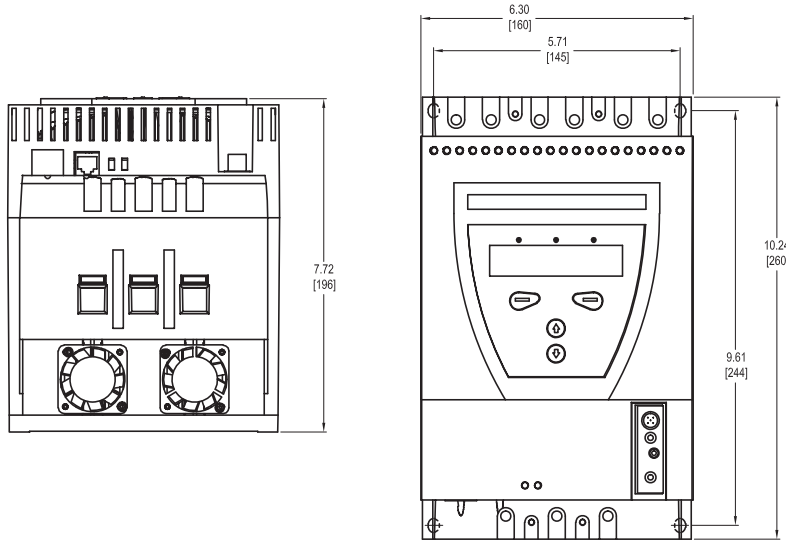
① See page 6.35 for across the line rated (AC3) contactor ratings.

Approximate dimensions
Open
PST30 – PST142

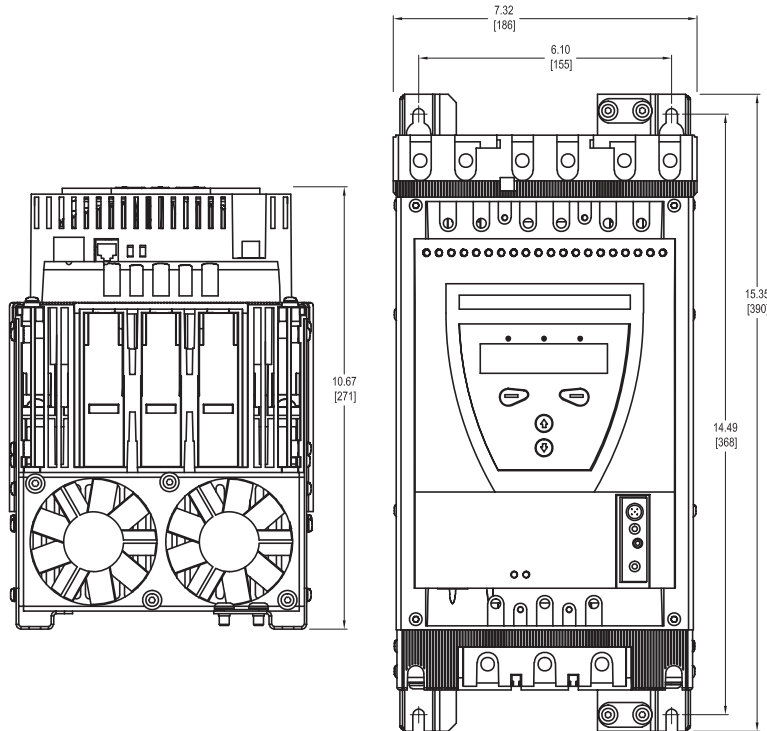
← 00.00 → Inches
00.00 → [Millimeters]

PST30 – PST72

6



PST85 – PST142



Approximate dimensions

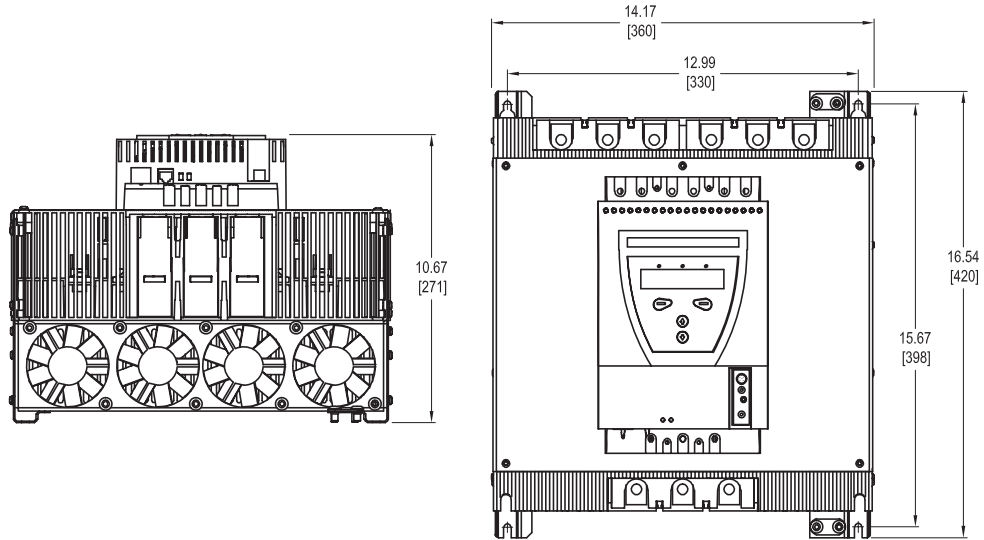
Open

PST175 – PSTB470

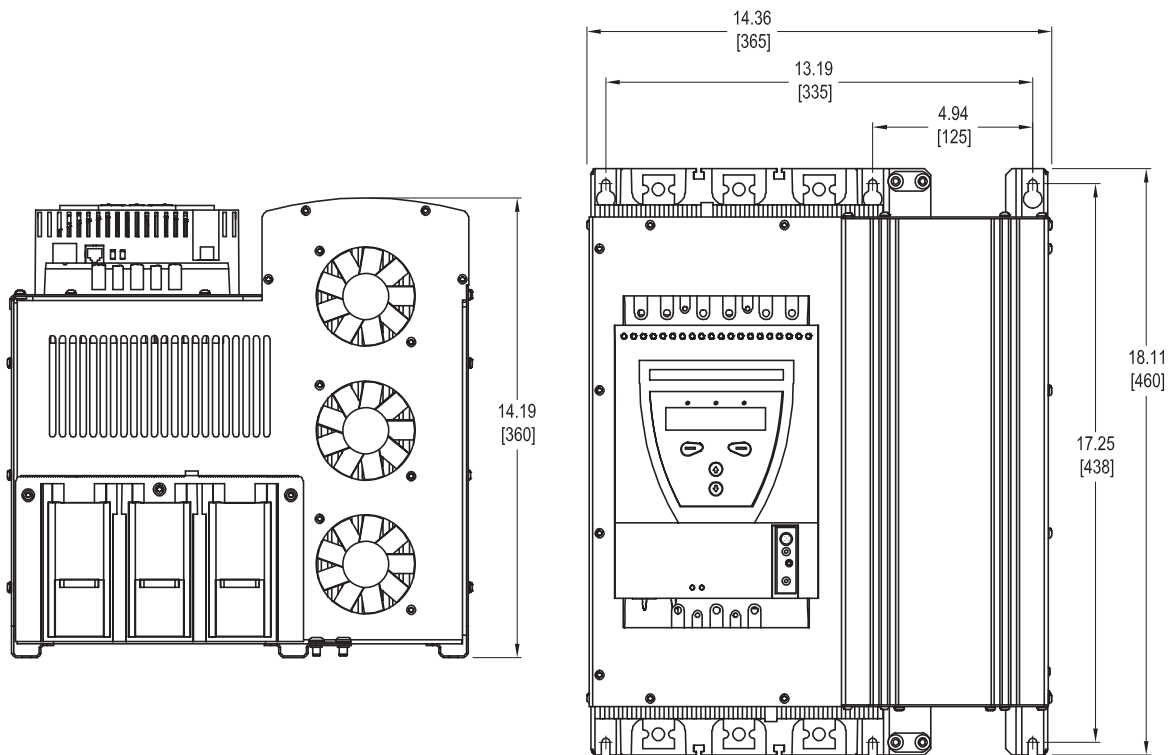
Softstarters
Type PST

00.00 Inches
00.00 [Millimeters]

PST175 – PST300



PSTB370 – PSTB470



6

Approximate dimensions

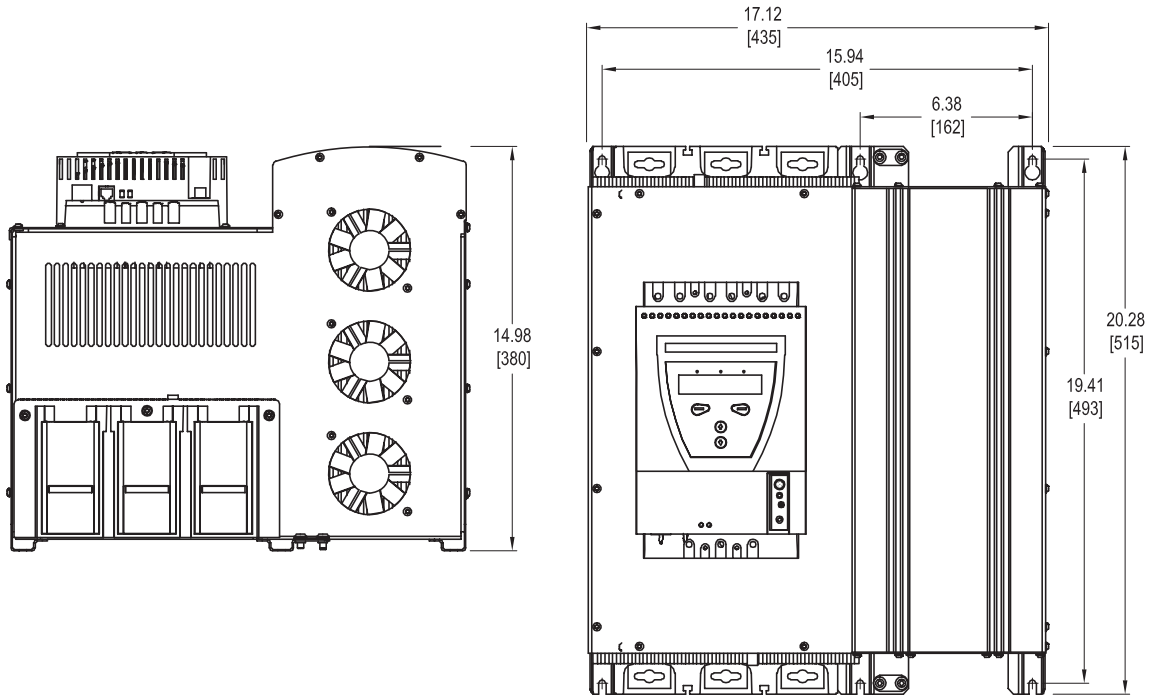
Open

PSTB570 – PSTB1050

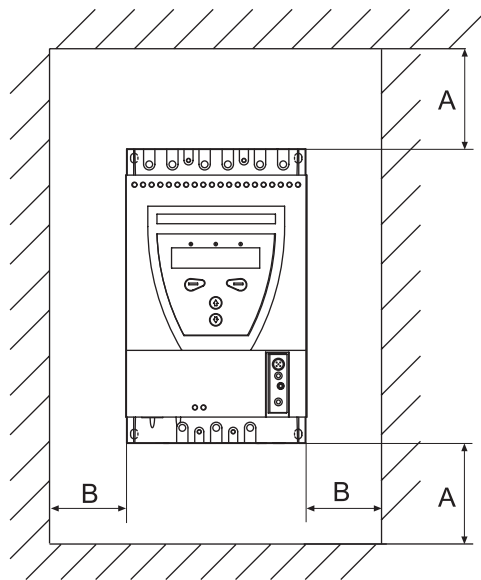
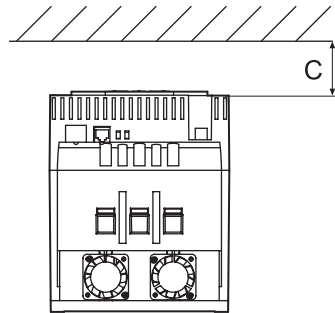
00.00 Inches
00.00 [Millimeters]

PSTB570 – PSTB1050

6



Approximate dimensions
Open
Wall mounting



Softstarter type	A In. / mm	B In. / mm	C In. / mm
PST30 – 72	3.94 / 100	0.39 / 10	0.79 / 20
PST85 – 300	3.94 / 100	0.39 / 10	0.79 / 20
PST175 – 300	3.94 / 100	0.39 / 10	0.79 / 20
PSTB370 – 470	5.91 / 150	0.59 / 15	0.79 / 20
PSTB570 – 1050	5.91 / 150	0.59 / 15	0.79 / 20



Approximate dimensions Enclosed Horsepower to PST Softstarter type cross-reference

Maximum horsepower in-line

208V	240V	380V	480V	600V	PST Type
5	5	10	10	—	PST30
—	—	—	—	15	
7.5	10	15	20	—	PST30
—	—	—	—	25	
10	10	20	25	—	PST37
—	—	—	—	30	
10	15	25	30	—	PST44
—	—	—	—	40	
15	20	30	40	—	PST50
—	—	—	—	50	
20	25	40	50	—	PST72
—	—	—	—	60	
25	30	50	60	—	PST85
—	—	—	—	75	
30	40	60	75	—	PST105
—	—	—	—	100	
40	50	75	100	—	PST142
—	—	—	—	125	
50	60	100	125	—	PST175
—	—	—	—	150	
60	75	125	150	—	PST210
—	—	—	—	200	
75	100	150	200	—	PST250
—	—	—	—	250	
100	100	150	250	—	PST300
—	—	—	—	300	
125	150	200	300	—	PSTB370
—	—	—	—	350	
—	—	250	350	—	PSTB470
—	—	—	—	400	
150	200	300	400	—	PSTB470
—	—	—	—	500	
200	250	350	500	—	PSTB570
—	—	—	—	600	
250	300	450	600	—	PSTB720
—	—	—	—	700	
300	350	500	700	—	PSTB840
—	—	—	—	800	
350	400	—	800	—	PSTB1050
—	—	—	—	900	
400	450	600	900	—	PSTB1050
—	—	—	—	1000	

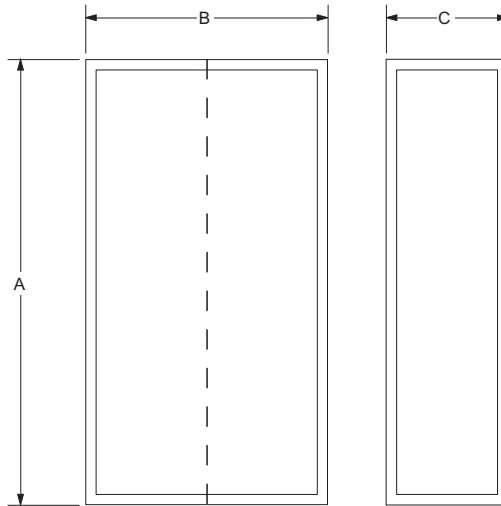
Maximum horsepower inside delta

208V	240V	380V	480V	600V	PST Type
7.5	10	15	20	—	PST30
—	—	—	—	25	
10	10	20	25	—	PST30
—	—	—	—	30	
10	15	25	30	—	PST30
—	—	—	—	40	
15	20	30	40	—	PST37
—	—	—	—	50	
20	25	40	50	—	PST44
—	—	—	—	60	
25	30	50	60	—	PST50
—	—	—	—	75	
30	40	60	75	—	PST72
—	—	—	—	100	
40	50	75	100	—	PST85
—	—	—	—	125	
50	60	100	125	—	PST105
—	—	—	—	150	
60	75	125	150	—	PST142
—	—	—	—	200	
75	100	150	200	—	PST175
—	—	—	—	250	
100	100	150	250	—	PST210
—	—	—	—	300	
125	150	200	300	—	PST250
—	—	—	—	350	
—	—	250	350	—	PST300
—	—	—	—	400	
150	200	300	400	—	PST300
—	—	—	—	500	
200	250	350	500	—	PST370
—	—	—	—	600	
250	300	450	600	—	PST470
—	—	—	—	700	
300	350	500	700	—	PST570
—	—	—	—	800	
350	400	—	800	—	PST720
—	—	—	—	900	
400	450	600	900	—	PST720
—	—	—	—	1000	
400	500	800	1000	—	PST720
—	—	—	—	1200	
500	600	900	1200	—	PST840
—	—	—	—	1500	
600	700	1200	1500	—	PST1050
—	—	—	—	1800	

Approximate dimensions

Enclosed

208V – 600V



Enclosed, 208V – 600V

Combination	In-Line			Inside Delta		
	A	B	C	A	B	C
PST30 – PST72						
Softstarter only	20 x 20 x 12			20 x 20 x 12		
Softstarter with bypass	20 x 20 x 12			20 x 20 x 12		
Softstarter with fused disconnect	20 x 20 x 12			24 x 20 x 12		
Softstarter with circuit breaker	20 x 20 x 12			24 x 20 x 12		
PST85 – PST142						
Softstarter only	24 x 20 x 12			36 x 24 x 12		
Softstarter with bypass	24 x 20 x 12			36 x 24 x 12		
Softstarter with fused disconnect	30 x 30 x 12			42 x 36 x 12		
Softstarter with circuit breaker	24 x 24 x 12			42 x 36 x 12		
PST175 – PST300						
Softstarter only	30 x 30 x 12			42 x 30 x 12		
Softstarter with bypass	30 x 30 x 12			42 x 30 x 12		
Softstarter with fused disconnect	36 x 36 x 12			36 x 36 x 12		
Softstarter with circuit breaker	36 x 36 x 12			36 x 36 x 12		

Combination	In-Line			Inside Delta		
	A	B	C	A	B	C
PSTB370 – PSTB470						
Softstarter with bypass, internal	48 x 36 x 16			48 x 36 x 16		
Softstarter with fused disconnect	48 x 36 x 16			87 x 36 x 24		
Softstarter with circuit breaker	48 x 36 x 16			48 x 36 x 16		
PSTB570 – PSTB720						
Softstarter with bypass, internal	48 x 36 x 16			48 x 36 x 16		
Softstarter with fused disconnect	87 x 36 x 24			87 x 36 x 24		
Softstarter with circuit breaker	48 x 36 x 16			48 x 36 x 16		
PSTB840 – PSTB1050						
Softstarter with bypass, internal	87 x 36 x 24			87 x 36 x 24		
Softstarter with fused disconnect	87 x 48 x 24			87 x 48 x 24		
Softstarter with circuit breaker	87 x 48 x 24			87 x 48 x 24		



Notes

Type SSM Softstarters

ABB

Softstarters
Type SSM
Medium voltage
2300 – 13,800V ①



6

Description

- Fused disconnect switch with blown fuse indicators and door safety interlocks rated for load break/fault make with automatic grounding arm
- Inline isolation vacuum contactor sized for across-the-line motor starting (optional on "soft start only" models)
- Bi-metallic thermal overload provides backup motor protection when operating in emergency bypass mode (optional on "soft start only" models)
- 120V fused control power transformer standard in line start section (optional on "soft start only" models)
- Digital controller provides solid state overload and numerous protective features for both the motor and the soft starter
- Fiber optic firing circuit for superior electrical noise isolation
- Programmable keypad with LCD and status LEDs for easy setup and operation
- Bypass vacuum contactor sized for across-the-line (emergency) motor starting is standard on all models to guarantee cool operation in all environments and extend unit life
- Heavy duty SCR stack assemblies with ring transformer isolated circuit for reliable, hard-firing gate pulse
- Isolated low voltage compartment provides maximum protection for operating personnel
- Mechanically interlocked medium voltage compartment
- UL File # E175732 ②

① Consult factory for higher voltages.

② For softstarters rated 4160V, 400A and below.



Heavy duty SCR power assemblies

- Rated for 500 percent overload for 60 seconds
- Field-proven design in use since 1975
- Fiber optics gate-firing circuit using "ring transformer" isolation design for superior noise immunity

Industrial "real world" packaging

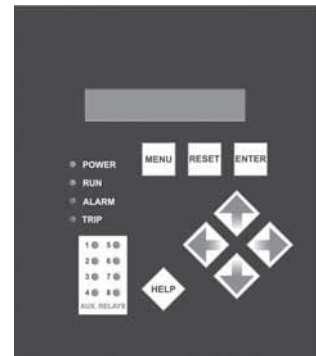
- Load break/fault make disconnect switch with door safety interlocking mechanism
- Isolated, noise-immune low voltage control compartment
- NEMA 12 enclosure with bypass vacuum contactor included as standard^{①②}
- Extra wiring space for MV cables for easy installation

Custom engineered systems

- Available in special enclosures and lineups
- Numerous control component options including:
 - Reversing contactors
 - Motor protection relays
 - Customer specified devices
- Horizontal and custom bus interconnects
- Various motor configurations including synchronous, wound rotor and two speed

Digital microprocessor control

- Full featured for flexibility, including dual ramp and programmable custom start curves
- LCD status/alarm display and built-in programming keypad
- Serial communications port standard: RS485 with Modbus RTU protocol or RS232 with Windows interface
- In-depth motor and system protection monitors
- Monitors 18 separate parameters and maintains a nonvolatile fault memory



Key construction features

- Fused disconnect switch with blown fuse indicators and door safety interlocks rated for load break/fault make with automatic grounding arm
- Inline isolation vacuum contactor^② sized for across-the-line motor starting (optional on "soft start only" models)
- Bi-metallic thermal overload provides backup motor protection when operating in emergency bypass mode (optional on "soft start only" models)
- 120V fused control power transformer standard in line start section (optional on "soft start only" models)
- Digital controller provides solid state overload and numerous protective features for both the motor and the soft starter
- Programmable keypad with LCD and status LEDs for easy setup and operation
- Bypass vacuum contactor^② standard on all models to guarantee cool operation in all environments and extend unit life
- Heavy duty SCR stack assemblies with ring transformer isolated circuit for reliable, hard-firing gate pulse
- Isolated low voltage compartment provides maximum protection for operating personnel
- Mechanically interlocked medium voltage compartment

① 13.8 kV softstarters are rated NEMA 1.

② 13.8 kV, 600A softstarters use circuit breakers for isolation and bypass functions.

Type SSM

Softstarters
Type SSM



Custom line-up



SSM-41200-E-S

Volts	Ratings ①		Soft start with line start section		Optional soft start only ②	
	Max. amps	Nominal max. HP	Catalog number	List price	Catalog number	List price
2300	200	800	SSM-23200-E-S	③	SSM-23200-E	④
	400	1500	SSM-23400-E-S			
	600	2500	SSM-23600-E-S			
3300	200	1000	SSM-33200-E-S	③	SSM-33200-E	④
	400	1800	SSM-33400-E-S			
	600	3000	SSM-33600-E-S			
4160	200	1250	SSM-41200-E-S	③	SSM-41200-E	④
	400	2500	SSM-41400-E-S			
	600	5000	SSM-41600-E-S			
6600/ 6900	200	2500	SSM-66200-E-S	③	SSM-66200-E	④
	400	5000	SSM-66400-E-S			
	600	7500	SSM-66600-E-S			
13,800	300	7500	SSM-138300-E-S	③	SSM-138300-E	④
	600	15,000	SSM-138600-E-S			

6

Catalog number explanation

SSM - 23 200 - E - S

Softstarter — SSM — medium voltage

Voltage
 23 = 2300V
 33 = 3300V
 41 = 4160V
 66 = 6600/6900V
 138 = 13,800V

Amperage
 200 = 200A
 400 = 400A
 600 = 600A

S = Switchgear line start panel

E = NEMA 12 enclosure ④⑤

① Contact factory for higher horsepower and voltage requirements.
 ② Must be used with customer supplied line start panel.
 ③ Consult factory.
 ④ Consult factory for other enclosure types.
 ⑤ 13.8 kV softstarters are rated NEMA 1.

Type of load

Three phase medium voltage AC induction motors

AC supply voltage

2300, 3300, 4160, 6600/6900, 13,800 VAC

+10% to -10%

50/60 Hz line voltages

HP ratings ^①

Up to 15,000 HP @ 13,800V (600 Amps max)

Overload rating

500% – 60 Seconds

Power circuit

Series strings of SCR power modules (2,4 or 6 matched pairs of SCRs per phase depending on voltage rating)

SCR peak inverse voltage

Amps	Line voltage	PIV rating
200 to 400	2300 V	6500
	3300 V	13,000
	4160 V	13,000
	6600/6900 V	19,500
	11-14 kV	39,000
600	2300 V	7000
	3300 V	14,000
	4160 V	14,000
	6600/6900 V	21,000
	11-14 kV	39,000

Transient voltage protection

dv/dt circuits (1 per SCR power module)

Vacuum bypass contactor ^③

Standard on all models, line start rated

Ambient operating temperature

0 to 50°C (32°F to 122°F)

(Optional -20° to 50°C with heaters)

Control

Digital microprocessor controller with read-out in English text

Alphanumeric LCD display

Non-volatile memory for programming and faults

Opto-isolated inputs

Communications

RS485 with modbus RTU protocol

RS232 with Windows interface

Auxiliary contacts

FORM C, 8 Amps @ 250V

Adjustments

Motor FLA

Dual adjustments — Two independent settings for:

Initial voltage 0 – 100% of nominal voltage

Current limit 0 – 600% of motor FLA

Acceleration time 1 – 120 seconds

Deceleration time 1 – 60 seconds

Kick start 0.1 – 2.0 seconds, 10 - 100% of line voltage

Under voltage trip 70 – 95% (adjustable trip delay)

Over voltage trip 105 – 130% (adjustable trip delay)

Under current trip 20 – 90% of motor FLA (adjustable trip delay)

Over current trip 100 - 300% of motor FLA (adjustable trip delay)

Allowable re-starts 0 – 10 (adjustable time inhibit)

Motor and starter protection

Electronic overload Inverse time, 75 – 150% of motor FLA

Electronic shear pin Trips within 1 cycle of setpoint

Phase loss One or more phases missing

Phase sequence Phase sequency incorrect

Over voltage Trips at high line setpoint

Under voltage Trips at low line setpoint

Stall protection Starting process is not complete

Shorted SCR Internal fault detected

Error connection Internal fault/motor connection

Starter over-temp Heatsink over temperature

Metering

Current Phase A, B, C & average current

Thermal data Thermal capacity of motor

Power KVA, KW, KVAR, power factor, KWH

Line start section

Load break/fault make disconnect switch with automatic grounding arm and viewing window

Fuses with blown fuse indicator

In-line vacuum contactor^③

Control power transformer with fused primary/secondary

Packaged in common enclosure with soft start

Optional "Soft Start" (requires customer supplied line start panel)

Statistical data

Total amount of run time since soft start was reset

Amount of time it took motor to start during last period

Maximum current during last start period

Total number of starts since soft start was reset

Event history for last 60 events

Elevation

1000 m / 3300 ft. without derating (contact factory for higher elevations)

Enclosure ^②

NEMA 12, top and bottom entrance plates

11 gauge steel

ASA #61 gray paint with lifting eyes

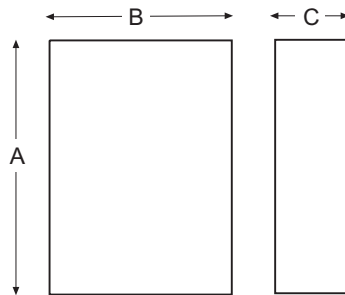
^① Consult factory for higher horsepower and voltage requirements.

^② 13.8 kV softstarters are rated NEMA 1.

^③ 13.8 kV, 600A softstarters use circuit breakers for isolation and bypass functions.

Approximate dimensions

Softstarters
Type SSM



6

Soft start with line start section (inches)				Optional softstart only (inches)			
Model number	A	B	C	Model number	A	B	C
SSM-23200-E-S	92	36	30	SSM-23200-E	92	36	30
SSM-23400-E-S	92	36	30	SSM-23400-E	92	36	30
SSM-23600-E-S	92	72	30	SSM-23600-E	92	36	30
SSM-33200-E-S	92	36	30	SSM-33200-E	92	36	30
SSM-33400-E-S	92	36	30	SSM-33400-E	92	36	30
SSM-33600-E-S	92	72	30	SSM-33600-E	92	36	30
SSM-41200-E-S	92	36	30	SSM-41200-E	92	36	30
SSM-41400-E-S	92	36	30	SSM-41400-E	92	36	30
SSM-41600-E-S	92	72	30	SSM-41600-E	92	36	30
SSM-66200-E-S	92	72	30	SSM-66200-E	92	36	30
SSM-66400-E-S	92	72	30	SSM-66400-E	92	36	30
SSM-66600-E-S	92	72	30	SSM-66600-E	92	72	30
SSM-138300-E-S	92	120	44	SSM-138300-E	Consult factory		
SSM-138600-E-S	92	84	96	SSM-138600-E			

Type PEB Power electronic brakes



Softstarters Power electronic brakes Type PEB



6

Description

Electronic braking stops the load by injecting a controlled amount of DC current into a three phase AC motor. The Power Electronic Brake (PEB) Series features full-wave DC braking which can be adjusted to stop your load quickly, repeatedly and reliably...even if load conditions change.

Unlike other brakes that only provide voltage control, the PEB Series is a current regulated brake. It automatically adjusts for resistance changes in the motor windings due to any input voltage fluctuations. What does this mean? Repeatable, reliable operation every time you stop your motor.

An exceptionally accurate method of micro-processor controlled sensing determines when

the motor shaft has come to a stop. Braking current is removed when the motor stops, eliminating excess braking current which means longer motor life.

Built-in jogging circuitry allows you to select the time you need for machine setup and positioning without applying DC current to the motor windings. DC current is only applied when system setup is complete... no excess current, no excess heating, no premature motor failure.

The PEB Series has a built-in feature to control a mechanical holding brake. Any fault indication automatically enables the mechanical brake for fail-safe operation.

The PEB Series has been designed and tested to meet the most stringent industry standards: UL & cUL.

UL File # E169883



General information

Catalog number explanation

PEB - 010 - 48 - 1

Maximum brake amps

- 010 - 10
- 024 - 24
- 050 - 50
- 100 - 100
- 200 - 200
- 300 - 300
- 400 - 400
- 550 - 550
- 800 - 800
- 1000 - 1000

Enclosure

- No digit - Open chassis
- 1 - NEMA 1
- 2 - NEMA 12
- 3 - NEMA 3R
- 4 - NEMA 4
- X - NEMA 4X

Voltage

- 24 - 208/240
- 48 - 480
- 60 - 600

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Power electronic brakes Open

Softstarters
Type PEB



PEB-100-48

PEB-10-48

6

Max amps ①	208V			240V			480V			600V			List price
	Horsepower		Catalog number	Horsepower		Catalog number	Horsepower		Catalog number	Horsepower		Catalog number	
	Std. duty	Hvy. duty		Std. duty	Hvy. duty		Std. duty	Hvy. duty		Std. duty	Hvy. duty		
10	3	1	PEB-010-24	3	1	PEB-010-24	7.5	3	PEB-010-48	10	5	PEB-010-60	\$ 755
24	7.5	3	PEB-024-24	10	5	PEB-024-24	20	10	PEB-024-48	25	15	PEB-024-60	1070
50	15	7.5	PEB-050-24	20	10	PEB-050-24	40	25	PEB-050-48	50	30	PEB-050-60	1450
100	30	20	PEB-100-24	40	15	PEB-100-24	75	50	PEB-100-48	100	60	PEB-100-60	2250
200	75	40	PEB-200-24	75	50	PEB-200-24	150	100	PEB-200-48	200	125	PEB-200-60	3900
300	100	60	PEB-300-24	125	75	PEB-300-24	250	150	PEB-300-48	300	200	PEB-300-60	4300
400	150	75	PEB-400-24	150	100	PEB-400-24	350	200	PEB-400-48	400	250	PEB-400-60	6500
550	250	125	PEB-550-24	200	150	PEB-550-24	500	300	PEB-550-48	600	350	PEB-550-60	8700
800	350	200	PEB-800-24	350	200	PEB-800-24	700	450	PEB-800-48	900	500	PEB-800-60	10,250
1000	400	250	PEB-1000-24	400	300	PEB-1000-24	900	500	PEB-1000-48	1000	600	PEB-1000-60	13,000

NOTE: If duty cycle is not known, it is recommended to use the heavy duty brake since braking current can be adjusted down to meet actual load requirements.

① Never exceed the motor FLA without checking the motor manufacturers data with regards to application duty cycle.

Power electronic brakes Enclosed, NEMA 1

Maximum Amps FLA	Maximum motor HP ratings								NEMA 1, 480V Catalog number	NEMA 1, 600V Catalog number	List price
	208V		240V		480V		600V				
	Standard Duty	Heavy Duty	Standard Duty	Heavy Duty	Standard Duty	Heavy Duty	Standard Duty	Heavy Duty			
10	3	1	3	1	7.5	3	10	5	PEB-010-48-1	PEB-010-60-1	\$ 805
24	7.5	3	10	5	20	10	25	15	PEB-024-48-1	PEB-024-60-1	1120
50	15	7.5	20	10	40	25	50	30	PEB-050-48-1	PEB-050-60-1	1650
100	30	20	40	15	75	50	100	60	PEB-100-48-1	PEB-100-60-1	2450
200	75	40	75	50	150	100	200	125	PEB-200-48-1	PEB-200-60-1	4320
300	100	60	125	75	250	150	300	200	PEB-300-48-1	PEB-300-60-1	4800
400	150	75	150	100	350	200	400	250	PEB-400-48-1	PEB-400-60-1	7000
550	250	125	200	150	500	300	600	350	PEB-550-48-1	PEB-550-60-1	9200
800	350	200	350	200	700	450	900	500	PEB-800-48-1	PEB-800-60-1	10,750
1000	400	250	400	300	900	500	1000	600	PEB-1000-48-1	PEB-1000-60-1	13,500

NOTE: See below for additional enclosure styles and price adders.

Options ⓘ

Model number	NEMA 12	NEMA 3R	NEMA 4	NEMA 4X
PEB-010	\$ 100	\$ 100	\$ 150	\$ 450
PEB-024	100	100	150	450
PEB-050	100	100	150	450
PEB-100	100	100	150	450
PEB-200	150	150	200	600
PEB-300	300	300	350	1050
PEB-400	300	300	350	1050
PEB-550	300	300	350	1050
PEB-800	300	300	350	1050
PEB-1000	300	300	350	1050

ⓘ Add to list price of NEMA 1 enclosed products and change part number appropriately.

Technical data

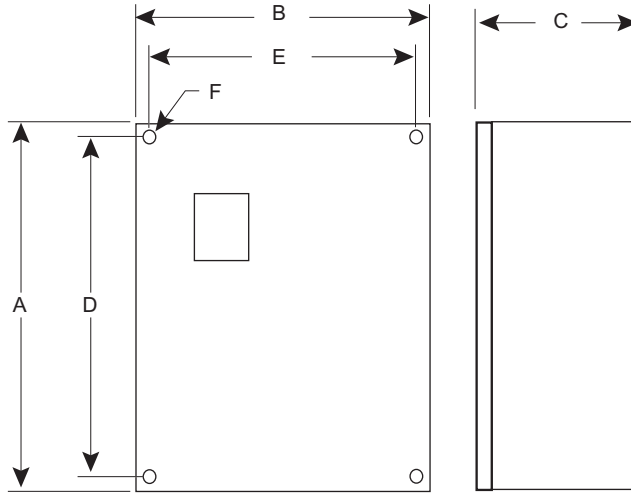


Item	Specification
Voltage rating	Models rated from 208 - 600V $\pm 10\%$ Selectable for 50/60Hz ± 2 Hz
Current ratings	10 - 1000A in 10 sizes: 10, 24, 50, 100, 200, 300, 400, 550, 800, 1000A
Output capacity	25% duty cycle at 100% unit rating
Power circuit	Full wave bridge, 4 SCRs, designed for use without isolation contactors
Transient protection	RC snubber dv/dt circuit on each SCR device
Fusing	Approved for use with existing motor starter fusing when unit is sized for motor FLA. Consult NEC for any other fusing requirements.
Control circuit	Self-powered directly from line terminals. No separate control voltage required
Control method	Microprocessor unit controls sequencing, I/O monitoring and status annunciation. Braking current is adjustable via true RMS regulated control using phase angle firing of SCRs.
Operator adjustments	Brake Time and Jog Time = 7 position binary dipswitch Brake Current = potentiometer
Adjustment ranges	Brake Jog Times = 0 - 127 seconds in 1 sec. increments Brake Current = Up to 100% unit rating
Inputs	Starter Monitor = Dry input for auxiliary contact from motor starter. Jumper selectable for N.O. or N.C. contact. Brake Disable = Dry input for N.O. contact to disable braking before or during operation. Can be wired to the starter thermal overload N.O. auxiliary contact to prevent braking of overloaded motor. Motor Power Sensor (T3) = voltage input used for sensing motor power presence in sequencing/status circuit and for zero speed sensing during braking
Outputs	Starter Coil Interlock = Two sets of FORM "C" relay contacts for use in interlocking the starter coil and/or other devices to prevent energizing as the braking power is applied. Mechanical Brake Release = N.O. relay contact for use in controlling electro-mechanical brake as a holding brake. When the PEB Series is "disabled," this circuit controls the mechanical brake normally as if it is the only brake in the system.
Auxilliary contact ratings	5 amps, 250VAC max
LED Status indicators	Large LEDs: Braking = green; Fault = red Small LEDs: Power On, Jog/Armed, Brake Off, Disabled, Over Temp, and Wiring Error
Operating design temperature	0 - 50 °C (32-122 °F) open 0 - 40 °C (32 - 104 °F) enclosed
Ambient conditions	0 - 95% relative humidity 0 - 3300ft (1000M) elevation
Approvals	UL, cUL Listed

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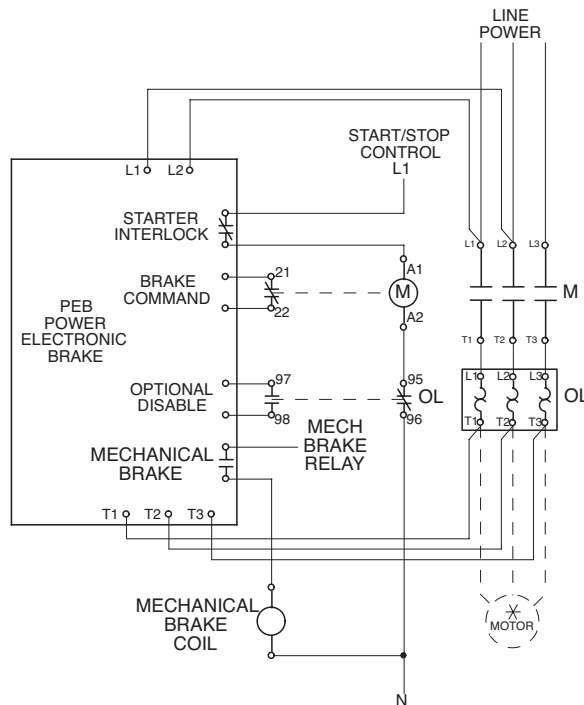
Approximate dimensions & Circuit diagram Open

Approximate dimensions (inches)



Model No.	A	B	C	D	E	F
PEB-10	8.5	7.3	6.2	8	6.9	0.21
PEB-24	8.5	7.3	6.2	8	6.9	0.21
PEB-50	10.5	7.9	7.2	10	6.8	0.22
PEB-100	10.5	7.9	7.2	10	6.8	0.22
PEB-200	16.5	10	10	15.9	9	0.28
PEB-300	16	16	10	15	15	0.5
PEB-400	16	16	10	15	15	0.5
PEB-550	16	16	10	15	15	0.5
PEB-800	16	16	10	15	15	0.5
PEB-1000	16	16	10	15	15	0.5

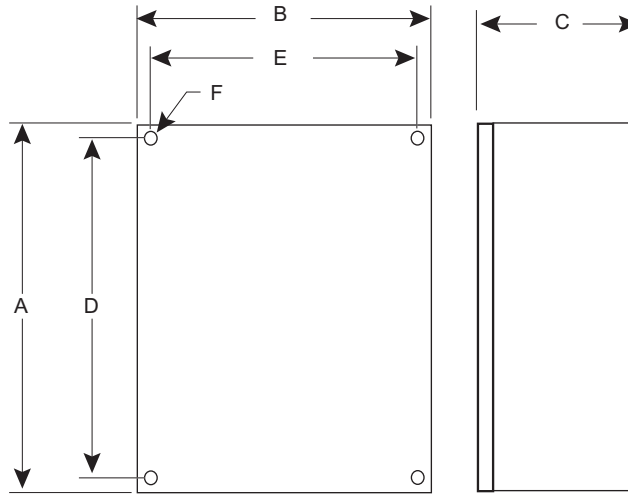
Circuit diagram



Approximate dimensions & Circuit diagram Enclosed

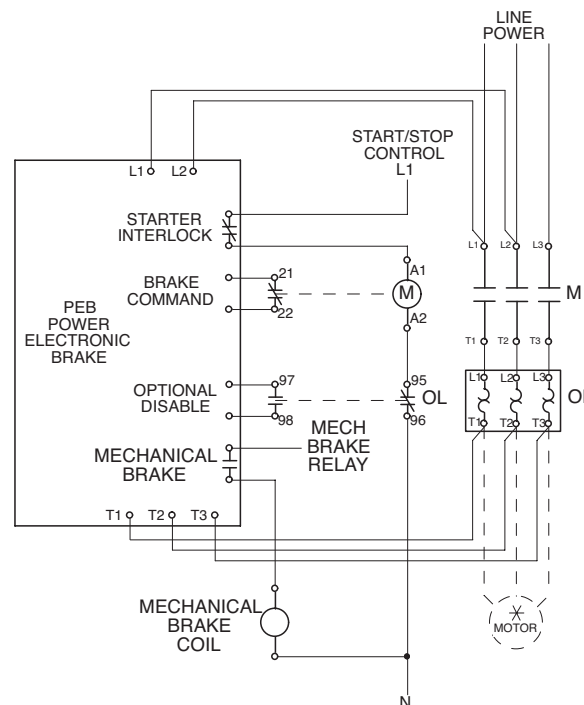
Softstarters
Type PEB

Approximate dimensions (inches) ①



Model No.	A	B	C	D	E	F
PEB-10	16	12	9	14.5	10.5	0.5
PEB-24	16	12	9	14.5	10.5	0.5
PEB-50	20	16	9	18.5	14.5	0.5
PEB-100	20	16	9	18.5	14.5	0.5
PEB-200	24	20	13	22.5	18.5	0.5
PEB-300	36	24	13	34.5	22.5	0.5
PEB-400	36	24	13	34.5	22.5	0.5
PEB-550	36	24	13	34.5	22.5	0.5
PEB-800	36	24	13	34.5	22.5	0.5
PEB-1000	36	24	13	34.5	22.5	0.5

Circuit diagram



① Dimensions apply to NEMA 1, NEMA 12, NEMA 3R and NEMA 4 enclosures. Consult factory for NEMA 4X dimensions.

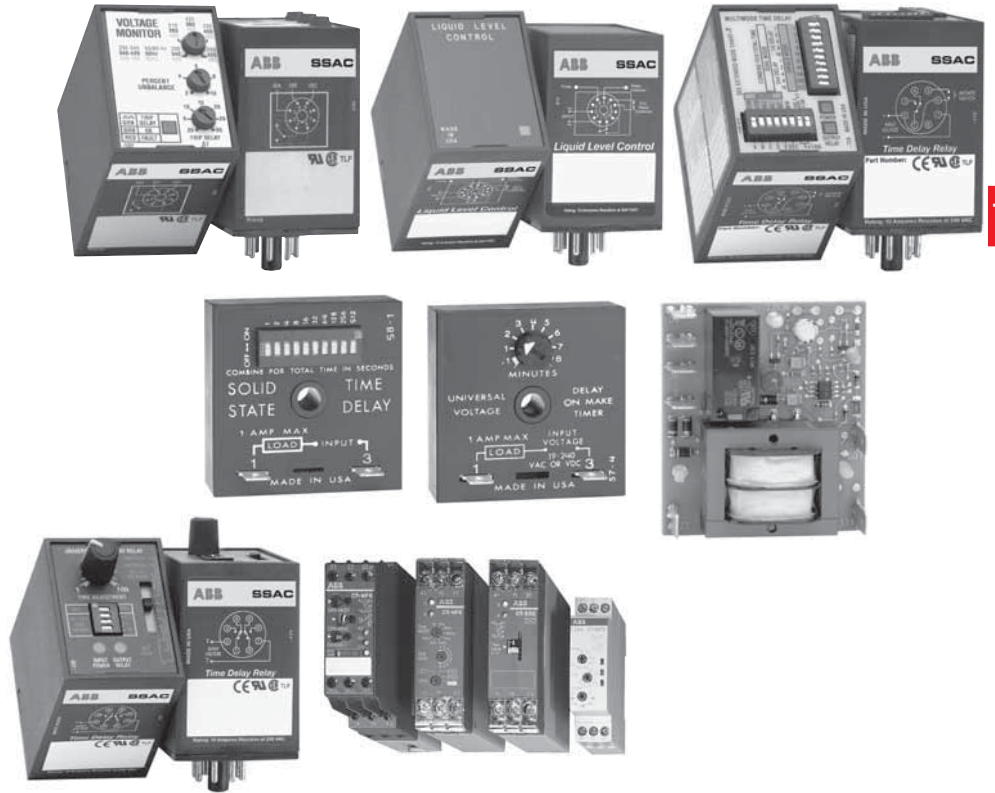


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Notes



Timers & controls

This section features product selection guides from the Timers and Controls Catalog (SS3 Cat. # 1TRC001009C0201). Use the SS3 catalog to view the individual product pages for the series shown in these selection guides. The SS3 is available in print and on CD-ROM.

SS3 Catalog:

This 552 page catalog and application manual provides concise data and application tips unavailable elsewhere. A double indexing system speeds the selection of:

- | | |
|---|--|
| <ul style="list-style-type: none"> Timers Time Delay Relays Encapsulated Timing Modules Universal Timers Multifunction Timers ProgramaCube® Timers and Counters Voltage Monitors Current Sensors & Monitors Phase Monitors Liquid Level Controls Accessories | <ul style="list-style-type: none"> Alternating Relays Vending Timers and Controls HVAC/ Timers and Controls Solid State Flashers Tower & Obstruction Lighting Controls Solid State Relays Motion Detectors Lamp Dimmers & Motor Speed Controls Power Factor Monitors Insulation Monitors |
|---|--|

This new edition includes the complete ABB brand of DIN3 mount timers, monitoring relays, and solid state relays.

All products are manufactured within an ISO9000 quality monitoring system. All products are shipped with UL and CSA approvals, and CE certification. Quality designs and rugged encapsulated construction allow the SSAC brand products to be backed by an exclusive 10 Year Product Warranty.

Each data sheet includes complete specifications, illustrations, photos and operational information needed to select one of the over 225 product series. The SS3 is easy-to-use and can be understood by designers, technicians, service contractors and non-technical users.

The SS3 includes informative application notes along with a colorful plant tour, and information about custom product design programs.

Selection Guide Multi-function Timers

To view individual catalog pages,
see Catalog SS3 (1TRC001009C0201)
or www.ssac.com

Knob or
Switch Adjust
Plug-in



S Series
Onboard
Adjust



E Series
Onboard
Adjust



Knob or
Switch
Adjust



Series

Output Form

TRDU
DPDT

TRU
DPDT

CT-MFS
DPDT

CT-MVS
DPDT

CT-MBS
SPDT

CT-MBS
DPDT

CT-MFE
SPDT

CT-MKE
Solid State

CT-MFD
SPDT

ASQU/ASTU
DSQU/DSTU
Solid State

Function and Features

Delay on Make (ON-delay)

• • • • • • • • • • •

Delay on Break (OFF-delay)

• • • • • • • • • • •

Delay on Break (Inverted)

• • • • • • • • • • •

Single Shot (Pulse Former)

• • • • • • • • • • •

Single Shot Trailing Edge

• • • • • • • • • • •

Single Shot Retriggerable
(Motion Detector)

• • • • • • • • • • •

Single Shot (Inverted)

• • • • • • • • • • •

Interval (Impulse ON)

• • • • • • • • • • •

Interval, Trailing Edge (Impulse OFF)

• • • • • • • • • • •

Interval/Recycling (Equal)

• • • • • • • • • • •

Recycling (Pulse Generator)
(Both Time Adjustable)

• • • • • • • • • • •

Recycling (Equal Times ON First)

• • • • • • • • • • •

Recycling (Equal Times OFF First)

• • • • • • • • • • •

Dual Functions

Star Delta Motor Starting

• • • • • • • • • • •

Delay on Make & Delay on Break

• • • • • • • • • • •

Delay on Make & Single Shot

• • • • • • • • • • •

Delay on Make & Interval

• • • • • • • • • • •

Delay on Make (Accumulative) & Interval

• • • • • • • • • • •

Delay on Make & Recycling (Equal)

• • • • • • • • • • •

Delay on Break & Recycle (Equal)

• • • • • • • • • • •

Single Shot & Recycle (Equal Times)

• • • • • • • • • • •

Interval & Delay on Make

• • • • • • • • • • •

General Features

Instantaneous Contacts

• • • • • • • • • • •

Accumulative Timing

• • • • • • • • • • •

Solid State Output

• • • • • • • • • • •

Relay Output

• • • • • • • • • • •

Knob or Onboard Adjustment

• • • • • • • • • • •

Switch Adjustment

• • • • • • • • • • •

External Adjustment

• • • • • • • • • • •

Dimensions

in
mm

1.78 x 2.39 x 3.40
45.2 x 60.7 x 87.4

0.89 x 3.07 x 3.98
22.5 x 78 x 101

0.89 x 3.07 x 3.09
22.5 x 78 x 78.5

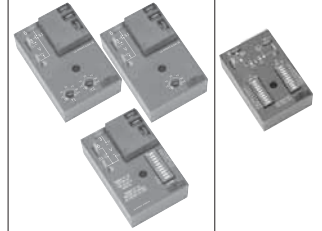
0.69x2.76x2.48
17.5 x 70 x 63

0.69 x 3.0 x 2.41
17.5 x 76.2 x 61.2

Selection Guide ProgramaCube®

Timers &
controls

To view individual catalog pages,
see Catalog SS3 (1TRC001009C0201)
or www.ssac.com



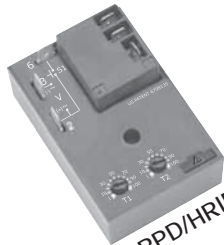
Series	KSPD	KSPS	KSPU	NHPD	NHPS	NHPU	KRPD	KRPS	HRPD	HRPS	HRPU	HSPZ
Functions and Features												
Relay Output Resistive Rating							10A	10A	30A	30A	30A	
Solid State Output Rating	1A	1A	1A	6...20A	6...20A	6...20A						1A
Knob or External Adjustment or Fixed	•	•		•	•		•	•	•	•		
Accurate Switch Adjustment			•			•					•	•
Repeat Accuracy 0.5%	•	•		•	•		•	•	•	•		
Repeat Accuracy 0.1%			•			•					•	•
Single Timer Functions		•	•		•	•		•		•	•	•
Accumulative Delay on Make (AM)		•	•		•	•		•		•	•	•
Alternating Relay (Trailing Edge Flip-Flop) (FT)								•		•	•	•
Delay on Break (B)		•	•		•	•		•		•	•	•
Delay on Make (M)		•	•		•	•		•		•	•	•
Interval (I)		•	•		•	•		•		•	•	•
Inverted Delay on Break (UB)		•	•		•	•		•		•	•	•
Inverted Single Shot (US)		•	•		•	•		•		•	•	•
Leading Edge Flip-Flop (F)		•	•		•	•		•		•	•	•
Recycling (RE, RD)		•	•		•	•		•		•	•	•
Retriggerable Single Shot (Motion Detector) (PSD)		•	•		•	•		•		•	•	•
Retriggerable Single Shot (Motion Detector) (PSE)		•	•		•	•		•		•	•	•
Single Shot (S, SD)		•	•		•	•		•		•	•	•
Trailing Edge Single Shot (TS)		•	•		•	•		•		•	•	•
Dual Timer Functions	•			•			•		•			•
Accumulative Delay on Make/Interval (AMI)	•			•			•		•			•
Delay on Break/Recycle (BRE)	•			•			•		•			•
Delay on Make / Delay on Break (MB)	•			•			•		•			•
Delay on Make/Interval (MI)	•			•			•		•			•
Delay on Make/Recycle (MRE)	•			•			•		•			•
Delay on Make/Single Shot (MS)	•			•			•		•			•
Interval/Delay on Make (IM)	•			•			•		•			•
Interval/Recycle (IRE)	•			•			•		•			•
Recycling (RXE, RXD)	•			•			•		•			•
Single Shot/Recycle (SRE)	•			•			•		•			•
Single Shot/Lockout (SL)	•			•			•		•			•
Counter Functions			•			•					•	
Counter Pulse Output (C)			•			•					•	
Counter Interval Output (CI)			•			•					•	

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New ProgramaCube® Products



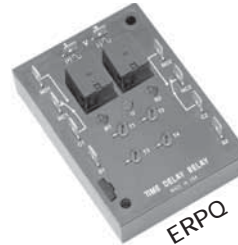
KRPD



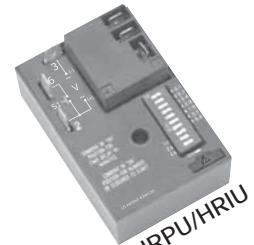
HRPD/HRID



HSPZ



ERPQ



HRPU/HRIU

Selection Guide

Solid State Timers with Relay Outputs

To view individual catalog pages,
see Catalog SS3 (1TRC001009C0201)
or www.ssac.com



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Dedicated Function

	S Series Onboard Adjust	Plug-in Switch Adjust	Plug-in Knob Adjust	E Range Onboard Adjust	D Range Onboard Adjust
Delay on Make (ON-Delay)	CT-ERS (a) CT-ERS (i)	TDM	TRM PRLM	CT-ERE	CT-ERD
Interval (Impulse ON)	CT-VWS	TDI	TRS PRLS	CT-VWE	CT-VWD
Interval, Trailing Edge (Impulse OFF)	CT-AWS (te)			CT-AWE	
Interval, True Trailing Edge (Impulse OFF)				CT-AWE	
Recycling Equal Times	CT-EBS (e)	TRU		CT-EBE	CT-EBD
Recycling, Unequal Times (Pulse Generator)	CT-TGS	TDR			CT-TGD
Single Shot (Pulse Former)		TDS	TRS PRLS		
Delay on Break (OFF - delay)	CT-AHS CT-APS	TDB	TRB PRLB	CT-AHE	CT-AHD
True Delay on Break (OFF - delay)	CT-ARS (tb)			CT-ARE (tb)	
Delay on Make / Delay on Break	CT-EAS (i),(e) CT-EVS (a)	TDMB			
Star Delta	CT-YDAV CT-YDEW			CT-SDE CT-YDE	
Delayed Interval (Single Pulse Generator)	CT-PGS	TRDU			

Time Delay & Adjustment

Time Delay Range	0.05 s to 300 h (i)	0.1 s to 2.8 h (i) TRDU to 1705 h	0.05 s to 10 m (i) TRU 16 h	0.1 s to 300 s (i)	.05 s to 100 h
Repeat Accuracy	≤ 0.2%	≤ 0.1%	≤ 2%	≤ 1%	≤ 0.5%
Knob Adjust			•		
Onboard Adjust	•			•	•
Switch Adjust		•			
External Adjust	Some Series		TR Series		
Factory Fixed			•		

General Features

DIN Rail Mounting (35 mm)	•	Socket Required	Socket Required	•	•	
Surface Mounting	Adaptor Required	Socket Required	Socket Required	Adaptor Required	Adaptor Required	
Output Relay	SPDT or DPDT (i)	SPDT or DPDT	SPDT or DPDT	SPDT	SPDT	
Resistive Rating at Contacts	4 A	10 A	10 A	4 A	6 A	
Screw Terminals	•	Socket Required	Socket Required	•	•	
Dimensions	in mm	0.89 x 3.07 x 3.98 22.5 x 78 x 101	1.78 x 2.39 x 3.20 45.2 x 60.7 x 81.3	1.78 x 2.39 x 3.62 45.2 x 60.7 x 91.6	0.89 x 3.07 x 3.09 22.5 x 78 x 78.5	.69 x 2.76 x 2.48 17.5 x 70 x 63

(a) = includes time accumulation; (e) = equal time delays; (i) = includes an instantaneous contact; (tb) = true delay on break; (te) = trailing edge triggered;
A = amps resistive rating; (l) = most series consult catalog pages

Selection Guide

Solid State Timers with Relay Outputs

To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com



	HR Series Onboard & External Adjust or Fixed	ERD Series Knob & External Adjust or Fixed	OR Series Knob & External Adjust or Fixed	KR Series Onboard & External Adjust or Fixed
Dedicated Function	Series	Series	Series	Series
Delay on Make (ON Delay)	HRDM	ERDM	ORM	KRDM
Interval (Impulse ON)	HRPS			KRPS
Recycling Equal Times	HRDI	ERDI	ORS	KRDI
Recycling (Pulse Generator)	HRPS			KRPS
Single Shot (Pulse Former)	HRD3 (e)	ERD3 (e)		KRD3 (e)
Delay on Break (On Release)	HRPS			KRPS
	HRDR			KRDR
	HRPD			KRPD
	HRDS	ERDI	ORS	KRDS
	HRD9 (r)			KRD9 (r)
	HRPS			
Delay on Make / Delay on Break	HRDB		ORB	KRDB
Delayed Interval (Single Pulse Generator)	HRPS			KRPS
Other Functions Available	HRPD			KRPD
	HRPD			KRPD
	•			•
Time Delay & Adjustment				
Time Delay Range	0.1 s to 1000 m	0.1 s to 500 m (!)	0.05 to 300 s (!)	0.1 s to 1000 m
Repeat Accuracy	≤ 0.5%	≤ 0.5% to 2%	≤ 2%	≤ 0.5%
Knob Adjust		•	•	
Onboard Adjust	•			•
Switch Adjust				•
External Adjust	•	•	•	•
Factory Fixed	•	•	•	•
General Features				
DIN Rail Mounting	Adaptor Required			Adaptor Required
Surface Mounting	•	•	•	•
DPDT Relay/Resistive Rating		10 A	10 A	
SPDT Relay/Resistive Rating	SPDT 30 A	10 A	10 A	10 A
Popular AC & DC Voltages		•	ORB, ORS AC Only	•
Encapsulated	•	•		•
Quick Connects	•	•	•	•
Dimensions	in mm	2.02 x 3.02 x 1.50 51.3 x 76.7 x 38.1	2.50 x 3.50 x 1.70 63.5 x 88.9 x 43.2	2.12 x 3.69 x 1.88 53.9 x 93.7 x 47.8
				2.0 x 2.0 x 1.21 50.8 x 50.8 x 30.7

(e) = equal time delays; (r) = retriggerable; (!) = Most series consult catalog pages

Selection Guide

Solid State Timers with Solid State Output

To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com

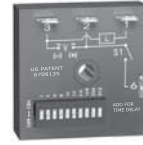
Digi-Timer Onboard, Switch, Fixed, or External Adjust



MicroTime Onboard or Switch Adjust



Digi-Timer Onboard, Switch, Fixed or External Adjust



E Range Knob Adjust


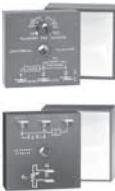





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	Digi-Timer Onboard, Switch, Fixed, or External Adjust	MicroTime Onboard or Switch Adjust	Digi-Timer Onboard, Switch, Fixed or External Adjust	E Range Knob Adjust
Dedicated Function	Series	Series	Series	Series
Delay on Make (ON Delay)	TSD1 KSD1		TDU KSDU	CT-EKE
Delay on Make Normally Closed	TSD4 KSD4			
Delay on Break (OFF-delay)	TSD7		TDUB	CT-AKE
Delay on Break (2 Terminal) Single Shot (Pulse Former)	TSD8 KSD8	ASQU/ASTU DSQU/DSTU	TDUS	
Single Shot (Motion Detector) Interval (Impulse ON)	TSD5 KSD5 KSPS (r)	ASQU/ASTU DSQU/DSTU	TDUI	
Interval (DC Volts Only) Interval (2 Terminal) Recycling (Delays Separately Adjustable)	TSD2 KSD2	ASQU/ASTU DSQU/DSTU		
Recycling (Equal Delays)	TSD6 (d) TSD7 ESDR TSDR KSDR			
Percentage Delay on Make/ Delay on Break Delay on Make/Interval	TSD3 (e) KSD3 (e) PT KSPD ESD5 KSPD	ASQU/ASTU DSQU/DSTU		
Time Delay & Adjustment				
Typical Time Delay Range	0.1 s to 1000 m	0.1 s to 100 m	0.1 s to 170 m (!)	0.1 to 300 s
Repeat Accuracy	≤ 0.1 to 1%	≤ 0.1 to 1%	≤ 0.5%	≤ 1%
Onboard Adjustment	•	AS_U Series DS_U Series	TDU_ Series	•
Switch Adjustment	•			
External Adjustment			KSDU Series	
Factory Fixed	Except PT and KSDR Series			
General Features				
DIN Rail Mounting	Adaptor Required	•	Adaptor Required	•
Surface Mounting	•	•	•	Adaptor Required
Output Rating	1 A	0.7 A	1 A	0.7 to 0.8 A
Popular AC Voltages	•	•	•	•
Popular DC Voltages	•	•	•	CT-AKE AC Only
Screw Terminals	•	•	•	•
Quick Connects	•	•	•	•
Dimensions	in mm			
	2.0 x 2.0 x 1.21 50.8 x 50.8 x 30.7	0.69 x 3.0 x 2.41 17.5 x 76.2 x 61.2	2.0 x 2.0 x 1.21 50.8 x 50.8 x 30.7	0.89 x 4.09 x 3.27 22.5 x 104 x 83

(d) = DC Volts Only; (e) = equal time delays; (s) = 3 or 4 channel sequencer; (!) = most series consult catalog pages; (r) = retriggerable

Selection Guide Solid State Timers

	Onboard, Fixed, or External Adjust	Digi-Power Onboard, Fixed or External Adjust	Digi-Set Switch Adjust	PC Mount / Wires Fixed	Surface Mount 2.5 x 3.5
To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssc.com					
Dedicated Function	Series	Series	Series	Series	Series
Delay on Make (ON Delay)	TMV/TSU TS1	THDM THD1 TH1		MSM	
Delay on Make Normally Closed	TS4	THD4			
Delay on Break (OFF - delay)	TSB	THDB			EISB (ii)
Single Shot (Pulse Former)	TSS	THDS THS			
Interval (Single Pulse on Operate)	TS2	THD2 TH2			
Interval (DC Volts Only)	TS6 (d)				
Interval (2 Terminal)		THD7			
Recycling (Delays Separately Adjust)		PTHA	RS		
Recycling (Equal Delays)		THD3			SQ (s) (e)
Percentage		PTHF			
Delay on Make/ Delay on Break		NHPD			
Delay on Make/Interval		NHPD			
Other Functions Available		•			
Time Delay Adjustment					
Typical Time Delay Range	0.05 to 600 s	0.1 s to 1000 m	0.1 s to 255.75 h	0.05 to 180 s	0.2 s to 1000 m
Repeat Accuracy	≤ 0.5 to 2%	≤ 0.5%	≤ 0.1%	≤ 5%	≤ 0.5%
Onboard Adjustment	Some (!)	Most (!)			
Switch Adjustment			•		
External Adjustment	•	•			•
Factory Fixed	•	•		•	•
General Features					
DIN Rail Mounting	Adaptor Required				
Surface Mounting	•	•	•	•	•
Output Rating	1A	6, 10, or 20 A	1 A	0.5 A	1 A
Popular AC Voltages	•	•	•	•	•
Popular DC Voltages	•	Delay On Make Only	•	•	
Screw Terminals				6" Wire Leads or PC Board Mount	
Male Quick Connects	•	•	•		
Dimensions	in mm	in mm	in mm	in mm	in mm
	2.0 x 2.0 x 1.21 50.8 x 50.8 x 30.7	2.0 x 2.0 x 1.51 50.8 x 50.8 x 38.4	3 x 2 x 1.5 76.7 x 51.3 x 38.1	0.94 x 1.5 23.8 x 38.1	2.5 x 3.5 x 1.22 63.5 x 88.9 x 31

(d) = DC Volts only; (e) = equal time delays; (ii) = isolated input; (s) = 3 or 4 channel sequencer; (!) Some Series consult catalog pages

Selection Guide Voltage Monitors

Three Phase

To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com



Available 4th Quarter, 2005




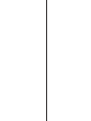









Functions and Features	WVM	DLM	DLA	PLM	PLMU	PLR	PLS	RLM	HLM	TVM	TVW	CM-MPS
General Features												
DIN Rail Mounting	w/a	•	•	w/s	w/s	w/s	w/s		w/a		w/a	•
Surface Mounting	•	•	•	w/s	w/s	w/s	w/s	•	•	•	•	w/a
8-Pin Plug-In				•	•	•	•					
Screw Terminals	•	•	•									•
Quick Connects								•	•	•	•	
Output												
DPDT Relay(s)			•									•
SPDT Relay	•	•		•	•	•	•	•	•	•	•	
SPST-NO												
Line V Connection												
Wired Phase-to-Phase	•	•	•	•	•	•	•	•	•	•	•	•
Universal Voltage			•						•			
Phase-to-Neutral												
Single Phase												
Trip Point(s) Adjustable	•	•	•	•	•	•	•	•	•		V	•
Trip Point(s) Fixed										•	•	
Supply Voltage Required												
Protection												
Phase Sequence	•	•	•	•	•	•	•	•	•	•	•	•
Phase Loss (!)	•	•	•	•	•	•	•	•	•	•	•	•
Motor (On Start Up Only)							•					
Motor (While Operating)	•	•	•	•	•	•		•	•	•	•	•
Undervoltage	•	•	•	•	•	•		•	•	•	•	•
Overvoltage	•	•	•	•	•	•		•	•	•	•	•
Unbalance (Asymmetry)	•	•	•	•	•	•		•	•	•	•	•
Rapid Recycling	•				•					•	•	
Time Delays & Reset												
Trip Delay	•	•	•	•	•			•	•	•	•	
Restart Delay	•				•					•	•	
Automatic Restart	•	•	•	•	•	•	•	•	•	•	•	•
Manual Reset	•											
Indicator LED(s)												
Output ON/OFF	•	•	•	•	•	•		•	•	•	•	•
Supply ON/OFF												
Fault(s)	•		•						•	•	•	•
Timing	•		•		•				•	•	•	
Dimensions	in	4.4 x 6.9 x 2.4	1.97 x 2.95 x 4.33	1.78 x 2.39 x ≤ 3.2	3.12 x 4.5 x 1.35					2.0 x 2.0 x ≤ 1.86		
	mm	111.8 x 175.3 x 61	50 x 75 x 110	45.2 x 60.7 x ≤ 81.3	79.3 x 114.3 x 34.3					50.8 x 50.8 x ≤ 47.2		

w/a = with adaptor; w/s = with socket; v = Line voltage adjustable on some models

! Phase loss protection for resistive and non-rotating loads. Motor protection can be affected by regenerated voltages.



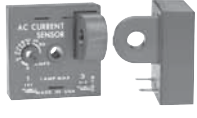


Selection Guide Voltage Monitors

To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com	Three Phase								Single Phase			
												
Functions and Features	CM-ASN	CM-PVN	CM-PFN	CM-ASS	CM-PFS	CM-PBE	CM-PFE	CM-PVE	KVM	CM-EFN	CM-ESN	CM-ESS
General Features												
DIN Rail Mounting	•	•	•	•	•	•	•	•	w/a	•	•	•
Surface Mounting	w/a	w/a	w/a	w/a	w/a	w/a	w/a	w/a	•	w/a	w/a	w/a
8-Pin Plug-In												
Screw Terminals	•	•	•	•	•	•	•	•		•	•	•
Quick Connects									•			
Output												
DPDT Relay(s)	•	•	•		•					•	•	
SPDT Relay				•			•					•
SPST-NO						•		•	•			
Line V Connection												
Wired Phase-to-Phase	•	•	•	•	•	•	•	•				
Universal Voltage					•		•					
Phase-to-Neutral						•		•	•			
Single Phase						•		•	•			
Trip Point(s) Adjustable	•	•				•		•	•	•	•	•
Trip Point(s) Fixed			•						•	•	•	•
Supply Voltage Required	•	•	•			•		•		•	•	•
Protection												
Phase Sequence	•	•	•	•	•		•					
Phase Loss (!)												
Motor (On Start Up Only)	•	•	•	•	•	•	•	•				
Motor (While Operating)	•			•		•	•	•				
Undervoltage		•	•			•		•	•	•	•	•
Overvoltage		•	•					•		•	•	•
Unbalance (Asymmetry)	•			•								
Rapid Recycling		•										
Time Delays & Reset												
Trip Delay	•	•	•			•		•		•	•	
Restart Delay		•	•	•						•	•	
Automatic Restart	•	•	•	•	•	•	•	•		•	•	•
Manual Reset												
Indicator LED(s)												
Output ON/OFF	•	•	•	•		•	•	•	•	•	•	•
Supply ON/OFF	•	•	•		•					•	•	•
Fault(s)	•	•	•							•		
Timing												
Dimensions												
	in	1.77 x 3.07 x ≤ 3.98		0.886 x 3.07 x ≤ 3.98		0.886 x 3.07 x 3.09			2 x 2 x 1.21	1.77 x 3.07 x ≤ 3.98		0.886 x 3.07 x ≤ 3.98
	mm	45 x 78 x ≤ 101		22.5 x 78 x ≤ 101		22.5 x 78 x 78.5			50.8 x 50.8 x 30.7	45 x 78 x ≤ 101		22.5 x 78 x ≤ 101





w/a = with adaptor; w/s = with socket

! Phase loss protection for resistive and non-rotating loads. Motor protection can be affected by regenerated voltages.

Selection Guide Current Monitoring

		Sensing/Control Relays			Analog Output	
To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com						
		Adjustable, AC over & undercurrent trip points w/selectable response modes.	Selectable AC over or undercurrent; adjustable trip point & delay.	Low cost AC current switch; direct connection to digital PLC input; sinking or sourcing.	Current transducer; linear output proportional to the RMS AC current.	Current transducer; linear output proportional to the RMS AC current.
Series		ECSW	ECS	TCS	TCSA	DCSA
Functions and Features						
General Features						
DIN Rail Mounting				w/adaptor	w/adaptor	•
Surface Mounting		•	•	•	•	w/adaptor
Screw Terminals		•				•
Quick Connects			•	•	•	
Output						
Linear 4 to 20 mA					•	•
SPDT Relay		•	•			
1 A Solid State				•		
Monitored Current						
AC		•	•	•	•	•
DC						
Input or Output Voltage						
24 VAC		•	•			
24 ... 240 V AC				Self-Powered		
110 ... 130 V AC		•	•			
220 ... 240 V AC		•	•			
12 & 24 V DC		•	•		Loop Powered	Loop Powered
3 ... 50 V DC				Self-Powered		
Trip Range(s)						
Fixed				•		
Adjustable		•	•	•	•	•
3 mA ... 1 A						
2 ... 45 A fixed / 2... 20 adjustable				•		
0 ... 50 A					•	•
0.5 ... 50 A		•	•			
Delay(s)						
Trip Delay		•	•			
Start up Delay		•	•			
Indicator LED(s)						
Output ON/OFF		•				
Supply ON/OFF						
Fault(s)			•			
Timing		•				
Dimensions	in mm	2.50 x 3.50 x 1.75 63.5 x 88.9 x 44.5		2.0 x 2.0 x 1.75 50.8 x 50.8 x 44.5		0.71 x 2.44 x 2.56 18 x 62 x 65

Selection Guide Current Monitoring

	Current Indicator	Motor Load Monitor	AC/DC Current Sensors	AC/DC Current Sensors	
To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com					
	Monitor AC current flow with visual indication up to 500 feet from source.	2 Relay outputs; monitors under & over loading.	AC/DC version w/selectable over or undercurrent; relay output.	AC/DC undercurrent trip points as low as 3mA; adjustable hysteresis; relay output.	
Series	LCS/LPM	CM-LWN	CM-SRN	CM-SRS	
Functions and Features					
General Features					
DIN Rail Mounting		•	•	•	
Surface Mounting		w/adaptor	w/adaptor	w/adaptor	
Screw Terminals		•	•	•	
Quick Connects					
Wire Leads	•				
Output					
DPDT Relay		2 SPDT	•		
SPDT Relay				•	
SPST Solid State					
Analog	•				
Monitored Current					
AC	•	•	•	•	
DC			•	•	
Supply Voltage					
24 VAC				•	
24 ... 240 V AC/DC		•	•		
42 ... 48 V AC				•	
110 ... 130 V AC		•	•	•	
220 ... 240 V AC		•	•	•	
380 ... 415 V AC		•	•		
480 ... 500 V AC		•			
Trip Range(s)					
Fixed	•				
Adjustable		•	•	•	
3 mA ... 1 A			•	•	
3 mA ... 15 A			•		
0.5 ... 20 A		•			
0.5 ... 50 A	•				
Hysteresis Adjustable			•	•	
Delay(s)					
Trip		•	•		
Inrush		•			
Indicator LED(s)					
Output ON/OFF		•	•	•	
Supply ON/OFF		•	•	•	
Fault(s)		•			
Timing					
Dimensions	in mm	0.98 x 1.51 x 0.46 24.89 x 38.35 x 11.68	1.77 x 3.07 x ≤ 3.98 45 x 78 x ≤ 101	1.77 x 3.07 x ≤ 3.98 45 x 78 x ≤ 101	0.886 x 3.07 x ≤ 3.98 22.5 x 78 x ≤ 101

Selection Guide Liquid Level Controls

To view individual catalog pages,
see Catalog SS3
(1TRC001009C0201)
or www.ssac.com

Open PC Board



Monitor and control conductive liquid levels when filling or emptying tanks. Low cost open board design.

Plug-in Package



Monitor and control conductive liquid levels when filling or emptying tanks. Convenient plug-in packaging.

DIN Mount 22.5 mm Fixed



Monitor and control conductive liquid levels to prevent dry running and overflow.

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Series	LLC1	LLC2	LLC8	LLC4	LLC5	LLC6	CM-ENE
Functions and Features							
General Features							
Single Probe & Common	•		•	•		•	•
Dual Probe & Common		•			•		
DIN Rail Mounting				w/socket	w/socket	w/socket	
Surface Mounting	•	•	•	w/socket	w/socket	w/socket	w/adaptor
Plug-In Socket Required				8 pin	8 pin	11 pin	
Screw Terminals		•		w/socket	w/socket	w/socket	•
Quick Connects	•	•	•				
Output Form							
Isolated Output (2) = Two Outputs	SPDT	SPDT	SPDT	SPDT	SPDT		SP-NO
Non-Isolated Output	SPST					SPDT	
Sensing Range							
6K ... 20K Ω							
1K or 5K ... 100K Ω		•			•		•
1K or 5K ... 250K Ω	•		•	•		•	
250 Ω ... 500K Ω							
Set Point: A = Adjustable; F = Fixed	A or F	A or F	F	A or F	A or F	F	F
Trip Delay Fixed	1...60 s		1...60 s	1...60 s		1...60 s	≅ 200 ms
Probe Voltage							
12 V AC	•	•	•	•	•	•	
20 V AC or 30 V AC							•
Logic Type							
Drain/Emptying	•	•		•	•		•
Fill	•	•		•	•		
Low Level Cut Off			•			•	
Input Voltage							
24 V AC	•	•	•	•	•	•	•
24 ... 240 V AC/DC							
110 ... 130 V AC	•	•	•	•	•	•	•
220 ... 240 V AC	•	•	•	•	•	•	•
380 ... 415 V AC							
Indicator LED (s)							
Output(s) ON/OFF			•		•	•	•
Supply ON/OFF							•
Dimensions							
in	2.75 x 3.5 x ≤2.0	3.0 x 4.0 x 2.0	2.19 x 2.5 x 1.88	1.78 x 2.39 x 2.91 (LLC5 D = 3.30)			0.886 x 3.07 x 3.09
mm	69.9 x 88.9 x ≤50.8	76.2 x 101.6 x 50.8	55.6 x 63.5 x 47.8	45.2 x 60.7 x 73.9 (LLC5 D = 83.8)			22.5 x 78 x 78.5

Selection Guide

Liquid Level Controls

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Timers & controls

To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com

DIN Mount
22.5 mm Adjustable



Monitor and control conductive liquid levels when filling or emptying tanks. Thin profile Snap-ON mounting package.

DIN Mount
45 mm Adjustable



Monitor and control conductive liquid levels when filling or emptying tanks w/time-dependent features.

Alternating Relays & Duplexors



Provides equal run time for two loads. Automatically changes lead load upon the opening of the control switch input. Industry standard wiring.

Insulation Monitors



Monitors the insulation resistance between ungrounded AC/DC systems and ground.

	Series	CM-ENS	CM-ENS UP/DOWN	CM-ENN	CM-ENN UP/DOWN	ARP_1	ARP_2	ARP_3	CM-IWN ... C558.03
Functions and Features									
General Features									
Single Probe & Common		•	•	•	•				
Dual Probe & Common		•	•	•	•				
DIN Rail Mounting		•	•	•	•				•
Surface Mounting		w/adaptor	w/adaptor	w/adaptor	w/adaptor	w/socket	w/socket	w/socket	•
Plug-In Socket Required						8 pin	11 pin	8 pin	•
Screw Terminals		•	•	•	•	w/socket	w/socket	w/socket	
Quick Connects									
Output Form									
Isolated Output (2) = Two Outputs		SPDT	SPDT	(2)SPDT	(2)SPDT	SPDT	DPDT		SPDT or DPDT
Non-Isolated Output								DPDT-X	
Sensing Range									
6K ... 20K Ω									
1K or 5K ... 100K Ω		•	•		•				
1K to 500K Ω									•
250 Ω ... 500K Ω				•					
Set Point: A=Adjustable; F=Fixed		A	A	A	A				
Trip Delay Fixed		250 ms	250 ms	0.1...10s Adj	0.1...10s Adj				
Probe Voltage									
20 V AC or 30 V AC		•	•	•	•				
Logic Type									
Drain/Emptying		•	Selectable	•	Selectable				
Fill		•	Selectable	•	Selectable				
Alarm Levels					Low & High				
Alternating/Duplexing						•	•	•	•
Set Point Control									
24 V AC		•	•	•	•	•	•	•	
24 ... 240 V AC/DC				•	•				•
110 ... 130 V AC		•	•	•	•	•	•	•	•
220 ... 240 V AC		•	•	•	•	•	•	•	•
380 ... 415 V AC		•		•	•				•
Indicator LED (s)									
Output(s) ON/OFF		•	•	•	•	Loads A/B	Loads A/B	Loads A/B	•
Supply ON/OFF		•	•	•	•				•
Dimensions	in	0.886 x 3.07 x ≤ 3.98		1.77 x 3.07 x ≤ 3.98		1.78 x 2.39 x 3.20			1.77 x 3.07 x 3.98
	mm	22.5 x 78 x ≤ 101		45 x 78 x ≤ 101		45.2 x 60.7 x 81.3			48 x 78 x ≤ 101

Semiconductor Contactor R100.xx and R300.xx Solid-State Relays R111, R12x and R31x Benefits and Advantages

R100.xx range



R100.20



R100.45

R300.xx range



R 300.20

To View Individual Catalog Pages See Catalog SS3
(1TRC001009C0201) or www.ssac.com

R111 range



R111/45

R12x range



R122/50

R31x range



R311/25

- Compact design
- Zero voltage or instantaneous tripping
- LED display
- Protected against electric shock
- Integrated heat sink
- Ready for use
- Mounting on 35 mm DIN rail or screw mounting on plate

Properties

- Load current range 20 A, 30 A and 45 A
- DC control
- Single-pole, three-pole
- Switching by thyristors
- Peak inverse voltage 1200 V
- Insulation voltage > 4000 V
- Connecting terminals for 2 x 2.5 mm² or 1 x 4 mm²

Special properties

- The semiconductor relay R100.45-SG is internally protected against overload with overload signaling via signaling output.
- Cables with a conductor cross section up to 1 x 25 mm² can be connected to the output terminals of the semiconductor relays R100.45 and R100.45-SG.

Application

- Contactless and wear-free switching of ohmic and inductive 1-phase and 3-phase AC loads with high switching frequency.

Approvals

- Depending on the device:



- Standard design
- Zero voltage tripping, radio interference suppressed
- LED display
- Screw mounting or snap-on mounting with adapter for 35 mm DIN rail according to DIN EN 50022

Properties

- R11x and R12x range - load side:
Thyristors for AC-51 and AC-53 up to 690 V AC and 100 A
- R31x - load side:
Alternistor for AC-51 and AC-53 up to 530 V AC and 50 A with internal RC circuit and overvoltage protection
- Electrical isolation by means of optocoupler between control circuit and load circuit
- Protection against electric shock:
R111 and R115 range with additional terminal cover
- Control side protected against reversed polarity

Special properties of R31x range

- Screw mounting

Application

- Contactless and wear-free switching of 1-phase and 3-phase AC loads up to a power factor of $\cos \phi = 0.5$.

Approvals



To view individual catalog pages,
see Catalog SS3
(1TRC001009C0201)
or www.ssac.com

Selection Guide Tower and Obstruction Lighting Controls ①

Flasher · Solid State Beacon Flasher

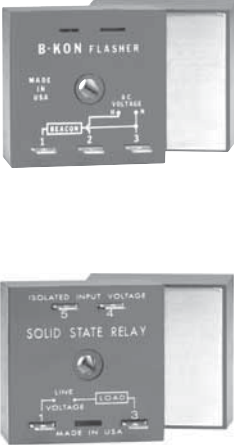

	P/N	Voltage	Description
	FS155-30RF	120 V AC	Beacon Flasher for High RF Installations, 2500 W (200 A Inrush Maximum) Meets FAA-AC NO: 150/5345-43E
	FS165-30RF	230 V AC	
	FS155-30T	120 V AC	Beacon Flasher for FM, TV, Chimneys, Bridges, Smoke Stacks, and Low RF Applications, 2500 W (200 A Inrush Maximum) Meets FAA-AC NO: 150/5345-43E
	FS165-30T	230 V AC	
	FA155-2	120 V AC	Auxiliary Unit for Synchronous Flashing of Additional Beacons, 2500 W (200 A Inrush Maximum)
	FA165-2	230 V AC	
	FA155	120 V AC	Auxiliary Unit Provides Alternate Operation for Constant Line Loading, 2500 W (200 A Inrush Maximum) (not shown)
	FA165	230 V AC	


Photo Control · Accurate Dusk to Dawn Control

	PCR10	120 V AC	Precision Photo Control Calibrated to FAA and FCC Specifications for Tower and Obstruction Lighting. Two SPST N.O. 20 A Contacts. Without Cast Aluminum Housing. Meets FAA-AC NO: 150/5345-43E
	PCR12	230 V AC	
	PCR11	120 V AC	As Above With Cast Aluminum Housing (as shown)
	PCR13	230 V AC	

Lamp Alarm Relays · Senses Lamp Failure

	SCR430T	120 V AC	Universal Light Alarm Relay. Senses the Failure of One Lamp Out of 1, 2, 3, or 4 Lamps; 116 or 620 W, 120 V AC Lamps SPDT - 10 A Isolated Alarm Contacts. Meets FAA-AC NO: 150/5345-43E
	SCR630T	230 V AC	
	SCR490D	120 V AC	Side Light Alarm Relay. Senses the Failure of One Lamp Out of 2, 3, 4, 5, 6, 7, 8, or 9; Steadily Burning 116 W, 120 V AC Lamps SPDT - 10 A Isolated Alarm Contacts (not shown)

Beacon Alarm Relay · Senses Lamp Failure and Flasher Failure

	FB120A	120 V AC	Flasher and Beacon Lamp Alarm Relay Senses Failure of Beacon Lamps Senses Failure of Beacon Flasher Two Line Voltage Alarm Outputs SPDT - 10 A Isolated Alarm Contacts Meets FAA-AC No: 150/5345-43E
	FB230A	230 V AC	

① To view individual catalog pages, see Catalog SS3 (1TRC001009C0201) or www.ssac.com

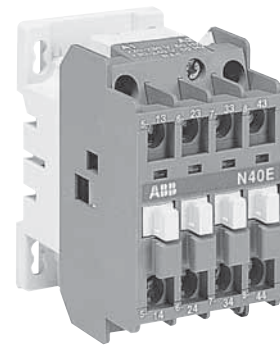


Notes

Type N, NE, NL & TNL Control relays



Control relays
Type N, NE, NL & TNL
Positive safety
AC/DC operated



7

Positive safety relays

There are many applications where safety is very critical and it is important to use electrical equipment which ensures that dangerous machine movement cannot occur when a fault is detected with the moving contacts during the cycle which the fault is indicated.

Regulations and standards have been written to ensure that safety is maintained:

- United States ANSI B11.19-1990
 ANSI B11.20-1991
- Germany SÜVA
 ZH1/457
- France INRS
- United Kingdom BIA
- Switzerland SA

The ABB Type N & NL 4 and 8 pole relays are designed with "Positive Guided" contacts and fulfill the regulations or standards shown. The relays can provide positive safety for the N.O. and N.C. contacts which assure that the N.O. contacts will not close before any N.C. contact opens. Therefore, if one of the contacts weld due to abnormal conditions in the control circuit, the other contacts will also remain in the same position as when the welding occurred. This means that the open contacts must maintain an air distance 0.5mm when the coil is energized at 110% Vc or when it is de-energized.

UL File No: E39231 (N & NL)

General information

Type N, AC operated

Description

- AC operated with laminated magnetic circuit.
- 2 versions: 4 pole or 8 pole. The width of 8 pole devices is identical to that of 4 pole devices; only the depth is increased.
- Side by side mounting possible.
- Self cleaning auxiliary contacts.
- Alone or by itself or with a 4 pole CA5 auxiliary contact block, these devices offer "positive safety" between their auxiliary contacts.

Application

Type N control relays are used for switching auxiliary circuits and control circuits.

7

Holes for screw mounting (screws not supplied). Distances between holes according to EN50 002.

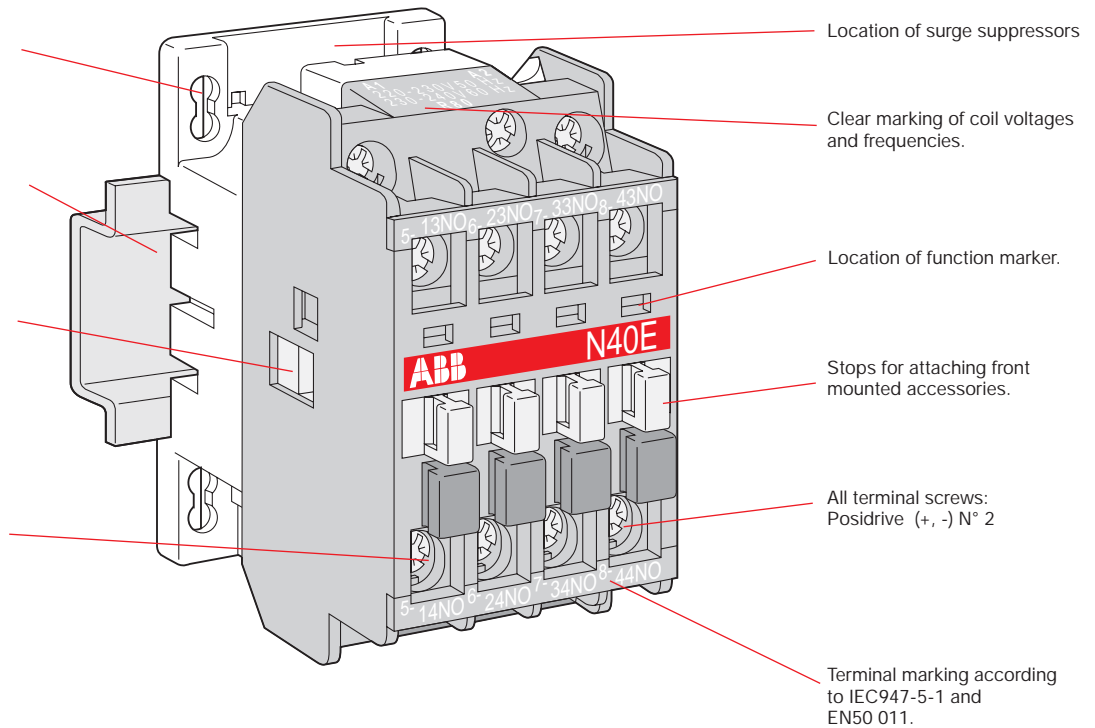
Quick mounting on 35 x 7.5mm DIN mounting rail according to IEC715 and EN50 022.

Location of side mounted accessories: mounting on right or left hand side.

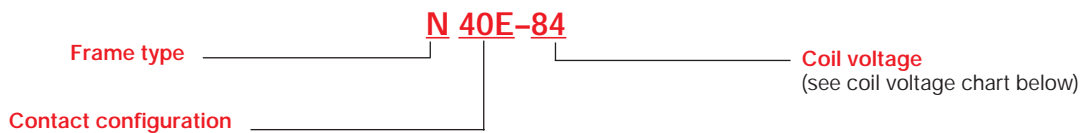
Terminals delivered in open position with captive screws (screws of unused terminals should be tightened).

Screwdriver guidance for all screws makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 – Part. 100 and offer IP 20 degree of protection according to IEC947-1.



Catalog number explanation



Coil voltage selection chart

Hz	Relay type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	N		81	83	84	84		34	36	80	42		86	86	51	53	55
50	N		81	83	84				80			85	86				55
DC	NE, NL	80	81	83	86		87		88	89							

General information

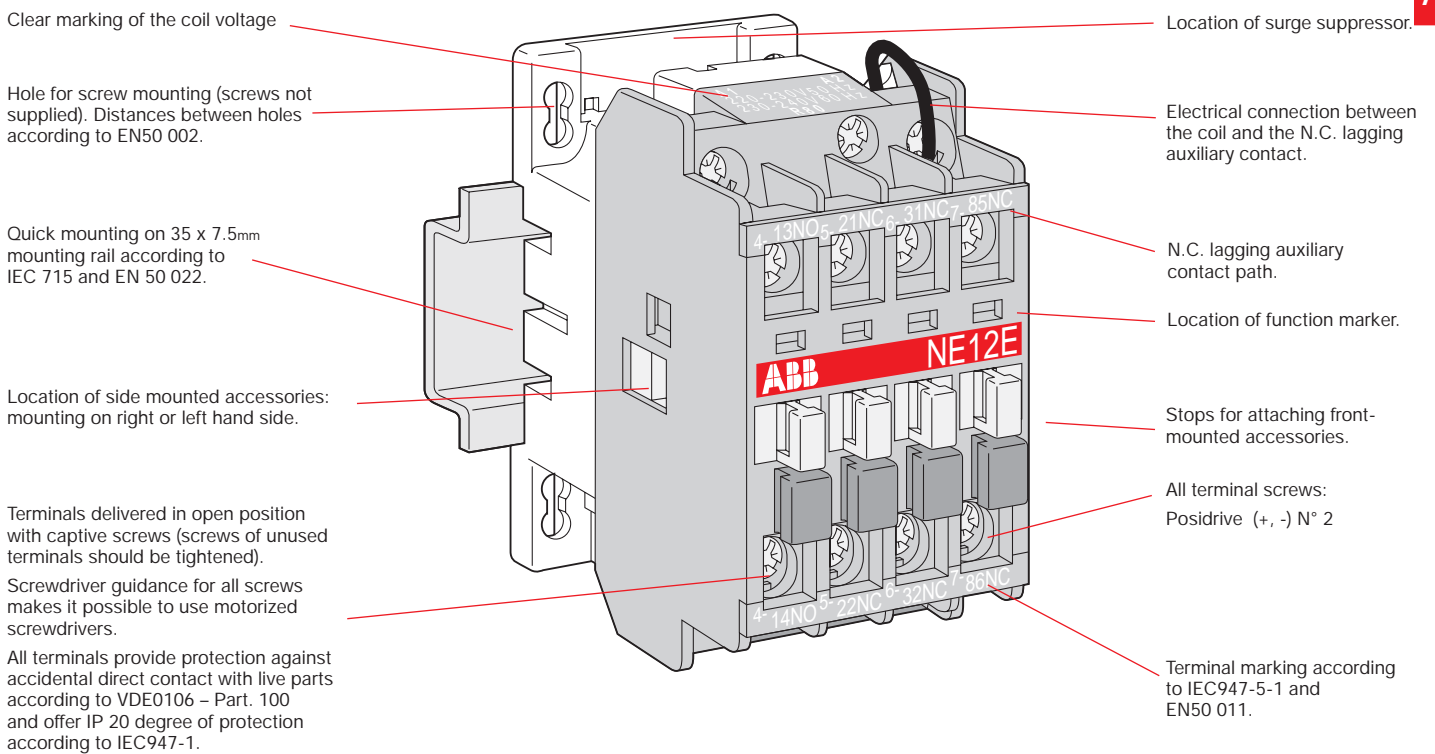
Type NE, DC operated

Description

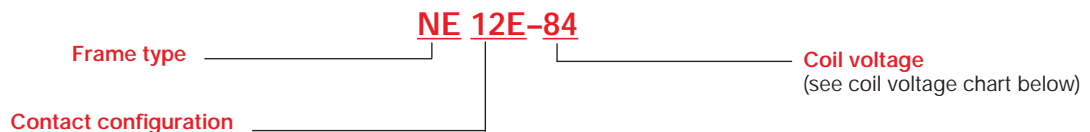
- Contactor relays with laminated magnet circuit and double-winding coil fed from a DC supply via a built-in N.C. lagging auxiliary contact.
- 1-stack version with three built-in auxiliary contacts.
- Self-cleaning auxiliary contacts
- Alone or fitted with a 4-pole CA5 auxiliary contact block, these devices offer mechanically linked contacts.
- Side by side mounting possible.

Application

NE... contactor relays are used for switching auxiliary circuits and control circuits.



Catalog number explanation



Coil voltage selection chart

Hz	Relay type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	N		81	83	84	84		34	36	80	42		86	86	51	53	55
50	N		81	83	84				80			85	86				
DC	NE, NL	80	81	83	86		87		88	89							

General information

Type NL & TNL, DC operated

Type NL

Description

- Magnetic circuit variants: NL types: d.c. operated with solid magnetic circuits.
- 2 versions: 4 pole or 8 pole
The width of 8 pole devices is identical to that of 4 pole devices; only the depth is increased.
- Bifurcated auxiliary contacts.
- Alone or mounted with a 4 pole CA5 auxiliary contact block, these devices offer "positive safety" between their auxiliary contacts.

Application

Type NL control relays are used for switching auxiliary circuits and control circuits.

Type TNL

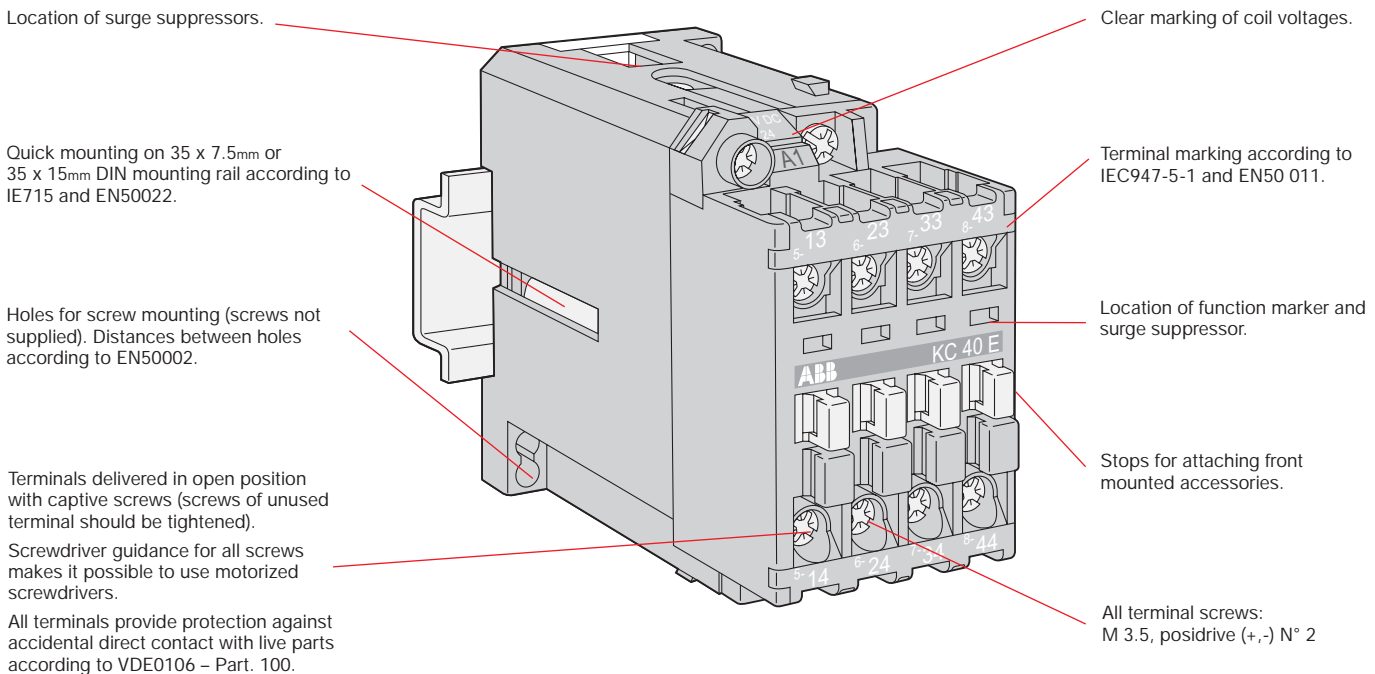
Description

- Magnetic circuit variants
 - NL types: D.C. operated with solid magnetic circuits.
 - TNL types: D.C. operated with solid magnetic circuit and large coil voltage range.
- 2 versions
 - 4-pole/1-stack or 8-pole/2-stack
 - The width of 8-pole devices is identical to that of 4 pole devices; only the depth is increased.
- Double sharp auxiliary contacts.
- Alone or mounted with a 4-pole CA 5 auxiliary contact block, these devices offer "positive safety" between their auxiliary contacts.

Application

Type NL and TNL control relays are used for switching auxiliary circuits and control circuits.

7



Catalog number explanation

(T)NL 44E-84



Coil voltage selection chart

Hz	Relay type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	N		81	83	84	84		34	36	80	42		86	86	51	53	55
50	N		81	83	84				80			85	86				
DC	NE, NL	80	81	83	86		87		88	89							

Type N & NL AC & DC operated



N40E-1



NE12E-1

A.C. operated

Contact configuration		Catalog number	List price
N.O.	N.C.		
4	0	N40E-84	\$ 60
3	1	N31E-84	
2	2	N22E-84	
4	4	N44E-84	120
5	3	N53E-84	
6	2	N62E-84	
7	1	N71E-84	
8	0	N80E-84	

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. All DC operated catalog numbers include a 110VDC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the first digit after the last dash in the catalog number.

Ex.: A 240V coil is required for an N80 control relay: N80E-80

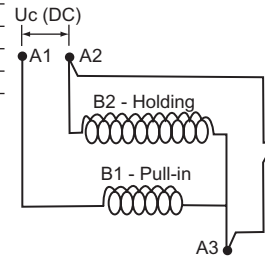
Coil voltage selection chart

Hz	Relay type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	N		81	83	84	84		34	36	80	42		86	86	51	53	55
50	N		81	83	84			80				85	86			55	
DC	NE, NL	80	81	83	86		87	88	89								

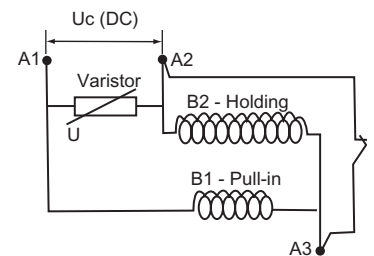
D.C. operated

Contact configuration		Catalog number	List price
N.O.	N.C.		
4	0	NL40E-86	\$ 72
3	1	NL31E-86	
2	2	NL22E-86	
4	4	NL44E-86 ①	144
5	3	NL53E-86	
6	2	NL62E-86	
7	1	NL71E-86	
8	0	NL80E-86	
1	2	NE12E-86	72
2	1	NE21E-86	
3	0	NE30E-86	
4	3	NE43E-86 ①	144
5	2	NE52E-86	
6	1	NE61E-86	
7	0	NE70E-86	

Block diagrams for NE... contactor relay coil supply



Coil supply $U_c < 110$ VDC



Coil supply via built-in varistor $U_c \leq 110$ VDC

① NE43 – NE70 and NL44 – NL62 control relays cannot accept any front mounted auxiliary contact blocks.

Type TNL 4 Pole & 8 Pole



TNL22E

4 Pole, 1 stack

Number of contacts				Weight	Catalog number	List price
1st stack		2nd stack				
N.O.	N.C.	N.O.	N.C.			
2	2	-	-	0.540	TNL22E-★	\$ 121
3	1	-	-	0.540	TNL31E-★	
4	-	-	-	0.540	TNL40E-★	

8 Pole, 2 stack

Number of contacts				Weight	Catalog number	List price
1st stack		2nd stack				
N.O.	N.C.	N.O.	N.C.			
4	-	-	4	0.600	TNL44E-★	\$ 180
4	-	2	2	0.600	TNL62E-★	

★ - Substitute the ★ for the coil voltage code. See the Type TNL Coil voltage Selection chart beneath the photos.

Coil characteristics

No extra tolerances applicable to the U_c min. ... max. values quoted in the Coil voltage selection table

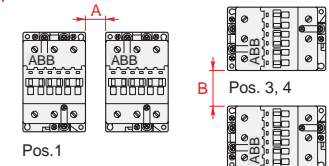
- Coil consumption at U_c max. $q = 20^\circ\text{C}$: 9 W pull-in/holding
- Replacement coils: consult us (standard coils used on NL control relays are not suitable for TNL control relays).

Coil voltage selection

Min. U_c	Max	Voltage
17	32	51
24	45	52
36	65	54
42	78	58
50	90	55
77	143	62
90	150	66
152	264	68

Mounting distance – for coil operating limits U_c min. ... U_c max.

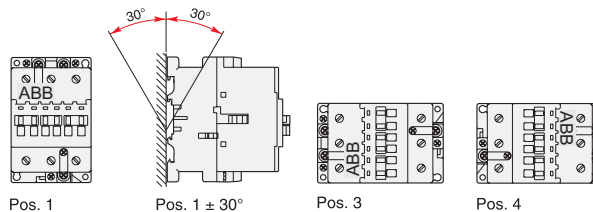
A mm	B mm	Ambient temp. $^\circ\text{C}$	Max. switching frequency Operating cycles/h
2	20	≤ 20	1200
5	20	≤ 55	1200



Add-on accessories

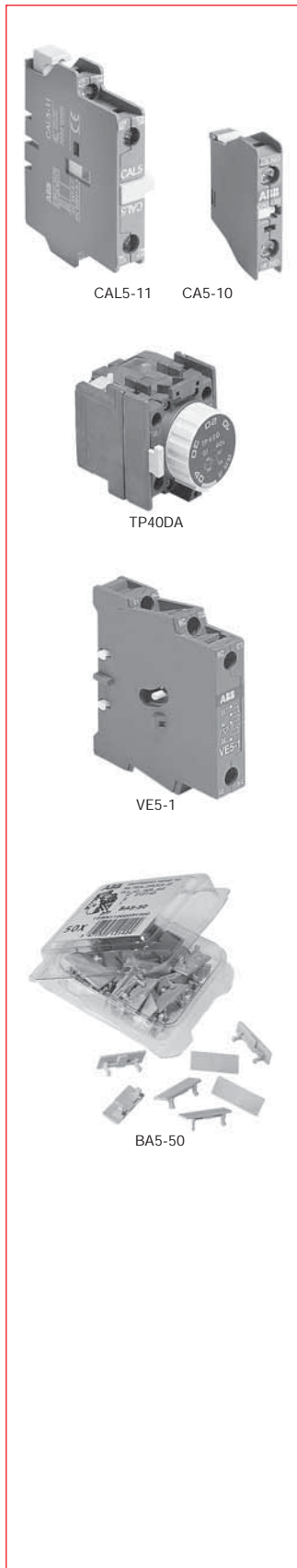
Control relays	Max. number of auxiliary contact blocks						Timer TP	Mechanical interlock	Label marker
	CA5-10	CA5-01	CA5-40	CA5-31	CA5-22	CA5-04			
Pos. 1, 3 or 4 TNL 40-E	4	2	1	1	1	-	-	VBC 30	BA 5-50
Pos. 1, 3 or 4 TNL 31-E	4	1	1	1	-	-	-	VBC 30	BA 5-50
Pos. 1, 3 or 4 TNL 22-E	4	-	1	-	-	-	-	VBC 30	BA 5-50
Pos. 1 $\pm 30^\circ$ TNL - all types	-	-	-	-	-	-	-	VBC 30	BA 5-50

Mounting positions



Accessories

Type N, NL & TNL



Auxiliary contact blocks

Positioning	Contacts		Catalog number	List price
	N.O.	N.C.		
N, NE, NL, TNL (front mount)	1	—	CA5-10 CA5-01	\$ 15
N, NL, NE, TNL (4 pole)	4	—	CA5-40N CA5-22N CA5-04N	30
	—	4		
N, NE, NL, TNL (side mount)	1	1	CAL5-11	

Pneumatic timers

	Timing range	Contacts		Catalog number	List price
		N.O.	N.C.		
N, NL NE, TNL	On delay 0.1 – 40s	1	1	TP40DA TP180DA TP40IA TP180IA	\$ 108
	On delay 10 – 180s	1	1		
	Off delay 0.1 – 40s	1	1		
	Off delay 10 – 180s	1	1		

Interlocks

Feature	Contacts		Catalog number	List price
	N.O.	N.C.		
N, NE, NL, TNL Mechanical/electrical	—	2	VE5-1	\$ 45
N, NE, NL, TNL Mechanical	—	—	VM5-1	21

Mechanical latches

Feature	Catalog number	List price
N, NL (4 pole only)	WB75A-★	\$ 84

Coil voltage selection chart — mechanical latches

50 Hz	60 Hz	Voltage code
24	24 – 28	01
42	42 – 48	02
48	48 – 55	03
110	110 – 127	04
220 – 230	220 – 255	06
230 – 240	230 – 277	05
380 – 415	380 – 440	07
415 – 440	440 – 480	08

Identification markers

Feature	Catalog number	List price
Pack of 50	BA5-50	\$ 15

Accessories

Type N, NL, NE & TNL



ZA16-84



RV5/50

RC5-1/50

Coils

Relay type	Catalog number	List price
N	ZA16-★	\$ 24
NE	ZAE16-★	24

★ Select the coil voltage from the Control Relay Coil Voltage Selection chart and substitute the letter code for the ★ as the last digit in the catalog number.

Coil voltage selection chart

Hz	Relay type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	N		81	83	84	84		34	36	80	42		86	86	51	53	55
50	N		81	83	84				80				85	86		55	
DC	NE, NL	80	81	83	86		87		88	89							

Surge suppressors — for Type N control relays

Feature	Type	Voltage range	Catalog number	List price
Varistor	N, NE NL, TNL	24 – 50 VAC/DC	RV5/50	\$ 30
		50 – 133 VAC/DC	RV5/133	
		110 – 250 VAC/DC	RV5/250	
		250 – 440 VAC/DC	RV5/440	
RC	N	24 – 50 VAC	RC5-1/50	\$ 30
		50 – 133 VAC	RC5-1/133	
		110 – 250 VAC	RC5-1/250	
		250 – 440 VAC	RC5-1/440	

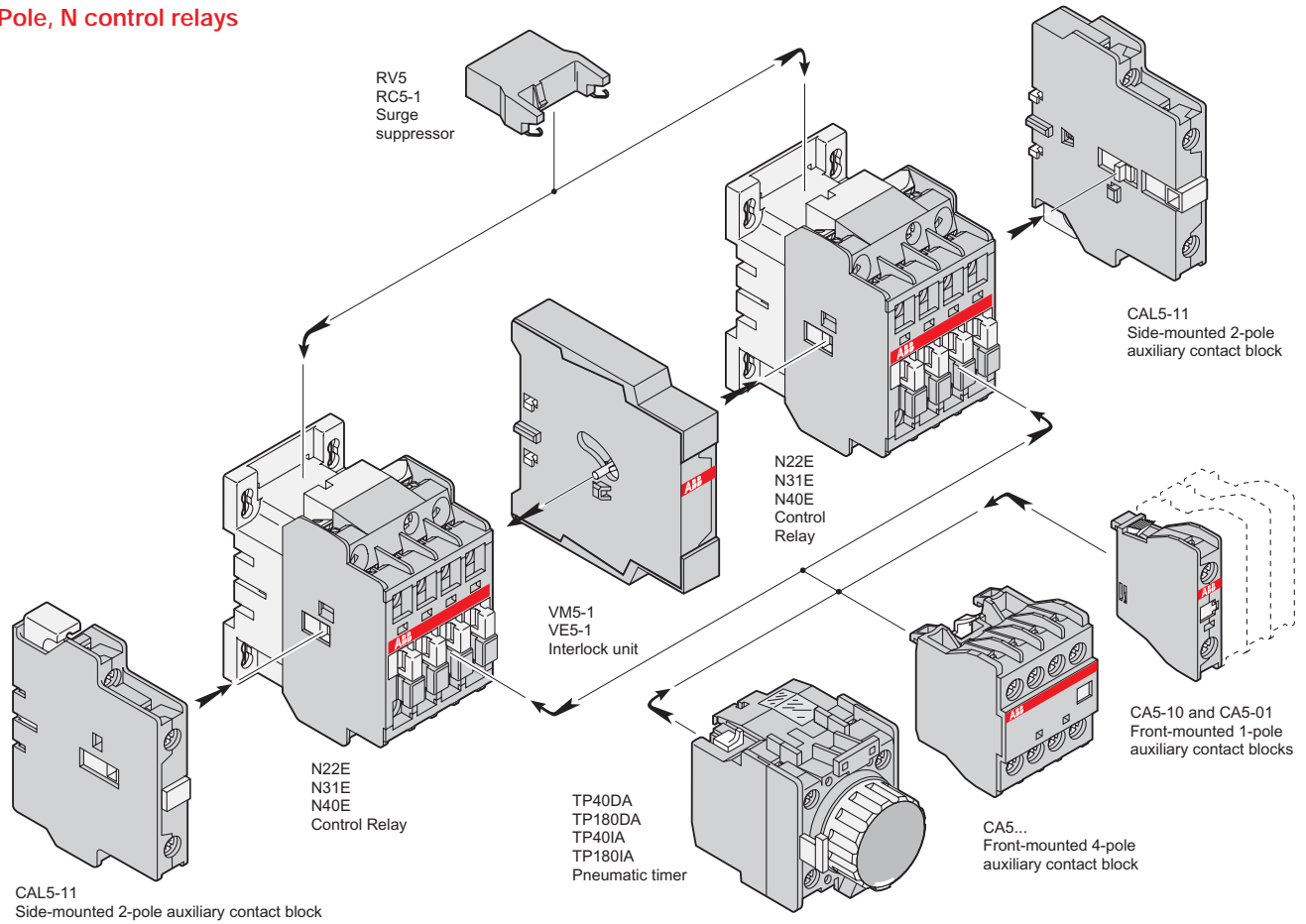
Technical data

Type	Control circuit	Opening time growth factor	Residual overvoltage or clipping voltage	Remarks	
RV5/... ing	AC/DC	1.1 to 1.5	132V	Advantages	
				Disadvantages	• Good energy absorption & damp-
					• Unpolarized system
					• Clipping from U_{vdr} thus voltage front up to this point
RC5-1/... or RC5-2/... RC-EH300/...	AC	1.2 to 3	2 to 3 x U_c	Advantages	
				• Very fast clipping	
				• Attenuation of steep fronts and therefore, high frequencies	
				• No operating delays	

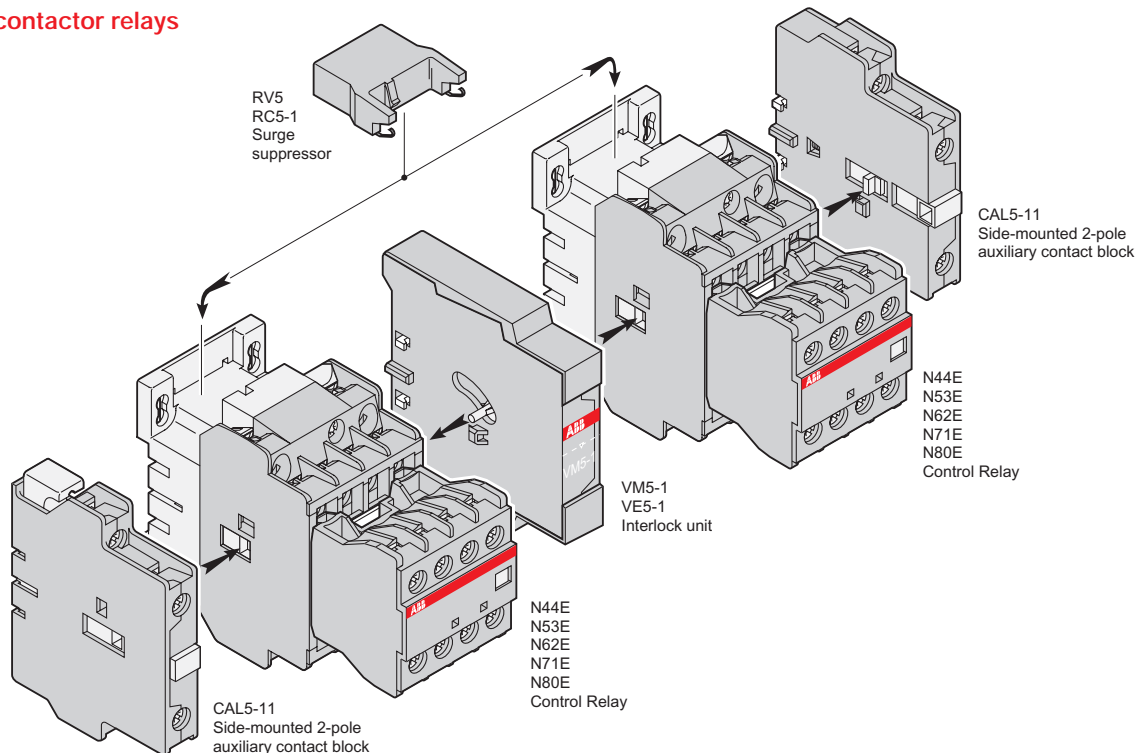
Accessory mounting information

Type N, NE, NL & TNL

4 Pole, N control relays




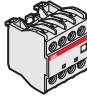
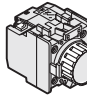
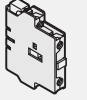
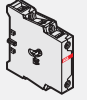

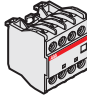
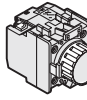
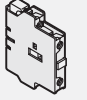
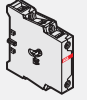

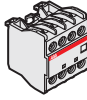
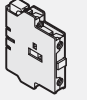
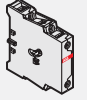

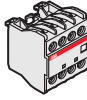
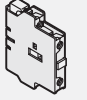
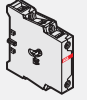
8 Pole, N contactor relays



Possible accessory combinations

Type N, NE, NL, TNL

Configurations of accessories are different depending on whether front or side mounted.

Type	Main poles	Built-in auxiliary contacts	Accessories — Front mounting			Accessories — Side mounting	
			Auxiliary contact blocks 1-pole CA5-	4-pole CA5-	TP - A Pneumatic timer block	Auxiliary contact Blocks 2-pole CAL5-11	Interlock units
N	① 2	2 E					
N	① 3	1 E	1 to 4 CA5- 1-pole blocks	1 CA5- 4-pole block	or 1 TP - A block	+ 1 to 2 CAL5-11 blocks	or 1 VM/ε5-1 block + 1 CAL5-11 block
N	① 4	0 E					
N	4	4 E					
N	5	3 E					
N	6	2 E	—	—	—	+ 1 to 2 CAL5-11 blocks	or 1 VM/ε5-1 block + 1 CAL5-11 block
N	7	1 E					
N	8	0 E					
NE	① 2	2 E					
NE	① 3	1 E	1 to 4 CA5- 1-pole blocks	1 CA5- 4-pole block	or 1 TP - A block	+ 1 to 2 CAL5-11 blocks	or 1 VM/ε5-1 block + 1 CAL5-11 block
NE	① 4	0 E					
NE	4	4 E					
NE	5	3 E					
NE	6	2 E	—	—	—	+ 1 to 2 CAL5-11 blocks	or 1 VM/ε5-1 block + 1 CAL5-11 block
NE	7	1 E					
NE	8	0 E					
NL	① 2	2 E			—		
NL	① 3	1 E	1 to 4 CA5- 1-pole blocks	1 CA5- 4-pole block	or —	or 1 CAL5-11 block	or 1 VM/ε5-1 block + 1 CAL5-11 block
NL	① 4	0 E					
NL	4	4 E					
NL	5	3 E					
NL	6	2 E	—	—	—	or 1 CAL5-11 block	or 1 VM/ε5-1 block + 1 CAL5-11 block
NL	7	1 E					
NL	8	0 E					
TNL	① 2	2 E			—		
TNL	① 3	1 E	1 to 4 CA5- 1-pole blocks	1 CA5- 4-pole block	or —	or 1 CAL5-11 block	or 1 VM/ε5-1 block + 1 CAL5-11 block
TNL	① 4	0 E					
TNL	4	4 E					
TNL	5	3 E					
TNL	6	2 E	—	—	—	or 1 CAL5-11 block	or 1 VM/ε5-1 block + 1 CAL5-11 block
TNL	7	1 E					
TNL	8	0 E					

Technical data

UL & CSA



AC inductive ratings — NEMA A600

Voltage	Continuous current	Maximum make	Maximum break
120V 240V 480V 600V	10	7200VA	720VA

DC inductive ratings — NEMA P300

Voltage	Continuous current	Maximum make	Maximum break
120V 250V 300-600V	5	138VA	138VA

AC coil consumption

In rush	Sealed
80VA	8VA

DC coil consumption

In rush	Sealed
7.0W	7.0W

AC operating time

Pickup	Dropout
10 – 20ms	10 – 20ms

DC operating time

Pickup	Dropout
30 – 90ms	10 – 20ms

AC mechanical endurance
30 million operations

DC mechanical endurance
30 million operations

7

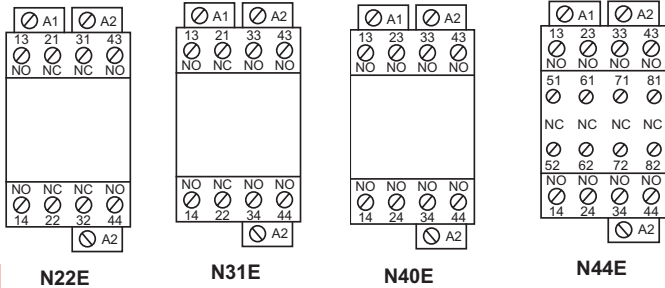
Technical data

Terminal marking and positioning

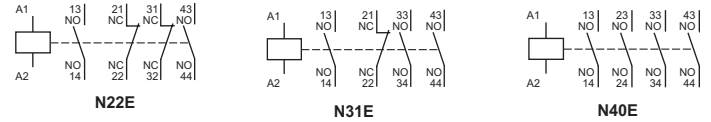
Type N

N control relays

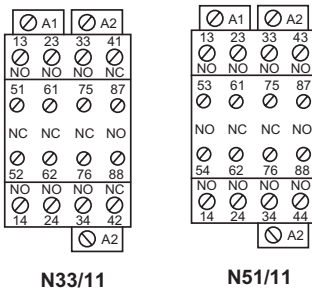
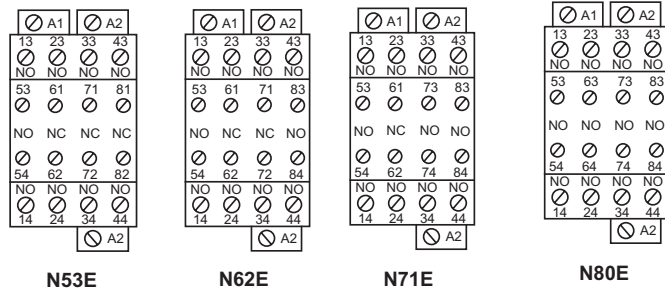
Pole configuration schematics



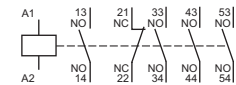
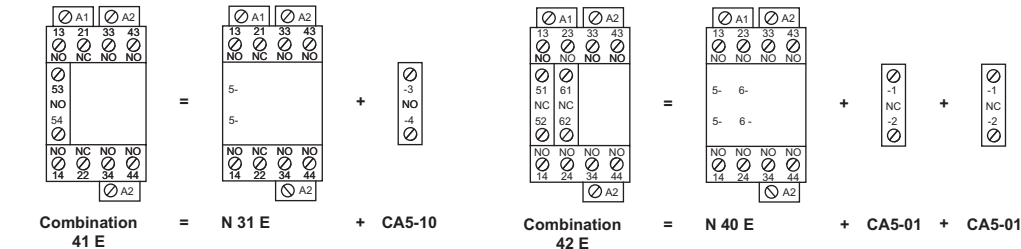
4 Pole control relay



4 Pole control relay with 4 pole adder deck



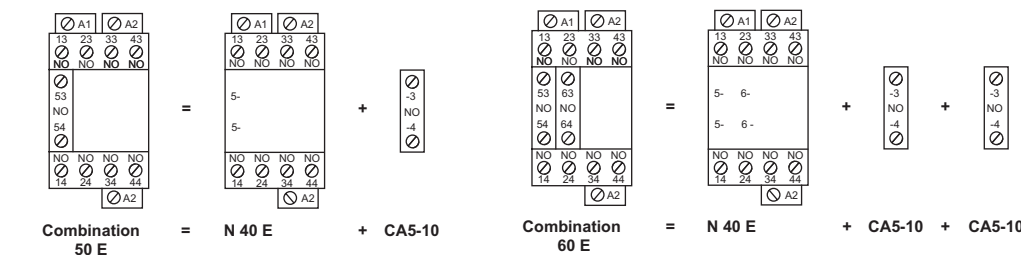
Other possible contact combinations with auxiliary contacts added by the user



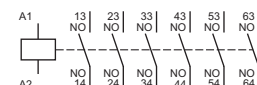
Combination 41 E



Combination 42 E



Combination 50 E



Combination 60 E

Technical data

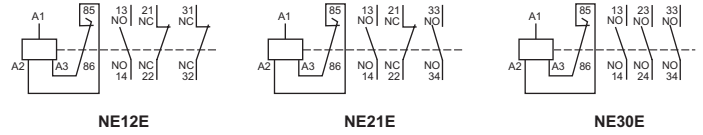
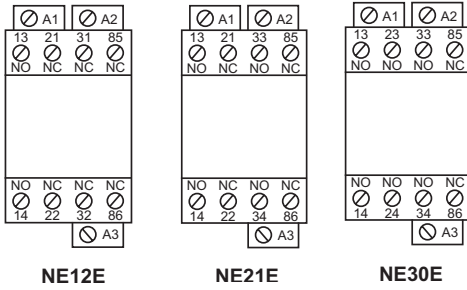
Terminal marking and positioning

Type NE



NE control relays

Pole configuration schematics

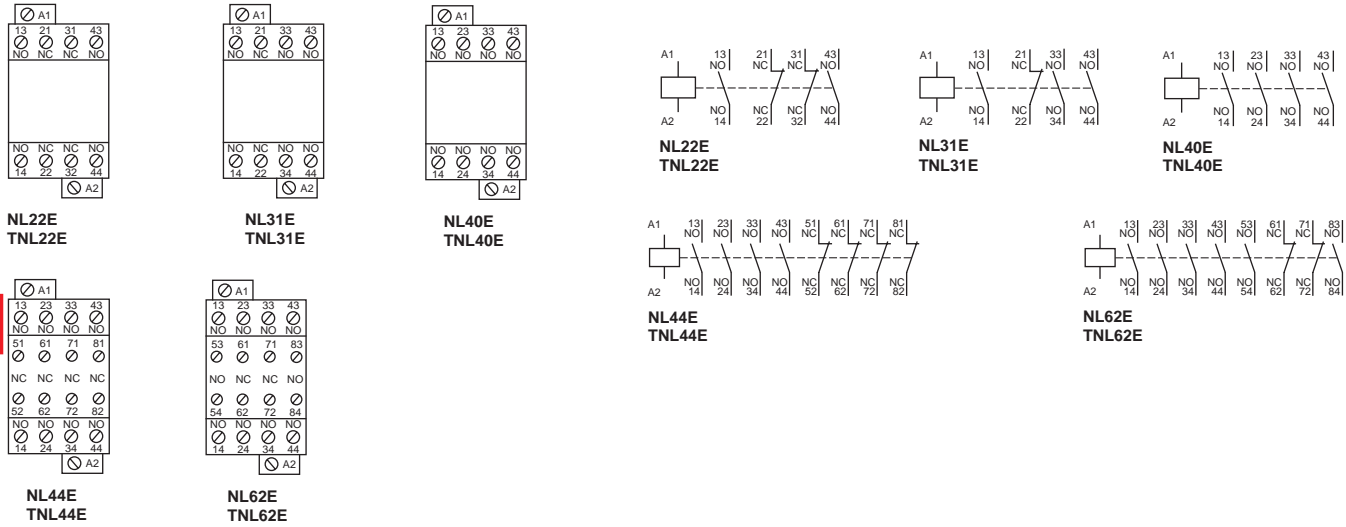


Technical data

Terminal marking and positioning

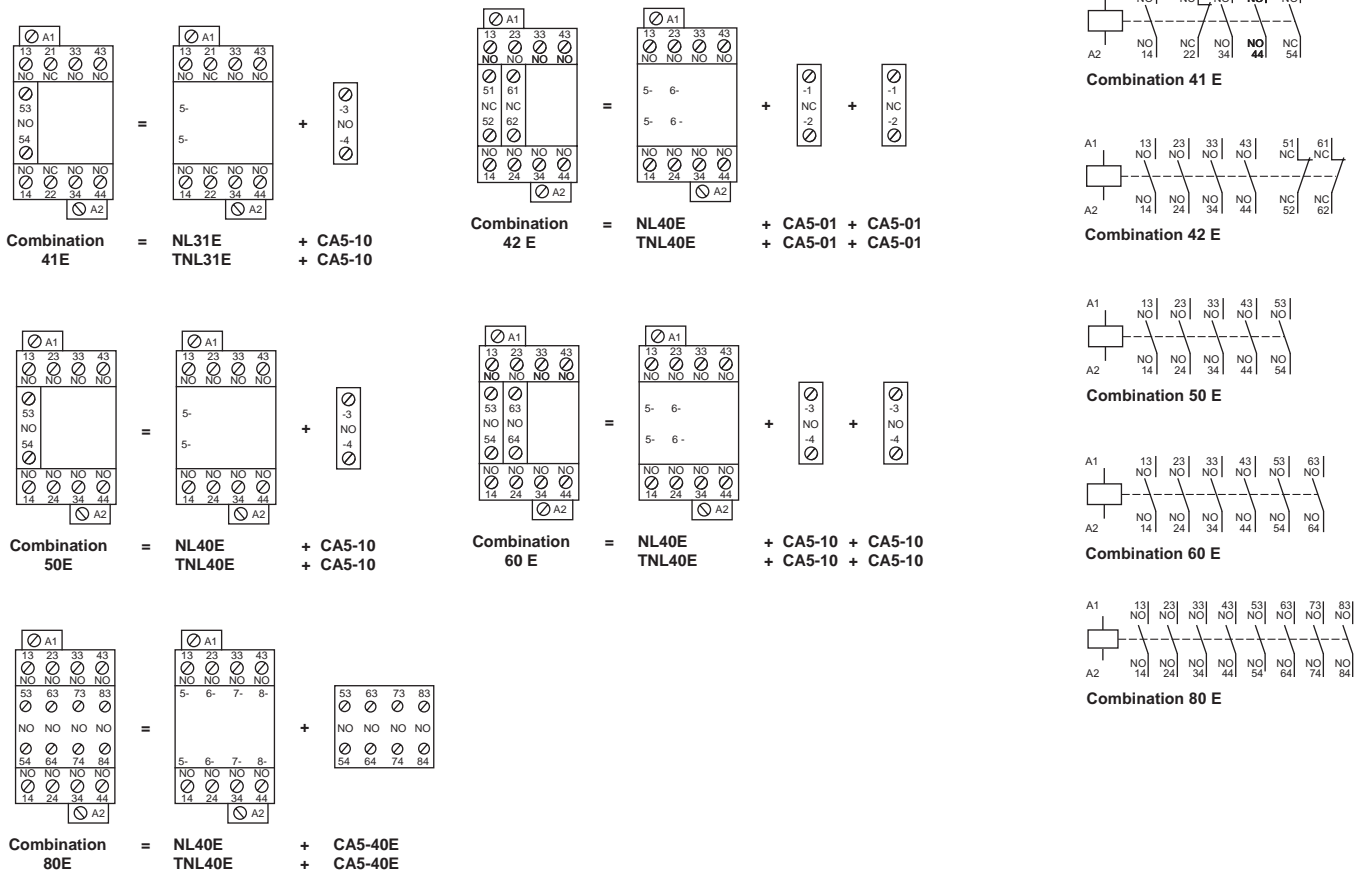
Type NL & TNL

Standard devices without addition of auxiliary contacts



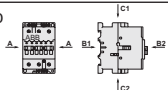
7

Other possible contact combinations with auxiliary contacts added by the user

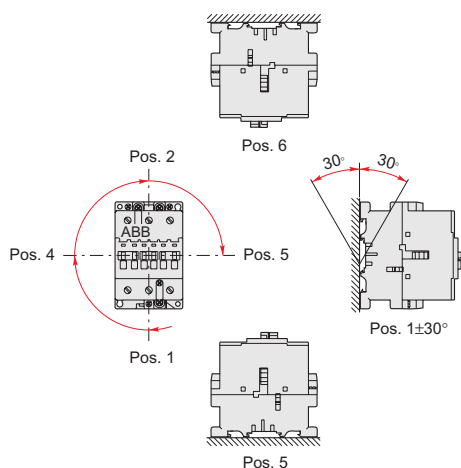


Technical data

IEC

Type	NE12, NE 21, NE 30	N22, N31, N40	N44, N53, N62, N71, N80	NL22, NL31, NL40	NL44, NL62
Number of poles	3	4	8	4	8
Insulation characteristics					
Rated insulation voltage U_i acc. to IEC947-5-1 and VDE0110 (Gr. C)	V		690		
acc. to UL/CSA	V		600		
Rated impulse withstand voltage U_{imp} acc. to IEC947-5-1	kV		8		
General technical data					
Standards	Devices complying with international standards IEC947-5-1/947-4-1 and European standards EN60 947-5-1/60 947-4-1 Electromagnetic compatibility (EMC) according to amendment A11 to IEC947-1; EN60 947-1 and amendment 2 to IEC947-4-1				
Air temperature near contactor — for operation in free air: — for storage:	°C	-40 to +55 (0.85 – 1.1 U_c) / +55 to +70 (U_c)			
	°C	-60 to +80			
Climatic withstand	according to IEC68-2-30 and 68-2-11 – UTE C63-100, Specification II				
Mounting positions	Positions 1 to 5 - $\theta \leq 55^\circ\text{C}$: 0.85 – 1.1 - $\theta = 55 - 70^\circ\text{C}$:				
(see diagrams below)	Position 6	- $\theta \leq 55^\circ\text{C}$: 0.95 – 1.1 - $\theta > 55^\circ\text{C}$: not acceptable	unauthorized		
Operating altitude	m	≤ 3000			
Shock withstand according to IEC 68-2-27 and EN 60068-2-27 Mounting pos. 1 (see below)			1/2 sinusoidal shock, 11ms: no change in contact position Shock direction: A, C1, C2 : 20 g B1 : 5 g B2 : 15 g		
Mounting — on mounting rail — with screws (not supplied)	35mm according to IEC715 and EN50022 2 x M4				
Connection terminals (delivered in open position, screws of unused terminals must be tightened)	M 3.5 (+,-) posidrive 2 screw with cable clamp				
Connection capacity	Rigid solid	1 x AWG 2 x AWG	16 – 12 16 – 12		
Degree of protection according to IEC529, IEC947-1 and EN60529 — Pole terminals — Coil terminals			IP20 IP20	IP20 IP20	

Mounting positions



Electrical durability of contacts

utilization category AC – 15 according to IEC947-5-1

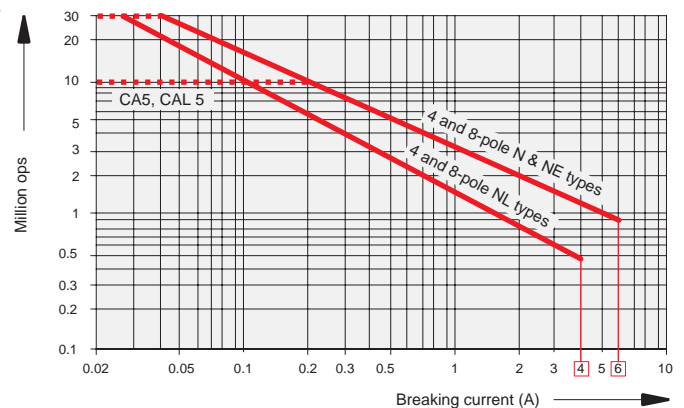
making current: 10 x

breaking current:

I_e with $\cos \varphi = 0.7$ and U_e

I_e with $\cos \varphi = 0.4$ and U_e

The curves opposite show the electrical durability of the control relays as well as the add-on auxiliary contact blocks in relation to the breaking current I_c . These curves have been drawn for resistive and inductive loads up to 690V, 40 – 60Hz.



Type	NE12, NE21, NE30	N22, N31, N40	N44, N53, N62, N71, N80	NL22, NL31, NL40	NL44, NL62
Number of poles	3	4	8	4	8
Pole utilization characteristics					
Rated operational voltage U_e V	690				
Conventional thermal current in free air I_{th} according to IEC947-5-1 $\theta \leq 40^\circ\text{C}$	A	16		16	
Rated operating current I_e					
in AC-15 according to IEC947-5-1					
24 – 127 V 50/60 Hz	A	6		6	
230 – 240 V 50/60 Hz	A	4		4	
400 – 415 V 50/60 Hz	A	3		3	
500 V 50/60 Hz	A	2		2	
690 V 50/60 Hz	A	2		2	
in DC-13 according to IEC947-5-1					
24VDC	A/W	6/144		6/144	
48VDC	A/W	2.8/134		2.8/134	
72VDC	A/W	1/72		1/72	
125VDC	A/W	0.55/69		0.55/69	
250VDC	A/W	0.3/75		0.3/75	
Field of rated frequencies	Hz	25 – 400			
Mechanical durability in operating cycles		10 million	> 20 million	30 million	
Max. switching frequency	cycles/h	3000	6000	6000	
Electrical durability in operating cycles		1200			
Max. switching frequency	cycles/h	1200			
Rated making capacity according to IEC947-5-1		10 x I_e /AC-15			
Rated breaking capacity according to IEC947-5-1		10 x I_e /AC-15			
gG (gl) protection fuse	A	10			
Rated short time withstand current					
at ambient temp. of 40 °C,	1.0 s	100A		50A	
in free air, from cold state	0.1 s	140A		100A	
Insulation resistance at 500 VDC		after durability test: 5 M Ω			
Min. switching capacity					
with failure rate below 10 ⁻⁶		17V / 5mA		24V / 5mA	
Non overlapping time between N.O. and N.C. contacts	ms	≥ 2			
Power loss per pole at 6A	W	0.10		0.15	
Magnet system characteristics					
Coil operating limits $\theta \leq 40^\circ\text{C}$		according to IEC 947-5-1 : 0.85 - 1.1 U_c			
Drop out voltage in % of U_c		10 – 30%	roughly 40 – 65%	roughly 10 – 30%	
Coil consumption (average value)					
— a.c. operation: 50 Hz pull in	VA	—	70	—	
60 Hz pull in	VA	—	80	—	
50/60 Hz [Ⓢ] pull in	VA/VA	—	74/70	—	
50/60Hz holding	VA/W	—	8/2	—	
— d.c. operation: cold pull in	W	90	—	3	
warm holding	W	2	—	3	
Rated control voltage U_c					
— AC operation: 50/60 Hz	V	—	20 – 690	—	
— DC operation:	VDC	12 – 250	—	12 – 240	
Max. permissible short supply interruption					
without opening of contacts	ms	2	2	2	
Operating time					
between coil energization and:					
— closing of N.O. contact	ms	10 – 16	10 – 26	100	
— opening of N.C. contact	ms	8 – 12	7 – 21	20 – 70	
between coil de energization and:					
— opening of N.O. contact	ms	5 – 14	4 – 11	10 – 17	
— closing of N.C. contact	ms	11 – 17	9 – 16	16 – 27	

Ⓢ 50/60 Hz coils: voltage codes 80 to 88, see page 7.5.

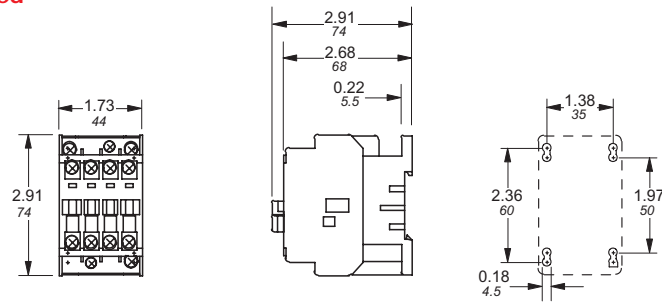
Approximate dimensions

Type N, NE, NL, & TNL

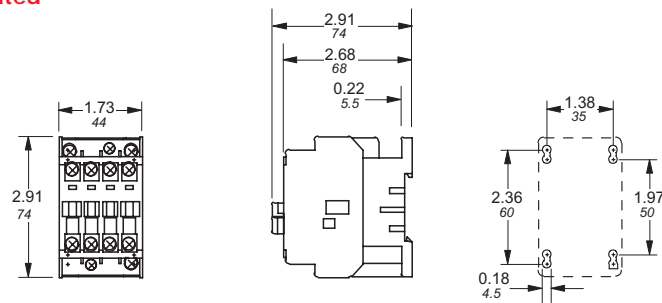
AC & DC operated

00.00
00.00 Inches
[Millimeters]

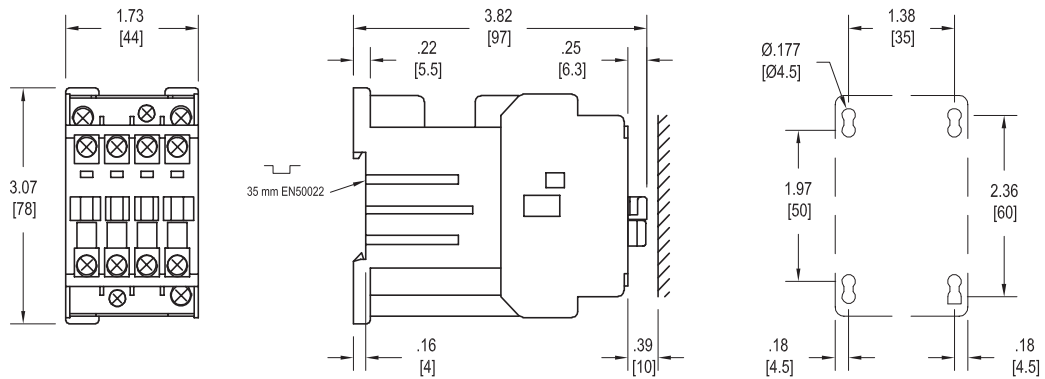
Type N, 4 Pole, AC operated



Type NE, 4 Pole, DC operated



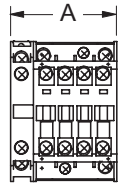
Type NL, TNL



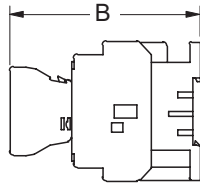
7

Approximate dimensions Accessories for Type N & NE

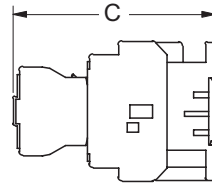
N & NE



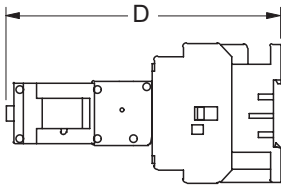
SIDE MOUNTED
AUXILIARY



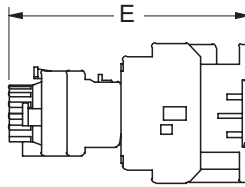
SINGLE POLE
TOP MOUNTED
AUXILIARY



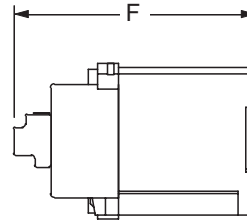
FOUR POLE
TOP MOUNTED
AUXILIARY



ON-POSITION
LATCH



PNEUMATIC
TIMER

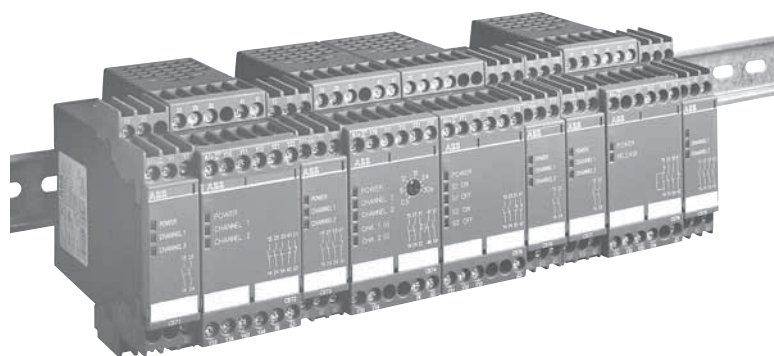


MECH INTERLOCK D.C.
OPERATED

Type		A	B	C	D	E	F
N	IN	2.20	3.96	4.21	5.71	5.00	—
	MM	56	100.5	107	145	127	—
NE	IN	2.20	3.96	4.21	5.71	5.00	—
	MM	56	100.5	107	145	127	—

Electronic Safety relays

ABB Electronic relays
Safety



7

Description

The C57x series covers 10 safety relays which perform safety functions on machines. Their fields of application extend from emergency-stop circuits through guard door monitoring functions and tread mats to presses and punches. All C57x products are UL Listed, CSA approved and bear the CE Mark.

All safety relays can be used on the basis of their classification into the risk categories to EN 954-1, they are approved by the employers' liability insurance associations and/or the German Technical Inspection Authority (TÜV) and comply with the requirements of EN 60204, Part 1.

Redundancy is achieved by series-connection of two N.O. contacts. These N.O. contacts are located in two mutually independent, positive-action, all-or-nothing relays which monitor each other by means of a special-purpose circuit.

Diversity is provided thanks to the combination of N.C. contact and N.O. contact. Cyclic monitoring of the safety circuit in each On/Off cycle ensures maximum reliability.

Thanks to the two-channel control and/or control which is immune to shorts across

contacts, it is also possible to monitor signalling devices such as emergency-stop buttons or limit switches of the guard doors. This ensures the required level of safety even on systems subject to a high level of pollution.

In the event of a fault or error, the safe state of the system is achieved directly after opening the safety contacts. These enable circuits are N.O. contacts which open reliably in the event of fault or error and thus reliably switch off the potentially hazardous drives or machines.

Additional signalling contacts, N.C. contacts which close in the event of a fault or error or semiconductor outputs, are available, depending on the type of equipment.

Easy, reliable and fast wiring is achieved by a clear and manageable terminal designation system. This allows wiring errors to be minimized.

In addition to all these safe features, the C57x safety relays correspond to the product design of ABB's range of switchgear and control systems. They fit in perfectly with the overall design of the switch cabinet.

Type C570



C570

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts	Instantaneous	Time delay					
—	24VDC							1SAR501042R0003	\$ 870
24VAC	—	4 N.O.	—	1 N.C.	3	33.86	1	1SAR501042R0002	
110VAC	—			1 N.O.				1SAR501042R0004	
230VAC	—							1SAR501042R0005	

Description

- Single channel connection
- Feedback circuit for monitoring external contactors
- LED indicators for power and operation
- Output: 4 N.O. and 1 N.O. & 1 N.C. positively driven
- Overall width: 75mm

Application

The safety relay can be used to monitor Emergency Stop circuits and for monitoring of other protective devices (i.e., safety gates).

Type C571



C571

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts		Auxiliary					
		Instan-taneous	Time delay						
24VAC	24VDC	2 N.O.	—	—	3, (4)ⓐ	8.47	1	1SAR501020R0001 1SAR501020R0003 1SAR501020R0004 1SAR501020R0005	\$ 280
	24VDC	2 N.O.			3, (4)ⓐ				
115 VAC	—	2 N.O.			3, (4)ⓐ				
230 VAC	—	2 N.O.			3, (4)ⓐ				

Description

Emergency Stop monitor and safety gate monitor C571

- Auto-start / monitored start
- Operating voltage Vc at Emergency Stop button or limit switch
- Feedback loop for monitoring of external contactors
- LED indicators for power, channel 1 and 2
- Safety outputs: 2 N.O. contacts, positively guided
- Width of enclosure: 22.5mm

Application

Use the safety control gears C571/C573 in Emergency Stop devices as per EN418 and in safety circuits as per VDE 0113 Part 1 (11.98) and/or EN 60 204-1 (11.98), e.g., with moveable covers and guard doors. Depending on the external connections, categories 3 and 4 (with additional external measures) as per DIN EN 954-1 are achievable.

ⓐ Possible with additional external measures. The digit in parenthesis applies only if the cables and sensors are laid safely and protected mechanically.

Type C572



C572

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts		Auxiliary					
		Instantaneous	Time delay						
—	24VDC	—	—	—	4	0.360	1	1SAR501032R0003	\$ 520
24VAC	—	3 N.O.	—	2 N.C.		0.450			
110VAC	—	3 N.O.	—	2 N.C.		0.450			
230VAC	—	3 N.O.	—	2 N.C.		0.360			

Description

Emergency Stop monitor and safety gate monitor C572

- Auto-start / monitored start
- 24 VDC at Emergency Stop button or limit switch
- Cross-short circuit detection at Emergency Stop button or limit switch
- Feedback loop for monitoring of external contactors
- LED indicators for power, channel 1 and 2
- Safety outputs: 3 NO contacts positively guided
- Signalling contacts: 2 NC contacts positively guided
- Width of enclosure: 45mm

Application

Use safety control gear C572 in Emergency Stop devices as per EN 418, in safety circuits as per VDE 0113 Part 1 (06.93) and/or EN 60 204-1 (12.97), e.g. with moveable covers and guard doors. Depending on the external connection, safety category 4 as per DIN EN 945-1 is achievable with this device.

Type C573



C573

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts	Auxiliary						
		Instantaneous	Time delay						
24VAC	24VDC	3 N.O.	—	1 N.C.	3, (4) ^①	8.47	1	1SAR501031R0001	\$ 340

Description

- Operating voltage U_e at Emergency-Stop button or limit switch
- Single or two-channel connection
- Feedback circuit for monitoring external contactors
- LED indicators for Power, Channels 1 and 2
- Output: 3NO and 1 NC positively driven
- Overall width: 45mm

Application

The safety relays C571/C573 can be used in Emergency Stop circuits as per EN 418 and in safety circuits as per VDE 0113 Part 1 (11.98) and/or EN 60 204-1 (11.98), i.e., with movable covers and guard doors. Depending on the external connections, categories 3 and 4 (with additional external measures) as per DIN EN 954-1 are achievable.

7

① Possible with additional external measures. The digit in parenthesis applies only if the cables and sensors are laid safely and protected mechanically.

Type C574



C574

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts		Auxiliary					
		Instantaneous	Time delay						
—	24VDC				3, (4) ①	15.87	1	1SAR503041R0003 1SAR503041R0002 1SAR503041R0004 1SAR503041R0005	\$ 675
24VAC	—	2 N.O.	2 N.O.	1 N.C.					
110VAC	—								
230VAC	—								

Description

Emergency Stop switching device and safety door monitor with time delay C574

- Single or two-channel connection
- Feedback circuit for monitoring external contactors
- LED indicators for Power, Channels 1 and 2, delayed channel 1/2
- Release time adjustable steplessly up to 30 s
- Output: 2 NO, 1 NC, 2 NO time-delayed
- Overall width: 45 mm

Application

The safety relay C574 can be used in Emergency Stop devices as per EN 418, in safety circuits as per VDE 0113 Part 1 (06.93) and/or EN 60 204-1 (12.97), such as for monitoring safety gates, or in circuits with controlled stand-still requirement (Stop Category 1). Depending on the external circuitry, this device can be used to realize Safety Category 4 instantaneous release circuits and Safety Category 3 delayed release circuits according to DIN EN 954-1.

• Delay time, 0.5 to 30 s stepless adjustment

• Auto-start

—	24VDC	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	15.17	1	1SAR503141R0003	\$ 675
24VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	21.16	1	1SAR503141R0002	
110VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	21.16	1	1SAR503141R0004	
230VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	15.17	1	1SAR503141R0005	

• Delay time, 0.05 to 3 s stepless adjustment

• Monitoring-start

—	24VDC	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	15.17	1	1SAR533241R0003	\$ 675
24VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	21.16	1	1SAR533241R0002	
110VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	21.16	1	1SAR533241R0004	
230VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	15.17	1	1SAR533241R0005	

• Auto-start

—	24VDC	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	15.17	1	1SAR533141R0003	\$ 675
24VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	21.16	1	1SAR533141R0002	
110VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	21.16	1	1SAR533141R0004	
230VAC	—	2 N.O.	2 N.O.	1 N.C.	3, (4) ①	15.17	1	1SAR533141R0005	

① Possible with additional external measures. The digit in parenthesis apply only if the cables and sensors are laid safely and protected mechanically.

Type C575



C575

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts		Auxiliary					
		Instantaneous	Time delay						
—	24VDC								
24VAC	—	2 N.O.	—	2 N.C.	4	12.35	1	1SAR504022R0003	\$ 780
110VAC	—							1SAR504022R0002	
230VAC	—							1SAR504022R0004	
							1SAR504022R0005		

Description

Two-hand control C 575

- For activating presses (e.g. in conjunction with overtravel monitor C 578)
- 24 V DC at the two-hand control switches
- Feedback circuit for monitoring external contactors
- 5 LED circuit state indicators for Power, S1 ON, S1 OFF, S2 ON, S2 OFF
- Simultaneity monitoring: 0.5 s
- Output: 2 NO, 2 NC positively driven
- Overall width: 45 mm

Application

C575 is suitable for installation in controls for presses.

- Hydraulic presses DIN EN 693
- Eccentric and related presses EN 692
- Screw presses EN 692

Type C576



C576

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts		Auxiliary					
		Instantaneous	Time delay						
24VAC	24VDC	2 N.O.	—	—	4	8.47	1	1SAR501120R0001	\$ 350

Description

Emergency Stop switching device and safety door monitor C 576

- Cross-short detection at the EMERGENCY-STOP button or limit switch
- 24 V DC at the EMERGENCY-STOP button
- Single or two-channel connection
- Feedback circuit for monitoring external contactors
- LED indicators for Power, Channel 1, Channel 2 and Power
- Output: 2 NO
- Auto-start
- Overall width: 22.5 mm

Application

The safety relay C576 can be used in safety circuits as per VDE 0113 Part 1 (11.98) or EN 60 204-1 (11.98), i.e., with movable covers and safety gates; the safety relay C577 in Emergency Stop circuits as per EN 418. Depending on external connections, category 4 as per DIN EN 954-1 is achievable.

Type C577



C575

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts	Auxiliary						
		Instantaneous	Time delay						
24VAC	24VDC	2 N.O.	—	—	4	8.47	1	1SAR501220R0001	\$ 350

Description

Emergency stop switching device and safety door monitor C577

- Cross-short detection at the Emergency Stop button or limit switch
- 24 V DC at the Emergency Stop button
- Single or two-channel connection
- Feedback circuit for monitoring external contactors
- LED indicators for Power, Channel 1, Channel 2 and Power
- Output: 2 NO
- Controlled start
- Overall width: 22.5 mm

Application

The safety relay C576 can be used in safety circuits as per VDE 0113 Part 1 (11.98), or EN 60 204-1 (11.98) i.e., with movable covers and safety gates; the safety relay C577 in Emergency Stop circuits as per EN 418. Depending on external connections, category 4 as per DIN EN 954-1 is achievable.

Type C578



C578

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts		Auxiliary					
		Instantaneous	Time delay						
— 24VAC 110VAC 230VAC	24VDC — — —	3 N.O.	—	1 N.C.	4	15.87	1	1SAR505031R0003 1SAR505031R0002 1SAR505031R0004 1SAR505031R0005	\$ 910

Description

Overtravel monitor C 578

- Cross-short detection at the EMERGENCY-STOP button or limit switch
- 24 V DC at the EMERGENCY-STOP button
- Feedback circuit for monitoring external contactors
- LED indicators for Power and Enable
- Output: 3 NO and 1 NC positively driven
- Controlled start
- Overall width: 45 mm

Application

The overtravel distance tester C578 is intended for checking the overtravel of linearly operating hydraulic, pneumatic and spindle presses in accordance with VBG 7n5.2 §11.

Type C579



C575

Voltage range		Output contacts			Safety category	Weight (oz.)	Piece per unit	Catalog number	List price
50/60Hz	VDC	Enable contacts	Auxiliary						
		Instan-taneous	Time delay						
24VAC 110VAC 230VAC	—	4 N.O.	—	—	—	8.47	1	1SAR502040R0001 1SAR502040R0004 1SAR502040R0003	\$ 390

Description

Expansion unit for contact expansion of the safety switching devices C 579.
One enable contact of the basic device is required for connection to the expansion unit.

- 4 NO positively driven
- Overall width: 22.5 mm

Application

You can use the C579 expansion unit in combination with all the C57x basic units. It extends the number of release circuits. Depending on the external connection, category 4 as per DIN EN 954-1 is achievable with this device.



Accessories for Type C560

Type	Description	Weight (oz.)	Pcs per unit pk	Catalog number	List price
C560.10	Cover cap sealable, for protection against unauthorized adjustment	8.47	5 sets	1SAR390000R1000	\$ 30
C560.20	Panel mounting bracket	8.47	5 sets of two pcs ea.	1SAR390000R2000	22

C565-S

with positively guided contacts

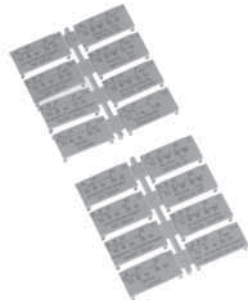
Electronic
Safety relays



1SAR330030R0000

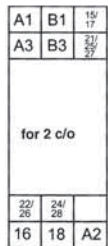


1SAR390000R2000



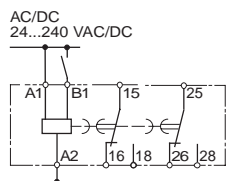
1SAR390000R4000

Terminal positioning C 565-S



Same voltage must be applied to Terminals A, B.

Circuit diagram C 565-S



Multifunction time relay – 8 functions^①, 15 time ranges, 2 c/o positively guided & gold plated

Time range with rotary switch can be set to	Supply voltage		Weight (oz.)	Piece per unit	Catalog number	List price
	AC 50/60Hz	DC				
0.05s - 100h ^①	24 - 240V ^②	24 - 240V ^③	5.28	1	1SAR330030R0000	\$ 129.00

Functions can be set by a rotary switch. Separate markers allow a clearly legible and distinctive setting of the timing functions. The markers are available as an accessory.

Accessories

Item description	Ident letter	Piece per unit	Catalog number	List price
C560.10, cover sealable For protecting against unauthorized readjustment	—	5	1SAR390000R1000	\$ 30.00
C560.20, plug-in tab for screw mounting Mounting on panel	—	5 with 2 pieces each	1SAR390000R2000	22.00
C560.40, Set of labels for multifunction relay C565, full set with 16 functions ON-delay OFF-delay, with auxiliary voltage ON and OFF-delay, with auxiliary voltage Flascher, starting with OFF Impulse-ON Impulse-OFF, with auxiliary voltage Pulseformer with auxiliary voltage	A B C D E F G	5 sets	1SAR390000R4000	42.00

- ① Switch position y no timing. To be used for testing purposes (ON/OFF function) within the installation. When voltage is applied the relay remains energized or remains de-energized permanently.
- ② Operating range 0,7 to 1,25 x U_s.
- ③ Operating range 0,85 to 1,1 x U_s.
- ④ The c/o contacts are operated simultaneously, so that 8 functions can be selected (no Ym, no instantaneous contact)
- ⑤ Positively guided: N/C and N/O contacts are never closed both, contact distance of 22.5mm is guaranteed, minimum switching load 12V, 3mA.

Technical data

Time relay		C 565-S
Mechanical service life	operations	30 x 10 ⁶
Rated insulated voltage (Pollution degree 3) Overvoltage categorie III acc. to DIN VDE 0110	AC V	300
Permissible ambient temperature	during operation storage	°C °C
		- 25 to + 60 - 40 to + 80
Operating range of excitation ^①		0.85 to 1.1 x U _s with AC; 0.8 to 1.25 x U _s with DC 0.95 to 1.05 times rated frequency
Rated power at AC 230V, 50 Hz	W VA	2 6
Rated operating currents I _e	AC-15 at AC 230V, 50 Hz AC-140; DC-13 DC-13 at DC 24V DC-13 at DC 48V DC-13 at DC 60V DC-13 at DC 110V DC-13 at DC 230V	A — A A A A A
Output relay		3 ^② — 1 0.45 0.35 0.2 0.1
Fusing DIAZED ^③ [Utilization category gL/gG]	A	4
Switching frequency when loaded with I _e , AC 230V when loaded with contactors B6, B7, AC 230 V	1/h 1/h	2500 5000
Recovery time	ms	150 ^④
Minimum ON period	ms	35
Setting tolerance referred to full scale value	typically ± 5%	
Repeat accuracy		≤ ± 1%
Enclosure acc. to DIN EN 60 529		IP 20 terminals IP 40 covers
Wire size	single-core stranded with wire end ferrule single-core or stranded	mm/in. mm ⁻ AWG
		1 x (0.5 - 4) 2 x (0.5 - 2.5) 1 x (0.5 - 2.5) 2 x (0.5 - 1.5) 2 x (20 - 14)
Terminal screws	for normal screw-driver size 3 and Pozidrive 2	M 3.5
Permissible normal position		any
Resistance to shock semi-sinusoidal acc. to IEC 60068-2-27	g/ms	15/11
Vibro-stability acc. to IEC 60068-2-6	Hz/mm	10-55 / 0,35
EMV-tests by basic specification		EN 50081-1 EN 50082-2

- ① Unless otherwise specified
- ② For C565-S; open I_e=1A
- ③ Without any welding as per IEC 60947-5-1.
- ④ Wide range voltage power pack; voltage dependent 10 to 250 ms.

C6700 - C6702 with solid state output



Electronic safety relays with solid-state output C 67xx

- Solid-state outputs – no contacts – no wear
- Low weight & small size – Space and weight advantage
- Positively guided standard contactors operate as switching elements

C 67xx safety relays are solely used to monitor the sensors connected (e.g. limit switches resp. EMERGENCY-STOP-buttons) and actuators (positively guided standard contactors).

The basic unit C 6700 itself does not feature safe outputs. Only when the unit is used together with positively guided actuators (e.g. contactors B6, B7) the complete circuit fulfills up to category 3 to EN 954-1.
Us = 24VDC; Ue = 24VDC; Ie = 0.5ADC 13.

The safety relay C 6701 with solid-state outputs can be used directly to switch off connected devices up to category 3 or 4 to EN 954-1. Us = 24VDC; Ue = 24VDC; Ie = 1.5ADC 13.

The safety relay C 6702 with solid-state outputs can also be used to directly switch off connected devices up to category 3 to EN 954-1 and stop categories 0 and 1 at a width of 22.5 mm only.
Time delay settable from 0.05-3 or 0.5-30s. Us = 24VDC; Ue = 24VDC; Ie = 1.5ADC 13.

Type	Supply voltage V_c	Package unit piece	Weight 1 piece kg/lb	Catalog number	List Price
C 6700 C 6701 C 6702 C 6702	24VDC	1	0.150/0.33	1SAR 510 120 R 0003 1SAR 511 320 R 0003 1SAR 543 320 R 0003 1SAR 513 320 R 0003	Consult factory

Technical data

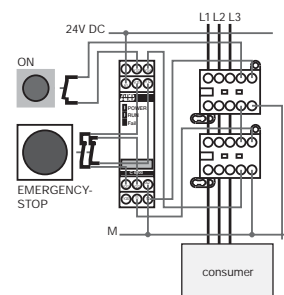
	C 6700	C 6701	C 6702
Permissible ambient temperature T_U Operation / storage Degree of protection acc. to EN 60 529 Rated insulation voltage V_i	-25...+60 °C / -40...+80 °C IP40, IP20 at terminals 50V		
Rated impulse withstand voltage V_{imp} Rated control supply voltage V_S Rated power consumption Operational voltage range Shock resistance (half-sine) acc. to IEC 60068 Weight Recovery time after EMERGENCY STOP Recovery time after power failure Release time after EMERGENCY STOP	500V 24VDC 1.5W 0.9...1.15 x V_S 8g/10ms 150g/0.33lb min. 20ms — < 30ms	2kV 24VDC 1.3W 0.9...1.15 x V_S 8g/10ms 150g/0.33lb min. 30ms 7 s min. 30ms	2kV 24VDC 1.3W 0.9...1.15 x V_S 8g/10ms 150g/0.33lb min. 30ms — 30ms / 0.05...3s or 0.5...30s adjustable
Recovery time after power failure Response time Response time monitored start Response time Auto-start Short circuit protection	max. 25ms — < 125ms < 250ms no fusing necessary	— max. 40ms — — no fusing necessary	— max. 40ms — — no fusing necessary

Utilization category acc. to IEC 60947-5-1:

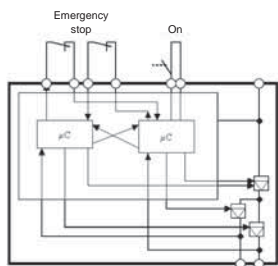
		Rated operational voltage V_e	Rated operational current I_e
C 6700	DC-13	24V	0.5A (per output, 60 °C)
C 6701	DC-13	24V	2.0A
C 6702	DC-13	24V	2.0A

- 7
- Solid-state control of actuators, therefore no wear
 - No contact failure at currents of 17V, 1mA
 - Short circuit proof
 - High switching frequencies
 - 24VDC sensor supply
 - Economical

Internal standard circuit diagram of a safe circuit in accordance to C 6700



Internal standard circuit diagram of safety relay C 6701 with solid-state output.



Technical data

C570 - C579

Type	C570	C571	C572	C573	C574	C575	C576	C577	C578	C579
Single-channel connection	x	x	x	x	x	x	x	x	-	x
2-channel connection	-	x	x	x	x	x	x	x	-	x
Cross-short protection	(x) ^①	(x) ^①	x	(x) ^①	x	x	x	x	-	-
Test certificate	BIA, SUVA	BG, SUVA UL, CSA								
Safety category to EN 954-1	2, (3) ^① , (4) ^①	3, (4) ^①	4	3, (4) ^①	4, (3) ^②	4	4	4	4	4
Mechanical service life	3 million operations	10 million operations								
Rated insulation voltage U _i	250 V control circuit	300 V								
Pollution severity 3	400 V output contacts									
Overvoltage category III to DIN VDE 0110										
Rated impulse strength U _{imp}	1.5 kV control circuit	4 kV								
Pollution severity 3	4 kV output contacts									
Permissible ambient temperature for operation	-25 to +55 °C	-25 to +60 °C (suitable for butt-mounting design) -40 to +80 °C								
for storage	-25 to +80 °C									
Enclosure to EN 60 529	IP20	IP20 ^③	IP20	IP20 ^③	IP20	IP20	IP20 ^③	IP20 ^③	IP20	IP20 ^③
Shock-hazard protection to VDE 0106	Safe from finger-touch	Safe from finger-touch								
Rated power										
DC/AC operation at 1.0 x U _s	6 W	1.5 W	3 W	1.5 W	4 W	3 W	1.5 W	1.5 W	4 W	1.5 W
Operating range										
AC operation	0.8 to 1.1 x U _s	0.85 to 1.1 x U _s								
DC operation	0.8 to 1.1 x U _s	0.85 to 1.1 x U _s								
Switching frequency	500/h at AC-15 resp. DC-13	1000/h when loaded with I _e								
Resistance to shock		8 g/10 ms semi-sinusoidal to IEC 60 068								
Short-circuit protection (non-welding fusing at I _k = 1kA)	Fuse-links for Enable/signalling contacts: l.v.h.b.c., neoZed and diaZed utilization cats. gL/gG quick-acting Fuse supply C570: Cartridge fuse quick-acting/slow-blow, power circuit bkr. A, B, C-characteristic	Fuse-links l.v.h.b.c. Type 3NA, DIAZED Type 5SB, NEOZED Type 5SE6A Utilisation category gL/gG quick-acting								
Wire ranges										
Flexible with wire end ferrule	2 x (0.5-1.5) mm ² or 1 x (0.5-2.5) mm ²									
Single-core	2 x (0.5-2.5) mm ² or 1 x (0.5-4) mm ²									
Tightening torque, terminal screw M3.5	0.8 to 1.2 Nm									
Electrical service life at I _e		100.000 operations								
Rated operating currents to IEC 60 947-5-1										
Thermal continuous current I _{th} I _e /AC-15	6A	5A								
I _e /DC-13	up to 230 V, 4 A	115 V, 5 A 230 V, 5 A 24 V, 2 A 115 V, 0.2 A 230 V, 0.1 A								
Continuous current		Enable circuits UT 70 °C 4 A 3.5 A 3 A UT 60 °C 4.5 A 4 A 3.5 A UT 50 °C 5 A 4.5 A 4 A								
Mounting positions	any									
Width / mm	75	22.5	45	22.5	45	45	22.5	22.5	45	22.5

① Possible with additional external measures. The figures in bracket apply only if the cables and sensors are laid safely and protected mechanically.

② Applies only to undelayed FK; category 3 applies to time-delayed FK

③ IP 20 terminals, IP 40 housing

Application examples

C6700

Applications

The C 6700 safety combination can be used in EMERGENCY STOP circuits according to EN 418 and in safety circuits according to EN 60 204-1 (11.98), e.g. for moving covers and safety gates. Safety category 3 according to DIN EN 954-1 or SIL2 according to IEC 61508 can be achieved, depending on the external circuits.

Functions and connections

The C 6700 safety relay has two solid-state outputs. Three LEDs indicate the operating state and the function. During operation, all internal circuit elements are cyclically monitored for faults.

The EMERGENCY STOP button or the position switch are connected to terminals Y11, 12 or Y21, 22. The ON button is connected in series to the NC contacts of the external actuators (feedback loop) to terminals Y33, 34.

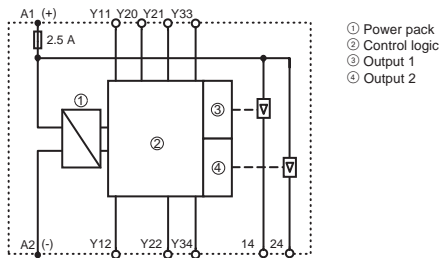
The C 6700 safety relay and the activated contactors K1 and K2 must have the same frame potential. Safety category 3 to EN 954-1 is achieved only in combination with 2 external actuators with positively driven feedback contacts.

⚠ Use a power pack to IEC 60536 safety class III (SELV or PELV) for power supply!

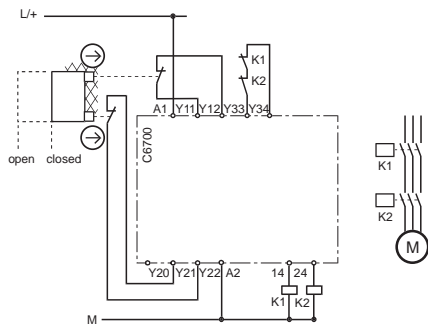
Terminal marking

Supply voltage	A1	L/+
	A2	M
Inputs	Y11, 12	Channel 1 EMERGENCY STOP or position switch
	Y21, 22	Channel 2 EMERGENCY STOP or position switch
	Y20	Single channel switch
Outputs	Y33, 34	ON button, feedback loop
	14, 24	Solid-state outputs

Internal circuit



Two channel autostart for safety gate monitoring Category 3/SIL2



Operation

LEDs			Operation			
POWER	RUN	FAIL	PS	E-STOP	ON	Outputs
☀	☀	●	ON	non activated	activated	on
☀	●	☀		activated	non activated	off
☀	●	●		non activated	non activated	off

Faults

☀	●	☀	• Defect in electronic • Crossover in EMERGENCY STOP circ.	off
●	●	●	No supply voltage	

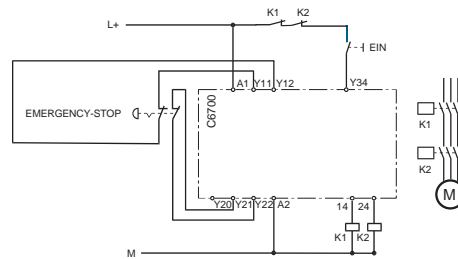
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

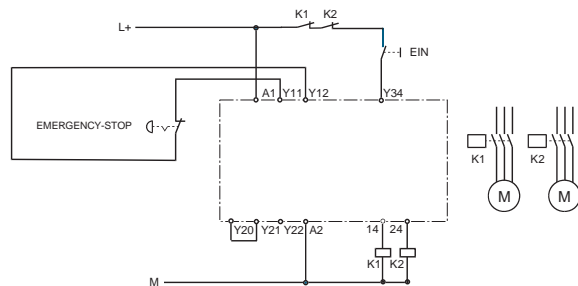
Cable length

for 2 x 1.5mm² 150nF/km max. 2000m total cable length for sensors

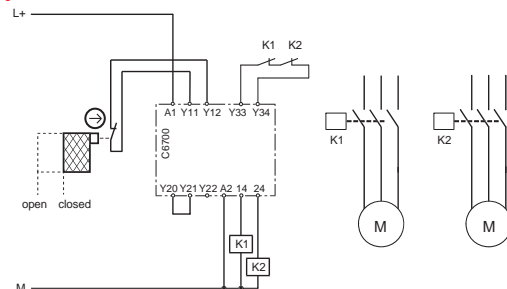
EMERGENCY STOP, single channel, with monitored start Category 3/SIL2



EMERGENCY STOP, single channel, with monitored start Category 2/SIL1



Single channel autostart for safety gate monitoring Category 2/SIL1



Application examples

C6701

Application

The C 6701 safety combination can be used in EMERGENCY STOP circuits according to EN 418 and in safety circuits according to EN 60 204-1 (11.98), e.g. in movable guards and safety gates. Depending on the external circuit elements, safety category 4 according to DIN EN 954-1 or SIL 3 according to IEC 61508 can be achieved.

Functions and connections

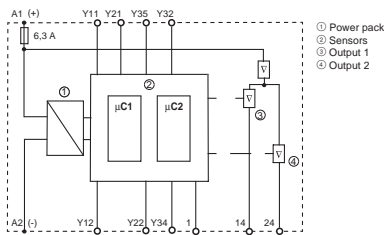
The C 6701 safety combination has two reliable solid-state outputs. Three LEDs indicate the operating state and the function. When the device is put into operation it runs through a self-test to test the correct functioning of the internal electronics. All internal circuit components are monitored for faults cyclically during operation. The EMERGENCY STOP button and/or the position switches or light arrays are connected to terminals Y11, Y12 and Y21, Y22. The ON button is connected in series with the NC contacts of the external actuators to the supply voltage L+ (24 V DC) and to terminal Y34. The cascading input 1 is connected either via a safe output or directly to the supply voltage L+ (24 V DC). External actuators or loads can be switched via safe outputs 14, 24. It must be ensured that the actuators or loads and the C 6701 electronic safety combination have the same frame potential. Paralleling outputs 14 and 24 to increase the load current is not permissible. If electronic sensors (e.g. light-array monitoring) are used, in single-channel operation, Y35 must be connected to L+ (24VDC). For autostart operation, Y32 must be connected directly to L+ (24VDC) and Y34 must be connected to it via NC contacts of the external actuators.

⚠ Use a power pack to IEC 60536 safety class III (SELV or PELV) for power supply!

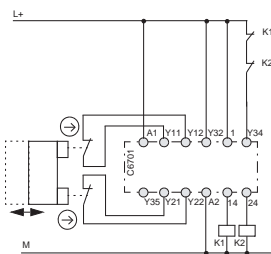
Terminal marking

Supply voltage	A1	L/+
	A2	M
Inputs	Y11, 12	Channel 1 EMERGENCY STOP or position switch
	Y21, 22	Channel 2 EMERGENCY STOP or position switch
	Y35	With / without cross circuit detection
	Y32	Autostart switch
	Y34	ON button, feedback loop
Input	1	Cascading input
Outputs	14, 24	Safe solid state outputs

Internal circuit



Safety gate monitoring, two channel, autostart Category 4/SIL 3



① Sensor circuits open; Cross circuit between the sensors; Short circuit of sensors to frame
 ② Only when using circuit variant with "cross circuit detection".

Operation

LEDs			Operation			
POWER	RUN	FAIL	PS	E-STOP	ON	Outputs
☀	☀	●	ON	non activated	activated	on
☀	●	☀		activated ①	non activated	off
☀	●	●		non activated	non activated	off
☀	●	☾ flashes	on start up self test approx. 7 sec.			
Fault						
☀	●	☾ flashes	Defect in the electronic Change in terminal assignment during operation Short circuit to 24V ②			off
●	●	●	No supply voltage			

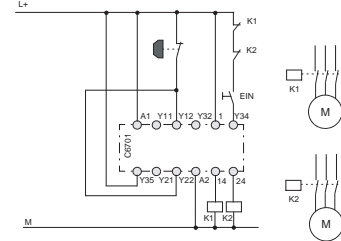
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

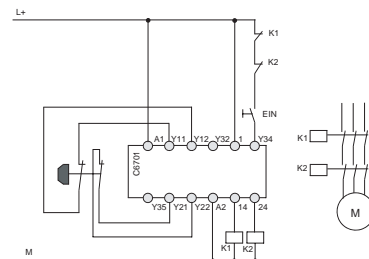
Cable length

for 2 x 1.5mm² max. 2000m total cable length for 150nF/km sensors

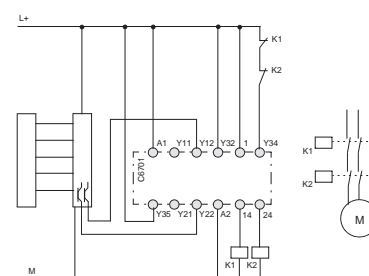
EMERGENCY STOP, single channel, monitored start Category 2/SIL 1



EMERGENCY STOP, two channel, monitored start with additional ON button category — Category 4/SIL3



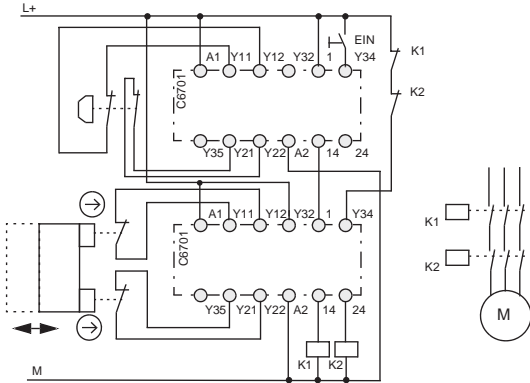
Light array monitoring, two channel, autostart category, Category 4/SIL3



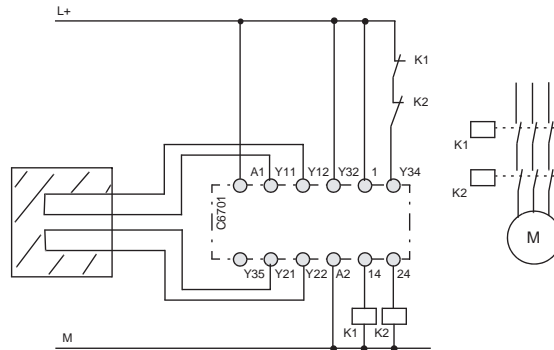
Application examples

C6702

Emergency Stop, two channel, monitored start with additional ON button and safety gate monitoring category 4/SIL 3



Safety mat, two channel, autostart category 3/SIL 2



7

Application

The C 6702 safety combination can be used in EMERGENCY STOP circuits according to EN 418 and in safety circuits according to EN 60 204-1 (11.98), e.g. in movable guards and safety gates. Depending on the external circuit elements, safety category 4 according to DIN EN 954-1 or SIL 3 according to IEC 61508 can be achieved.

Functions and connections

The C 6702 solid-state safety combination has one safe solid-state output and one time-delayed safe solid-state output. Three LEDs indicate the operating state and the function.

When the device is put into operation it runs through a self-test to test the correct functioning of the internal electronics. All internal circuit components are monitored for faults cyclically during operation.

The EMERGENCY STOP button and/or the position switches or light arrays are connected to terminals Y11, Y12 and Y21, Y22. The ON button is connected in series with the NC contacts of the external.

The cascading input 1 is connected either via a safe output or directly to the supply voltage L+ (24 V DC). External actuators or loads can be switched via safe outputs 14, 28. It must be ensured that the actuators or loads and the C 6702 electronic safety combination have the same frame potential. Paralleling outputs 14 and 28 to increase the load current is not permissible.

If electronic sensors (e.g. light-array monitoring) are used in single-channel operation, Y35 must be connected to L+ (24VDC).

For autostart operation, Y32 must be connected directly to L+ (24VDC) and Y34 must be connected to it via NC contacts of the external actuators.

⚠ Use a power pack to IEC 60536 safety class III (SELV or PELV) for power supply!

Terminal marking

Supply voltage	A1	L+
	A2	M
Inputs	Y11, 12	Channel 1 EMERGENCY STOP or position switch
	Y21, 22	Channel 1 EMERGENCY STOP or position switch
	Y35	With / without cross circuit detection
	Y32	Autostart changeover switch
	Y34	ON button, feedback circuit
Input	1	Cascading input
Outputs	14	Safe solid state output
	28	Safe solid state output, time delayed

Operation

LEDs			Operation			
POWER	RUN	FAIL	PS	E-STOP	ON	Outputs
☀	☀	●	ON	non activated	activated	on
☀	●	☀		activated ①	non activated	off
☀	●	●		non activated	non activated	off
☀	☾ flashes	☀		activated	non activated	off/on
☀	●	☾ flashes	on start up self test approx. 7 sec.			
Fault						
☀	●	☾ flashes	Defect in electronic Change in terminal assignment during operation Short circuit to 24V ②			off
●	●	●	No supply voltage			

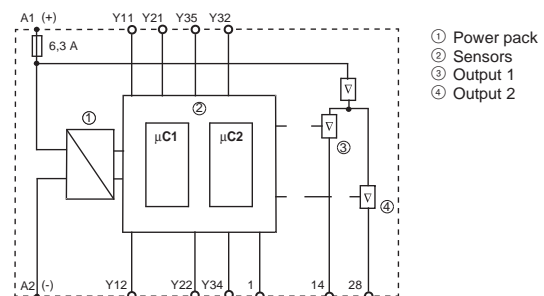
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

Cable length

for 2 x 1.5mm² 150nF/km max. 2000m total cable length for sensors

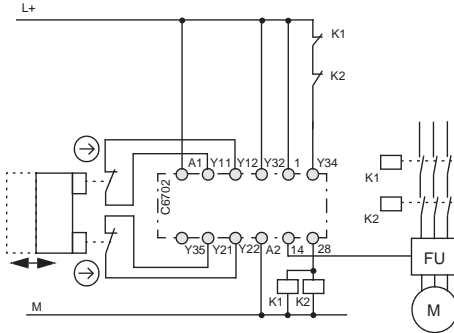
Internal circuit



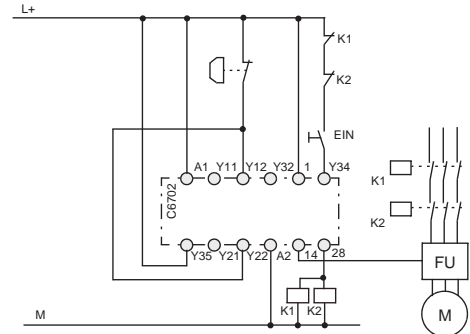
① Sensor circuits open; Cross circuit between the sensors; Short circuit of sensors to frame
② Only when using device with "cross circuit detection".

Application examples C670x

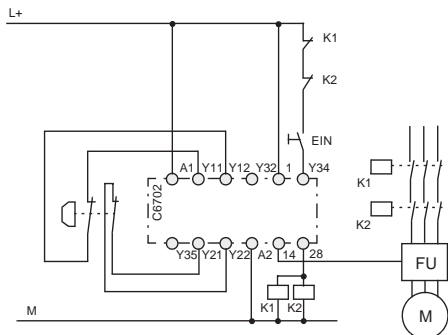
Safety gate monitoring, two-channel, autostart category 4 / SIL 3 with voltage-operated e.i.c.b. and delayed disconnection, stop category 1



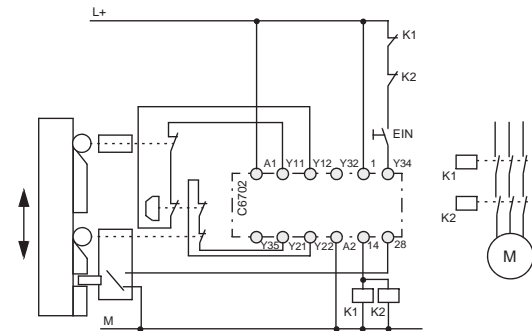
EMERGENCY STOP, single-channel, monitored start with additional ON button category 2 / SIL 1 with voltage-operated e.i.c.b. and delayed disconnection, stop category 1



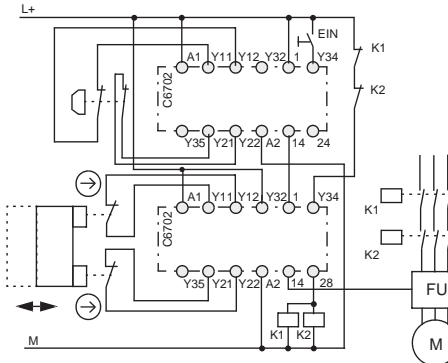
EMERGENCY STOP, two-channel, monitored start with additional ON button category 4 / SIL 3 with voltage-operated e.i.c.b. and delayed disconnection, stop category 1



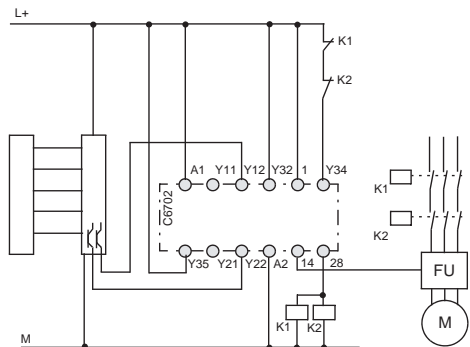
EMERGENCY STOP and safety gate monitoring, two channel with tumbler, monitored start category 4 / SIL 3



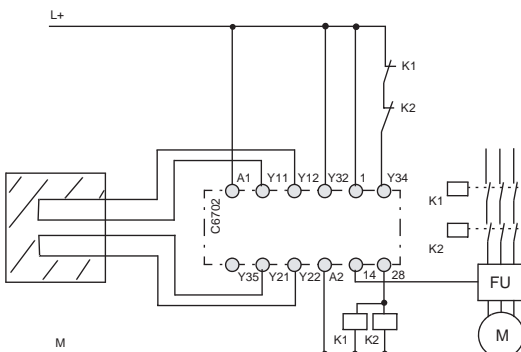
EMERGENCY STOP, two-channel, monitored start with additional ON button and safety gate monitoring, two-channel, autostart; category 4 / SIL 3



Light-array monitoring, two-channel, autostart category 4 SIL 3



Safety mat, two-channel, autostart; category 3 SIL2



Personnel safety and machine protection

Risk category according to EN 954-1

Classification of a machine into categories to EN 954-1

Pursuant to the Machinery Directive 89/393/EEC, every machine must comply with the relevant directives and standards. Measures must be taken to keep the risk to persons below a tolerable extent.

In the first step, the project planner performs a risk evaluation to EN 1050 "Risk Assessment". This must take into consideration the machine's ambient conditions for instance. Any overall risk must then be assessed. This risk assessment must be conducted in such a form as to allow documentation of the procedure and the results achieved. The risks, dangers and possible technical measures to reduce risks and dangers must be stipulated in this risk assessment. After stipulating the extent of the risk, the category on the basis of which the safety circuits are to be designed is determined with the aid of EN 954-1 "Safety-Related Components of Controls".

This determined category defines the technical requirements applicable to the design of the safety equipment.

7 There are five categories (B, 1, 2, 3 and 4), whereby B (standing for basic category) defines the lowest risk and, thus, also the minimum requirements applicable to the controller.

Possible selection of categories pursuant to EN 954-1

Starting point for the risk assessment of the safety-related component of the controller.

S- Serious injuries

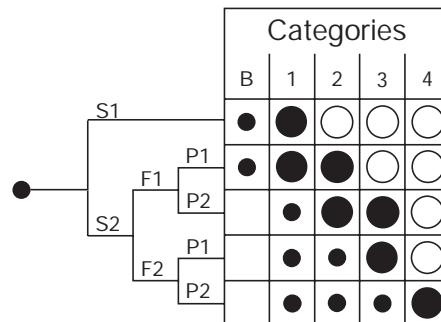
- S1 Slight (normally reversible) injuries,
- S2 Serious (normally irreversible) injuries, including death

F- Frequency and/or duration of the risk exposure

- F1 Rare to frequent and/or short duration of exposure
- F2 Frequent to sustained and/or long duration of exposure

P- Options for risk avoidance

- (Generally referred to the speed and frequency at which the dangerous components moves and to the clearance from the dangerous component).
- P1 Possible under certain conditions
- P2 Hardly possible



B1-4 Categories for safety-related components of controls

- Preferred category
- Possible category requiring additional measures
- Disproportionately extensive measures by comparison with the risk

Safety category ①	Summary of requirements	System behaviour ②	Principles for achieving safety
B	The safety-related components of controls and/or their protection devices and their components must be designed, constructed, selected, assembled and combined in compliance with the applicable standards, such that they can withstand the anticipated influences.	The occurrence of a fault may lead to loss of the safety function.	Predominantly characterised by selection of components!
1	The requirements of B must be complied with. Time-proven components and time-proven safety principles must be applied.	The occurrence of a fault may lead to loss of the safety function but the probability of occurrence is less than in category B.	
2	The requirements of B and the use of the time-proven safety principles must be complied with. The safety function must be checked at appropriate intervals by the machine control.	<ul style="list-style-type: none"> • The occurrence of a fault may lead to loss of the safety function between the inspection intervals. 	Predominantly characterised by the structure
3	The requirements of B and the use of the time-proven safety principles must be complied with. Safety related components must be designed such that: <ul style="list-style-type: none"> • a single fault in any of these components does not lead to loss of the safety function and • the individual fault is detected, wherever feasible in an appropriate manner. 	<ul style="list-style-type: none"> • The loss of the safety function is detected by the check/inspection. • If the single fault occurs, the safety function is always retained. • Certain faults but not all faults are detected. • An accumulation of undetected faults may lead to loss of the safety function. 	
4	The requirements of B and the use of the time-proven safety principles must be complied with. Safety related components must be designed such that: <ul style="list-style-type: none"> • a single fault in any of these components does not lead to loss of the safety function and • the individual fault is detected at or before the next requirement applicable to the safety function or, if this is not possible an accumulation of faults may then not lead to loss of the safety function. 	<ul style="list-style-type: none"> • If the faults occur, the safety function is always retained. • The faults are detected in good time to prevent loss of the safety function 	

This mandatory classification runs like a red thread from selection of the smallest limit switch through to the overall concept of the entire machine, whereby it is necessary to grapple with the permanent conflict between what is technically feasible and what is permitted on the basis of "pure theory".

Thus: Depending on application, not every technically feasible safety category is also permitted. For instance, in the case of contactless protection devices (light barriers etc.) only categories 2 or 4 are permitted. By contrast, in the case of tread mats, categories B to 4 can be used, depending on risk assessment, provided these categories can be reached at all owing to the design.

The 2-hand control C575 would technically also comply with the lower categories but it cannot be connected in categories 1-3.

① The categories are not intended to be applied in any specific order or hierarchical arrangements with respect to the technical-safety requirements.

② The risk assessment will indicate whether full or partial loss of the safety function(s) as the result of fault is acceptable.

Classification of a machine into categories to EN 954-1

Pursuant to the Machinery Directive 89/393/EEC, every machine must comply with the relevant Directives and Standards. Measures must be taken to keep the risk to persons below a tolerable extent.

In the first step, the project planner performs a risk evaluation to EN 1050 "Risk Assessment". This must take into consideration the machine's ambient conditions for instance. Any overall risk must then be assessed. This risk assessment must be conducted in such a form as to allow documentation of the procedure and the results achieved. The risks, dangers and possible technical measures to reduce risks and dangers must be stipulated in this risk assessment. After stipulating the extent of the risk, the category on the basis of which the safety circuits are to be designed is determined with the aid of EN 954-1 "Safety-Related Components of Controls".

This determined category defines the technical requirements applicable to the design of the safety equipment. There are five categories (B, 1, 2, 3 and 4) whereby B (standing for basic category) defines the lowest risk and, thus, also the minimum requirements applicable to the controller.

Possible selection of categories pursuant to EN 954-1

Starting point for risk assessment of the safety-related components of the control.

Description

Scope of application

Potential risks and hazards posed by a machine must be eliminated as quickly as possible in the event of danger.

For dangerous movements, the safe state is generally standstill. All safety switching devices of Series C 570 switch to de-energised state, i.e. standstill for drives, in the event of danger or fault. Standard EN 60204 demands that every machine must feature the Stop function of category 0.

Stop functions of categories 1 and/or 2 must be provided if necessary for technical-safety and/or technical-function requirements of the machine. Category-0 and category-1 stops must be operable independently of the operating mode, and a category-0 stop must have priority.

There are three categories of stop function:

Category 0:

Shut-down by immediate switch-off of the energy supply to the machine drives.

Category 1:

Controlled shut-down, whereby the energy supply to the machine drive is retained in order to achieve shut-down and the energy supply is only interrupted when shut-down has been reached.

Category 2:

A controlled shut-down in which the energy supply to the machine drive is retained.

EMERGENCY-STOP

EMERGENCY-STOP devices must have priority over all other functions. The energy supplied to the machine drives which may cause dangerous states must be switched off as quickly as possible without further risks or dangers. Resetting of the drives may not trigger a restart. The EMERGENCY-STOP must act either as a stop of category 0 or as a stop of category 1.

The basic device of the 570 Series of safety switching devices can be used for EMERGENCY-STOP applications up to maximum category 4 to EN 954-1. Depending on external wiring and cable routing of the sensors, category 3 resp. 4 to EN 954-1 must be reached.

Safety door monitoring

Pursuant to EN 1088, a distinction is made between interlocked, separating protective devices and interlocked, separating protective devices with follower. Here as well, the safety switching devices are used for EMERGENCY-STOP applications. Controls up to category 4 to EN 954-1 are possible.

Presses and punches

The two-hand control C 575 is a device on which the operator must use both hands simultaneously, thus protecting him against risks and dangers.

The overtravel monitor C 578 is used on linear-driven presses (e.g. hydraulic, pneumatic and spindle presses) in accordance with VBG7n52. It checks for the following only once during the test stroke:

- Correct connection of the operating controls
- External cable discontinuity
- Possible failure of the components to be monitored cyclically

The overtravel monitor can be used only in conjunction with a two-hand control. The press controllers and overtravel monitors are suitable for installation in controls for eccentric, hydraulic and spindle presses. They can be used up to category 4 to EN 954-1. Type III C to DIN 574 is possible specifically for presses.

Device construction

The safety switching device C 570 operates internally with several contactor relays. The contacts of the relays comply with the requirement in respect of positively driven operation to ZH 1/457, Edition 2, 1978. This means that NO contact and NC contact may not be closed simultaneously.

Safety relays with positively driven contacts are used in the newly developed safety switching devices C 571-C 574, C 576, C 577, the contact expansion C 579 and on the press controllers C 575 and C 578. This series of devices is characterised by an extremely narrow design (22.5mm and 45 mm). Approvals and test certificates, conventional on the market, have been issued by BG, SUVA, UL and CSA.

The function of the internal contactor relays/relays is monitored in a redundant circuit. In the event of failure of a relay, the safety switching device always switches to de-energised state. The fault is detected and the safety switching device can no longer be switched on. Using normally closed contacts and normally open contacts for the same function complies with the requirement in respect of diversity.

Enable contacts (FK)

The safety-related function must be controlled via safe output contacts, the so-called Enable contacts. Enable contacts are always normally open contacts and switch off without delay.

Signalling contacts (MK)

Normally open contacts and normally closed contacts which may not perform safety-related functions are used as the signalling contact.

An Enable contact may also be used as a signalling contact.

Delayed Enable contacts

Drives which have a long overtravel must be decelerated in the event of danger. For this purpose, the energy supply must be maintained for electrical braking (stop category 1 to EN 60 204-1). The safety switching device C 574 also feature OFF-delayed Enable contacts, besides undelayed Enable contacts. Delay times of 0.5 to 30 s are available.

The sealable cover cap C 560.10 (see Selection data and Ordering details, Accessories) can be fitted onto C 574, C 6702 to protect against unauthorised adjustment of the set delay time.

Contact expansion

If the Enable contacts of the basic device do not suffice, positively driven contactors (e.g. B6, B7) may be used for contact expansion. One solution for increasing the number of Enable contacts, which is both simple to use and space-saving, is the expansion unit C 579 (only 22.5mm wide). The expansion unit C 579 provides 4 additional Enable contacts.

Expansion unit C 579

Expansion unit C 579 may not be operated separately in safety-related circuits but must be combined with a safety switching device C 57x. One Enable contact of the basic device is required for connection of an expansion unit. The category of a control with expansion units corresponds to the category of the basic device.

Mounting

Snap-on mounting on 35mm top-hat rail to EN 50 022. Screw mounting of the safety switching devices C 57x can be implemented with two additional plug-in tabs C 560.20 (see Selection data and Ordering details, Accessories).

User Manual

A User Manual with a device description, connection diagrams and application information in several languages is enclosed with every safety switching devices of Series C 570 and C 67xx.

"Safety Engineering" Application Manual

You can find further information in the "Safety Engineering" Application Manual. It provides you with the required information on the relevant safety standards and project planning information.

The entire range of components used for safety applications is explained in this Manual, from the sensor (Emergency-Stop command devices and position switches), through evaluation units (safety switching devices C 57x and fail-safe control

AC 31 S) to the actuator (e.g. contactor for switching motors). All these components must be selected correctly in order to meet the requirements applicable to modern safety facilities.

Please order the "Safety Engineering" Application Manual

1SAC 103 201 H 0101 German

1SAC 103 201 H 0201 English

Selection guide C570 – C6702

Selection table for ABB safety relays in accordance to risk category (EN 954-1):

Category	C 570	C 571	C 572	C 573	C 574	C 575	C 576	C 577	C 578	C 6700	C 6701	C 6702
B												
1	x	x	x	x	x		x	x		x	x	x
2	x	x	x	x	x		x	x		x	x	x
3	x ^①	x	x	x	x		x	x		x	x	x
4		x ^①	x	x ^①	x ^②	x	x	x	x		x	x

Selection table for ABB safety relays in accordance to device characteristics

Characteristics suitable for device	C 570	C 571	C 572	C 573	C 574	C 575	C 576	C 577	C 578	C 579	C 6700	C 6701	C 6702
7 EMERGENCY STOP	yes	yes	yes	yes	yes	—	yes	yes	—	③	yes	yes	yes
Safety gate monitoring	yes	yes	yes	yes	yes	—	yes	yes	—	③	yes	yes	yes
Tread mats	—	—	—	—	—	—	—	—	—	—	—	—	-
Two-hand control e.g. presses	—	—	—	—	—	yes	—	—	—	—	—	—	-
Feedback loop for monitoring of external contactors	yes	yes	yes	yes	yes	yes	yes	yes	—	—	yes	yes	yes
Single channel	yes	yes	yes	yes	yes	—	—	—	—	—	yes	yes	yes
Two channel	—	yes	yes	yes	—	yes	yes	yes	—	—	yes	yes	yes
Cross-short circuit monitoring	—	—	yes	—	yes	—	yes	yes	—	—	—	yes	yes
24VDC at the EMERGENCY STOP limit switch	—	—	yes	—	—	yes	yes	yes	yes	—	yes	yes	yes
Operating voltage at the EMERG. STOP limit switch	yes	yes	—	yes	yes	—	—	—	—	—	—	—	-
No. of safety outputs	4	2	3	3	2	2	2	2	—	4	2 ^④	2	1
No. of time delayed safety output contacts	—	—	—	—	1	—	—	—	—	—	—	—	1
No. of signalling contacts	2	—	2	1	2	2	—	—	—	—	—	— ^⑤	— ^⑤
Enclosure width in mm	75	22.5	45	22.5	45	45	22.5	22.5	45	22.5	22.5	22.5	22.5
Monitoring overtravel e.g. presses	—	—	—	—	—	—	—	—	yes	—	—	—	—
Auto-start	yes	yes	yes	yes	yes	—	yes	—	—	—	yes	yes	yes
Controlled/monitored start	—	—	yes	—	—	—	—	yes	—	—	yes	yes	yes

① Possible with additional external measures.

② Applies only to undelayed contact. Category 3 applies to delayed contact.

③ Contact extension

④ Solid-state outputs requirements of safety in acc. to 954-1 only in combination with positively guided contactors.

⑤ Solid-state outputs could also be used as safe messaging outputs.

Application examples

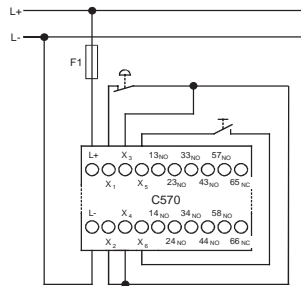
C570, C571, C573

Information

The safety relays are tested by BIA. The shown external wiring diagrams / application examples are examples of use only. A risk appraisal has to be done by the user. Further application examples on request.

C570 Application

The safety relay can be used to monitor EMERGENCY STOP circuits and for monitoring of other protective devices (e.g. safety gates)

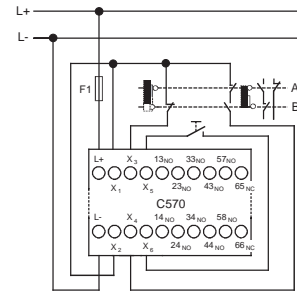


EMERGENCY-STOP circuit

Operation

Operating states indication:

"READY" indicates that the supply voltage is applied to the unit, provided that the contacts of the EMERGENCY STOP pushbutton or door safety switch are closed. "ON" lights up, when the ON button is pressed and the enabling circuits are switched through.



Safety gate monitoring
(A= door open,
B= door closed)

7

C571, C573 Application

Application

The safety relays C 571/C 573 can be used in EMERGENCY STOP circuits as per EN 418 and in safety circuits as per VDE 0113 Part 1 (11.98) and/or EN 60 204-1 (11.98), e.g. with movable covers and guard doors. Depending on the external connections, categories 3 and 4 (with additional external measures) as per DIN EN 954-1 are achievable.

Functions and connection

The safety relay C 573 has three release circuits (safety outputs) which are configured as NO contacts and a signal circuit configured as a NC contact. The safety relay C 571 has two release (safe) circuits which are configured as NO contacts. The number of release circuits can be increased by adding one or more C 579 extension units. Three LEDs indicate the operating state and function. When the EMERGENCY STOP button or the limit switch is unlocked and when the ON button is pressed, the internal circuits of the safety relays and the external contactors are checked for proper functioning. Connect the EMERGENCY STOP pushbutton or the limit switch in the supply cable from A1 to +24 or L24 V. To evaluate over two channels, connect Channel 2 from A2 to 0 V or N. Connect the ON button in series with the NC contacts of the external contactor (feedback loop) between terminals Y1 and Y2.

Terminal markings

Supply voltage	A1	L/+
Sensors	A2	N/-
Outputs	Y1, Y2	ON button, feedback loop
	13, 14	Safety output 1 (n/o)
	23, 24	Safety output 2 (n/o)
	33, 34	Safety output 3 (n/o)*
	41, 42	Signal circuit 1 (n/c)*
		* with C 573 only

Operating states

LEDs	Channel		Operation			
	Channel 1	Channel 2	PS	EMERG. STOP	ON	Safety output
☀	☀	☀	ON	non activated	activated	closed
☀	●	●		activated	non activated	open
☀	●	●		non activated	non activated	open
Faults						
☀	☀	●	Relay fusion-welded			open
☀	●	☀	Motor contactor fusion-welded			
☀	●	●	Defects in electronic			
●	●	●	Cross or ground faults in EMERG. STOP circuit (min. fault current $I_{kmin} = 0.5A$; PTC-fuse trips or supply voltage missing)			

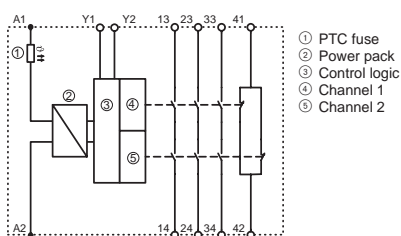
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

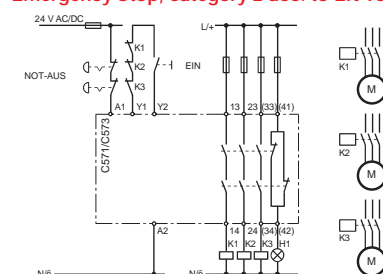
Cable length

for 2 x 1.5mm² max. 1000m (total cable length for 150 nF/km sensors and power supply lines)

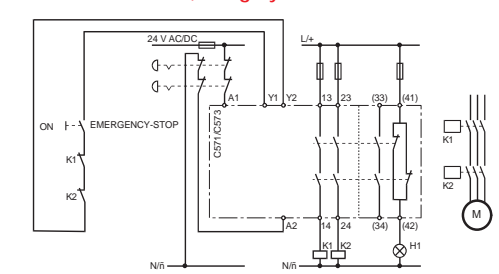
Internal circuit



Emergency Stop, category 2 acc. to EN 954-1

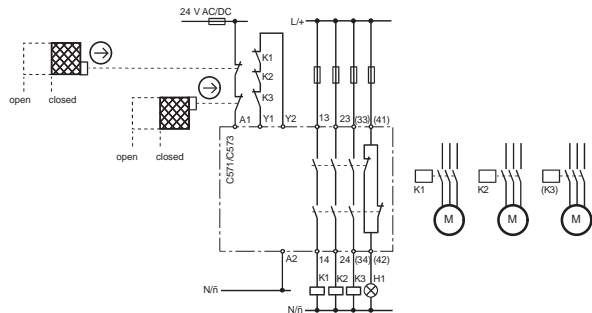


EMERGENCY STOP, category 3 and 4 acc. to EN 954-1

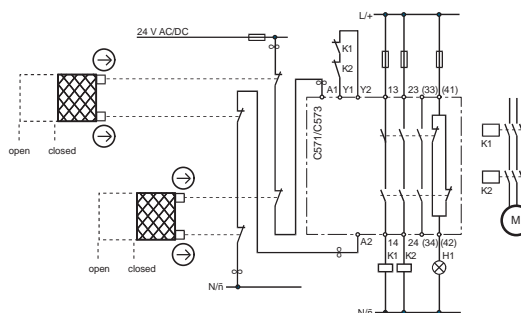


Application examples C571-AC

Safety gate monitoring, category 2 acc. to EN 954-1



Safety gate monitoring, category 3 and 4 acc. to EN 954-1



7 Application

The safety relay C 571-AC can be used in EMERGENCY STOP circuits as per EN 418 and in safety circuits as per VDE 0113 Part 1 (11.98) and/or EN 60 204-1 (12.97), e.g. with movable covers and safety gates. Depending on the external connections, safety categories 3 and 4 as per DIN EN 954-1 are achievable. When the safety combination is used in «automatic start» mode, automatic re-starting (as per EN 60 204-1, sections 9.2.5.4.2 and 10.8.3) must be prevented by the higher-level control system in the event of EMERGENCY STOP.

Functions and connections

The safety relay C 571-AC has two release circuits (safety outputs) which are configured as NO contacts. The number of safety outputs can be increased by adding one or more C 579 extension modules. Three LEDs indicate the operating state and function.

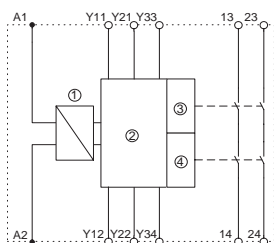
When the EMERGENCY STOP button or the limit switch is unlocked and when the ON button is pressed, the internal circuits of the safety relay and the external contactors are checked for proper functioning.

Connect the EMERGENCY STOP button or the limit switch to terminals Y11, 12 and Y21, 22. The ON button is connected in series with the NC contacts of the external contactor (feedback loop) between terminals Y33, 34.

Terminal marking

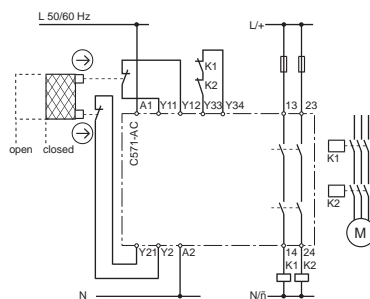
Supply voltage	A1	L
	A2	N
Sensors	Y11, 12	Channel 1 EMERGENCY STOP or limit switch
	Y21, 22	Channel 2 EMERGENCY STOP or limit switch
	Y33, 34	ON button, feedback loop
Outputs	13, 14	Safety output 1 (n/o)
	23, 24	Safety output 2 (n/o)

Internal circuit



- ① Power pole
- ② Control logic
- ③ Channel 1
- ④ Channel 2

Two channel autostart for contactor monitoring; Safety category 3 and 4 acc. to EN 954-1



Operating states

LEDs			Operation			
POWER	Channel 1	Channel 2	PS	E-STOP	ON	Safety output
☀	☀	☀	ON	non activated	activated	closed
☀	●	●		activated	non activated	open
☀	●	●		non activated	non activated	open
Faults						
☀	☀	●	Relay fusion-welded Motor cont.fusion-welded Defects in electronic			open
●	●	●	Cross or ground faults in EMERG. STOP circuit			

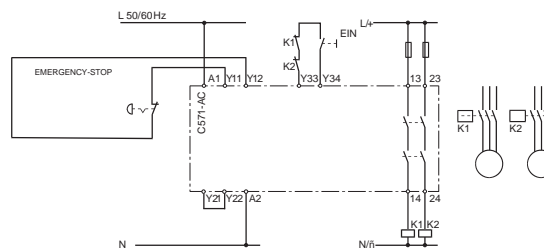
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

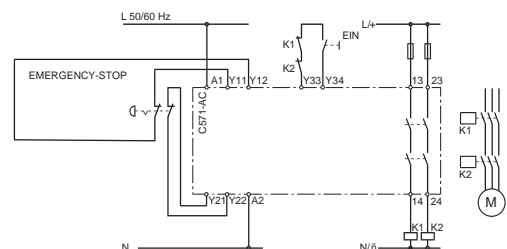
Cable length

for 2 x 1.5mm² max. 1000m (total cable length for 150 nF/km sensors and power supply lines)

Single-channel EMERGENCY STOP with additional ON button Safety category 2 acc. to EN 954-1



Two-channel EMERGENCY STOP with additional ON button Safety category 3 and 4 acc. to EN 954-1



Application examples C572

Application

The safety relay C 572 can be used in EMERGENCY STOP circuits as per EN 418, in safety circuits as per VDE 0113 Part 1 (06.93) and/or EN 60 204-1 (12.97), e.g. with movable covers and safety gates. Depending on the external connection, safety category 4 as per DIN EN 945-1 is achievable with this device.

Functions and connections

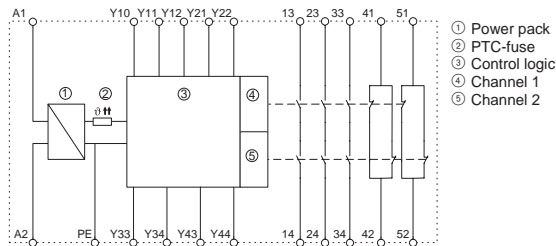
The safety relay C 572 has three release circuits (safety outputs) which are configured as NO contacts and two signal circuits configured as an NC contact. Three LEDs indicate operating state and function. When the EMERGENCY STOP pushbutton or limit pushbutton is unlocked and the ON pushbutton is pressed, the redundant safety relays, electronic circuitry and external contactors are tested for proper functioning. On the C 572, the ON circuit Y33, 34 is checked for short circuit. This means that a fault is detected when Y33,34 is closed before the EMERGENCY STOP button is closed.

Terminal marking

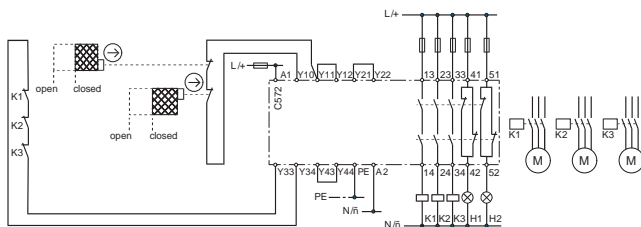
Supply voltage	A1 A2	L/+ N/-
Outputs	13, 14 23, 24 33, 34 41, 42 51, 52	Safety output 1 (n/o) Safety output 2 (n/o) Safety output 3 (n/o) Signal output 1 (n/c) Signal output 2 (n/c)

Function	Monitored start	Monitored start / Autostart	Autostart
1-channel	ON push button at Y33, 34	Jumper from Y11 to Y12 Jumper from Y21 to Y22 EMERGENCY-STOP circuits at Y10, 11	Feedback loop or jumper to Y33, 34 and jumper from
2-channel		Jumper from Y10 to Y11 EMERGENCY-STOP circuits at Y11, 12 and Y21, 22	Y43 auf Y44 Important: Y21, 22 must be closed before or at the same time as Y11, 12

Internal circuit



Autostart for guard door monitoring; Safety category 2 acc. to EN 954-1



Operation states

LEDs			Operation			
POWER	Channel 1	Channel 2	PS	E-STOP	ON	Safety outputs
☀	☀	☀	ON	non activated	activated	closed
☀	●	●		activated	non activated	open
☀	●	●		non activated	non activated	open
Faults						
☀	☀	●	Relay fusion-welded			open
☀	●	☀	Motor cont.fusion-welded			
☀	●	●	Defects in electronic Short circuit in ON circuit			
●	●	●	Cross or ground faults in EMERG. STOP circuit (min. fault current $I_{Kmin} = 0.5A$; PTC-fuse trips or supply voltage missing)			

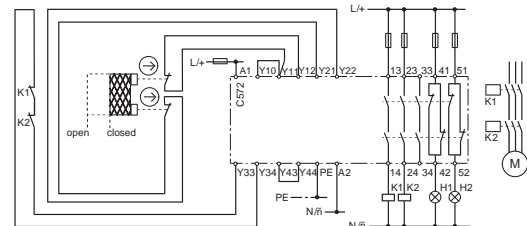
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

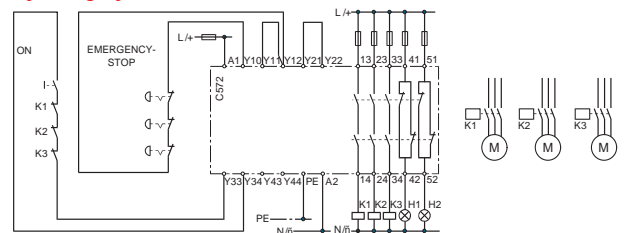
Cable length

for 2 x 1.5mm² max. 1000m (total cable length for 150 nF/km sensors and power supply lines)

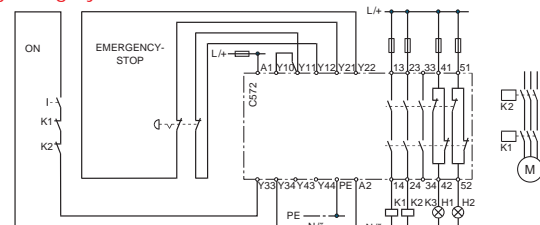
Autostart and safety gate monitoring Safety category 4 acc. to EN 954-1



Monitored start for EMERGENCY STOP Safety category 2 acc. to EN 954-1



Monitored start for EMERGENCY STOP Safety category 3 and 4 acc. to EN 954-1



Application examples C574

Application

The safety relay C 574 can be used in EMERGENCY STOP devices as per EN 418, in safety circuits as per VDE 0113 Part 1 (06.93) and/or EN 60 204-1 (12.97), such as for monitoring safety gates, or in circuits with controlled stand-still requirement (STOP Category 1). Depending on the external circuitry, this device can be used to realize Safety Category 4 instantaneous release circuits and Safety Category 3 delayed release circuits according to DIN EN 954-1.

Functions and connections

The C 574 safety relay possesses two delayed and two instantaneous release circuits (safety outputs) as NO contacts and one instantaneous signal output as NC contact. Five LEDs indicate the operating status and the functions.

The redundant safety relays, the electronics and the operated motor contactors are tested for proper functioning when the EMERGENCY STOP button or the limit switch button is unlatched, and when ON circuit Y33, Y34 is closed.

On the C 574 (monitored start), the ON circuit Y33, 34 is checked for short circuit. This means that a fault is detected when Y33, 34 is closed before the EMERGENCY STOP button is closed.

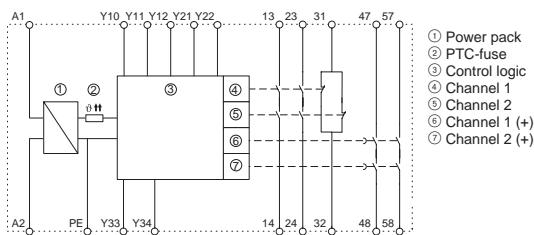
Terminal marking

Supply voltage	A1 A2	L/+ N/-
Output	13, 14 23, 24 31, 32 47, 48 57, 58	Safety output 1, instantaneous Safety output 2, instantaneous Signal output, instantaneous Safety output 1, delayed (t) Safety output 2, delayed (t)

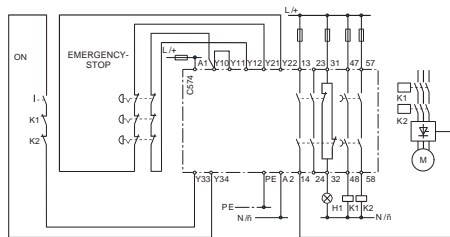
Function Monitored Start

1-channel	ON pushbutton at Y33, 34	Jumper from Y11 to Y12 Jumper from Y21 to Y22 EMERGENCY STOP circuits at Y10, 11
2-channel		Jumper from Y10 to Y11 EMERGENCY STOP circuits at Y11, 12 and Y21, 22

Internal circuit



Monitored start for EMERGENCY STOP Safety category 3 and 4 acc. to EN 954-1



Operation

LEDs					Operation			
POWER	Ch 1	Ch 2	Ch 1	Ch 2	PS	E-STOP	ON	Safety outputs
☀	☀	☀	☀	☀	ON	non activated	activated	closed
☀	●	●	●	●		activated delay time elapsed	non activated	open
☀	●	●	●	●		non activated	non activated	open
☀	●	●	☀	☀		activated delay time elapsed	non activated	FK 1 & 2 open, FK1(t) & FK2(t) closed
					Faults			
☀	☀	●	☀	●		Relay fusion-welded		open
☀	●	☀	●	☀		Motor cont. fusion-welded		
☀	●	●	●	●		Defect in electronic Short circuit in ON circuit		
●	●	●	●	●		Cross or ground faults in emergency trip circuit (min. fault current $I_{kmin} = 0.5A$; PTC fuse trips)		

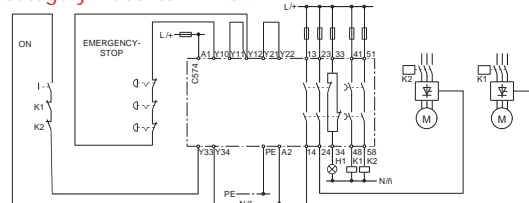
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

Cable length

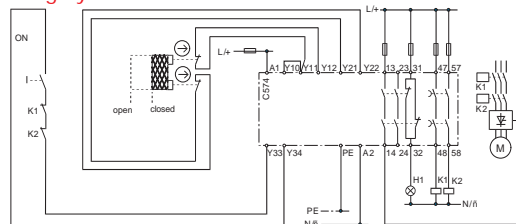
for 2 x 1.5 mm² 150nF/km max. 1000m total cable length for sensors and power supply lines)

Monitored start for EMERGENCY STOP Safety category 2 acc. to EN 954-1



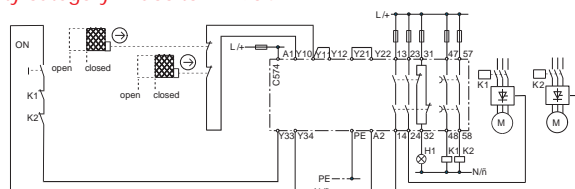
Safety gate monitoring

Safety category 3 and 4 acc. to EN 954-1



Safety gate monitoring

Safety category 2 acc. to EN 954-1



Application examples

C575

Application

C 575 is suitable for installation in controls for presses.

- Hydraulic presses DIN EN 693,
- Eccentric and related presses EN 692,
- Screw presses EN 692.

Functions and connections

The two-hand control unit C 575 possesses two release circuits (safety outputs) configure as NO contacts and two signal outputs configured as NC contacts. Five LEDs indicate the operating status and the functions.

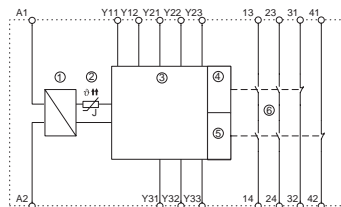
The safety outputs are closed by simultaneous operation (< 0.5s) of the push-buttons S1, S2. If one pushbutton is no longer pressed, the outputs open. They do not close again until both pushbuttons are no longer pressed and then simultaneously pressed again.

1. Operating voltage to be applied to the terminals A1 and A2.
The operating voltage must be de-energized with the operating energy of the press.
2. Feedback loop to be closed:
Y11, Y12 to be jumperd or connected to the NC contacts of external contactors.
3. Input circuits to be connected:
Pushbutton S1 to terminals Y21, Y22, Y23 and
pushbutton S2 to terminals Y31, Y32, Y33.

Terminal marking

Supply voltage	A1	L/+
	A2	N/-
Outputs	13, 14	Safety output 1 (n/o contact)
	23, 24	Safety output 2 (n/o contact)
	31, 32	n/c signal output
	41, 42	n/c signal output
Inputs	Y11, Y12	Feedback loop
	Y21, 22, 23	Pushbutton S1
	Y31, 32, 33	Pushbutton S2

Internal circuit



Operation

LEDs					Operation
POWER	S1 ON	S2 ON	Channel 1	Channel 2	
☀	●	●	●	●	Pushbutton non activated
☀	☀	●	●	●	only S1 activated
☀	●	☀	●	●	only S2 activated
☀	☀	☀	☀	☀	S1 and S2 activated

The unit cannot be started with the following faults:

- Short circuit, e.g. between the pushbuttons
- Defective relay coils
- Conductor failure
- Welded contacts

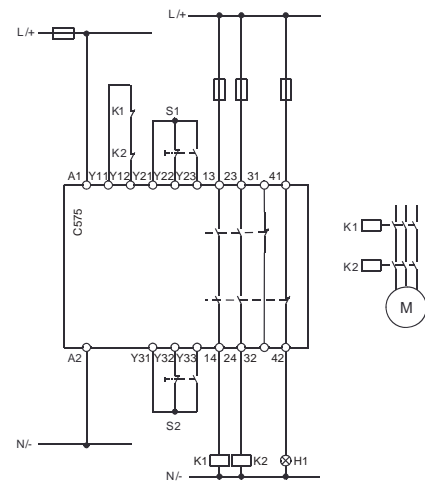
The output relays does not energize if:

- The pushbuttons are not pressed simultaneously (< 0.5s)
- Only one pushbutton is pressed
- The feedback loop Y11, Y12 is open.

Cable length

max. 1000m for 2 x 1.5mm² (Total cable length for sensors and power supply lines)

External circuit S1, S2 pushbuttons on two-hand control console, H1 indicator light, K1 and K2 must be positively guided contactors, Safety category 4 acc.to EN 954-1



Application examples C576, C577

Application

The safety relay C 576 can be used in safety circuits as per VDE 0113 Part 1 (11.98) or EN 60 204-1 (11.98), e.g. with movable covers and safety gates; the safety relay C 577 in EMERGENCY STOP circuits as per EN 418. Depending on external connections, category 4 as per DIN EN 954-1 is achievable.

Functions and connections

The safety relays C 576/C 577 have two release circuits (safety outputs) configured as NO contacts. The number of release circuits can be increased by adding one or more C 579 extension units.

Three LEDs indicate operating state and function.

When the EMERGENCY STOP button or the limit switch is unlocked and when the ON button is pressed, the internal circuit of the safety relay and the external contactors are checked for proper functioning.

On the C 577, the ON circuit Y33, 34 is checked for short circuit.

This means that a fault is detected when Y33, 34 is closed before the EMERGENCY STOP button is closed.

The EMERGENCY STOP button or the limit switch are connected to terminals Y11, 12, 21, 22. The ON button is connected in series to the NC contacts of the external contactors (feedback loop) to terminals Y33, 34.

Terminal marking

Supply voltage	A1 A2	L/+ N/-
Sensors	Y11, 12 Y21, 22	Channel 1 EMERGENCY STOP or limit switch Channel 2 EMERGENCY STOP or limit switch
Outputs	Y33, 34 13, 14 23, 24	ON button, feedback loop Safety output 1 (n/o contact) Safety output 2 (n/o contact)

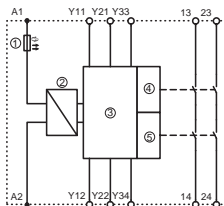
Fault clearance

1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

Cable length

for 2 x 1.5mm² max. 1000m total cable length for
150nF/km sensors and power supply lines)

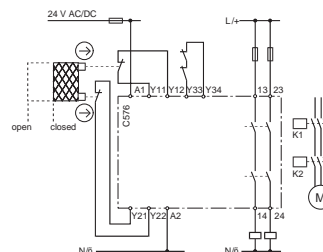
Internal circuit



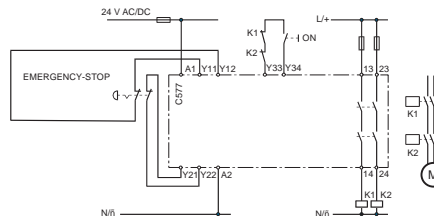
Operation

LEDs			Operation			
POWER	Channel 1	Channel 2	PS	E-Stop	ON	Safety outputs
☀	☀	☀	ON	non activated	activated	closed
☀	●	●		activated	non activated	open
☀	●	●		non activated	non activated	open
Faults						
☀	☀	●	Relay fusion-welded			open
☀	●	☀	Motor cont. fusion-welded			
☀	●	●	Defect in electronic Short circuit in ON circuit			
●	●	●	Cross or ground faults in EMERGENCY STOP circuit (min. fault current I _{Kmin} = 0.5A; PTC fuse trips)			

C 577 with monitored start for EMERGENCY STOP Category 4 acc. to EN 954-1



C 577 with monitored start for EMERGENCY STOP Category 4 acc. to EN 954-1



Application examples

C578

Application

The overtravel distance tester C 578 is intended for checking the overtravel of linearly operating hydraulic, pneumatic and spindle presses in accordance with VBG 7n5.2 §11.

Functions and connections

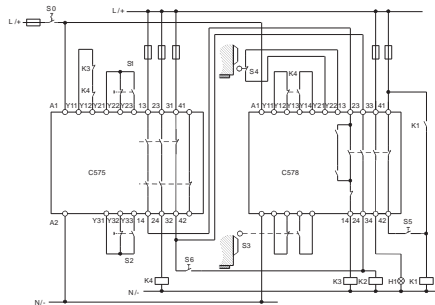
The overtravel distance tester C 578 has four safety outputs, three NO contacts and one NC contact. Two LEDs indicate the functions.

The C 578 tests the overtravel distance in connection with a position switch every time the control voltage is switched on. The permissible overtravel distance corresponds to dimension 's' of the cam that is used to operate the position switch. Obtain dimension 's' from the press manufacturer in accordance with ZH 1/456 (published by the German central office for accident prevention and labour safety, Cologne).

Terminal marking

Supply voltage	A1 A2	L/+ N/-
Outputs	13, 14 23, 24 33, 34 41, 42	Safety output 1 (tool down) n/o contact (tool up) n/o contact (overtravel distance OK) n/c contact (hydraulic pump ON)
Inputs	Y11, 12, 13, 14 Y21, 22 Y31, 32, 33, 34	Feedback loop (K4) Position switch (S4) Top dead centre switch (S3)

External circuit



C 575 two hand control unit,
S0 Main switch,
S1, S2 keys at two hand control console,
S3 Position switch for top dead centre,
S4 Position switch for test cam
S5 Hydraulic pump "ON",
S6 Tool "up" (manual mode),
K1 Contactor for hydr. pump,
K2 Tool "up",
K3, K4 Tool "down",
H1 Indicator light

Operation

Sequence of operations after the press has been switched on:

1. Switch on the hydraulic pump with S5, move plunger to top dead centre, if necessary by means of S6.
2. Operate S1, S2 on the two-hand control console until the position switch for test-cam (S4) opens.
3. Stop operating S1, S2.
4. Operate S1, S2 again: Indicator light H1 lights up if the overtravel distance is OK.
5. Stop operating S1, S2: The plunger returns to top dead centre.
6. If overtravel distance is OK, all outputs remain active until the control voltage is switched OFF.

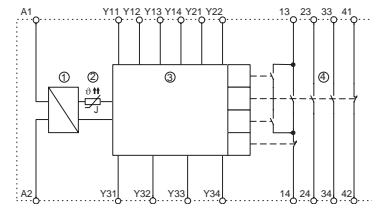
LEDs		Operation
POWER	Release	
		Overtravel distance OK.
		Overtravel distance incorrect or test not yet performed

Fault

If the cam overtravels position switch S4, indicator light H1 does not light up. The hazardous part of the machine can be moved up to top dead centre only by means of S6.

The press can no longer be used for production. When this happens, notify the maintenance staff that the press needs attention.

Internal circuit



Application examples C579

Applications

You can use the C 579 expansion unit in combination with all the C 57x basic units. It extends the number of release circuits. Depending on the external connection, category 4 as per DIN EN 954-1 is achievable with this device.

Functions and connections

The C 579 expansion unit has four release circuits (safety circuits) configured as NO circuits.

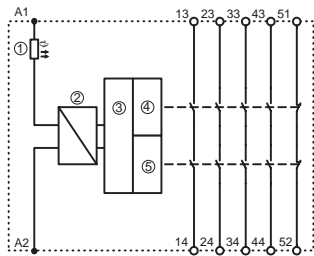
Two LEDs indicate operating state and function. The device is controlled via any release circuit of the safety relays C 57x.

When the EMERGENCY STOP pushbutton or the limit switch is unlocked and the ON button is pressed, the internal circuit of the safety relay and the external contactors are checked for correct functioning.

7 Terminal marking

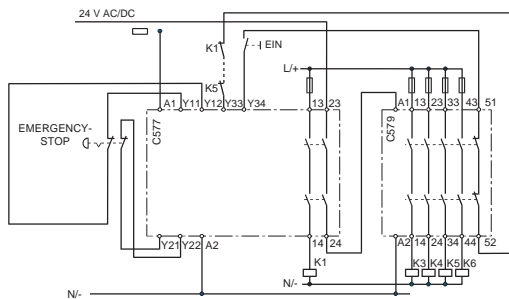
Supply voltage	A1 A2	L/+ N/-
Outputs	13, 14 23, 24 33, 34 43, 44	Safety output 1 (n/o contact) Safety output 2 (n/o contact) Safety output 3 (n/o contact) Safety output 4 (n/o contact)
Feedback loop	51, 52	Monitoring of the extension unit

Internal circuit



EMERGENCY STOP

Safety category 4 acc. to EN 954-1



Operation

LEDs		Operation	
Channel 1	Channel 2	PS	Safety output of C 57x safety relays
		ON	closed
			open
		Faults	
		Relay fusion-welded	
		Defect in electronics	
		Motor contactor fusion welded	

Fault clearance

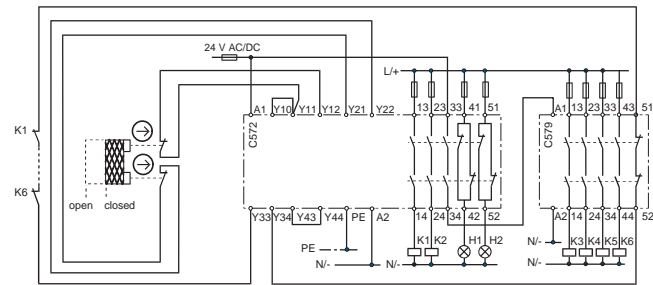
1. Switch supply voltage off.
2. Clear fault or replace device.
3. Switch supply voltage back on.

Cable length

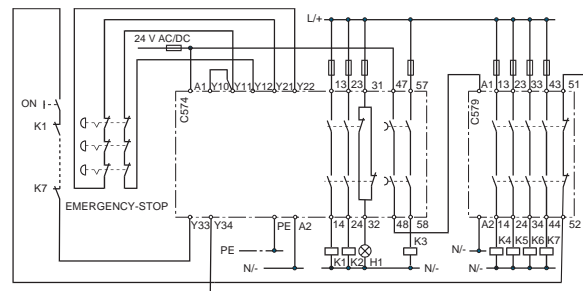
For 2 x 1.5mm² max. 1000m total cable length for 150nF/km sensors and power supply lines.

Safety gate monitoring

Safety category 4 acc. to EN 954-1

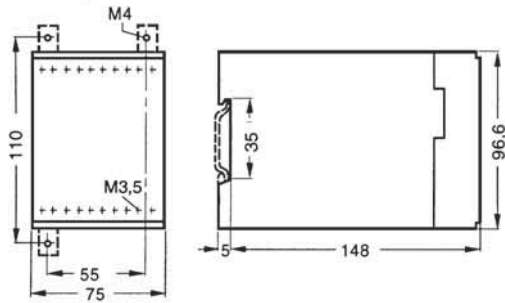


EMERGENCY STOP with time delay

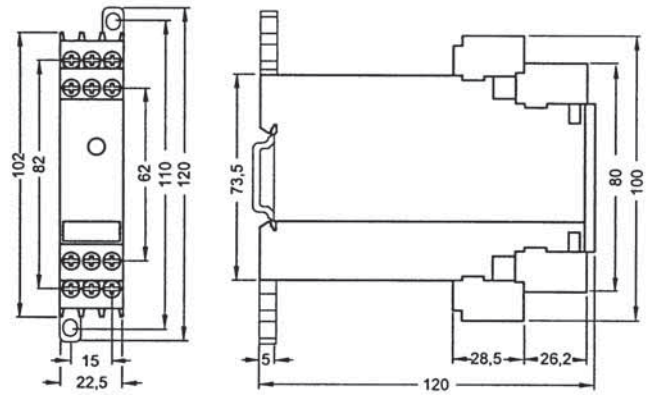


Approximate dimensions

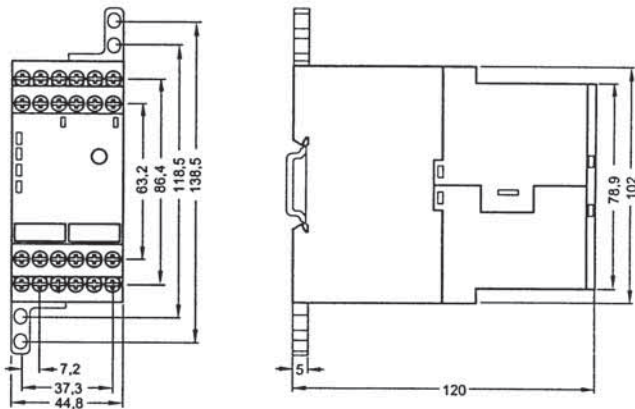
C570



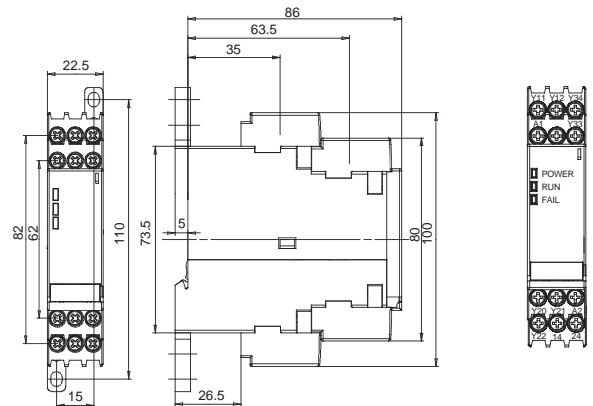
C571, C573, C576, C577, C579



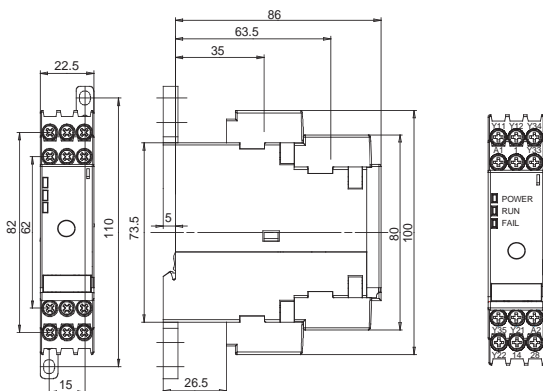
C572, C574, C575, C578



C6700 / C6701 / C6702



C565-S



Modular	8.1 - 8.30
22mm Hole plug	8.27
30mm Adaptors.....	8.26
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Modular range Pilot devices



Modular range



8

General construction

- Snap-on feature reduces installation time
- Bezels: Black plastic, chrome metal. Grey plastic available as an option
- Contact block holder features rear mounting with quick-release locking mechanism for high security
- Buttons available in several colors
- Engraved text caps available
- Custom-specific markings on request
- UL File# E57057
- CSA File# LR19700

Operators

- Pushbuttons, illuminated and non-illuminated
- Double pushbuttons, illuminated and non-illuminated
- Mushroom pushbuttons, illuminated and non-illuminated, Ø 40 mm and Ø 60 mm
- Emergency stop pushbuttons, illuminated and non-illuminated, twist or pull release
- Selector switches, illuminated and non-illuminated, 2 or 3 position, short or long handle
- Key operated selector switches, 2 or 3 position
- Toggle switches, 2 or 3 position

Pilot lights

- Full voltage, resistor and transformer
- LED & filament bulbs available for illuminated pushbuttons and pilot lights

Contact blocks

- Quick-mount, quick-release contact block holder for fast and easy assembly
- NO & NC contact blocks are color coded for easy identification: Green = NO, Red = NC
- Silver tipped contacts
- Wiping action for high reliability
- Low energy gold plated contact blocks
- Base mounted contact blocks which snap onto a 35 mm DIN rail or into a plastic enclosure
- Contact block holder for three or five blocks in a single row

Additional products

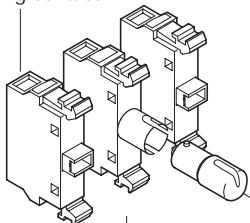
- Buzzer, continuous and pulsating
- 5 k Ω and 10 k Ω potentiometers
- Definite purpose pushbuttons
- Reset pushbuttons
- Broad range of accessories

General information Mounting

Exploded view

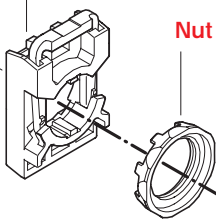
Contact block

Single pole with making or breaking contact



Holder

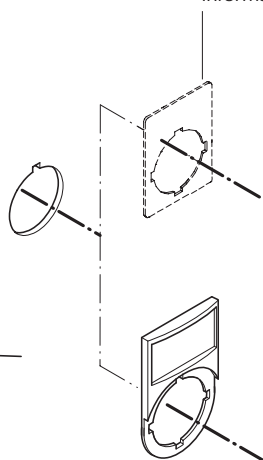
Available either for three or five blocks in one single row. Additional blocks can be stacked on holders for three blocks.



Nut

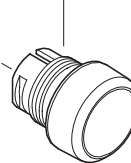
Legend plates

Of aluminum with slots that guide the legend plate and the operator into the correct position. Please, see the chapter 'legend plates' for more information.



Operator

Buttons, lenses and handles in several colors. Illuminated or non-illuminated.



Legend plate holder

Of black plastic. Insert of brushed aluminum. Please, see the chapter 'legend plates' for more information.

Bezels

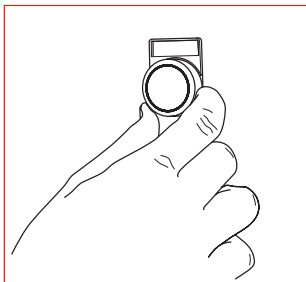
Pushbuttons, selector switches and toggle switches with bezel in black plastic, chrome metal are available.

Lamp block

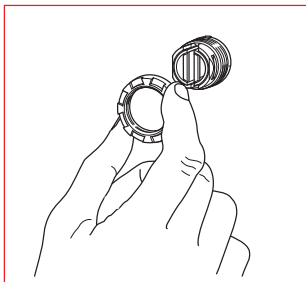
Illuminated pushbuttons, illuminated selector switches and pilot lights have a lamp block in the center position of the holder.

8

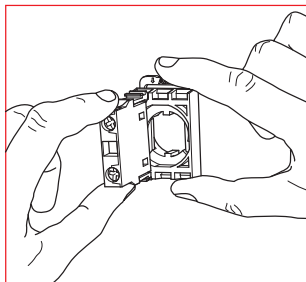
Easy to mount



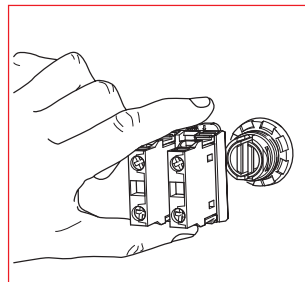
The operator is to be inserted from the front.....



...and secured at the back with a nut.

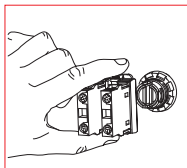
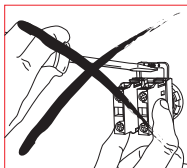


The contact blocks/lamp block are then snapped on to the holder...



...and the holder snaps on to the operator.

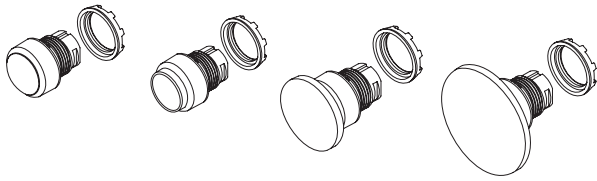
...and to remove



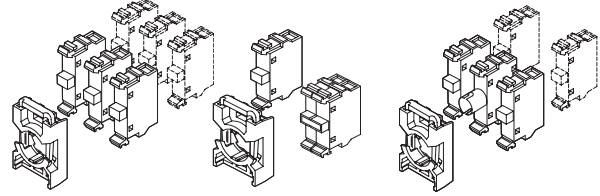
Press down the spring on the holder and pull the holder from the actuator.

Selection Guide

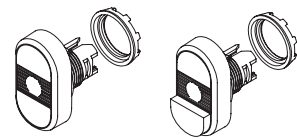
Pushbuttons and Mushroom pushbuttons



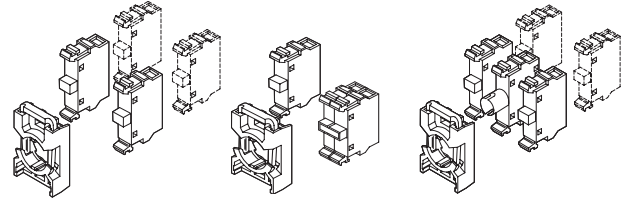
Contact block/lamp block combinations



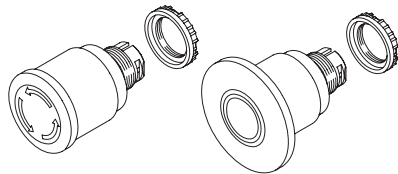
Double pushbuttons



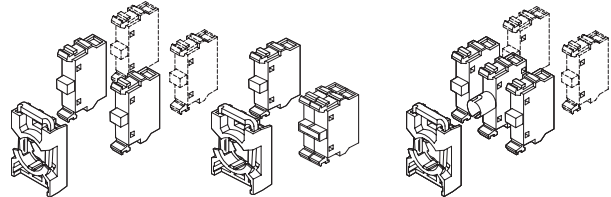
Contact block/lamp block combinations



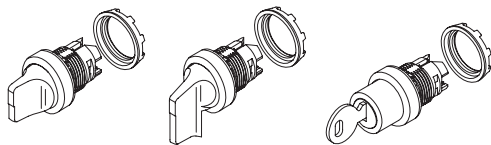
Emergency stop pushbuttons



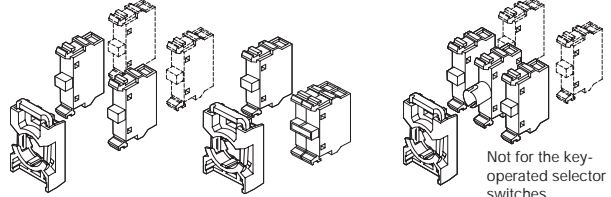
Contact block/lamp block combinations



Selector switches

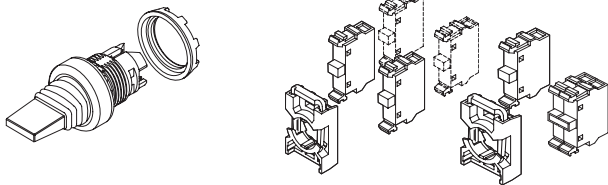


Contact block/lamp block combinations

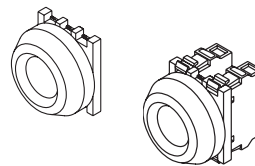


Toggle switches

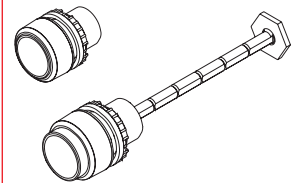
Contact block combinations



Definite purpose push-buttons

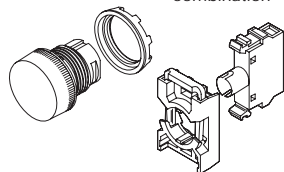


Reset pushbuttons



Pilot lights

Lamp block combination



Buzzers



Potentiometers

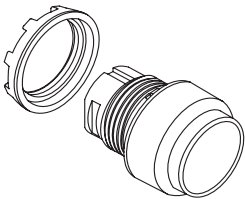
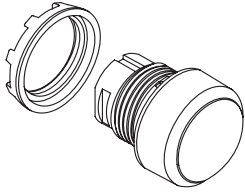


Flush and extended pushbuttons

Non-illuminated

Momentary and maintained

8



Bezel in black plastic as standard

Bezel in metal:

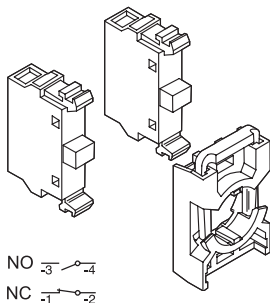
Replace '1' in the:

Cat No. MPX-1 0X

Ref Code 1SFA 611XXX R 1XXX

3 for metal bezel

4 for grey plastic



Operator ...

Description	Catalog No.	Ref. Code	List Price
with flush button			
Momentary			
Red	MP1-10R	1SFA 611 100 R1001	\$ 6.10
Green	MP1-10G	1SFA 611 100 R1002	
Yellow	MP1-10Y	1SFA 611 100 R1003	
Blue	MP1-10L	1SFA 611 100 R1004	
White	MP1-10W	1SFA 611 100 R1005	
Black	MP1-10B	1SFA 611 100 R1006	
Clear	MP1-10C	1SFA 611 100 R1008	
Maintained ①			
Red	MP2-10R	1SFA 611 101 R1001	17.30
Green	MP2-10G	1SFA 611 101 R1002	
Yellow	MP2-10Y	1SFA 611 101 R1003	
Blue	MP2-10L	1SFA 611 101 R1004	
White	MP2-10W	1SFA 611 101 R1005	
Black	MP2-10B	1SFA 611 101 R1006	
Clear	MP2-10C	1SFA 611 101 R1008	
with extended button			
Momentary			
Red	MP3-10R	1SFA 611 102 R1001	6.10
Green	MP3-10G	1SFA 611 102 R1002	
Yellow	MP3-10Y	1SFA 611 102 R1003	
Blue	MP3-10L	1SFA 611 102 R1004	
White	MP3-10W	1SFA 611 102 R1005	
Black	MP3-10B	1SFA 611 102 R1006	
Clear	MP3-10C	1SFA 611 102 R1008	
Maintained ①			
Red	MP4-10R	1SFA 611 103 R1001	17.30
Green	MP4-10G	1SFA 611 103 R1002	
Yellow	MP4-10Y	1SFA 611 103 R1003	
Blue	MP4-10L	1SFA 611 103 R1004	
White	MP4-10W	1SFA 611 103 R1005	
Black	MP4-10B	1SFA 611 103 R1006	
Clear	MP4-10C	1SFA 611 103 R1008	

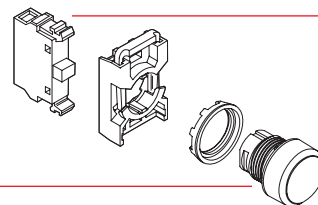
Contact blocks, and holder

Blocks	Catalog No.	Ref. Code	List Price
1 NO with holder	MCBH-10	1SFA 611 605 R1101	\$ 10.00
1 NC with holder	MCBH-01	1SFA 611 605 R1110	10.00
2 NO with holder	MCBH-20	1SFA 611 605 R1102	18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	18.00
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	18.00
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

Ordering example

Requested: A modular pushbutton, momentary, with red flush button and one NO contact.

Ref.: 1 piece of MP1-10R + 1 piece of MCBH-10



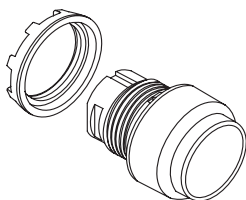
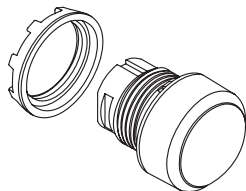
① No contact block in the center position

Flush and extended pushbuttons

Illuminated

Momentary and maintained

Bulb max 1.2 W



Bezel in black plastic as standard

Bezel in metal:

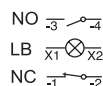
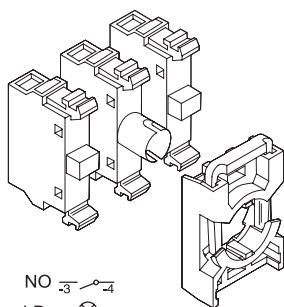
Replace '1' in the:

Catalog No. MPX-1 0X

Ref. Code 1SFA611XXX R 1XXX

3 for metal bezel

4 for grey plastic bezel



Operator ...

Description	Catalog No.	Ref. Code	List Price
with flush button			
Momentary ①			
Red	MP1-11R	1SFA 611 100 R1101	\$ 6.10
Green	MP1-11G	1SFA 611 100 R1102	
Yellow	MP1-11Y	1SFA 611 100 R1103	
Blue	MP1-11L	1SFA 611 100 R1104	
White	MP1-11W	1SFA 611 100 R1105	
Clear	MP1-11C	1SFA 611 100 R1108	
Maintained ①③			
Red	MP2-11R	1SFA 611 101 R1101	17.30
Green	MP2-11G	1SFA 611 101 R1102	
Yellow	MP2-11Y	1SFA 611 101 R1103	
Blue	MP2-11L	1SFA 611 101 R1104	
White	MP2-11W	1SFA 611 101 R1105	
Clear	MP2-11C	1SFA 611 101 R1108	
with extended button			
Momentary ①			
Red	MP3-11R	1SFA 611 102 R1101	6.10
Green	MP3-11G	1SFA 611 102 R1102	
Yellow	MP3-11Y	1SFA 611 102 R1103	
Blue	MP3-11L	1SFA 611 102 R1104	
White	MP3-11W	1SFA 611 102 R1105	
Clear	MP3-11C	1SFA 611 102 R1108	
Maintained ①③			
Red	MP4-11R	1SFA 611 103 R1101	17.30
Green	MP4-11G	1SFA 611 103 R1102	
Yellow	MP4-11Y	1SFA 611 103 R1003	
Blue	MP4-11L	1SFA 611 103 R1004	
White	MP4-11W	1SFA 611 103 R1005	
Clear	MP4-11C	1SFA 611 103 R1108	

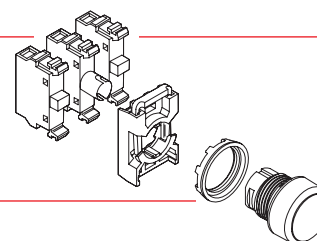
Contact blocks, lamp block and holder ②

Blocks	Catalog No.	Ref. Code	List Price
1 NO + 1 LB with holder	MCBH-101	1SFA 611 605 R1201	\$ 27.50
1 NC + 1 LB with holder	MCBH-011	1SFA 611 605 R1210	27.50
2 NO + 1 LB with holder	MCBH-201	1SFA 611 605 R1202	35.50
2 NC + 1 LB with holder	MCBH-021	1SFA 611 605 R1220	35.50
1 NO + 1 NC + 1 LB with holder	MCBH-111	1SFA 611 605 R1211	35.50
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Lamp block for 2 W, max 230 V AC/DC bulb or LED	MLB-1	1SFA 611 620 R1001	17.50
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

Ordering example

Requested: A modular pushbutton, maintained and illuminated with green flush button and one NO + one NC contact.

Ref.: 1 piece of MP2-11G + 1 piece of MCBH-111
Bulb - see accessories



- ① No contact block in the center position
- ② Lamp block MLB-1. Bulb not included. For other lamp blocks see Accessories.
- ③ Bulb max 1.2 W, not included.

Double pushbuttons Non-illuminated

Operator ...

Upper button		Lower button		Catalog No.	Ref. Code	List Price
Color	Text	Color	Text			
with flush buttons ①						
Green	No text	Red	No text	MPD1-11B	1SFA 611 130 R1106	\$ 18.00
	I		O	MPD2-11B	1SFA 611 131 R1106	21.00
	ON		OFF	MPD3-11B	1SFA 611 132 R1106	21.00
	START		STOP	MPD4-11B	1SFA 611 133 R1106	21.00
White	No text	Black	No text	MPD5-11B	1SFA 611 134 R1106	18.00
	I		O	MPD6-11B	1SFA 611 135 R1106	21.00
	ON		OFF	MPD7-11B	1SFA 611 136 R1106	21.00
	START		STOP	MPD8-11B	1SFA 611 137 R1106	21.00
with extended lower button ①						
Green	No text	Red	No text	MPD12-11B	1SFA 611 141 R1106	18.00
	I		O	MPD13-11B	1SFA 611 142 R1106	21.00
	ON		OFF	MPD14-11B	1SFA 611 143 R1106	21.00
	START		STOP	MPD15-11B	1SFA 611 144 R1106	21.00
White	No text	Black	No text	MPD16-11B	1SFA 611 145 R1106	18.00
	I		O	MPD17-11B	1SFA 611 146 R1106	21.00
	ON		OFF	MPD18-11B	1SFA 611 147 R1106	21.00
	START		STOP	MPD19-11B	1SFA 611 148 R1106	21.00

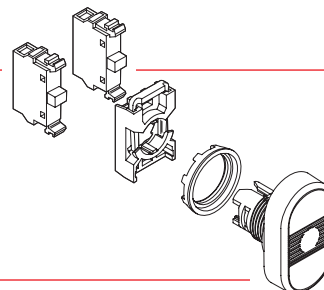
Contact blocks, and holder

Blocks	Catalog No.	Ref. Code	List Price
2 NO with holder	MCBH-20	1SFA 611 605 R1102	\$ 18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

Ordering example – Double pushbutton

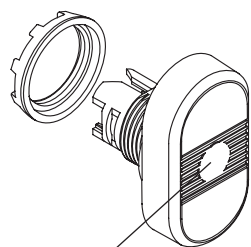
Requested: A non-illuminated double pushbutton, Green/Red, No text, with 2 NO blocks

Ref.: 1 piece of MPD1-11B + 1 piece of MCBH-20

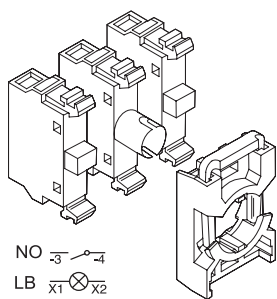


① No contact block in the center position.

Double pushbuttons Illuminated



Lens colors:
Red
Green
Yellow
Clear



Operator ...

Upper button		Lower button		Catalog No.	Ref. Code	List Price
Color	Text	Color	Text			
with flush buttons ①						
Red lens						
Green	No text	Red	No text	MPD1-11R	1SFA 611 130 R1101	\$ 26.00
	I		O	MPD2-11R	1SFA 611 131 R1101	29.00
	ON		OFF	MPD3-11R	1SFA 611 132 R1101	29.00
	START		STOP	MPD4-11R	1SFA 611 133 R1101	29.00
White	No text	Black	No text	MPD5-11R	1SFA 611 134 R1101	26.00
	I		O	MPD6-11R	1SFA 611 135 R1101	29.00
	ON		OFF	MPD7-11R	1SFA 611 136 R1101	29.00
	START		STOP	MPD8-11R	1SFA 611 137 R1101	29.00
Green lens						
Green	No text	Red	No text	MPD1-11G	1SFA 611 130 R1102	26.00
	I		O	MPD2-11G	1SFA 611 131 R1102	29.00
	ON		OFF	MPD3-11G	1SFA 611 132 R1102	29.00
	START		STOP	MPD4-11G	1SFA 611 133 R1102	29.00
White	No text	Black	No text	MPD5-11G	1SFA 611 134 R1102	26.00
	I		O	MPD6-11G	1SFA 611 135 R1102	29.00
	ON		OFF	MPD7-11G	1SFA 611 136 R1102	29.00
	START		STOP	MPD8-11G	1SFA 611 137 R1102	29.00
Yellow lens						
Green	No text	Red	No text	MPD1-11Y	1SFA 611 130 R1103	26.00
	I		O	MPD2-11Y	1SFA 611 131 R1103	29.00
	ON		OFF	MPD3-11Y	1SFA 611 132 R1103	29.00
	START		STOP	MPD4-11Y	1SFA 611 133 R1103	29.00
White	No text	Black	No text	MPD5-11Y	1SFA 611 134 R1103	26.00
	I		O	MPD6-11Y	1SFA 611 135 R1103	29.00
	ON		OFF	MPD7-11Y	1SFA 611 136 R1103	29.00
	START		STOP	MPD8-11Y	1SFA 611 137 R1103	29.00
Clear lens						
Green	No text	Red	No text	MPD1-11C	1SFA 611 130 R1108	26.00
	I		O	MPD2-11C	1SFA 611 131 R1108	29.00
	ON		OFF	MPD3-11C	1SFA 611 132 R1108	29.00
	START		STOP	MPD4-11C	1SFA 611 133 R1108	29.00
White	No text	Black	No text	MPD5-11C	1SFA 611 134 R1108	26.00
	I		O	MPD6-11C	1SFA 611 135 R1108	29.00
	ON		OFF	MPD7-11C	1SFA 611 136 R1108	29.00
	START		STOP	MPD8-11C	1SFA 611 137 R1108	29.00

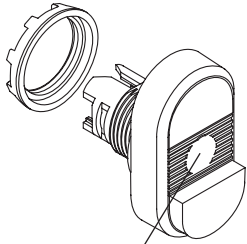
Contact blocks, lamp block and holder ②

Blocks	Catalog No.	Ref. Code	List Price
2 NO + 1 LB with holder	MCBH-201	1SFA 611 605 R1202	\$ 35.50
2 NC + 1 LB with holder	MCBH-021	1SFA 611 605 R1220	
1 NO + 1 NC + 1 LB with holder	MCBH-111	1SFA 611 605 R1211	
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Lamp block for 2 W, max 230 V AC/DC bulb or LED	MLB-1	1SFA 611 620 R1001	17.50
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

① No contact block in the center position.

② Lamp block MLB-1. Bulb not included. For other lamp blocks see Accessories, bulb max 1.2 W.

Double pushbuttons Illuminated

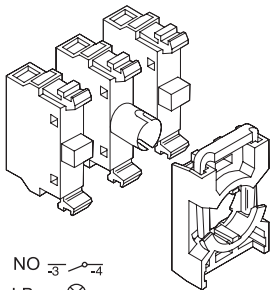


Lens colors:
Red
Green
Yellow
Clear

8

Operator ...

Upper button		Lower button		Catalog No.	Ref. Code	List Price
Color	Text	Color	Text			
with extended lower button ①						
Red lens						
Green	No text	Red	No text	MPD12-11R	1SFA 611 141 R1101	\$ 26.00
	I		O	MPD13-11R	1SFA 611 142 R1101	29.00
	ON		OFF	MPD14-11R	1SFA 611 143 R1101	29.00
	START		STOP	MPD15-11R	1SFA 611 144 R1101	29.00
White	No text	Black	No text	MPD16-11R	1SFA 611 145 R1101	26.00
	I		O	MPD17-11R	1SFA 611 146 R1101	29.00
	ON		OFF	MPD18-11R	1SFA 611 147 R1101	29.00
	START		STOP	MPD19-11R	1SFA 611 148 R1101	29.00
Green lens						
Green	No text	Red	No text	MPD12-11G	1SFA 611 141 R1102	26.00
	I		O	MPD13-11G	1SFA 611 142 R1102	29.00
	ON		OFF	MPD14-11G	1SFA 611 143 R1102	29.00
	START		STOP	MPD15-11G	1SFA 611 144 R1102	29.00
White	No text	Black	No text	MPD16-11G	1SFA 611 145 R1102	26.00
	I		O	MPD17-11G	1SFA 611 146 R1102	29.00
	ON		OFF	MPD18-11G	1SFA 611 147 R1102	29.00
	START		STOP	MPD19-11G	1SFA 611 148 R1102	29.00
Yellow lens						
Green	No text	Red	No text	MPD12-11Y	1SFA 611 141 R1103	26.00
	I		O	MPD13-11Y	1SFA 611 142 R1103	29.00
	ON		OFF	MPD14-11Y	1SFA 611 143 R1103	29.00
	START		STOP	MPD15-11Y	1SFA 611 144 R1103	29.00
White	No text	Black	No text	MPD16-11Y	1SFA 611 145 R1103	26.00
	I		O	MPD17-11Y	1SFA 611 146 R1103	29.00
	ON		OFF	MPD18-11Y	1SFA 611 147 R1103	29.00
	START		STOP	MPD19-11Y	1SFA 611 148 R1103	29.00
Clear lens						
Green	No text	Red	No text	MPD12-11C	1SFA 611 141 R1108	26.00
	I		O	MPD13-11C	1SFA 611 142 R1108	29.00
	ON		OFF	MPD14-11C	1SFA 611 143 R1108	29.00
	START		STOP	MPD15-11C	1SFA 611 144 R1108	29.00
White	No text	Black	No text	MPD16-11C	1SFA 611 145 R1108	26.00
	I		O	MPD17-11C	1SFA 611 146 R1108	29.00
	ON		OFF	MPD18-11C	1SFA 611 147 R1108	29.00
	START		STOP	MPD19-11C	1SFA 611 148 R1108	29.00



NO $\overline{3}$ \rightarrow $\overline{4}$
 LB $\overline{x1}$ \otimes $\overline{x2}$
 NC $\overline{1}$ \rightarrow $\overline{2}$

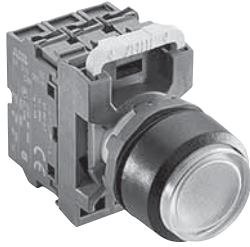
Contact blocks, lamp block and holder ②

Blocks	Catalog No.	Ref. Code	List Price
2 NO + 1 LB with holder	MCBH-201	1SFA 611 605 R1202	\$ 35.50
2 NC + 1 LB with holder	MCBH-021	1SFA 611 605 R1220	35.50
1 NO + 1 NC + 1 LB with holder	MCBH-111	1SFA 611 605 R1211	35.50
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Lamp block for 2 W, max 230 V AC/DC bulb or LED	MLB-1	1SFA 611 620 R1001	17.50
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

① No contact block in the center position

② Lamp block MLB-1. Bulb not included. Other lamp block see Accessories, bulb max 1.2 W.

Press-to-test pushbuttons Illuminated



MP1-MLFPT1C

Press-to-test

Type	Black plastic ring	Chrome metal ring	
	Catalog number	Catalog number	List price
Operator only ① Full voltage type 6V 12V 24V 48V 120V	MP1-KLPT★	MP1-MLPT★	\$ 22.50
	MP1-KLFPT6★ MP1-KLFPT7★ MP1-KLFPT8★ MP1-KLFPT9★ MP1-KLFPT1★	MP1-MLFPT6★ MP1-MLFPT7★ MP1-MLFPT8★ MP1-MLFPT9★ MP1-MLFPT1★	46.00
Resistor type 120V 240V	MP1-KLRPT1★ MP1-KLRPT2★	MP1-MLRPT1★ MP1-MLRPT2★	54.00
Transformer type 120V/6V 240V/6V 380V/6V 480V/6V	MP1-KLTPT1★ MP1-KLTPT2★ MP1-KLTPT3★ MP1-KLTPT4★	MP1-MLTPT1★ MP1-MLTPT2★ MP1-MLTPT3★ MP1-MLTPT4★	80.00
120V/24V 240V/24V 380V/24V 480V/24V	MP1-KLTPT5★ MP1-KLTPT6★ MP1-KLTPT7★ MP1-KLTPT8★	MP1-MLTPT5★ MP1-MLTPT6★ MP1-MLTPT7★ MP1-MLTPT8★	80.00

★ Select the lens color from the “Illuminated buttons & lenses” selection chart and substitute the suffix code for the ★. The lens and bulb are included in the price.

Press-to-test (LED bulb) ②

Type	Black plastic ring	Chrome metal ring	
	Catalog number	Catalog number	List price
Full voltage type 24V 120V 230V	MP1-KLFPTL8★ MP1-KLFPTL1★	MP1-MLFPTL8★ MP1-MLFPTL1★ MP1-MLFPTL2★	\$ 55.00 55.00 61.00
Transformer type 120V/24V 240V/24V 380V/24V 480V/24V	MP1-KLFPTL2★ MP1-KLTPTL2★ MP1-KLTPTL3★ MP1-KLTPTL4★	MP1-MLTPTL1★ MP1-MLTPTL2★ MP1-MLTPTL3★ MP1-MLTPTL4★	80.00

★ Select the lens color from the “Illuminated buttons & lenses” selection chart and substitute the suffix code for the ★. The lens and bulb are included in the price.

Press-to-test (neon bulb) ③

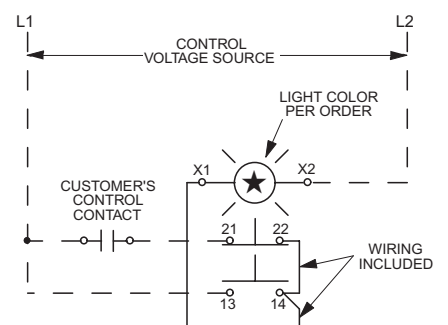
Type	Black plastic ring	Chrome metal ring	
	Catalog number	Catalog number	List price
Full voltage type 220VAC	MP1-KLTPN2★	MP1-MLTPN2★	\$ 46.00

★ Illuminated buttons

Button color	Suffix code
Red	R
Green	G
Yellow	Y
Blue	L
Clear	C
White	W

NOTE: White LEDs use clear lenses.

Schematic

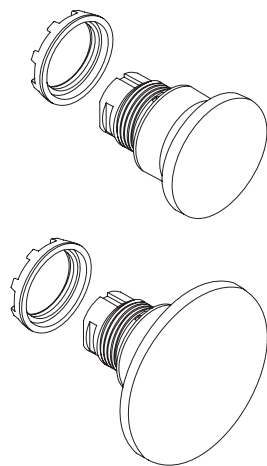


Press- to-test schematic

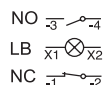
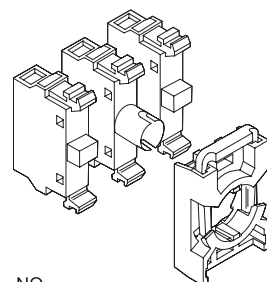
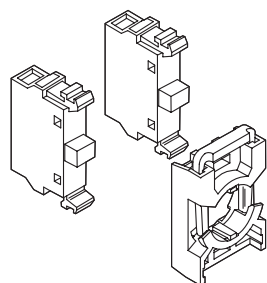
- ① 1 N.O. & 1 N.C. contact supplied; lamp module and bulb must be ordered separately.
- ② For blue or white LEDs, add \$ 3 to the list price.
- ③ Use with red, yellow and clear lenses only. For 120VAC, consult factory.

Mushroom pushbuttons Non-illuminated and illuminated Momentary

8



Bezel in black plastic as standard
Bezel in metal:
Replace '1' in the:
Catalog No. MPMX-1 0X
Ref. Code 1SFA611XXX R 1XXX
3 for metal bezel
4 for grey plastic bezel



Operator ...

Operator material	Button color	Catalog No.	Ref. Code	List Price
non-illuminated				
Ø 40 mm				
Plastic	Red	MPM1-10R	1SFA 611 124 R1001	\$ 16.00
	Yellow	MPM1-10Y	1SFA 611 124 R1003	16.00
	Black	MPM1-10B	1SFA 611 124 R1006	16.00
Ø 60 mm				
Plastic	Red	MPM2-10R	1SFA 611 125 R1001	20.00
	Yellow	MPM2-10Y	1SFA 611 125 R1003	20.00
	Black	MPM2-10B	1SFA 611 125 R1006	20.00
illuminated ①				
Ø 40 mm				
Plastic	Red	MPM1-11R	1SFA 611 124 R1101	16.00
	Yellow	MPM1-11Y	1SFA 611 124 R1103	16.00
Ø 60 mm				
Plastic	Red	MPM2-11R	1SFA 611 125 R1101	20.00
	Yellow	MPM2-11Y	1SFA 611 125 R1103	20.00

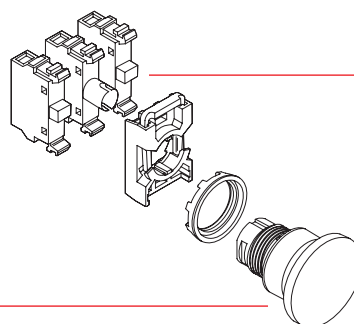
Contact blocks, lamp block and holder ②

Blocks	Catalog No.	Ref. Code	List Price
1 NO with holder	MCBH-10	1SFA 611 605 R1101	\$ 10.00
1 NC with holder	MCBH-01	1SFA 611 605 R1110	10.00
2 NO with holder	MCBH-20	1SFA 611 605 R1102	18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	18.00
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	18.00
1 NO + 1 LB with holder	MCBH-101	1SFA 611 605 R1201	27.50
1 NC + 1 LB with holder	MCBH-011	1SFA 611 605 R1210	27.50
2 NO + 1 LB with holder ①	MCBH-201	1SFA 611 605 R1202	35.50
2 NC + 1 LB with holder	MCBH-021	1SFA 611 605 R1220	35.50
1 NO + 1 NC + 1 LB with holder	MCBH-111	1SFA 611 605 R1211	35.50
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Lamp block for 2 W, max 230 V AC/DC bulb or LED	MLB-1	1SFA 611 620 R1001	17.50
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

Ordering example – Mushroom Pushbutton

Requested: A modular mushroom pushbutton, Ø 40 mm, illuminated, red, with one NO + one NC contact and a standard lamp block

Ref.: 1 piece of MPM1-11R + 1 piece of MCBH-111
Bulb - see accessories

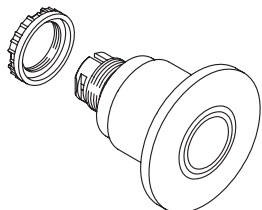
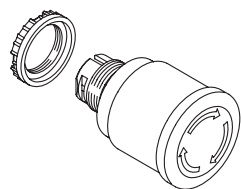


① No contact block in the center position

② Lamp block MLB-1. Bulb not included. Other lamp block see Accessories, bulb max 1.2 W.

Emergency stop pushbuttons Non-illuminated and illuminated

Fulfills IEC 60947-5-5



Operator ...

Operator function	Button color and material	Catalog No.	Ref. Code	List Price
non-illuminated				
Ø 40 mm				
Twist release	Red, plastic	MPMT3-10R	1SFA 611 510 R1001	\$ 34.00
Pull release	Red, plastic	MPMP3-10R	1SFA 611 511 R1001	
Ø 60 mm				
Twist release	Red, plastic	MPMT4-10R	1SFA 611 513 R1001	46.00
Pull release	Red, plastic	MPMP4-10R	1SFA 611 514 R1001	
illuminated ①				
Ø 40 mm				
Twist release	Red, plastic	MPMT3-11R	1SFA 611 510 R1101	34.00
Pull release	Red, plastic	MPMP3-11R	1SFA 611 511 R1101	
Ø 60 mm				
Twist release	Red, plastic	MPMT4-11R	1SFA 611 513 R1101	46.00
Pull release	Red, plastic	MPMP4-11R	1SFA 611 514 R1101	

For compact E-Stops, see page 8.31.

Contact blocks, lamp block and holder ②

Blocks	Catalog No.	Ref. Code	List Price
1 NO with holder	MCBH-10	1SFA 611 605 R1101	\$ 10.00
1 NC with holder	MCBH-01	1SFA 611 605 R1110	10.00
2 NO with holder	MCBH-20	1SFA 611 605 R1102	18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	18.00
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	18.00
1 NO + 1 LB with holder	MCBH-101	1SFA 611 605 R1201	27.50
1 NC + 1 LB with holder	MCBH-011	1SFA 611 605 R1210	27.50
2 NO + 1 LB with holder	MCBH-201	1SFA 611 605 R1202	35.50
2 NC + 1 LB with holder	MCBH-021	1SFA 611 605 R1220	35.50
1 NO + 1 NC + 1 LB with holder	MCBH-111	1SFA 611 605 R1211	35.50
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Lamp block for 2 W, max 230 V AC/DC bulb or LED	MLB-1	1SFA 611 620 R1001	17.50
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

To comply with the standard, IEC 60947-5-5, a number of tests have to be conducted:

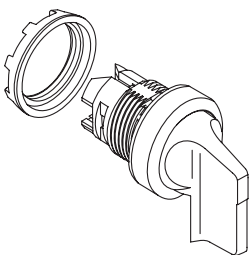
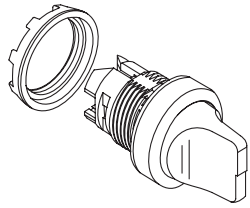
Durability test	6,050 cycles. This is not a test of mechanical life. The product has a mechanical life of 100,000 operations.	Latching test	Impulse voltage test at 2,500 V
Robustness	The force 113 N applied in three axes	Resetting test	Pulling force < 50 N Turning torque < 1 Nm
Conditioning	Heat and cold, moist atmosphere, and in 5 % NaC	Shock	15 g shock
		Vibration	2 h at 50m/s ²
		Contacts with positive opening operation	15 g shock

① No contact in the center position

② Lamp block MLB-1. Bulb not included. Other lamp block see Accessories, bulb max 2 W.

Two-position selector switches Non-illuminated

8



Bezel in black plastic as standard

Bezel in metal:

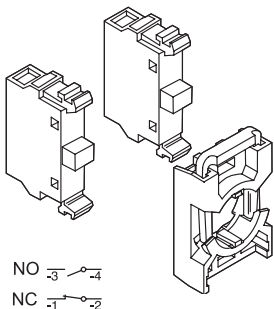
Replace '1' in the:

Catalog No. M2SSX-1 0X

Ref. Code 1SFA61 XXX R 1XXX

3 for metal bezel

4 for grey plastic bezel



NO $\overline{3}$ $\overline{4}$

NC $\overline{1}$ $\overline{2}$

Contact functions

Block positions as seen from operator front.

Handle position	Left block	Right block
A (B)	O	O
C	x	x

O = not actuated (normal state)

x = actuated (state changed)

Operator ...

Symbol	Handle color	Catalog No.	Ref. Code	List Price
with short handle ①				
Maintained				
	Red	M2SS1-10R	1SFA 611 200 R1001	\$ 11.00
	Black	M2SS1-10B	1SFA 611 200 R1006	
	Grey	M2SS1-10U	1SFA 611 200 R1007	
Maintained				
	Red	M2SS2-10R	1SFA 611 201 R1001	\$ 11.00
	Black	M2SS2-10B	1SFA 611 201 R1006	
	Grey	M2SS2-10U	1SFA 611 201 R1007	
Momentary, spring return from C to B				
	Red	M2SS3-10R	1SFA 611 202 R1001	14.00
	Black	M2SS3-10B	1SFA 611 202 R1006	
	Grey	M2SS3-10U	1SFA 611 202 R1007	
with long handle ①				
Maintained				
	Red	M2SS4-10R	1SFA 611 203 R1001	11.00
	Black	M2SS4-10B	1SFA 611 203 R1006	
	Grey	M2SS4-10U	1SFA 611 203 R1007	
Maintained				
	Red	M2SS5-10R	1SFA 611 204 R1001	14.00
	Black	M2SS5-10B	1SFA 611 204 R1006	
	Grey	M2SS5-10U	1SFA 611 204 R1007	
Momentary, spring return from C to B				
	Red	M2SS6-10R	1SFA 611 205 R1001	14.00
	Black	M2SS6-10B	1SFA 611 205 R1006	
	Grey	M2SS6-10U	1SFA 611 205 R1007	

Contact blocks and holder

Blocks	Catalog No.	Ref. Code	List Price
1 NO with holder	MCBH-10	1SFA 611 605 R1101	\$ 10.00
1 NC with holder	MCBH-01	1SFA 611 605 R1110	10.00
2 NO with holder	MCBH-20	1SFA 611 605 R1102	18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	18.00
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	18.00
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

Ordering example

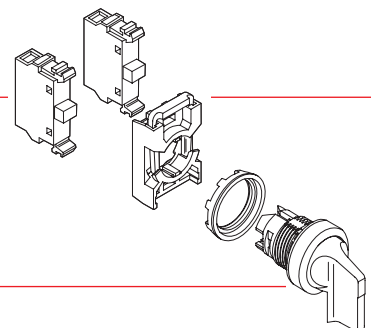
Requested: A non-illuminated modular selector switch. Black.

Maintained.

Handle positions: A and C

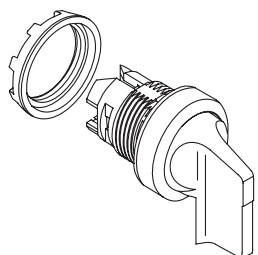
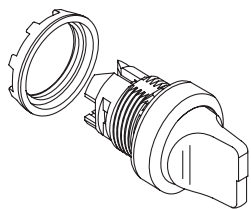
With 2 NC contacts

Ref.: 1 piece of M2SS2-10B + 1 piece of MCBH-02



① No contact block in the center position

Three-position selector switches Non-illuminated



Bezel in black plastic as standard

Bezel in metal:

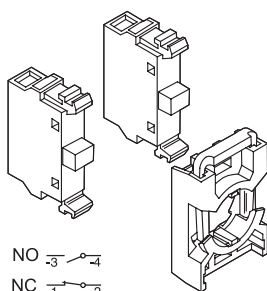
Replace '1' in the:

Catalog No. M3SSX-1 0X

Ref. Code 1SFA611XXX R 1XXX

3 for metal bezel

4 for grey plastic bezel



Contact functions

Block positions as seen from operator front.

Handle position	Left block	Right block
A	X	O
B	O	O
C	O	X

Operator ...

Symbol	Handle color	Catalog No.	Ref. Code	List Price
with short handle ☉				
Maintained				
	Red	M3SS1-10R	1SFA 611 210 R1001	\$ 11.00
	Black	M3SS1-10B	1SFA 611 210 R1006	
	Grey	M3SS1-10U	1SFA 611 210 R1007	
Momentary, spring return from A to B and from C to B				
	Red	M3SS2-10R	1SFA 611 211 R1001	14.00
	Black	M3SS2-10B	1SFA 611 211 R1006	
	Grey	M3SS2-10U	1SFA 611 211 R1007	
Momentary, spring return from C to B				
	Red	M3SS3-10R	1SFA 611 212 R1001	14.00
	Black	M3SS3-10B	1SFA 611 212 R1006	
	Grey	M3SS3-10U	1SFA 611 212 R1007	
Momentary, spring return from A to B				
	Red	M3SS7-10R	1SFA 611 216 R1001	14.00
	Black	M3SS7-10B	1SFA 611 216 R1006	
	Grey	M3SS7-10U	1SFA 611 216 R1007	

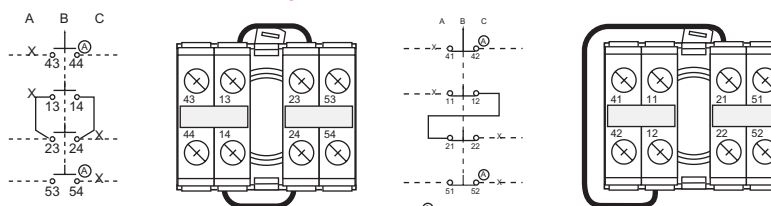
with long handle ☉

Maintained				
	Red	M3SS4-10R	1SFA 611 213 R1001	11.00
	Black	M3SS4-10B	1SFA 611 213 R1006	
	Grey	M3SS4-10U	1SFA 611 213 R1007	
Momentary, spring return from A to B and from C to B				
	Red	M3SS5-10R	1SFA 611 214 R1001	14.00
	Black	M3SS5-10B	1SFA 611 214 R1006	
	Grey	M3SS5-10U	1SFA 611 214 R1007	
Momentary, spring return from C to B				
	Red	M3SS6-10R	1SFA 611 215 R1001	14.00
	Black	M3SS6-10B	1SFA 611 215 R1006	
	Grey	M3SS6-10U	1SFA 611 215 R1007	
Momentary, spring return from A to B				
	Red	M3SS8-10R	1SFA 611 217 R1001	14.00
	Black	M3SS8-10B	1SFA 611 217 R1006	
	Grey	M3SS8-10U	1SFA 611 217 R1007	

Contact blocks and holder

Blocks	Catalog No.	Ref. Code	List Price
1 NO with holder	MCBH-10	1SFA 611 605 R1101	\$ 10.00
1 NC with holder	MCBH-01	1SFA 611 605 R1110	10.00
2 NO with holder	MCBH-20	1SFA 611 605 R1102	18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	18.00
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	18.00
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

Center position connection detail



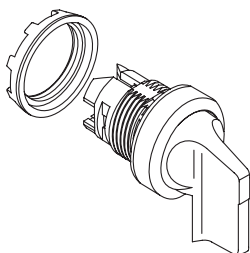
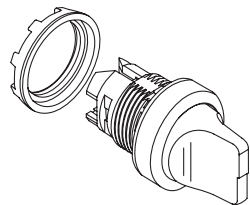
☉ Contacts may be N.O. or N.C.

☉ Contacts may be N.O. or N.C.

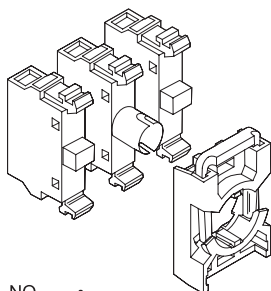
☉ No contact block in center position

Two-position selector switches Illuminated

8



Bezel in black plastic as standard
Bezel in metal:
Replace '1' in the:
Catalog No. M2SSX-1 0X
Ref. Code 1SFA61 XXX R 1XXX
3 for metal bezel
4 for grey plastic bezel



NO $\overline{3}$ $\overline{4}$
LB $\overline{X1}$ $\overline{X2}$
NC $\overline{1}$ $\overline{2}$

Operator ...

Symbol	Handle color	Catalog No.	Ref. Code	List Price
--------	--------------	-------------	-----------	------------

with short handle ①

Maintained



Red	M2SS1-11R	1SFA 611 200 R1101	\$ 17.00
Green	M2SS1-11G	1SFA 611 200 R1102	
Yellow	M2SS1-11Y	1SFA 611 200 R1103	
Blue	M2SS1-11L	1SFA 611 200 R1104	
Clear	M2SS1-11C	1SFA 611 200 R1108	

Maintained



Red	M2SS2-11R	1SFA 611 201 R1101	17.00
Green	M2SS2-11G	1SFA 611 201 R1102	
Yellow	M2SS2-11Y	1SFA 611 201 R1103	
Blue	M2SS2-11L	1SFA 611 201 R1104	
Clear	M2SS2-11C	1SFA 611 201 R1108	

Momentary, spring return from C to B



Red	M2SS3-11R	1SFA 611 202 R1101	26.00
Green	M2SS3-11G	1SFA 611 202 R1102	
Yellow	M2SS3-11Y	1SFA 611 202 R1103	
Blue	M2SS3-11L	1SFA 611 202 R1104	
Clear	M2SS3-11C	1SFA 611 202 R1108	

with long handle ①

Maintained



Red	M2SS4-11R	1SFA 611 203 R1101	17.00
Green	M2SS4-11G	1SFA 611 203 R1102	
Yellow	M2SS4-11Y	1SFA 611 203 R1103	
Blue	M2SS4-11L	1SFA 611 203 R1104	
Clear	M2SS4-11C	1SFA 611 203 R1108	

Maintained



Red	M2SS5-11R	1SFA 611 204 R1101	17.00
Green	M2SS5-11G	1SFA 611 204 R1102	
Yellow	M2SS5-11Y	1SFA 611 204 R1103	
Blue	M2SS5-11L	1SFA 611 204 R1104	
Clear	M2SS5-11C	1SFA 611 204 R1108	

Momentary, spring return from C to B



Red	M2SS6-11R	1SFA 611 205 R1101	26.00
Green	M2SS6-11G	1SFA 611 205 R1102	
Yellow	M2SS6-11Y	1SFA 611 205 R1103	
Blue	M2SS6-11L	1SFA 611 205 R1104	
Clear	M2SS6-11C	1SFA 611 205 R1108	

Contact blocks, lamp block and holder ②

Blocks	Catalog No.	Ref. Code	List Price
1 NO + 1 LB with holder	MCBH-101	1SFA 611 605 R1201	\$ 27.50
1 NC + 1 LB with holder	MCBH-011	1SFA 611 605 R1210	27.50
2 NO + 1 LB with holder	MCBH-201	1SFA 611 605 R1202	35.50
2 NC + 1 LB with holder	MCBH-021	1SFA 611 605 R1220	35.50
1 NO + 1 NC with holder	MCBH-111	1SFA 611 605 R1211	35.50
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Lamp block for 2 W, max 230 V AC/DC bulb or LED	MLB-1	1SFA 611 620 R1001	17.50
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

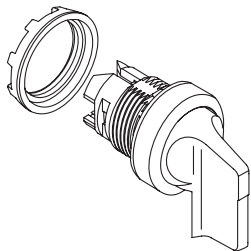
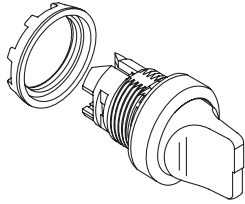
Contact functions See Page 8.11

Ordering example See Page 8.12

① No contact block in the center position

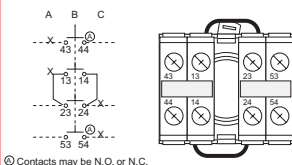
② Lamp block MLB-1. Bulb not included. Other lamp block see Accessories, bulb max 1.2 W.

Three-position selector switches Illuminated

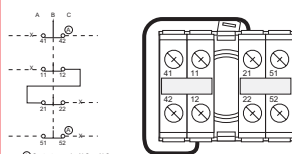


Bezel in black plastic as standard
Bezel in metal:
Replace '1' in the:
Catalog No. M3SSX-1 0X
Ref. Code 1SFA611XXX R 1XXX
3 for metal bezel
4 for grey plastic bezel

Center position connection detail



Ⓞ Contacts may be N.O. or N.C.



Ⓞ Contacts may be N.O. or N.C.

Operator ...

Symbol	Handle color	Catalog No.	Ref. Code	List Price
with short handle ①				
Maintained				
	Red	M3SS1-11R	1SFA 611 210 R1101	\$ 17.00
	Green	M3SS1-11G	1SFA 611 210 R1102	
	Yellow	M3SS1-11Y	1SFA 611 210 R1103	
	Blue	M3SS1-11L	1SFA 611 210 R1104	
	Clear	M3SS1-11C	1SFA 611 210 R1108	
Momentary, spring return from A to B and from C to B				
	Red	M3SS2-11R	1SFA 611 211 R1101	26.00
	Green	M3SS2-11G	1SFA 611 211 R1102	
	Yellow	M3SS2-11Y	1SFA 611 211 R1103	
	Blue	M3SS2-11L	1SFA 611 211 R1104	
	Clear	M3SS2-11C	1SFA 611 211 R1108	
Momentary, spring return from C to B				
	Red	M3SS3-11R	1SFA 611 212 R1101	26.00
	Green	M3SS3-11G	1SFA 611 212 R1102	
	Yellow	M3SS3-11Y	1SFA 611 212 R1103	
	Blue	M3SS3-11L	1SFA 611 212 R1104	
	Clear	M3SS3-11C	1SFA 611 212 R1108	
Momentary, spring return from A to B				
	Red	M3SS7-11R	1SFA 611 216 R1101	26.00
	Green	M3SS7-11G	1SFA 611 216 R1102	
	Yellow	M3SS7-11Y	1SFA 611 216 R1103	
	Blue	M3SS7-11L	1SFA 611 216 R1104	
	Clear	M3SS7-11C	1SFA 611 216 R1108	
with long handle ①				
Maintained				
	Red	M3SS4-11R	1SFA 611 213 R1101	17.00
	Green	M3SS4-11G	1SFA 611 213 R1102	
	Yellow	M3SS4-11Y	1SFA 611 213 R1103	
	Blue	M3SS4-11L	1SFA 611 213 R1104	
	Clear	M3SS4-11C	1SFA 611 213 R1108	
Momentary, spring return from A to B and from C to B				
	Red	M3SS5-11R	1SFA 611 214 R1101	26.00
	Green	M3SS5-11G	1SFA 611 214 R1102	
	Yellow	M3SS5-11Y	1SFA 611 214 R1103	
	Blue	M3SS5-11L	1SFA 611 214 R1104	
	Clear	M3SS5-11C	1SFA 611 214 R1108	
Momentary, spring return from C to B				
	Red	M3SS6-11R	1SFA 611 215 R1101	26.00
	Green	M3SS6-11G	1SFA 611 215 R1102	
	Yellow	M3SS6-11Y	1SFA 611 215 R1103	
	Blue	M3SS6-11L	1SFA 611 215 R1104	
	Clear	M3SS6-11C	1SFA 611 215 R1108	
Momentary, spring return from A to B				
	Red	M3SS8-11R	1SFA 611 217 R1101	26.00
	Green	M3SS8-11G	1SFA 611 217 R1102	
	Yellow	M3SS8-11Y	1SFA 611 217 R1103	
	Blue	M3SS8-11L	1SFA 611 217 R1104	
	Clear	M3SS8-11C	1SFA 611 217 R1108	

Contact blocks, lamp block and holder See Page 8.13

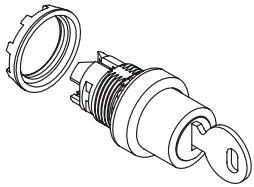
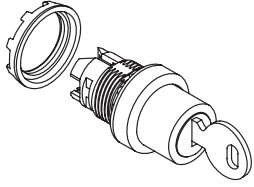
Contact functions See Page 8.12

Ordering example See Page 8.12

① No contact block in the center position

Key-operated selector switches Two and three positions

8



Bezel in black plastic as standard

Bezel in metal:

Replace '1' in the:

Catalog No. MXSSKX-1 0

Ref. Code 1SFA6112XX R 1XX

3 for metal bezel

② Key codes

71 (standard) ■ =1

72 ■ =2

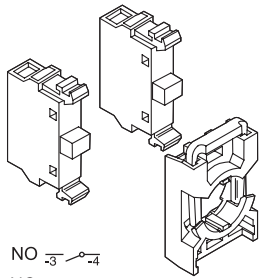
73 ■ =3

Other (on request)

③ Key codes

71 (standard) ■ =1

72 ■ =2



Operator ...

Symbol	The key can be removed in	Catalog No.	Ref. Code	List Price
two positions ①				
Maintained 	in both positions	M2SSK1-10 ■ ②	1SFA 611 280 R100 ■ ②	\$ 41.00
Maintained 	in position B only	M2SSK2-10 ■ ②	1SFA 611 281 R100 ■ ②	
Momentary, spring return from C to B 	in position B only	M2SSK3-10 ■ ②	1SFA 611 282 R100 ■ ②	
three positions ①				
Maintained 	in all positions	M3SSK1-10 ■ ②	1SFA 611 283 R100 ■ ②	53.00
Maintained 	in position B only	M3SSK2-10 ■ ②	1SFA 611 284 R100 ■ ②	
Momentary, spring return from A to B and from C to B 	in position B only	M3SSK3-10 ■ ②	1SFA 611 285 R100 ■ ②	
Momentary, spring return from C to B 	in position A only	M3SSK4-10 ■ ③	1SFA 611 286 R100 ■ ③	
Momentary, spring return from C to B 	in all positions	M3SSK5-10 ■ ②	1SFA 611 287 R100 ■ ②	

Contact blocks and holder

Blocks	Catalog No.	Ref. Code	List Price
2 NO with holder	MCBH-20	1SFA 611 605 R1102	\$ 18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00

Contact functions

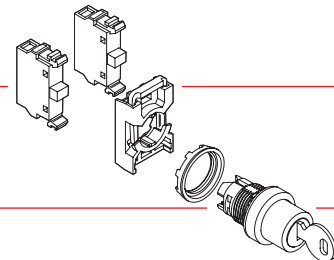
Two positions: See Page 8.12

Three positions: See Page 8.13

Ordering example

Requested: A key-operated selector switch. Three positions. Maintained. The key removeable in position B. Key code 72. With 2 NC contacts

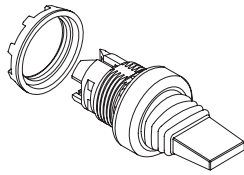
Ref.: 1 piece of M3SSK2-102 + 1 piece of MCBH-02



① No contact block in the center position

Toggle switches

Two and three positions



Operator

Symbol	Bezel	Catalog No.	Ref. Code	List Price
--------	-------	-------------	-----------	------------

Toggle switch with two positions

Maintained



Black plastic
Metal

MTS1-10B
MTS1-30B

1SFA 611 300 R1006
1SFA 611 300 R 3006

\$ 18.00

Toggle switch with three positions

Momentary, spring return from A to B and from C to B



Black plastic
Metal

MTS2-10B
MTS2-30B

1SFA 611 301 R1006
1SFA 611 301 R 3006

18.00

Maintained



Black plastic
Metal

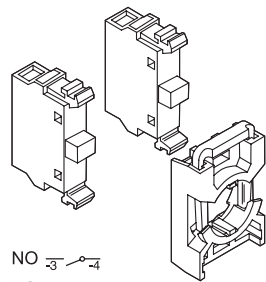
MTS3-10B
MTS3-30B

1SFA 611 302 R1006
1SFA 611 302 R 3006

18.00

Contact blocks and holder

Blocks	Catalog No.	Ref. Code	List Price
1 NO with holder	MCBH-10	1SFA 611 605 R1101	\$ 10.00
1 NC with holder	MCBH-01	1SFA 611 605 R1110	10.00
2 NO with holder	MCBH-20	1SFA 611 605 R1102	18.00
2 NC with holder	MCBH-02	1SFA 611 605 R1120	18.00
1 NO + 1 NC with holder	MCBH-11	1SFA 611 605 R1111	18.00
1 NO without holder	MCB-10	1SFA 611 610 R1001	8.00
1 NC without holder	MCB-01	1SFA 611 610 R1010	8.00
Holder for 3 blocks	MCBH-00	1SFA 611 605 R1100	2.00



NO $\overline{3}$ 4
NC $\overline{1}$ 2

Contact block functions

Block positions as seen from operator front.

Two-position maintained switch

Handle position	Left block	Right block
A	O	O
C	x	x

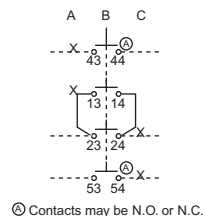
O = not actuated (normal state)
x = actuated (state changed)

Three-position switch

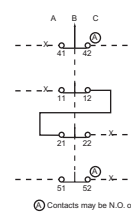
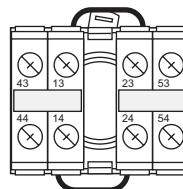
Handle position	Left block	Middle block	Right block
A	O	x	x
B	O	O	O
C	x	x	O

O = not actuated (normal state)
x = actuated (state changed)

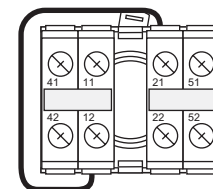
Center position connection detail



⊗ Contacts may be N.O. or N.C.



⊗ Contacts may be N.O. or N.C.



Definite purpose pushbuttons 30 mm IP 66 Rated only

Definite purpose pushbuttons

The definite purpose pushbutton, 30 mm, is a robust and compact pushbutton for use in cold, hot, damp, oily and other tough environments.

Suitable especially for hydraulic lifts, compact pendant controllers and pushbutton stations.

Included contact blocks	Membrane color	Catalog No.	Ref. Code	List Price
1 NO + 1 NC	Black	1SFA 616 105 R4076	1SFA 616 105 R4076	\$ 45.00
1 NO	Black	1SFA 616 105 R4016	1SFA 616 105 R4016	37.00
1 NC	Black	1SFA 616 105 R4046	1SFA 616 105 R4046	37.00
2 NO	Black	1SFA 616 105 R4026	1SFA 616 105 R4026	45.00
2 NC	Black	1SFA 616 105 R4056	1SFA 616 105 R4056	45.00
-	Red	KP6-40R	1SFA 616 105 R4001	29.00
-	Green	KP6-40G	1SFA 616 105 R4002	29.00
-	Black	KP6-40B	1SFA 616 105 R4006	29.00

Contact block

Description	Catalog No.	Ref. Code	List Price
1 NO	MCB-10	1SFA 611 610 R1001	\$ 8.00
1 NC	MCB-01	1SFA 611 610 R1010	

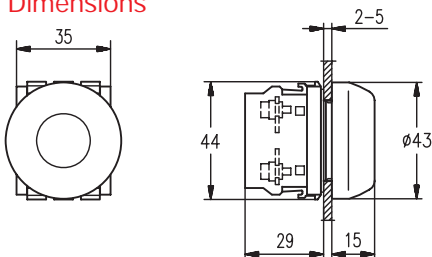
Accessories

Description	Catalog No. ①	Ref. Code	List Price
Guide washer for positioning and anti rotation	2154 373-1	2154 373-1	\$ 3.00

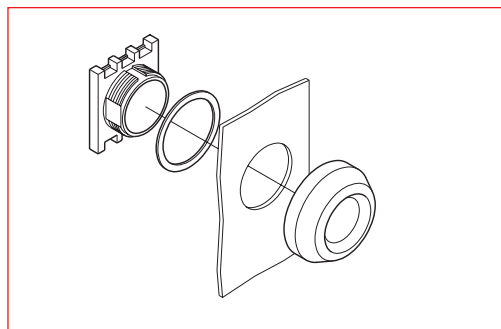
Technical data

Degree of protection	IP66
Ambient temperature	-30° ...+70°

Dimensions

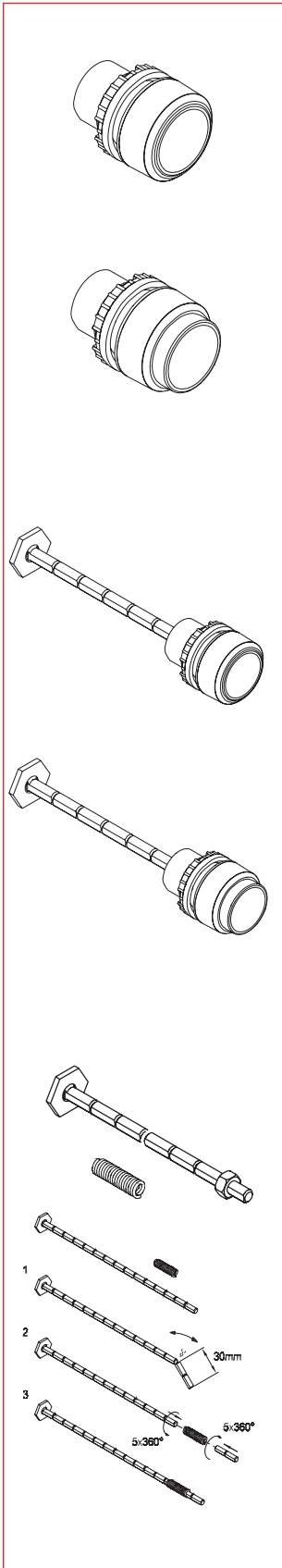


Mounting



① IP66 Rating only.

Reset pushbuttons



Reset pushbutton without shaft

Lens Color	Text	Catalog No.	Ref. Code	List Price
With flush button				
Red	No text	KPR1-100R	1SFA 616 160 R1001	\$ 8.50
Green	No text	KPR1-100G	1SFA 616 160 R1002	8.50
	II	KPR1-103G	1SFA 616 160 R1032	8.50
Yellow	No text	KPR1-100Y	1SFA 616 160 R1003	8.50
Blue	No text	KPR1-100L	1SFA 616 160 R1004	8.50
	R	KPR1-101L	1SFA 616 160 R1014	8.50
White	No text	KPR1-100W	1SFA 616 160 R1005	8.50
	R	KPR1-101W	1SFA 616 160 R1015	8.50
	I	KPR1-102W	1SFA 616 160 R1025	8.50
	II	KPR1-103W	1SFA 616 160 R1035	8.50
Black	No text	KPR1-100B	1SFA 616 160 R1006	8.50
	RESET	KPR1-104B	1SFA 616 160 R1046	12.00
With extended button				
Red	No text	KPR2-100R	1SFA 616 161 R1001	9.10
	O	KPR2-105R	1SFA 616 161 R1051	
White	No text	KPR2-100W	1SFA 616 161 R1005	
Black	No text	KPR2-100B	1SFA 616 161 R1006	
	O	KPR2-105B	1SFA 616 161 R1056	

Reset pushbutton with shaft The shaft can be cut to desired length

Lens Color	Text	Catalog No.	Ref. Code	List Price
With flush button				
Red	No text	KPR3-100R	1SFA 616 162 R1001	\$ 11.00
Green	No text	KPR3-100G	1SFA 616 162 R1002	11.00
	II	KPR3-103G	1SFA 616 162 R1032	11.00
Yellow	No text	KPR3-100Y	1SFA 616 162 R1003	11.00
Blue	No text	KPR3-100L	1SFA 616 162 R1004	11.00
	R	KPR3-101L	1SFA 616 162 R1014	11.00
White	No text	KPR3-100W	1SFA 616 162 R1005	11.00
	R	KPR3-101W	1SFA 616 162 R1015	11.00
	I	KPR3-102W	1SFA 616 162 R1025	11.00
	II	KPR3-103W	1SFA 616 162 R1035	11.00
Black	No text	KPR3-100B	1SFA 616 162 R1006	11.00
	RESET	KPR3-104B	1SFA 616 162 R1046	14.00
	RESET	KPR3-104BMR	(Reset w/metal shaft)	29.00
With extended button				
Red	No text	KPR4-100R	1SFA 616 163 R1001	12.00
	O	KPR4-105R	1SFA 616 163 R1051	
White	No text	KPR4-100W	1SFA 616 163 R1005	
Black	No text	KPR4-100B	1SFA 616 163 R1006	
	O	KPR4-105B	1SFA 616 163 R1056	

Accessories

In applications with a long shaft, a flexible joint can be used to avoid damage to the shaft.

Description	Catalog No.	Ref. Code	List Price
Shaft Including fixing nut	KA1-8046	1SFA 616 920 R8046	\$ 2.25
Flexible joint	KA1-8047	1SFA 616 920 R8047	5.00
Metal shaft Including fixing nut & foot	KA1-8046MR	—	12.00

Pilot lights and Buzzers

Pilot light head ①②

Lens color	Catalog No.	Ref. Code	List Price
Red	ML1-100R	1SFA 611 400 R1001	\$ 4.50
Green	ML1-100G	1SFA 611 400 R1002	
Yellow	ML1-100Y	1SFA 611 400 R1003	
Blue	ML1-100L	1SFA 611 400 R1004	
White	ML1-100W	1SFA 611 400 R1005	
Clear	ML1-100C	1SFA 611 400 R1008	

Lamp blocks with holder ①

Supply voltage	Catalog No.	Ref. Code	List Price
For max. 2 W, 230 V AC and DC filament bulb or LED 230 V, 2 W X1 ⊗ X2	MCBH-001	1SFA 611 605 R1200	\$ 19.50
115 V AC supply voltage. For 60 V filament bulb max. 1.2 W X1 — 115 V — 60 V ⊗ — 1.2 W — X2	MCBH-002	1SFA 611 605 R1300	23.50
230 V AC supply voltage. For 130 V filament bulb max. 2 W X1 — 230 V — 130 V ⊗ — 2 W — X2	MCBH-003	1SFA 611 605 R1400	23.50

Light diffusing lens

To improve illumination. *Note: Cannot be used with text cap.*

Description	Catalog No.	Ref. Code	List Price
The lens is used instead of text cap	KA1-8005	1SFA 616 920 R8005	\$ 3.00

Buzzers

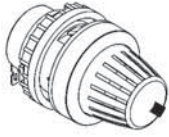
Black. Frequency: Approx. 2400 Hz. Loudness: Min 80 dB (A)/10 cm
Rated current: ≤ 8 mA. Service life: >5000 h

Supply voltage	Tone	Catalog No.	Catalog No.	Ref. Code	List Price
24 V AC/DC	Continuous	KB1-4010	KB1-4010	1SFA 616 401 R4010	\$ 75.00
115 V AC/DC	Continuous	KB1-4030	KB1-4030	1SFA 616 401 R4030	75.00
230 V AC	Continuous	KB1-4040	KB1-4040	1SFA 616 401 R4040	75.00
24 V AC/DC	Pulsating	KB1-4110	KB1-4110	1SFA 616 401 R4110	85.00
115 V AC/DC	Pulsating	KB1-4130	KB1-4130	1SFA 616 401 R4130	85.00
230 V AC	Pulsating	KB1-4140	KB1-4140	1SFA 616 401 R4140	85.00

① Bulb not included. See page 8.23

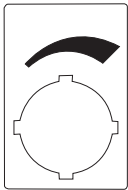
② For compact style, see page 8.33.

Potentiometers

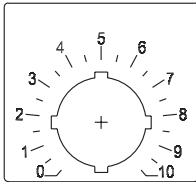


Resistor data

Element Catalog No. Cermet
 Power rating 2 W
 Mechanical angle 280°
 Terminals Solder lugs
 Insulation voltage 900 V
 Operating temperature -1 – +70 °C



29.6 x 44.5 mm



48.5 x 44.5 mm

Complete potentiometers

Black knob with integrated position indication and marking in white.

Description	Catalog No.	Ref. Code	List Price
- with resistor 5 kohm			
Black plastic	KT-105B	1SFA 616 410 R1056	\$ 90.00
Metal	KT-305B	1SFA 616 410 R3056	95.00
- with resistor 10 kohm			
Black plastic	KT-110B	1SFA 616 410 R1106	90.00
Metal	KT-310B	1SFA 616 410 R3106	95.00

Operating knob – without resistor

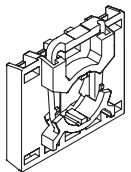
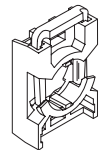
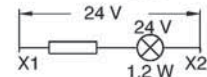
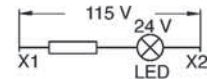
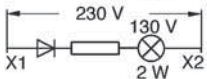
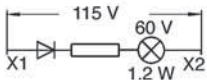
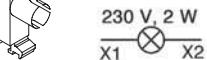
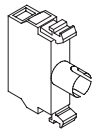
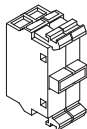
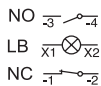
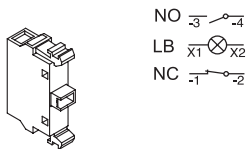
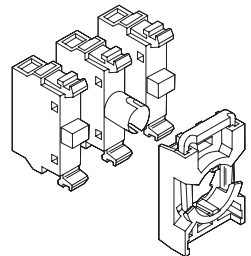
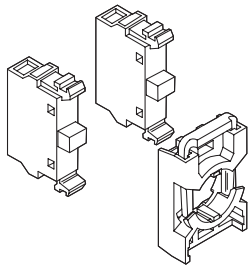
Black knob with integrated position indication and marking in white.

For shaft diameter 6 - 6.35 mm.
 Min. shaft length 20 mm

Description	Catalog No.	Ref. Code	List Price
Black plastic	KT-100B	1SFA 616 410 R1006	\$ 15.00
Metal	KT-300B	1SFA 616 410 R3006	20.00

Legend plates

Aluminum			
Description	Catalog No.	Ref. Code	List Price
Symbol - see figure	SK 615 562-87	SK 615 562-87	\$ 10.00
Scale: 0 - 10	SK 615 562-88	SK 615 562-88	



Contact blocks and lamp blocks with holder for front mounting

Max. number of blocks in holder	Included blocks	Catalog No.	Ref. Code	List Price
For non-illuminated operators				
3	1 NC	MCBH-01	1SFA 611 605 R1110	\$ 10.00
3	1 NO	MCBH-10	1SFA 611 605 R1101	10.00
3	2 NC	MCBH-02	1SFA 611 605 R1120	18.00
3	2 NO	MCBH-20	1SFA 611 605 R1102	18.00
3	3 NC	MCBH-03	1SFA 611 605 R1130	26.00
3	3 NO	MCBH-30	1SFA 611 605 R1103	26.00
3	1 NO + 1 NC	MCBH-11	1SFA 611 605 R1111	18.00
3	1 NO + 2 NC	MCBH-12	1SFA 611 605 R1121	26.00
3	2 NO + 1 NC	MCBH-21	1SFA 611 605 R1112	26.00

For illuminated operators				
3	1 NC + 1 LB	MCBH-011	1SFA 611 605 R1210	27.50
3	1 NO + 1 LB	MCBH-101	1SFA 611 605 R1201	27.50
3	1 NO + 1 NC + 1 LB	MCBH-111	1SFA 611 605 R1211	35.50
3	2 NC + 1 LB	MCBH-021	1SFA 611 605 R1220	35.50
3	2 NO + 1 LB	MCBH-201	1SFA 611 605 R1202	35.50

Single contact blocks for front mounting

Included blocks	Catalog No.	Ref. Code	List Price
1 NO	MCB-10	1SFA 611 610 R1001	\$ 8.00
1 NC	MCB-01	1SFA 611 610 R1010	8.00
1 NO with gold plated contacts	MCB-10G	1SFA 611 610 R1101	16.00
1 NC with gold plated contacts	MCB-01G	1SFA 611 610 R1110	16.00

Double contact block for front mounting

To be used together with MCBH5-00 when contact blocks in position 4- and 5- are needed.
Also when using MCBH-00 together with selector switch and contact block in position 3- is needed

Included blocks	Catalog No.	Ref. Code	List Price
2 NO	MCB-20	1SFA 611 610 R1002	\$ 16.00
2 NC	MCB-02	1SFA 611 610 R1020	
1 NO + 1 NC	MCB-11	1SFA 611 610 R1011	

Single lamp blocks for front mounting, Ba 9s base

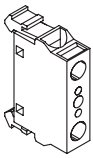
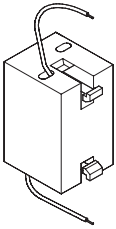
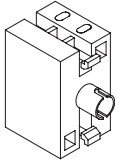
Description	Catalog No.	Ref. Code	List Price
For max. 2 W, 230 V AC and DC filament bulb or LED	MLB-1	1SFA 611 620 R1001	\$ 17.50
115 V AC supply voltage. For 60 V filament bulb max. 1.2 W	MLB-2	1SFA 611 620 R1002	21.50
230 V AC supply voltage. For 130 V filament bulb max. 2 W	MLB-3	1SFA 611 620 R1003	21.50
115 V AC and DC supply voltage For 24 V LED	MLB-4	1SFA 611 620 R1004	21.50
24 V AC and DC supply voltage. With resistor. Intended for electronic circuits. The resistor limits the making current and protects against disturbances in the electronic circuit For 24 V filament bulb	MLB-5	1SFA 611 620 R1005	21.50

Holders

Description	Catalog No.	Ref. Code	List Price
Holders for front mounting			
For three blocks	MCBH-00	1SFA 611 605 R1100	\$ 2.00
For five blocks	MCBH5-00	1SFA 611 601 R1100	4.00

Contact blocks and lamp blocks for rear mounting See Page 8.43

Accessories



Transformer block

For 6 or 24 V filament bulb and 24 V LED. Rated power 1.5 W.

Primary voltage	Secondary voltage	Catalog No.	Ref. Code	List Price
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With lamp holder for front mounting, Ba 9s base

Intended to supply a 1.2 W filament bulb.

110 - 127V AC	6 V AC	KTR1-1001	1SFA 616 950 R1001	\$ 35.00
220 - 250 V AC	6 V AC	KTR1-1002	1SFA 616 950 R1002	
380 - 420 V AC	6 V AC	KTR1-1003	1SFA 616 950 R1003	
440 - 480 V AC	6 V AC	KTR1-1004	1SFA 616 950 R1004	
500 - 600 V AC	6 V AC	KTR1-1005	1SFA 616 950 R1005	
110 - 127 V AC	24 V AC ①	KTR1-1011	1SFA 616 950 R1011	\$ 35.00
220 - 250 V AC	24 V AC ①	KTR1-1012	1SFA 616 950 R1012	
380 - 420 V AC	24 V AC ①	KTR1-1013	1SFA 616 950 R1013	
440 - 480 V AC	24 V AC ①	KTR1-1014	1SFA 616 950 R1014	

For illuminated operators ②

Intended to supply a 1.2 W filament bulb mounted in lamp block MLB-1 (1SFA 611 620 R1001) only.

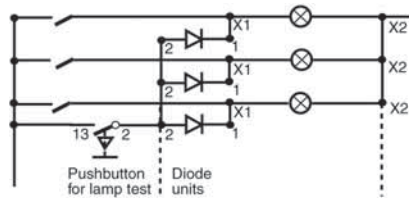
110 - 127V AC	6 V AC	KTR1-2001	1SFA 616 950 R2001	35.00
220 - 250 V AC	6 V AC	KTR1-2002	1SFA 616 950 R2002	
380 - 420 V AC	6 V AC	KTR1-2003	1SFA 616 950 R2003	
440 - 480 V AC	6 V AC	KTR1-2004	1SFA 616 950 R2004	
500 - 600 V AC	6 V AC	KTR1-2005	1SFA 616 950 R2005	
110 - 127 V AC	24 V AC ①	KTR1-2011	1SFA 616 950 R2011	35.00
220 - 250 V AC	24 V AC ①	KTR1-2012	1SFA 616 950 R2012	
380 - 420 V AC	24 V AC ①	KTR1-2013	1SFA 616 950 R2013	
440 - 480 V AC	24 V AC ①	KTR1-2014	1SFA 616 950 R2014	

Diode block

To be used if several lamps are to be connected to a common lamp-test pushbutton. A diode must be connected in series with each lamp. The diode block snaps onto the lamp block or is placed at the side.

Description	Catalog No.	Ref. Code	List Price
Diode block	MDB-1001	1SFA 611 630 R1001	\$ 14.00

Diagram for lamp test with three diode block



① Can be used with LED bulb
② To be used with with directly supplied lamp blocks only.

Accessories

Filament bulbs

Ba 9s base Catalog No. of current: AC/DC. A lamp changing tool is required for changing bulb.

Description					Catalog No.	Ref. Code	List Price
Rated voltage V	Rated current mA	Rated output W	Service life h	Lumiance mcd			
6	200	1.2	10 000	350	5911 086-11	5911 086-11	\$ 6.00
12	100	1.2	10 000	230	5911 086-12	5911 086-12	
24	50	1.2	10 000	280	5911 086-13	5911 086-13	
30	40	1.2	10 000	250	5911 086-4	5911 086-4	
48	42	2	6 000	500	5911 086-5	5911 086-5	
60	20	1.2	5 000	190	5911 086-14	5911 086-14	
110	18	2	7 500	250	5911 086-7	5911 086-7	
130	15	2	7 500	120	5911 086-15	5911 086-15	

LEDs

With one diode chip mounted on a Ba 9s base. Choose the same color for the LED and the lamp cap or else use a clear lamp cap.

For white light use white LED with clear lamp cap. At DC the lamp base have to be connected to cathode (-) and the bottom contact to anode (+).

Description				Catalog No.	Ref. Code	List Price
Color	Rated current mA	Wave-length nm	Luminance mcd			
Rated voltage 12 V, DC Service life >50 000 h						
Red	15	630	250	KA2-2011	1SFA 616 921 R2011	\$ 21.00
Green	15	525	1000	KA2-2012	1SFA 616 921 R2012	
Yellow	15	592	250	KA2-2013	1SFA 616 921 R2013	
Blue	15	470	450	KA2-2014	1SFA 616 921 R2014	
White	15	x=0.31 y=0.32	600	KA2-2015	1SFA 616 921 R2015	
Rated voltage 24 V, (AC)/DC Service life >50 000 h						
Red	15	630	250	KA2-2021	1SFA 616 921 R2021	15.00
Green	15	525	800	KA2-2022	1SFA 616 921 R2022	
Yellow	15	592	250	KA2-2023	1SFA 616 921 R2023	
Blue	15	470	400	KA2-2024	1SFA 616 921 R2024	
White	15	x=0.31 y=0.32	500	KA2-2025	1SFA 616 921 R2025	
Rated voltage 48 V, (AC)/DC Service life >50 000 h						
Red	12	630	200	KA2-2041	1SFA 616 921 R2041	21.00
Green	12	525	1700	KA2-2042	1SFA 616 921 R2042	
Yellow	12	592	240	KA2-2043	1SFA 616 921 R2043	
Blue	12	470	720	KA2-2044	1SFA 616 921 R2044	
White	12	x=0.31 y=0.32	1200	KA2-2045	1SFA 616 921 R2045	
Rated voltage 60 V, (AC)/DC Service life >50 000 h						
Red	10	630	160	KA2-2051	1SFA 616 921 R2051	21.00
Green	10	525	1400	KA2-2052	1SFA 616 921 R2052	
Yellow	10	592	200	KA2-2053	1SFA 616 921 R2053	
Blue	10	470	600	KA2-2054	1SFA 616 921 R2054	
White	10	x=0.31 y=0.32	1000	KA2-2055	1SFA 616 921 R2055	
Rated voltage 110-130 V, AC Service life 25 000 h						
Red	4-6	630	60-100	KA2-2131	1SFA 616 921 R2131	15.00
Green	4-6	525	500-850	KA2-2132	1SFA 616 921 R2132	
Yellow	4-6	592	70-120	KA2-2133	1SFA 616 921 R2133	
Blue	4-6	470	220-350	KA2-2134	1SFA 616 921 R2134	
White	4-6	x=0.31 y=0.32	350-600	KA2-2135	1SFA 616 921 R2135	
Rated voltage 110-130 V, AC/DC Service life 25 000 h						
Red	4-6	630	60-100	KA2-2141	1SFA 616 921 R2141	21.00
Green	4-6	525	500-850	KA2-2142	1SFA 616 921 R2142	
Yellow	4-6	592	70-120	KA2-2143	1SFA 616 921 R2143	
Blue	4-6	470	220-350	KA2-2144	1SFA 616 921 R2144	
White	4-6	x=0.31 y=0.32	350-600	KA2-2145	1SFA 616 921 R2145	
Rated voltage 230 V, AC Service life 25 000 h						
Red	4	630	60	KA2-2221	1SFA 616 921 R2221	21.00
Green	4	525	500	KA2-2222	1SFA 616 921 R2222	
Yellow	4	592	70	KA2-2223	1SFA 616 921 R2223	
Blue	4	470	220	KA2-2224	1SFA 616 921 R2224	
White	4	x=0.31 y=0.32	350	KA2-2225	1SFA 616 921 R2225	

① At AC the luminance is decreased with 30 % and there is also a slight flickering.

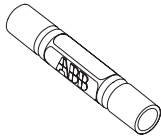
Accessories



Flashing LED

A lamp changing tool is required for changing bulb.
Choose the same color for the LED and the lamp cap or use a clear lamp cap.
The lamp base has to be connected to cathode (-) and the bottom contact to anode (+).

Description	Catalog No.	Ref. Code	List Price
Rated voltage 24 V, rated current 25 mA, DC			
	Wave length nm	Service life hours	
Color			
Red	630	50 000	4950 512-1
Green	565	50 000	4950 512-2
Yellow	585	50 000	4950 512-3
			4950 512-1
			4950 512-2
			4950 512-3
			\$ 20.00
			44.25
			20.00



Lamp changing tool

Description	Catalog No.	Ref. Code	List Price
For LEDs and for bulbs	KA1-8072	1SFA 616 920 R8072	\$ 10.00



Mounting tool

Description	Catalog No.	Ref. Code	List Price
Used for tightening the sleeve	KA1-8015	1SFA 611 920 R8015	\$ 10.00



Membrane of rubber

Of transparent, heat and cold resistant rubber. Does not harden at low temperature.
Gives IP 67 degree of protection. When membrane is used, remove the gasket.

For operator with	Catalog No.	Ref. Code	List Price
Flush button	KA1-8052	1SFA 616 920 R8052	\$ 8.00
Extended button	KA1-8002	1SFA 616 920 R8002	

Emergency stop shroud

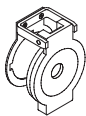
For 40 mm Emergency Stop Pushbuttons. Not for use with plastic enclosure.

Color	Catalog No.	Ref. Code	List Price
To prevent inadvertant operation.			
Yellow	KA1-8053	1SFA 616 920 R8053	\$ 16.00



Protective ring

Description	Catalog No.	Ref. Code	List Price
For flush and extended buttons			
To prevent inadvertant operation.			
Not together with legend plate holder.	SK 615 512-1	SK 615 512-1	\$ 4.00



Protective cover

Description	Catalog No.	Ref. Code	List Price
For flush button.			
To prevent inadvertant operation.			
Not together with legend plate holder.	KA1-8010	1SFA 616 920 R8010	\$ 15.00



Bezel (Packing unit 10 pieces)			
Description	Catalog No.	Ref. Code	List Price
For pushbutton			
Grey, plastic	KA1-8079	1SFA 616 920 R8079	\$ 1.00
Black, plastic	KA1-8022	1SFA 616 920 R8022	1.00
Metal	KA1-8021	1SFA 616 920 R8021	2.50
For selector switch			
Grey, plastic	KA1-8077	1SFA 616 920 R8077	1.00
Black, plastic	KA1-8080	1SFA 616 920 R8080	1.00
Metal	KA1-8024	1SFA 616 920 R8024	2.50



Square bezel			
Description	Catalog No.	Ref. Code	List Price
Black, plastic (Packing unit 10 pieces)	SK 616 016-2	SK 616 016-2	2.00
Grey, plastic (Packing unit 10 pieces)	KA1-8124	1SFA 611 920 R8124	

Accessories

30 mm adaptors

For use when fitting the 22 mm pilot devices in 30 mm mounting holes. (1.5 – 4 mm panels)

Description	Catalog No.	Ref. Code	List Price
For use with emergency stop pushbuttons			
Black plastic.	KA1-8027	1SFA 616 920 R8027	\$ 8.00
Metal.	KA1-8028	1SFA 616 920 R8028	10.00
For use with pushbuttons, selector switches, pilot lights, potentiometers and buzzers			
Black plastic.	KA1-8029	1SFA 616 920 R8029	8.00
Metal.	KA1-8030	1SFA 616 920 R8030	10.00

Adaptors

Description	Catalog No.	Ref. Code	List Price
For flush mounted pushbuttons			
	KA1-8073	1SFA 616 920 R8073	\$ 15.00
For flush mounted selector switches			
	KA1-8074	1SFA 616 920 R8074	

Extra key

Description	Catalog No.	Ref. Code	List Price
Ronis 455 (key code 71)	SK 616 021-71	SK 616 021-71	
Ronis 421 (key code 72)	SK 616 021-72	SK 616 021-72	\$ 10.00
Ronis 3433-E (key code 73)	SK 616 021-73	SK 616 021-73	

Label sheet

Description	Catalog No.	Ref. Code	List Price
For marking of contact blocks at two levels	2949 1725-1	2949 1725-1	\$ 10.00

Lenses for pilot lights (Packing unit 10 pieces)

Description/Color	Catalog No.	Ref. Code	List Price
Red	KA1-8031	1SFA 616 920 R8031	
Green	KA1-8032	1SFA 616 920 R8032	
Yellow	KA1-8033	1SFA 616 920 R8033	\$ 2.50
Blue	KA1-8034	1SFA 616 920 R8034	
White	KA1-8035	1SFA 616 920 R8035	

Buttons for pushbuttons (Packing unit 10 pieces)

Description	Color	Catalog No.	Ref. Code	List Price
Flush, opaque	Red	KA1-8081	1SFA 616 920 R8081	
	Green	KA1-8082	1SFA 616 920 R8082	
	Yellow	KA1-8083	1SFA 616 920 R8083	
	Blue	KA1-8084	1SFA 616 920 R8084	
	White	KA1-8085	1SFA 616 920 R8085	
	Black	KA1-8086	1SFA 616 920 R8086	
	Grey	KA1-8087	1SFA 616 920 R8087	
	Clear	KA1-8088	1SFA 616 920 R8088	
Extended, opaque	Red	KA1-8091	1SFA 616 920 R8091	
	Green	KA1-8092	1SFA 616 920 R8092	
	Yellow	KA1-8093	1SFA 616 920 R8093	
	Blue	KA1-8094	1SFA 616 920 R8094	
	White	KA1-8095	1SFA 616 920 R8095	
	Black	KA1-8096	1SFA 616 920 R8096	\$ 1.50
	Grey	KA1-8097	1SFA 616 920 R8097	
	Clear	KA1-8098	1SFA 616 920 R8098	
Flush, transparent	Red	KA1-8101	1SFA 616 920 R8101	
	Green	KA1-8102	1SFA 616 920 R8102	
	Yellow	KA1-8103	1SFA 616 920 R8103	
	Blue	KA1-8104	1SFA 616 920 R8104	
	White	KA1-8105	1SFA 616 920 R8105	
	Clear	KA1-8108	1SFA 616 920 R8108	
Extended, transparent	Red	KA1-8111	1SFA 616 920 R8111	
	Green	KA1-8112	1SFA 616 920 R8112	
	Yellow	KA1-8113	1SFA 616 920 R8113	
	Blue	KA1-8114	1SFA 616 920 R8114	
	White	KA1-8115	1SFA 616 920 R8115	
	Clear	KA1-8118	1SFA 616 920 R8118	

Accessories

22mm hole plug (UL Type 1, 3R, 4, 4X, 12)

Hole plugs are used to cover pushbutton holes in panels

Description	Catalog No.	List Price
22mm hole plug	SK 616 502-B	\$ 2.00

Padlock attachment for 30mm mushroom head (twist release only)

Prevents unauthorized use of equipment. Provides space for up to 4 padlocks with the button in the depressed position. Holes fit standard 1/4" padlock.

Description	Catalog No.	List Price
Padlock attachment	SK 615 502-D	\$ 20.00

Spare gasket

Description	Catalog No.	List Price
Gasket	2152 0357-1	\$ 1.00

Selector switch lock

Description	Catalog No.	List Price
Selector switch lock	CBK-XSWL	\$ 35.00

Selector switch guard

Description	Catalog No.	List Price
Selector switch guard	CBK-XSWG	\$ 8.00





Approvals

The pushbuttons, selector switches and pilot lights are approved by:
- National approval agencies: UL, CSA and China Compulsory Product Certification

For detail information please contact ABB

Standards

IEC 60947-1	Low-voltage switchgear and controlgear - Part 1: General rules
IEC 60947-5-1	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
8 IEC 60947-5-5	Low-voltage switchgear and controlgear - Part 5-5: Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function
IEC 60073	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators
IEC 60529	Degrees of protection provided by enclosures (IP Code)
EN 60947-1	Low-voltage switchgear and controlgear - Part 1: General rules
EN 60947-5-1	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
EN 60947-5-5	Low-voltage switchgear and controlgear - Part 5-5: Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function
EN 60073	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indication devices and actuators
EN 60529	Degrees of protection provided by enclosures (IP Code)
EN 50013	Low-voltage switchgear and controlgear for industrial use - Terminal marking and distinctive number for particular control switches
UL 508	Industrial Control Equipment
CSA C22.2 No 14	Industrial Control Equipment

Degrees of protection

Operators	IP	UL/CSA
Pushbutton with flush or extended button, MP	IP 66	Type 1, 3R, 4, 4X, 12, 13
Double pushbutton, MPD	IP 66	Type1, 3R, 4, 4X, 12, 13
Mushroom pushbutton, momentary, MPM	IP 66	Type 1, 3R, 4, 4X, 12, 13
Emergency stop pushbutton, MPMT/P	IP 66	Type 1, 3R, 4, 4X, 12, 13
Selector switch, M2SS/M3SS	IP 66	Type 1, 3R, 4, 4X, 12, 13
Key operated selector switch, M2SSK/M3SSK	IP 66	Type 1, 3R, 4, 4X, 12
Toggle switch, MTS2/MTS3	IP 66	Type 1, 3R, 4, 4X, 12, 13
Definite purpose pushbutton, 30 mm, KP6	IP 66	-
Reset button, KPR	IP 66	Type 1, 3R, 4, 4X, 12, 13
Pilot lights, ML	IP 66	Type 1, 3R, 4, 4X, 12, 13
Buzzer, KB	IP 65	Type 4X
Potentiometer, KT	IP 66	Type 1, 3R, 4, 4X, 12, 13
Contact block & transformer block	IP 20	
Enclosures		
Plastic enclosures	IP 66	
Metallic enclosures	IP 67	



Material

No ozone depleting substances in the products.

All front parts are made of polycarbonate

Material		
PC	Polycarbonate	High impact strength, good outdoor resistance. Can withstand light acid solutions, aliphatic hydrocarbons, paraffin, alcohols, animal and vegetable greases.
PSU	Polysulphone	Can withstand high temperatures, acids, basic solutions, alkaline compounds, oils, alcohols.
PA	Polyamide	Can withstand high temperatures, aliphatic, aromatic and chlorinated hydrocarbons, esters, ketone-aldehydes, alcohols and basic solutions.
PBT		Can withstand high temperature, aliphatic and aromatic hydrocarbons, acids, basic solutions, alcohols, grease and oils
Zinc		Good corrosion resistance in inland-, sea and industrial atmosphere.
Light-alloy		Good corrosion resistance in inland-, sea and industrial atmosphere.
Rubber		Chloroprene Nitrile

Mechanical life

Operators

Pushbuttons with flush or extended button, momentary mushroom pushbutton 2 million operations

Selector switch, maintained mushroom pushbutton, key operated selector switch and double pushbutton 0.5 million operations

Emergency stop pushbutton 0.1 million operations

Toggle switch 1 million operations

Lockable pushbuttons 0.3 million operations

Temperature

Ambient temperature during operation -25 to +70 °C

Exception: All pilot devices with 2 W continuously lit filament bulb -25 to +40 °C

Storage temperature -30 to +85 °C

Terminals

Plus-minus Pozidriv No.2 screw with DIN-washer.

Connectable area min. 1 x 0.5 mm²/AWG 20
max. 2 x 2.5 mm²/2 x AWG14

Recommended torque 0.9 Nm

Tightening torque

Locking nut, M22 Min. 2 Nm
Max. 2.3 Nm

Contact blocks

Mechanical endurance 10 million operations

Self cleaning contacts of silver, NC contact with positive opening.

At voltages and currents below 24 V and 5.6 mA two contact blocks in parallel are recommended. As an alternative, gold plated contacts can be used.

Ratings as per UL, CSA, NEMA	A600	Q600
	AC	DC
Rated insulation voltage	600 V	600 V
Rated thermal current	10 A	2.5 A
Rated operational current	at 120 V 6 A	at 125 V 0.55 A
	240 V 3 A	250 V 0.27 A
	480 V 1.5 A	480 V 0.10 A
	600 V 1.2 A	600 V 0.10 A

Ratings as per IEC 60 947-5-1

Rated insulation voltage, U_i 690 V

Rated thermal current, I_{th} 10 A

Rated operational current, I_e utilisation category AC 15, at 120 V 8 A
230 V 6 A
400 V 4 A
690 V 2 A

Rated operational current, I_e utilisation category DC 13, at 24 V 5 A
125 V 1.1 A
250 V 0.55 A

Contact resistance < 25 mΩ

Compulsory function test at 5V, 16 mA

Max. number of contact blocks per operator ①

Pushbutton, toggle switch and mushroom pushbutton 6
Maintained pushbutton 4
Double pushbutton, selector switch, key operated selector switch and emergency stop pushbutton 4

Short circuit protection

Max. fuse at 1 kA 16 A ordinary
10 A delayed

Lamp block

Ratings as per IEC 60 947-5-1

Rated insulation voltage 230 V

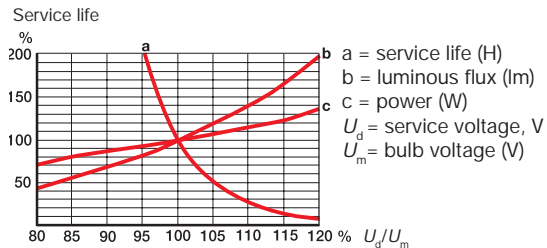
Base Ba 9s

Permissible power, up to 2 W

Service life of filament bulb

Relative service life, luminous flux and power consumption at different service voltages.

It is generally true to say that bulbs for lower voltages give more light and have better vibration-withstand capability than bulbs for higher voltages.



Lamp comparison

Bulb Catalog No.	Approx. life (hours)	Shock and service immunity	High vibration temperature	Low power operating	Brightness consumption
Filament	5000 - 10 000	+	+	+	+++
LED	25 000 - 50 000	+++	++	++	++

Very good +++

Good ++

Less good +

Transformer block

Suitable for filament bulb 6 or 24 V AC and 1.2 W and LED 24 V.

Rated power 1.5 W

Rated voltage Ratio, see Accessories page 8.25

Rated insulation voltage acc. to IEC 70 °C (DT)

Class E

① The contact blocks can be stacked in max. two levels on the 3- block holder.
Only one level is accepted on the 5-block holder.



Compact range



8

The compact range is a new competitive choice for customers with high requirements of cost efficient, easy to use and reliable products.

General construction

- "All-in-one function"
- One Ref. code = one complete function
- Easy mounting
- Less inventory
- Broad range of accessories
- Same front design as for the modular range.
- Durable actuators in clear colors with large text and push area
- UL File# E57057
- CSA File# LR19700

Technical advantages

- High degree of protection:
UL Type 1, 3R, 4, 4X, 12 & 13
- One or two built-in electrically separated contacts (1NO, 1NC, 2NO, 2NC or 1NC & 1NO)
- Contacts with wiping action
- Low built-in depth

Operators

- Pushbuttons, non-illuminated
- Emergency stop pushbuttons, non-illuminated, twist, pull or key release
- Selector switches, non-illuminated, 2 or 3 position

Pilot lights

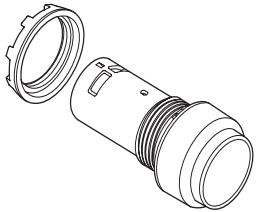
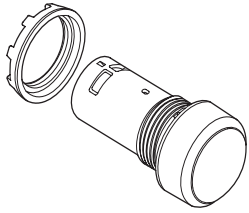
- Ba 9s base for bulbs (6-130 V) or LED (12-130 V DC, 24-230 V AC)
- Pilot light with integrated LED (12-220 V DC, 24-230 V AC)



42 mm

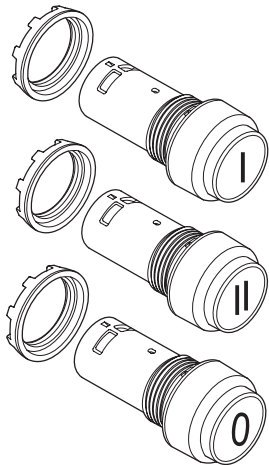
Flush and extended pushbuttons Non-illuminated

8



Bezel in black plastic as standard
Bezel in metal:

Replace '1' in the:
Catalog No. CPX-1 0X
Ref. Code 1SFA619XXX R 1XXX
3 for metal bezel



Codes for button colors

	Catalog No.	Ref. Code
	■	□
Red	R	1
Green	G	2
Yellow	Y	3
Blue	L	4
White	W	5
Black	B	6
Grey	U	7

Pushbutton with ...

Description	Catalog No.	Ref. Code	List Price
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Flush button

Momentary

Contacts included:

1 NO	CP110■-10	1SFA 619 100 R101□	\$ 15.20
2 NO	CP110■-20	1SFA 619 100 R102□	19.90
1 NC	CP110■-01	1SFA 619 100 R104□	15.20
2 NC	CP110■-02	1SFA 619 100 R105□	19.90
1 NO +1 NC	CP110■-11	1SFA 619 100 R107□	19.90

Maintained

Contacts included:

1 NO	CP210■-10	1SFA 619 101 R101□	19.90
2 NO	CP210■-20	1SFA 619 101 R102□	22.50
1 NC	CP210■-01	1SFA 619 101 R104□	19.90
2 NC	CP210■-02	1SFA 619 101 R105□	22.50
1 NO +1 NC	CP210■-11	1SFA 619 101 R107□	22.50

Extended button

Momentary

Contacts included:

1 NO	CP310■-10	1SFA 619 102 R101□	15.20
2 NO	CP310■-20	1SFA 619 102 R102□	19.90
1 NC	CP310■-01	1SFA 619 102 R104□	15.20
2 NC	CP310■-02	1SFA 619 102 R105□	19.90
1 NO +1 NC	CP310■-11	1SFA 619 102 R107□	19.90

Maintained

Contacts included:

1 NO	CP410■-10	1SFA 619 103 R101□	19.90
2 NO	CP410■-20	1SFA 619 103 R102□	22.50
1 NC	CP410■-01	1SFA 619 103 R104□	19.90
2 NC	CP410■-02	1SFA 619 103 R105□	22.50
1 NO +1 NC	CP410■-11	1SFA 619 103 R107□	22.50

Flush button

Momentary

White button with black I

Contacts included:

1 NO	CP1110W-10	1SFA 619 110 R1015	16.70
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Momentary

White button with black II

Contacts included:

1 NO	CP1210W-10	1SFA 619 120 R1015	16.70
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Extended button

Momentary

Black button with white O

Contacts included:

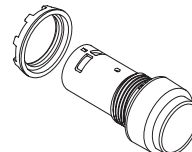
1NC	CP3310B-01	1SFA 619 132 R1046	16.70
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Ordering example – Compact pushbutton

Requested: A compact pushbutton, momentary,
with red extended button and one NO contact.

Ref.: 10 pieces of CP3-10R-10

Minimum Ref. quantity: 10 pieces
Packing: 10 pieces/plastic bag, 10 bags/box



Emergency stop pushbuttons Non-illuminated

Fulfills IEC 60947-5-5

Plastic operator

Description	Color	Catalog No.	Ref. Code	List Price
Ø 30 mm				
Twist release	Red			
<u>Contacts included:</u>				
1 NC		CE3T-10R-01	1SFA 619 500 R1041	\$ 28.00
2 NO		CE3T-10R-20	1SFA 619 500 R1021	28.00
2 NC		CE3T-10R-02	1SFA 619 500 R1051	33.60
1 NO +1 NC		CE3T-10R-11	1SFA 619 500 R1071	33.60
Pull release	Red			
<u>Contacts included:</u>				
2 NC		CE3P-10R-02	1SFA 619 501 R1051	33.60
1 NO +1 NC		CE3P-10R-11	1SFA 619 501 R1071	33.60
Key release (Key code 71, Ronis 455)	Red			
<u>Contacts included:</u>				
2 NC		CE3K1-10R-02	1SFA 619 502 R1051	53.40
1 NO +1 NC		CE3K1-10R-11	1SFA 619 502 R1071	53.40
Ø 40 mm				
Twist release	Red			
<u>Contacts included:</u>				
1 NC		CE4T-10R-01	1SFA 619 550 R1041	30.80
2 NO		CE4T-10R-20	1SFA 619 550 R1021	36.40
2 NC		CE4T-10R-02	1SFA 619 550 R1051	36.40
1 NO +1 NC		CE4T-10R-11	1SFA 619 550 R1071	36.40
Pull release	Red			
<u>Contacts included:</u>				
2 NC		CE4P-10R-02	1SFA 619 551 R1051	36.40
1 NO +1 NC		CE4P-10R-11	1SFA 619 551 R1071	36.40
Key release (Key code 71, Ronis 455)	Red			
<u>Contacts included:</u>				
2 NC		CE4K1-10R-02	1SFA 619 552 R1051	57.50
1 NO +1 NC		CE4K1-10R-11	1SFA 619 552 R1071	57.50

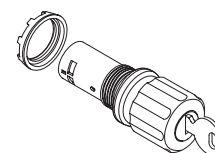
The emergency stops with key release are delivered with two keys.

Ordering example – Compact Emergency stop pushbutton

Requested: A compact emergency stop pushbutton, 30 mm, with key release and two NC contacts.

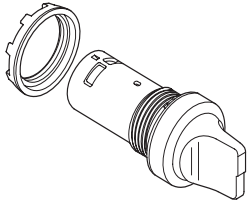
Ref.: 10 pieces of CE3K1-10R-02.

*Minimum Ref. quantity: 10 pieces
Packing: 1 piece/plastic bag.*



Two and three position selector switches Non-illuminated

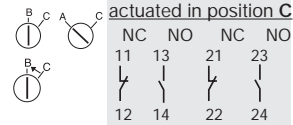
8



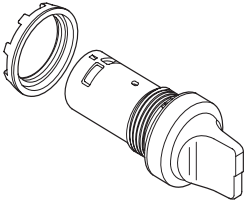
Contacts actuated

Two position selector switch

Contacts included,



1NO	-	1	-	-
2NO	-	1	-	1
1NC	1	-	-	-
2NC	1	-	1	-
1NO + 1NC	-	1	1	-



Bezel in black plastic as standard

Bezel in metal:

Replace '1' in the:

Catalog No. CPX-1 0X

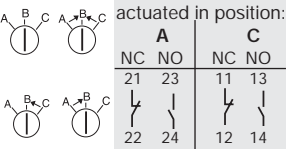
Ref. Code 1SFA619XXX R 1XXX

3 for metal bezel

Contacts actuated

Three position selector switch

Contacts included,



2NO	-	1	-	1
2NC	1	-	1	-
1NO + 1NC	1	-	-	1

Codes for handle colors

	Catalog No.	Ref. Code
Red	R	1
Black	B	6
Grey	U	7

Selector switch with ...

Description	Catalog No.	Ref. Code	List Price
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Short handle. Two positions

Maintained

Contacts included:

1 NO		C2SS110-10	1SFA 619 200 R101	\$ 19.60
2 NO		C2SS110-20	1SFA 619 200 R102	27.20
1 NC		C2SS110-01	1SFA 619 200 R104	22.70
2 NC		C2SS110-02	1SFA 619 200 R105	27.20
1 NO + 1 NC		C2SS110-11	1SFA 619 200 R107	27.20

Maintained

Contacts included:

1 NO		C2SS210-10	1SFA 619 201 R101	16.70
2 NO		C2SS210-20	1SFA 619 201 R102	27.20
1 NC		C2SS210-01	1SFA 619 201 R104	22.70
2 NC		C2SS210-02	1SFA 619 201 R105	27.20
1 NO + 1 NC		C2SS210-11	1SFA 619 201 R107	27.20

Momentary

Contacts included:

1 NO		C2SS310-10	1SFA 619 202 R101	22.70
2 NO		C2SS310-20	1SFA 619 202 R102	27.20
1 NC		C2SS310-01	1SFA 619 202 R104	22.70
2 NC		C2SS310-02	1SFA 619 202 R105	27.20
1 NO + 1 NC		C2SS310-11	1SFA 619 202 R107	27.20

Short handle. Three positions

Maintained

Contacts included:

2 NO		C3SS110-20	1SFA 619 210 R102	27.20
2 NC		C3SS110-02	1SFA 619 210 R105	
1 NO + 1 NC		C3SS110-11	1SFA 619 210 R107	

Momentary

Contacts included:

2 NO		C3SS210-20	1SFA 619 211 R102	27.20
2 NC		C3SS210-02	1SFA 619 211 R105	
1 NO + 1 NC		C3SS210-11	1SFA 619 211 R107	

Momentary

Contacts included:

2 NO		C3SS310-20	1SFA 619 212 R102	27.20
2 NC		C3SS310-02	1SFA 619 212 R105	
1 NO + 1 NC		C3SS310-11	1SFA 619 212 R107	

Momentary

Contacts included:

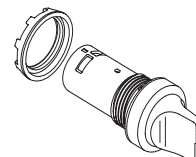
2 NO		C3SS710-20	1SFA 619 216 R102	27.20
2 NC		C3SS710-02	1SFA 619 216 R105	
1 NO + 1 NC		C3SS710-11	1SFA 619 216 R107	

Ordering example – Compact selector switch

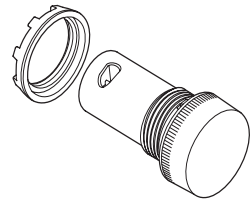
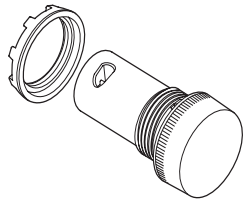
Requested: A red compact selector switch with three positions, Momentary, spring return from A to B and maintained position in C. With 2 NC contacts.

Ref.: 10 pieces of C3SS7-10R-02

Minimum Ref. quantity: 10 pieces
Packing: 10 pieces/plastic bag, 10 bags/box



Pilot lights



Pilot light Ba 9s base, bulb not included

Description	Catalog No.	Ref. Code	List Price
Color:			
Red	CL-100R	1SFA 619 402 R1001	\$ 14.00
Green	CL-100G	1SFA 619 402 R1002	
Yellow	CL-100Y	1SFA 619 402 R1003	
Blue	CL-100L	1SFA 619 402 R1004	
White	CL-100W	1SFA 619 402 R1005	
Clear	CL-100C	1SFA 619 402 R1008	

Pilot light with integrated LED Service life >50 000 hours

Color	Rated current mA	Lumi-nance mcd	Wave-length nm	Catalog No.	Ref. Code	List Price
Rated voltage 12 V, DC ①						
Red	30	60	625	CL-501R	1SFA 619 402 R5011	\$ 25.00
Green	15	126	520	CL-501G	1SFA 619 402 R5012	
Yellow	30	60	590	CL-501Y	1SFA 619 402 R5013	
Blue	30	22	470	CL-501L	1SFA 619 402 R5014	
White	30	88	②	CL-501W	1SFA 619 402 R5015	
Rated voltage 24 V, AC/DC						
Red	15	60	625	CL-502R	1SFA 619 402 R5021	25.00
Green	15	126	520	CL-502G	1SFA 619 402 R5022	
Yellow	15	60	590	CL-502Y	1SFA 619 402 R5023	
Blue	15	22	470	CL-502L	1SFA 619 402 R5024	
White	15	88	②	CL-502W	1SFA 619 402 R5025	
Rated voltage 48 V, AC/DC						
Red	15	60	625	CL-504R	1SFA 619 402 R5041	25.00
Green	15	126	520	CL-504G	1SFA 619 402 R5042	
Yellow	15	60	590	CL-504Y	1SFA 619 402 R5043	
Blue	15	22	470	CL-504L	1SFA 619 402 R5044	
White	15	88	②	CL-504W	1SFA 619 402 R5045	
Rated voltage 60 V, AC/DC						
Red	15	60	625	CL-505R	1SFA 619 402 R5051	25.00
Green	15	126	520	CL-505G	1SFA 619 402 R5052	
Yellow	15	60	590	CL-505Y	1SFA 619 402 R5053	
Blue	15	22	470	CL-505L	1SFA 619 402 R5054	
White	15	88	②	CL-505W	1SFA 619 402 R5055	
Rated voltage 110-130 V, AC						
Red	15	60	625	CL-513R	1SFA 619 402 R5131	25.00
Green	15	126	520	CL-513G	1SFA 619 402 R5132	
Yellow	15	60	590	CL-513Y	1SFA 619 402 R5133	
Blue	15	22	470	CL-513L	1SFA 619 402 R5134	
White	15	88	②	CL-513W	1SFA 619 402 R5135	
Rated voltage 110-130 V, DC ①						
Red	15	60	625	CL-515R	1SFA 619 402 R5151	25.00
Green	15	126	520	CL-515G	1SFA 619 402 R5152	
Yellow	15	60	590	CL-515Y	1SFA 619 402 R5153	
Blue	15	22	470	CL-515L	1SFA 619 402 R5154	
White	15	88	②	CL-515W	1SFA 619 402 R5155	
Rated voltage 220 V, DC ①						
Red	15	60	625	CL-520R	1SFA 619 402 R5201	25.00
Green	15	126	520	CL-520G	1SFA 619 402 R5202	
Yellow	15	60	590	CL-520Y	1SFA 619 402 R5203	
Blue	15	22	470	CL-520L	1SFA 619 402 R5204	
White	15	88	②	CL-520W	1SFA 619 402 R5205	
Rated voltage 230 V, AC						
Red	15	60	625	CL-523R	1SFA 619 402 R5231	25.00
Green	15	126	520	CL-523G	1SFA 619 402 R5232	
Yellow	15	60	590	CL-523Y	1SFA 619 402 R5233	
Blue	15	22	470	CL-523L	1SFA 619 402 R5234	
White	15	88	②	CL-523W	1SFA 619 402 R5235	
Rated voltage 380 V, AC						
Red	15	60	625	CL-530R	1SFA 619 402 R5301	25.00
Green	15	126	520	CL-530G	1SFA 619 402 R5302	
Yellow	15	60	590	CL-530Y	1SFA 619 402 R5303	
Blue	15	22	470	CL-530L	1SFA 619 402 R5304	
White	15	88	②	CL-530W	1SFA 619 402 R5305	
Rated voltage 415 V, AC						
Red	15	60	625	CL-541R	1SFA 619 402 R5411	25.00
Green	15	126	520	CL-541G	1SFA 619 402 R5412	
Yellow	15	60	590	CL-541Y	1SFA 619 402 R5413	
Blue	15	22	470	CL-541L	1SFA 619 402 R5414	
White	15	88	②	CL-541W	1SFA 619 402 R5415	

① Care should be taken for DC supply where + and - must be correctly connected. (this is marked on the product, X1 (+) and X2 (-)).

② X=0.31, Y=0.32

Minimum Ref. quantity: 10 pieces
Packing: 10 pieces/plastic bag, 10 bags/box

Accessories



Filament bulbs Ba 9s base Catalog No. of current: AC/DC. A lamp changing tool is required for changing bulb.

Description					Catalog No.	Ref. Code	List Price
Rated voltage V	Rated current mA	Rated output W	Service life h	Luminance mcd			
6	200	1.2	10 000	350	5911 086-11	5911 086-11	\$ 6.00
12	100	1.2	10 000	230	5911 086-12	5911 086-12	
24	50	1.2	10 000	280	5911 086-13	5911 086-13	
30	40	1.2	10 000	250	5911 086-4	5911 086-4	
48	42	2	6 000	500	5911 086-5	5911 086-5	
60	20	1.2	5 000	190	5911 086-14	5911 086-14	
110	18	2	7 500	250	5911 086-7	5911 086-7	
130	15	2	7 500	120	5911 086-15	5911 086-15	

LEDs

With one diode chip mounted on a Ba 9s base. Choose the same color for the LED and the lamp cap or else use a clear lamp cap.

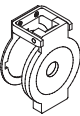
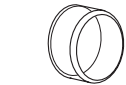
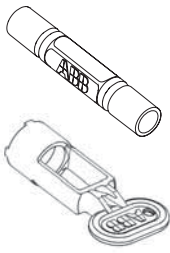
For white light use white LED with clear lamp cap. At DC the lamp base have to be connected to cathode (-) and the bottom contact to anode (+).



Color	Rated current mA	Wave-length nM	Luminance mcd	Catalog No.	Ref. Code	List Price
Rated voltage 12 V, DC Service life >50 000 h						
Red	15	630	250	KA2-2011	1SFA 616 921 R2011	\$ 21.00
Green	15	525	1000	KA2-2012	1SFA 616 921 R2012	
Yellow	15	592	250	KA2-2013	1SFA 616 921 R2013	
Blue	15	470	450	KA2-2014	1SFA 616 921 R2014	
White	15	x=0.31 y=0.32	600	KA2-2015	1SFA 616 921 R2015	
Rated voltage 24 V, (AC)/DC Ⓢ Service life >50 000 h						
Red	15	630	250	KA2-2021	1SFA 616 921 R2021	15.00
Green	15	525	800	KA2-2022	1SFA 616 921 R2022	
Yellow	15	592	250	KA2-2023	1SFA 616 921 R2023	
Blue	15	470	400	KA2-2024	1SFA 616 921 R2024	
White	15	x=0.31 y=0.32	500	KA2-2025	1SFA 616 921 R2025	
Rated voltage 48 V, (AC)/DC Ⓢ Service life >50 000 h						
Red	12	630	200	KA2-2041	1SFA 616 921 R2041	21.00
Green	12	525	1700	KA2-2042	1SFA 616 921 R2042	
Yellow	12	592	240	KA2-2043	1SFA 616 921 R2043	
Blue	12	470	720	KA2-2044	1SFA 616 921 R2044	
White	12	x=0.31 y=0.32	1200	KA2-2045	1SFA 616 921 R2045	
Rated voltage 60 V, (AC)/DC Ⓢ Service life >50 000 h						
Red	10	630	160	KA2-2051	1SFA 616 921 R2051	21.00
Green	10	525	1400	KA2-2052	1SFA 616 921 R2052	
Yellow	10	592	200	KA2-2053	1SFA 616 921 R2053	
Blue	10	470	600	KA2-2054	1SFA 616 921 R2054	
White	10	x=0.31 y=0.32	1000	KA2-2055	1SFA 616 921 R2055	
Rated voltage 110-130 V, AC Ⓢ Service life 25 000 h						
Red	4-6	630	60-100	KA2-2131	1SFA 616 921 R2131	15.00
Green	4-6	525	500-850	KA2-2132	1SFA 616 921 R2132	
Yellow	4-6	592	70-120	KA2-2133	1SFA 616 921 R2133	
Blue	4-6	470	220-350	KA2-2134	1SFA 616 921 R2134	
White	4-6	x=0.31 y=0.32	350-600	KA2-2135	1SFA 616 921 R2135	
Rated voltage 110-130 V, AC/DC Ⓢ Service life 25 000 h						
Red	4-6	630	60-100	KA2-2141	1SFA 616 921 R2141	21.00
Green	4-6	525	500-850	KA2-2142	1SFA 616 921 R2142	
Yellow	4-6	592	70-120	KA2-2143	1SFA 616 921 R2143	
Blue	4-6	470	220-350	KA2-2144	1SFA 616 921 R2144	
White	4-6	x=0.31 y=0.32	350-600	KA2-2145	1SFA 616 921 R2145	
Rated voltage 230 V, AC Ⓢ Service life 25 000 h						
Red	4	630	60	KA2-2221	1SFA 616 921 R2221	21.00
Green	4	525	500	KA2-2222	1SFA 616 921 R2222	
Yellow	4	592	70	KA2-2223	1SFA 616 921 R2223	
Blue	4	470	220	KA2-2224	1SFA 616 921 R2224	
White	4	x=0.31 y=0.32	350	KA2-2225	1SFA 616 921 R2225	

Ⓢ At AC the luminance is decreased with 30 % and there is also a slight flickering.

Accessories



Lamp changing tool

Description	Catalog No.	Ref. Code	List Price
For LEDs and for bulbs	KA1-8072	1SFA 616 920 R8072	\$ 10.00

Mounting tool

Description	Catalog No.	Ref. Code	List Price
Used for tightening the locking nut	KA1-8015	1SFA 611 920 R8015	\$ 10.00

Membrane of silicone

Of transparent, heat and cold resistant silicon rubber. Does not harden at low temperature. Gives IP 67 degree of protection. When membrane is used, remove the gasket.

For operator with	Catalog No.	Ref. Code	List Price
Flush button	KA1-8052	1SFA 616 920 R8052	\$ 8.00
Extended button	KA1-8002	1SFA 616 920 R8002	8.00

Protective ring

Description	Catalog No.	Ref. Code	List Price
For flush and extended pushbutton To prevent inadvertant operation. Not together with legend plate holder.	SK 615 512-1	SK 615 512-1	\$ 4.00

Protective cover

Description	Catalog No.	Ref. Code	List Price
For flush button. To prevent inadvertant operation. Not together with legend plate holder.	KA1-8010	1SFA 616 920 R8010	\$ 15.00

Button

Description	Catalog No.	Ref. Code	List Price
Grey, flush (Packing unit 10 pieces)	KA1-8087	1SFA 616 920 R8087	\$ 1.50
Grey, extended (Packing unit 10 pieces)	KA1-8097	1SFA 616 920 R8097	1.50

Bezel

Description	Catalog No.	Ref. Code	List Price
For pushbutton			
Grey (Packing unit 10 pieces)	KA1-8079	1SFA 616 920 R8079	\$ 1.00
Black (Packing unit 10 pieces)	KA1-8022	1SFA 616 920 R8022	1.00
Metal (Packing unit 10 pieces)	KA1-8021	1SFA 616 920 R8021	2.50
For selector switch			
Grey (Packing unit 10 pieces)	CA1-8076	1SFA 619 920 R8076	1.00
Black (Packing unit 10 pieces)	CA1-8077	1SFA 619 920 R8077	1.00
Metal (Packing unit 10 pieces)	CA1-8078	1SFA 619 920 R8078	2.50

Square bezel

Black, plastic (Packing unit 10 pieces)	SK 616 016-2	SK 616 016-2	2.00
Grey, plastic (Packing unit 10 pieces)	KA1-8124	1SFA 611 920 R8124	2.00

Accessories



30 mm adaptors

For use when fitting the 22 mm pilot devices in 30 mm mounting holes. (1.5 – 4 mm panels)

Description	Catalog No.	Ref. Code	List Price
For use with pushbuttons, selector switches, emergency stop push-button and pilot lights			
Black plastic.	KA1-8029	1SFA 616 920 R8029	\$ 8.00
Metal.	KA1-8030	1SFA 616 920 R8030	10.00



Adaptors

For flush mounted pushbutton

KA1-8073

1SFA 616 920 R8073

15.00

For flush mounted selector switches

CA1-8075

1SFA 619 920 R8075

Extra key

Description	Catalog No.	Ref. Code	List Price
Ronis 455 (key code 71)	SK 616 021-71	SK 616 021-71	\$ 10.00



Technical data



Approvals

The pushbuttons, selector switches and pilot lights are approved by:
- National approval agencies: UL and China Compulsory Product Certification

For detail information please contact ABB

Standards

IEC 60947-1	Low-voltage switchgear and controlgear - Part 1: General rules
IEC 60947-5-1	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
IEC 60947-5-5	Low-voltage switchgear and controlgear - Part 5-5: Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function
IEC 60073	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators
IEC 60529	Degrees of protection provided by enclosures (IP Code)
EN 60947-1	Low-voltage switchgear and controlgear - Part 1: General rules
EN 60947-5-1	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
EN 60947-5-5	Low-voltage switchgear and controlgear - Part 5-5: Control circuit devices and switching elements - Electrical emergency stop device with mechanical latching function
EN 60073	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indication devices and actuators
EN 60529	Degrees of protection provided by enclosures (IP Code)
EN 50013	Low-voltage switchgear and controlgear for industrial use - Terminal marking and distinctive number for particular control switches
UL 508	Industrial Control Equipment
CSA C22.2 No 14	Industrial Control Equipment

Degrees of protection

Pilot device	IP	UL/CSA
Compact pushbutton, CP1, CP2, CP3, CP4	IP66	Type 1, 3R, 4, 4X, 12, 13
Compact selector switch, C2SS, C3SS	IP66	Type 1, 3R, 4, 4X, 12, 13
Compact pilot light, CL	IP66	Type 1, 3R, 4, 4X, 12, 13
Compact emergency stop pushbutton, CE3T, CE3P, CE4T, CE4P, CE3K1, CE4K1	IP66	Type 1, 3R, 4, 4X, 12, 13
Terminals	IP20	

Temperature

Ambient temperature during operation	-25 to +70 °C
Exception: All pilot devices with 2 W continuously lit filament bulb	-25 to +40 °C
Storage temperature	-30 to +85 °C

Tightening torque

Locking nut, M22	Min. 2 Nm Max. 2.3 Nm
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Contacts

Ratings as per UL, CSA, NEMA	C300	R300
Rated insulation voltage	250 V	250 V
Rated thermal current	2.5 A	1 A
Rated operational current		
at 120 V	1.5 A	
125 V		0.22 A
240 V	0.75 A	
250 V		0.11 A
Ratings as per IEC 60947-5-1		
Rated insulation voltage, U _i	300 V	
Rated thermal current, I _{th}	5 A	
Rated operational current, I _e		
utilisation category AC-15		
at 120 V	1.5 A	
240 V	1 A	
Rated operational current, I _{e'}		
utilisation category DC-13,		
at 24 V	0.3 A	
125 V	0.2 A	
Short circuit protection		
Max. fuse at 1 kA	16 A ordinary 10 A delayed	
Tightening torque		
compact pushbutton & selector switch	0.8 Nm (M3)	
compact pilot light	0.9 Nm (M3.5)	
compact emergency stop pushbutton	0.8 Nm (M3)	
Terminals		
Plus-minus Pozidriv No. 2		
Compact pushbutton		
Compact selector switch		
Compact emergency stop		
Connectable area	min. 1 x 0.5 mm ² /1 x AWG22 max. 2 x 1.5 mm ² /2 x AWG14	
Compact pilot light		
Connectable area	min. 1 x 0.5 mm ² /1 x AWG20 max. 2 x 2.5 mm ² /2 x AWG14	

Material

No ozone depleting substances in the products.

All front parts are made of polycarbonate

Material	Characteristics
PC Polycarbonate	High impact strength, good outdoor resistance. Can withstand light acid solutions, aliphatic hydrocarbons, paraffin, alcohols, animal and vegetable greases.
PA Polyamide	Can withstand high temperatures, aliphatic, aromatic and chlorinated hydrocarbons, esters, ketone-aldehydes, alcohols and basic solutions.
PBT	Can withstand temperature, aliphatic and aromatic hydrocarbons, acids, basic solutions, alcohols, grease and oils
Zinc	Good corrosion resistance in inland-, sea and industrial atmosphere.
Light-alloy	Good corrosion resistance in inland-, sea and industrial atmosphere.
Rubber	Chloroprene Nitrile



Features

- Available for 1, 2, 3, 4 & 6 operators.
- Base mounted contacts allow for easy removal of operator cover. Wiring remains with base.
- Up to 5 contact blocks can be used per operator for some combinations.
- Environmental ratings: UL/CSA Type 1, 3R, 4, 4X, 12 & 13, IP66
- Available in high impact strength polycarbonate (plastic) material.
- Rated for outdoor use.
- Enclosures can withstand light acid solutions and other chemicals.
- Metallic enclosures available.

Plastic enclosures 1, 2 & 3 seat



1 Position

1-seat Plastic enclosures. Yellow top/light grey bottom

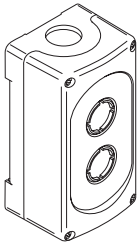
Description					Catalog No.	List Price
	Pos - 1	Pos - 2	Pos - 3	Pos - 4		
Type	Twist Release 40mm E	—	—	—	P1-ES	\$ 84.00
Color	Stop	—	—	—		
Contacts	Red	—	—	—		
Name plate	EMERGENCY STOP	—	—	—		
	—	—	—	—		
Type	Ill. Twist Release 40mm E	—	—	—	P1-1ES	107.50
Color	40mm E-Stop	—	—	—		
Contacts	Red, 120V	—	—	—		
Name plate	EMERGENCY STOP	—	—	—		
	—	—	—	—		

1-seat Plastic enclosure, dark grey top/light grey bottom

Description					Catalog No.	List Price
	Pos - 1	Pos - 2	Pos - 3	Pos - 4		
Type	3-pos sel. Main	—	—	—	P1-HOA	\$ 55.00
Color	Black	—	—	—		
Contacts	2 NO	—	—	—		
Name plate	HAND/OFF/AUTO	—	—	—		
	—	—	—	—		

2-seat Plastic enclosure, dark grey top/light grey bottom

Description					Catalog No.	List Price
	Pos - 1	Pos - 2	Pos - 3	Pos - 4		
Type	Button mom, Ext.	Button mom, Flush	—	—	P2-SS	\$ 63.20
Color	Red	Green	—	—		
Contacts	1 NC	1 NO	—	—		
Name plate	STOP	START	—	—		
	—	—	—	—		
Type	3-pos sel. Main	Pilot Light	—	—	P2-1HOARL	90.00
Color	Black	Red	—	—		
Contacts	2 NO	1 LB	—	—		
Name plate	HAND/OFF/AUTO	RUN	—	—		
	—	—	—	—		
Type	2-pos sel. Main	Pilot Light	—	—	P2-1OORL	82.00
Color	Black	Red	—	—		
Contacts	1 NO	1 LB	—	—		
Name plate	ON/OFF	RUN	—	—		
	—	—	—	—		

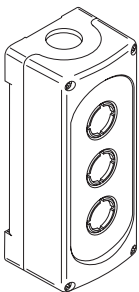


2 Position

1 Position

3-seat Plastic enclosure, dark grey top/light grey bottom

Description					Catalog No.	List Price
	Pos - 1	Pos - 2	Pos - 3	Pos - 4		
Type	Button mom, Ext.	Button mom, Flush	Pilot Light	—	P3-1SSRL	\$ 96.70
Color	Red	Green	Red	—		
Contacts	1 NC	1 NO	1 LB	—		
Name plate	STOP	START	RUN	—		
	—	—	—	—		
Type	3-pos sel. Main	Pilot Light	Pilot Light	—	P3-1HOARLGL	123.50
Color	Black	Red	Green	—		
Contacts	2 NO	1 LB	1 LB	—		
Name plate	HAND/OFF/AUTO	RUN	OFF	—		
	—	—	—	—		
Type	2-pos sel. Main	Pilot Light	Pilot Light	—	P3-1OORLGL	115.50
Color	Black	Red	Green	—		
Contacts	1 NO	1 LB	1 LB	—		
Name plate	ON/OFF	RUN	OFF	—		
	—	—	—	—		
Type	3-pos sel. Main	Button mom, Flush	Pilot Light	—	P3-1HOASRL	109.60
Color	Black	Green	Red	—		
Contacts	2 NO	1 NO	1 LB	—		
Name plate	HAND/OFF/AUTO	START	RUN	—		
	—	—	—	—		
Type	Twist Release 40mm E Stop	3-pos sel. Main	Pilot Light	—	P3-1ESHOARL	145.50
Color	Red	Black	Red	—		
Contacts	2 NC	2 NO	1 LB	—		
Name plate	EMERGENCY STOP	HAND/OFF/AUTO	RUN	—		
	—	—	—	—		



3 Position

2 Position

1 Position

Plastic enclosures 4 seat



4-seat Plastic enclosure, dark grey top/light grey bottom

Description					Catalog No.	List Price
	Pos - 1	Pos - 2	Pos - 3	Pos - 4		
Type	Button mom., Ext.	Button mom., Flush	Pilot Light	Pilot Light	P4-1SSRLGL	\$ 134.20
Color	Red	Green	Green	Red		
Contacts	1 NC	1 NO	1 LB	1 LB		
Name plate	STOP	START	OFF	RUN		
Type	3-pos sel. Main	Button mom. Flush	Pilot Light	Pilot Light	P4-1HOASRLGL	147.10
Color	Black	Green	Green	RED		
Contacts	2 NO	1 NO	1 LB	1 LB		
Name plate	HAND/OFF/AUTO	START	OFF	RUN		
Type	3-pos sel. Main	Pilot Light	Pilot Light	Pilot Light	P4-1HOARLYLGL	161.00
Color	Black	Green	Yellow	Red		
Contacts	2 NO	1 LB	1 LB	1 LB		
Name plate	HAND/OFF/AUTO	OFF	FAULT	RUN		
Type	2-pos. sel. Main	Pilot Light	Pilot Light	Pilot Light	P4-1OORLYLGL	153.00
Color	Black	Green	Yellow	Red		
Contacts	1 NO	1 LB	1 LB	1 LB		
Name plate	ON/OFF	OFF	FAULT	RUN		
Type	Twist Release 40mm E Stop	Button mom., Ext.	Button mom., Flush	Pilot Light	P4-1ESSRL	156.20
Color	Red	Red	Green	Red		
Contacts	2 NC	1 NC	1 NO	1 LB		
Name plate	EMERGENCY STOP	STOP	START	RUN		
Type	Twist Release 40mm E Stop	3-pos. sel. Main	Pilot Light	Pilot Light	P4-1ESHOARLGL	183.00
Color	Red	Black	Green	Red		
Contacts	2 NC	2 NO	1 LB	1 LB		
Name plate	EMERGENCY STOP	HAND/OFF/AUTO	OFF	RUN		
Type	Twist Release 40mm E Stop	2-pos sel. Main	Pilot Light	Pilot Light	P4-1ESOORLGL	175.00
Color	Red	Black	Green	Red		
Contacts	2 NC	1 NO	1 LB	1 LB		
Name plate	EMERGENCY STOP	ON/OFF	OFF	RUN		

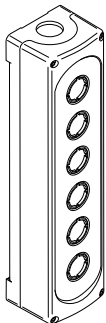
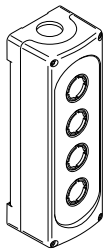
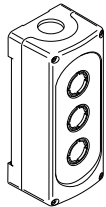
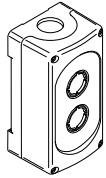
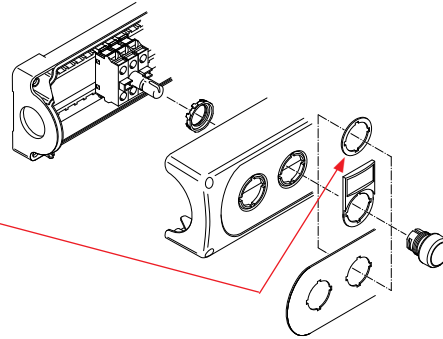
Degree of protection IP 66

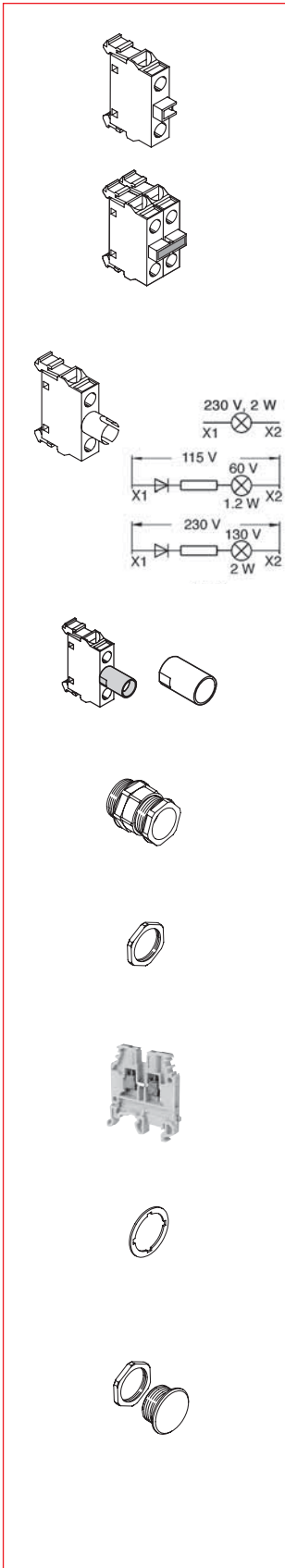
Empty plastic enclosures Now with stainless steel screws

Size	Color top/bottom	Catalog No.	Ref. Code	List Price
1-seat	Dark grey/Light grey	MEP1-0	1SFA 611 811 R1000	\$ 28.00
1-seat	Yellow/Light grey	MEPY1-0	1SFA 611 821 R1000	28.00
2-seat	Dark grey/Light grey	MEP2-0	1SFA 611 812 R1000	32.00
3-seat	Dark grey/Light grey	MEP3-0	1SFA 611 813 R1000	36.00
4-seat	Dark grey/Light grey	MEP4-0	1SFA 611 814 R1000	44.00
6-seat	Dark grey/Light grey	MEP6-0	1SFA 611 816 R1000	52.00

When Ordering

- Select operators from page 8.4 and 8.38.
N.B. Selector switches with short handle for vertically mounted selector switches must be Ref.ed from page 8.45 - 8.46
- Select contact blocks and lamp blocks for **rear** mounting, see page 8.44.
- Accessories, see page 8.43
N.B. **One spacer per operator** has to be Ref.ed if legend plate is not used.
(for rear mounted pilot devices)





Contact blocks for rear mounting

Description	Catalog No.	Ref. Code	List Price
Contact block			
1NO	MCB-10B	1SFA 611 610 R2001	\$ 8.00
1NC	MCB-01B	1SFA 611 610 R2010	

Double contact block			
2NO	MCB-20B	1SFA 611 610 R2002	16.00
2NC	MCB-02B	1SFA 611 610 R2020	
1NO+1NC	MCB-11B	1SFA 611 610 R2011	

Contact block with gold plated contacts			
1NO	MCB-10BG	1SFA 611 610 R2101	16.00
1NC	MCB-01BG	1SFA 611 610 R2110	

Description	Catalog No.	Ref. Code	List Price
Lamp blocks			
For max. 2 W, 230 V AC and DC filament bulb or LED	MLB-1B	1SFA 611 620 R2001	17.50
115 V AC supply voltage. For 60 V filament bulb max. 1.2 W	MLB-2B	1SFA 611 620 R2002	21.50
230 V AC supply voltage. For 130 V filament bulb max. 2 W	MLB-3B	1SFA 611 620 R2003	21.50

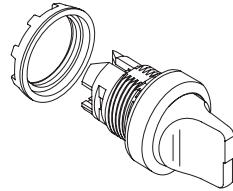
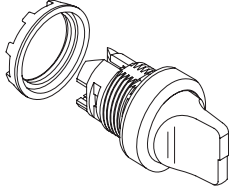
Description	Catalog No.	Ref. Code	List Price
Protective sleeve			
To make a rear mounted lamp block screen protected. IP20	5396 0543-1	5396 0543-1	\$ 2.00

Description	Catalog No.	Ref. Code	List Price
Earthing terminal			
For plastic enclosure.	MA5-2005	1SFA 611 925 R3005	\$ 2.00

Description	Catalog No.	Ref. Code	List Price
Spacer			
1 mm thick. Needed when legend plates are not used in plastic enclosures.			
Spacer (Packing unit 10 pieces)	SK 615 516-1	SK 615 516-1	\$ 1.00
Spacer for Modular emergency stop pushbutton, page ?? (Packing unit 10 pieces)	KA1-8045	1SFA 616 920 R 8045	1.00

Description	Catalog No.	Ref. Code	List Price
Blanking plug (22mm)			
Black plastic	SK 615 502-B	SK 615 502-B	\$ 2.00

Two position selector switches for mounting in vertically mounted enclosures



Bezel in black plastic as standard
Bezel in metal:
 Replace '1' in the:
 Catalog No. M2SSX-1 0X
 Ref. Code 1SFA611XXX R 1XXX
 3 for metal bezel
 4 for grey plastic bezel

Contact functions

Block positions as seen from operator front.

Handle position	Left block	Right block
A (B)	O	O
O	x	x

O = not actuated (normal state)
 x = actuated (state changed)

Non-illuminated operator ... ①

Symbol	Handle color	Catalog No.	Ref. Code	List Price
with short handle				
Maintained				
	Red	M2SSV1-10R	1SFA 611 220 R1001	\$ 11.00
	Black	M2SSV1-10B	1SFA 611 220 R1006	
Maintained				
	Red	M2SSV2-10R	1SFA 611 221 R1001	11.00
	Black	M2SSV2-10B	1SFA 611 221 R1006	
Momentary, spring return from C to B				
	Red	M2SSV3-10R	1SFA 611 222 R1001	14.00
	Black	M2SSV3-10B	1SFA 611 222 R1006	

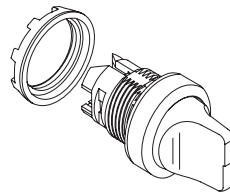
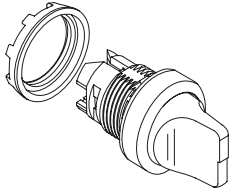
Illuminated operator ... ① ②

Symbol	Handle color	Catalog No.	Ref. Code	List Price
with short handle				
Maintained				
	Red	M2SSV1-11R	1SFA 611 220 R1101	\$ 17.00
	Green	M2SSV1-11G	1SFA 611 220 R1102	
	Yellow	M2SSV1-11Y	1SFA 611 220 R1103	
Maintained				
	Red	M2SSV2-11R	1SFA 611 221 R1101	17.00
	Green	M2SSV2-11G	1SFA 611 221 R1102	
	Yellow	M2SSV2-11Y	1SFA 611 221 R1103	
Momentary, spring return from C to B				
	Red	M2SSV3-11R	1SFA 611 222 R1101	26.00
	Green	M2SSV3-11G	1SFA 611 222 R1102	
	Yellow	M2SSV3-11Y	1SFA 611 222 R1103	

① No contact in center position

② Lamp block for max 230 V AC/DC. Bulb not included. Other lamp block see Accessories

Three position selector switches for mounting in vertically mounted enclosures



Bezel in black plastic as standard
Bezel in metal:
Replace '1' in the:
Catalog No. M3SSX-1 0X
Ref. Code 1SFA611XXX R 1XXX
3 for metal bezel
4 for grey plastic bezel

Contact functions
Block positions as seen from operator front.

Handle position	Left block	Right block
A	x	O
B	O	O
C	O	x

Non-illuminated operator ... ①

Symbol	Handle color	Catalog No.	Ref. Code	List Price
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with short handle

Maintained



Red
Black

M3SSV1-10R
M3SSV1-10B

1SFA 611 230 R1001
1SFA 611 230 R1006

\$ 11.00

**Momentary, spring return
from A to B and from C to B**



Red
Black

M3SSV2-10R
M3SSV2-10B

1SFA 611 231 R1001
1SFA 611 231 R1006

14.00

**Momentary, spring return
from C to B**



Red
Black

M3SSV3-10R
M3SSV3-10B

1SFA 611 232 R1001
1SFA 611 232 R1006

14.00

Illuminated operator ... ① ②

Symbol	Handle color	Catalog No.	Ref. Code	List Price
--------	--------------	-------------	-----------	------------

with short handle

Maintained



Red
Green
Yellow

M3SSV1-11R
M3SSV1-11G
M3SSV1-11Y

1SFA 611 230 R1101
1SFA 611 230 R1102
1SFA 611 230 R1103

\$ 17.00

**Momentary, spring return
from A to B and from C to B**



Red
Green
Yellow

M3SSV2-11R
M3SSV2-11G
M3SSV2-11Y

1SFA 611 231 R1101
1SFA 611 231 R1102
1SFA 611 231 R1103

26.00

**Momentary, spring return
from C to B**



Red
Green
Yellow

M3SSV3-11R
M3SSV3-11G
M3SSV3-11Y

1SFA 611 232 R1001
1SFA 611 232 R1002
1SFA 611 232 R1003

26.00

Contact blocks, lamp block and holder See Page 8.45

① No contact in center position

② Lamp block for max 230 V AC/DC. Bulb not included. Other lamp block see Accessories

Pilot Devices
Enclosed

Notes



Fixed legend plates

- Of silvergrey aluminum for:
 - pushbuttons
 - two-position selector switches
 - three-position selector switches
 - toggle switches
 - customer selected text
- Of black/white plastic. Text on one side or both sides:
 - with customer selected text

Special legend plates

- For emergency stop pushbuttons
- Legend plate with or without customer selected text
- Legend plate holders with inserts of brushed aluminum on black plastic. With or without text or symbol for:
 - pushbuttons
 - two-position selector switch
 - three position selector switch
 - customer selected text
- For plastic enclosures:
 - Legend plate holders with inserts of brushed aluminum on black plastic. With or without text or symbol for push-buttons
 - Legend plates of silvergrey aluminum For 1- 2-, 3- 4- or 6-seat plastic enclosures With or without text or symbol for:
 - pushbuttons

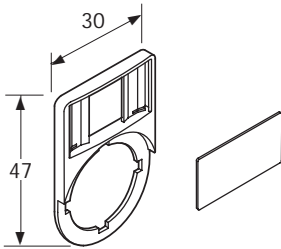
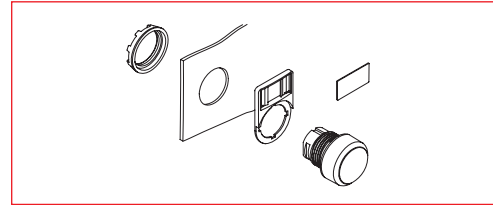
Text caps

- For illuminated pushbuttons (flush or extended) and pilot lights with or without text or symbol or with customer selected text.

Special legend plates

Legend plate holders with inserts

- Holder of black plastic.
 - Holder of grey plastic for plastic enclosures.
 - Insert of brushed aluminum on black plastic.
- The insert is securely retained in a pocket and can be removed.
3 mm high text in typeface Helvetica.



Legend plate holder (black)

Description	Catalog No.	List Price
Black	1SFA 616 920 R8120	\$.70

Inserts

Description	Catalog No.	List Price
Of brushed aluminum on black plastic Without text or symbol	1SFA 616 920 R8121	\$.70

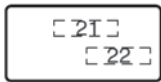
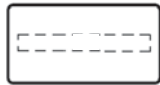
Inserts with text/symbol

Description	Catalog No.	List Price
Of brushed aluminum on black plastic <u>With text or symbol</u>		\$.70
O	1SFA 611 930 R1032	
I	1SFA 611 930 R1033	
→	1SFA 611 930 R1034	
→→	1SFA 611 930 R1035	
Close	1SFA 611 930 R1036	
Open	1SFA 611 930 R1037	
On	1SFA 611 930 R1038	
Off	1SFA 611 930 R1039	
Fast	1SFA 611 930 R1040	
Slow	1SFA 611 930 R1041	
Down	1SFA 611 930 R1042	
Up	1SFA 611 930 R1043	
Start	1SFA 611 930 R1044	
Stop	1SFA 611 930 R1045	

Inserts for two-position selector switches

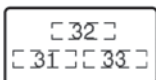
Of brushed aluminum on black plastic. Text on both sides.

Description	Catalog No.	List Price
<u>With text or symbol</u>		\$.70
Pos. 21 Pos. 22		
O I	1SFA 611 930 R 1070	
I II	1SFA 611 930 R 1071	
→ →→	1SFA 611 930 R 1072	
Off On	1SFA 611 930 R 1073	
Stop Start	1SFA 611 930 R 1074	
Low High	1SFA 611 930 R 1075	
Slow Fast	1SFA 611 930 R 1076	
Close Open	1SFA 611 930 R 1077	
Jog Run	1SFA 611 930 R 1078	
Hand Auto	1SFA 611 930 R 1079	

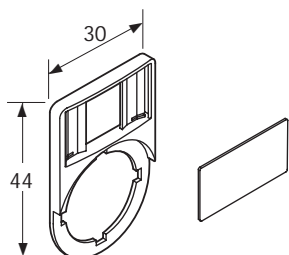
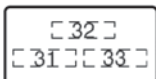
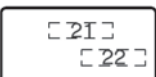
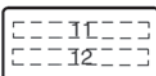
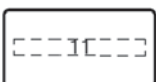


For two-position. selector switch

Special legend plates



For three-position selector switch



Inserts for three-position selector switches

Of brushed aluminum on black plastic. Text on both sides.

Description	Catalog No.	List Price
With text or symbol		
Pos. 31 Pos. 32 Pos. 33		
← O →	1SFA 611 930 R 1080	\$.70
→ O →→	1SFA 611 930 R 1081	
I O II	1SFA 611 930 R 1082	
Hand O Auto	1SFA 611 930 R 1083	
Slow Off Fast	1SFA 611 930 R 1084	

Legend plate holder (grey) for plastic enclosures

Description	Catalog No.	List Price
Grey	1SFA 611 930 R1060	\$.70

Inserts

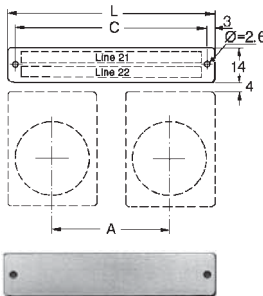
Description	Catalog No.	List Price
Of brushed aluminum on black plastic Without text or symbol	1SFA 611 930 R1061	\$.70

Inserts with text/symbol

Description	Catalog No.	List Price
Of brushed aluminum on black plastic		
With text or symbol		
O	1SFA 611 930 R1062	\$.70
I	1SFA 611 930 R1063	
II	1SFA 611 930 R1064	

Special legend plates

Emergency stop legend plates ①



Description/Text	Catalog No.	List Price
Black text on a yellow aluminum plate. Nöd Stopp Emergency Stop Not Aus ARRET D'URGENCE HÄTÅSEIS PARADA DE EMERGENCIA EMERGENCY STOP NOT AUS ARRET D'URGENCE Without text	SK 615 546-1 SK 615 546-2 SK 615 546-3 SK 615 546-4 SK 615 546-5 SK 615 546-6 SK 615 546-13 SK 615 546-8	\$ 6.00
Black text on a yellow plastic plate. Quantity per package: 10 Can be used as yellow background. Emergency Stop	1SFA 616 915 R1005	5.00

More emergency stop legend plates on page 8.60.

Legend plates without or with customer-selected text

Of aluminum

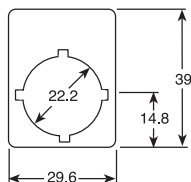
Number of operations	Max. number of characters per line	Dimensions			Without text ② Catalog No.	With text ③ Catalog No.	List Price
		A	L	C			
1	7	-	29.6	23.6	SK 615 545-1	SK 615 998-1	\$ 6.00
2	20	30.5	60	54	SK 615 545-2	SK 615 998-2	
2	24	40	70	64	SK 615 545-3	SK 615 998-3	
3	33	30.5	90	84	SK 615 545-4	SK 615 998-4	
3	42	40	110	104	SK 615 545-5	SK 615 998-5	

① Does not work with pushbutton enclosure.

② Quantity per package: 10.

③ When ordering, please state text and position (Line 21 and Line 22). Only the initial character is upper case unless other is stated. Quantity per package: 1.

Legend plates for pushbuttons



Engraved fixed legend plates, with symbols ①

Of silvergrey aluminum

Symbol	Catalog No.	List Price
O	SK 615 550-61	\$ 1.50
I	SK 615 550-62	
II	SK 615 550-63	
SK 615 562-12		
SK 615 562-18		
SK 615 562-27		

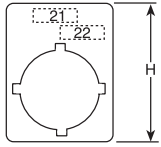
Engraved fixed legend plates, with text ①

Of silvergrey aluminum

Text	Catalog No.	List Price
English		\$ 1.50
Close	SK 615 552-13	
Down	SK 615 552-14	
Emergency stop	SK 615 552-15	
Fast	SK 615 552-16	
Forward	SK 615 552-17	
In	SK 615 550-29	
Inching	SK 615 552-18	
Left	SK 615 552-39	
Lower	SK 615 552-20	
Off	SK 615 552-21	
On	SK 615 552-22	
Open	SK 615 552-23	
Out	SK 615 552-24	
Raise	SK 615 552-25	
Reset	SK 615 552-27	
Reverse	SK 615 552-28	
Right	SK 615 552-40	
Run	SK 615 552-29	
Slow	SK 615 552-30	
Start	SK 615 550-44	
Stop	SK 615 552-31	
Up	SK 615 552-32	

① Text height 3 mm.

Legend plates for two-position selector switches



H = 39 mm

Engraved fixed legend plates, with symbols ①

Of silvergrey aluminum

Symbol/Text

Pos 21 Pos. 22

O I

I II

→ →→

Catalog No.

SK 615 550-75

SK 615 550-76

SK 615 562-72

List Price

\$ 1.50

Engraved fixed legend plates, with text ①

Of silvergrey aluminum

Symbol/Text

Pos 21 Pos. 22

English

Hand Auto

Jog Run

Off On

Stop Start

Catalog No.

SK 615 550-71

SK 615 552-52

SK 615 552-53

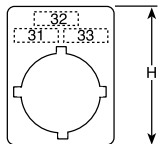
SK 615 552-55

List Price

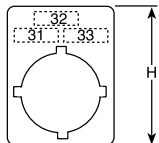
\$ 1.50

① Text height 3 mm. Only the initial character is upper case unless other is stated.

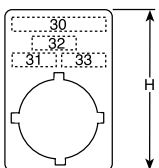
Legend plates for three-position selector switches



H = 39 mm



H = 39 mm



H = 44.5 mm

Engraved fixed legend plates, with symbols ①

Of silvergrey aluminum

Symbol/Text

Pos. 31	Pos. 32	Pos. 33	Catalog No.	List Price
I	O	II	SK 615 550-81	\$ 1.50
←	O	→	SK 615 562-82	
→	O	→→	SK 615 562-83	

Engraved fixed legend plates, with text ①

Of silvergrey aluminum

Symbol/Text

Pos. 31	Pos. 32	Pos. 33	Catalog No.	List Price
Hand	O	Auto	SK 615 550-80	\$ 1.50
Slow	Off	Fast	SK 615 552-60	

Plastic name plate blank (white/black)

Blank	39mm	SK 616 540-2	1.50
	44.5mm	SK 616 541-2	

Plastic name plate blank (silvergray aluminum/black)

Blank	39mm	SK 615 540-3	1.50
	44.5mm	SK 615 541-3	1.50

Aluminum name plate blank (silvergray aluminum)

Blank	39mm	SK 615 540-1	1.50
	44.5mm	SK 615 541-1	

① Text height 3 mm. Only the initial character is upper case unless other is stated.

Custom engraved inserts for legend plate holders



Nameplate inserts — Brushed aluminum on black plastic ①

8

Type	Maximum letters per line	Catalog number	List price
<p>1 line</p>	11	MP-NP19-01	\$ 5.90
<p>2 lines</p>	11	MP-NP19-02	
<p>2 position selector switch</p>	5	MP-NP19-03	
<p>3 position selector switch</p>	5	MP-NP19-04	
<p>2 position selector switch</p>	5	MP-NP19-05	

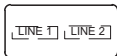
General specifications

- All characters are 1/8" high, upper & lower case. Please specify if all capital letters are desired.
- The legend plate inserts and the fixed legend plates are silver-grey anodized aluminum.
- All special engravings involve engraving the desired lettering into the metal surface and then treating the engraved surfaces with black ink.

EXAMPLE:

MP-NP19-05

- FWD
- REV



"MP-NP19" is the blank legend plate catalog number. "-05" refers to the layout of text (see dimension illustrations).

① For drilling plans, see page 8.74.

② "PW" and "PB" are the same material with either the white or black side showing.

Custom engraved nameplates

Fixed nameplates — aluminum or plastic ①

Type	Maximum letters per line	Finish ②	Catalog number	List price
<p>Pushbuttons or pilot lights</p>	11 39mm	A B BA W	MP-NPE28-01 MP-NPE28B-01 MP-NPE28BA-01 MP-NPE28W-01	\$ 6.50
	11 44.5mm	A B BA W	MP-NPE29-01 MP-NPE29B-01 MP-NPE29BA-01 MP-NPE29W-01	
<p>2 Position selector switches</p>	5 39mm	A B BA W	MP-NPE28-02 MP-NPE28B-02 MP-NPE28BA-02 MP-NPE28W-02	\$ 6.50
	11 (line 1) 5 (line 2) 5 (line 3) 44.5mm	A B BA W	MP-NPE29-02 MP-NPE29B-02 MP-NPE29BA-02 MP-NPE29W-02	
<p>3 Position selector switches</p>	5 39mm	A B BA W	MP-NPE28-03 MP-NPE28B-03 MP-NPE28BA-03 MP-NPE28W-03	\$ 6.50
	11 (line 1) 5 (line 2) 5 (line 3A) 5 (line 3B) 44.5mm	A B BA W	MP-NPE29-03 MP-NPE29B-03 MP-NPE29BA-03 MP-NPE29W-03	
<p>2 Position toggle switches</p>	4 39mm	A B BA W	MP-NPE28-04 MP-NPE28B-04 MP-NPE28BA-04 MP-NPE28W-04	\$ 6.50
	5 44.5mm	A B BA W	MP-NPE29-04 MP-NPE29B-04 MP-NPE29BA-04 MP-NPE29W-04	
<p>3 Position toggle switches</p>	39mm	A B BA W	MP-NPE28-05 MP-NPE28B-05 MP-NPE28BA-05 MP-NPE28W-05	\$ 6.50
	44.5mm	A B BA W	MP-NPE29-05 MP-NPE29B-05 MP-NPE29BA-05 MP-NPE29W-05	



Fixed nameplates — aluminum or plastic ①

Type	Maximum letters per line	Finish ②	Catalog number	List price
<p>Pushbuttons or pilot lights</p>	11 39mm	A B BA W	MP-NPE28-06 MP-NPE28B-06 MP-NPE28BA-06 MP-NPE28W-016	\$ 6.50
	11 44.5mm	A B BA W	MP-NPE29-06 MP-NPE29B-06 MP-NPE29BA-06 MP-NPE29W-06	
<p>2 Position selector switches</p>	5 39mm	A B BA W	MP-NPE28-07 MP-NPE28B-07 MP-NPE28BA-07 MP-NPE28W-07	\$ 6.50
	11 (line 1) 5 (line 2) 5 (line 3) 44.5mm	A B BA W	MP-NPE29-07 MP-NPE29B-07 MP-NPE29BA-07 MP-NPE29W-07	

General specifications

- All characters are 1/8" high, upper & lower case. Please specify if all capital letters are desired.
- The legend plate inserts and the fixed legend plates are silver-grey anodized aluminum.
- All special engravings involve engraving the desired lettering into the metal surface and then treating the engraved surfaces with black ink.

Ordering custom engraved nameplates

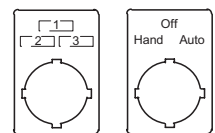
- Select the desired legend plate.
- Indicate the catalog number.
- Write the desired words to be engraved on each line.

EXAMPLE:

MP-NPE28P-03

- OFF
- HAND
- AUTO

"MP-NPE28P" is the blank legend plate catalog number. "B" indicates that the black side of the plate is to be engraved. "-03" refers to the layout of text (see dimension illustrations above).



① For drilling plans, see page 8.74.

② Finish: A = brushed aluminum; B = black plastic face with white letters; BA = plastic with brushed aluminum finish; W = white plastic face with black letters.

Engraved legend plate form

Custom engraved nameplates

ENGRAVED LEGEND PLATE FORM
MP-NP19, MP-NP19B, MP-NP19W

PAGE: ____ OF: ____

MP-NP19- ____ (BRUSHED ALUMINUM)

ORDER NUMBER: _____

MP-NP19B- ____ (PLASTIC, BLACK FACE / WHITE LTRS)

ORDER: QTY: _____

MP-NP19W- ____ (PLASTIC, WHITE FACE / BLACK LTRS)

SHIPPING METHOD: _____

ORIG. DATE: _____

DUE DATE: ____ - ____ - ____

ISSUED BY: _____

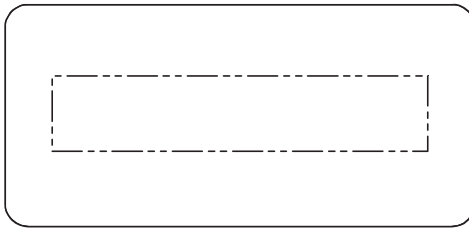
ENGRAVER: _____

ALL CAPITALS? YES NO

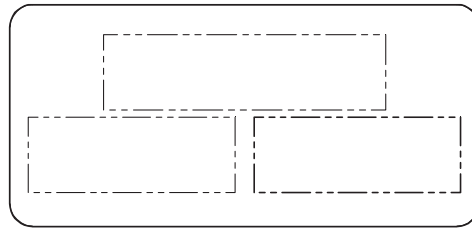
REMARKS: _____

Q.C. INSPECTION: _____

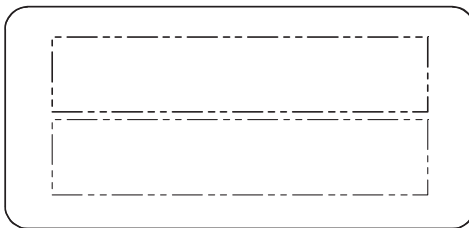
PRINT INFORMATION TO BE ENGRAVED



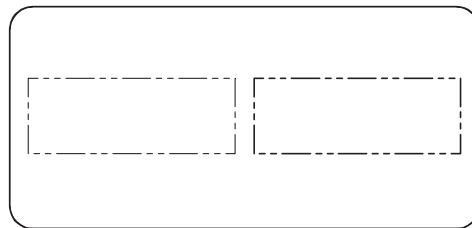
-01



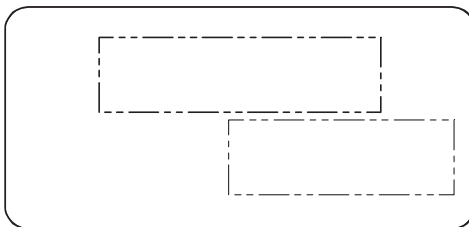
-04



-02



-05



-03

MP-NP19: REV. A
03/04/05

Engraved legend plate form

Custom engraved nameplates



ENGRAVED LEGEND PLATE FORM

MP-NPE28, MP-NPE28P, MP-NPE28B, MP-NPE28W PAGE: ___ OF: ___

<p>MP-NPE28-____ (BRUSHED ALUMNINUM)</p> <p>MP-NPE28BA-____ (PLASTIC, BRUSHED FINISH)</p> <p>MP-NPE28B-____ (PLASTIC, BLACK FACE/WHITE LTRS)</p> <p>MP-NPE28W-____ (PLASTIC, WHITE FACE/BLACK LTRS)</p> <p>ORIG. DATE: _____</p> <p>ISSUED BY: _____</p> <p>ALL CAPITALS? YES NO</p> <p>REMARKS: _____</p>	<p>ORDER NUMBER: _____</p> <p>ORDER: QTY: _____</p> <p>SHIPPING METHOD: _____</p> <p>DUE DATE: ___ - ___ - ___</p> <p>ENGRAVER: _____</p> <p>Q.C. INSPECTION: _____</p>
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PRINT INFORMATION TO BE ENGRAVED

MP-NPE28

5/26/04

Engraved legend plate form

Custom engraved nameplates

ENGRAVED LEGEND PLATE FORM

G1 MP-NPE28, G1 MP-NPE28P, G1 MP-NPE28B, G1 MP-NPE28W PAGE: ___ OF: ___

G1 MP-NPE28-___ (BRUSHED ALUMNINUM)
 G1 MP-NPE28BA-___ (PLASTIC, BRUSHED FINISH)
 G1 MP-NPE28B-___ (PLASTIC, BLACK FACE/WHITE LTRS)
 G1 MP-NPE28W-___ (PLASTIC, WHITE FACE/BLACK LTRS)
 ORIG. DATE: _____
 ISSUED BY: _____
 ALL CAPITALS? YES NO
 REMARKS: _____

ORDER NUMBER: _____
 ORDER: QTY: _____
 SHIPPING METHOD: _____
 DUE DATE: ___ - ___ - ___
 ENGRAVER: _____
 Q.C. INSPECTION: _____

PRINT INFORMATION TO BE ENGRAVED

The diagram illustrates seven different engraved legend plate layouts, labeled -01 through -07. Each layout is contained within a rounded rectangular border and features a central circle. The layouts are as follows:

- 01:** A large dashed rectangular box at the top, divided into two horizontal sections.
- 02:** A small solid rectangular box at the top, and a larger dashed rectangular box below it.
- 03:** A small solid rectangular box at the top, and two dashed rectangular boxes below it, one on the left and one on the right.
- 04, -05 or -06:** Three dashed rectangular boxes stacked vertically on the left side of the circle.
- 07:** Two dashed rectangular boxes at the top, one on the left and one on the right.

G1 MP-NPE28
6/10/04

Engraved legend plate form

Custom engraved nameplates

ENGRAVED LEGEND PLATE FORM

G1 MP-NPE29, G1 MP-NPE29P, G1 MP-NPE29B, G1 MP-NPE29W PAGE: ___ OF: ___

<p>G1 MP-NPE29-___ (BRUSHED ALUMNINUM)</p> <p>G1 MP-NPE29BA-___ (PLASTIC, BRUSHED FINISH)</p> <p>G1 MP-NPE29B-___ (PLASTIC, BLACK FACE/WHITE LTRS)</p> <p>G1 MP-NPE29W-___ (PLASTIC, WHITE FACE/BLACK LTRS)</p> <p>ORIG. DATE: _____</p> <p>ISSUED BY: _____</p> <p>ALL CAPITALS? YES NO</p> <p>REMARKS: _____</p>	<p>ORDER NUMBER: _____</p> <p>ORDER: QTY: _____</p> <p>SHIPPING METHOD: _____</p> <p>DUE DATE: ___ - ___ - ___</p> <p>ENGRAVER: _____</p> <p>Q.C. INSPECTION: _____</p>
--	---

PRINT INFORMATION TO BE ENGRAVED

-01

-02

-03

-04, -05 or -06

-07

G1MP-NPE29

6/10/04

Engraved legend plate form

Custom engraved nameplates

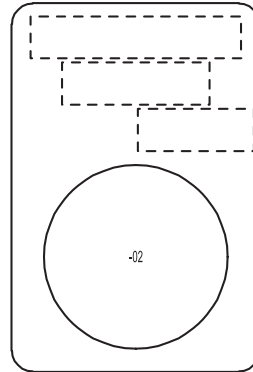
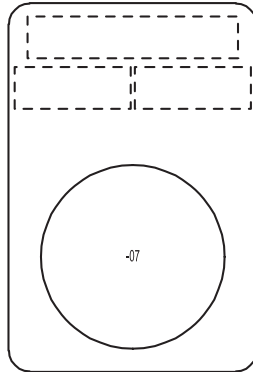
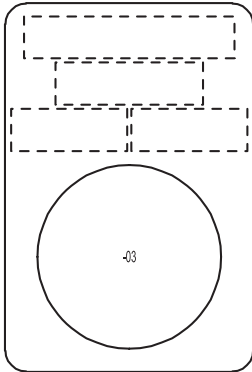
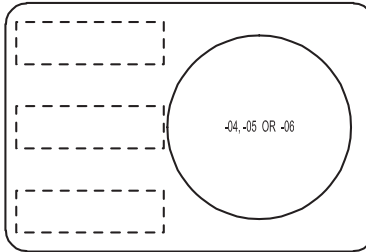
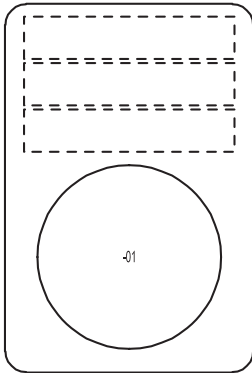
ENGRAVED LEGEND PLATE FORM

MP-NPE29, MP-NPE29P, MP-NPE29B, MP-NPE29W PAGE: ___ OF: ___

MP-NPE29- ___ (BRUSHED ALUMINUM)
 MP-NPE29BA- ___ (PLASTIC, BRUSHED FINISH)
 MP-NPE29B- ___ (PLASTIC, BLACK FACE/WHITE LTRS)
 MP-NPE29W- ___ (PLASTIC, WHITE FACE/BLACK LTRS)
 ORIG. DATE: _____
 ISSUED BY: _____
 ALL CAPITALS? YES NO
 REMARKS: _____


ORDER NUMBER: _____
 ORDER: QTY: _____
 SHIPPING METHOD: _____
 DUE DATE: ___ - ___ - ___
 ENGRAVER: _____
 Q.C. INSPECTION: _____

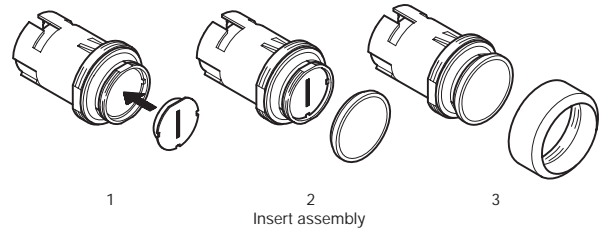
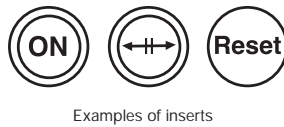
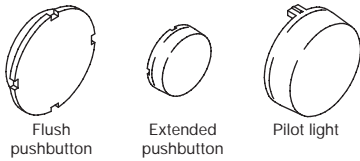
PRINT INFORMATION TO BE ENGRAVED



MP-NPE29
6/10/04

Text caps

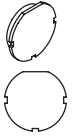
Legend	Cap color ①	Suffix code ②	Flush button catalog number	Extended button catalog number	Pilot light catalog number	List price
	White	C82	1SFA616901R9036	—	—	\$.90
Start	White	C67	1SFA616901R2030	1SFA616902R2030	1SFA616903R2030	
START	Green Black	C5 C81	1SFA616906R1042 1SFA616908R1042	— —	— —	
On	White	C68	1SFA616901R1020	1SFA616902R1020	1SFA616903R1020	
ON	White Green Black	C69 C70 C1	1SFA616901R1039 1SFA616906R1039 1SFA616908R1030	— — —	1SFA616903R1039 — —	
Off	White	C71	1SFA616901R1019	1SFA616902R1019	1SFA616903R1019	
OFF	White Red Black	C72 C73 C2	— — 1SFA616908R1040	1SFA616902R1040 1SFA616905R1040 1SFA616909R1040	— — —	
Stop	White	C74	1SFA616901R1031	1SFA616902R1031	1SFA616903R1031	
STOP	Red	C4	1SFA616904R1047	1SFA616905R1047	—	
Reset	White	C75	1SFA616901R1025	1SFA616902R1025	1SFA616903R1025	
Blank	White Green	C15 CG	1SFA616901R9000 2949 1468-2	1SFA616902R9000 2949 1469-2	1SFA616903R9000 —	
UP	Green	C11	1SFA616906R1043	—	—	
DOWN	Green	C12	1SFA616906R1044	—	—	
OPEN	White Green	C16 C19	1SFA616901R1045 1SFA616906R1045	— —	— —	
CLOSE	White Green	C17 C20	1SFA616901R1046 1SFA616906R1046	— —	— —	
REV	Green	C6	1SFA616906R1048	—	—	
FWD	Green	C7	1SFA616906R1049	—	—	
SLOW	Green	C8	1SFA616906R1050	—	—	
FAST	Green	C9	1SFA616906R1051	—	—	
JOG	Green	C10	1SFA616906R1052	—	—	
RESET	Black	C3	1SFA616908R1041	—	—	
LATCH	White	C18	1SFA616901R1053	—	—	



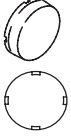
① Illuminated pushbuttons and pilot lights must use white insert.
② For extended pushbuttons, insert "E" at the end of the catalog number. For pilot lights, insert "P" at end of the catalog number.

Text caps

Flush button

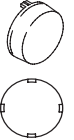


Extended button



Can be turned 90° or 180°

Pilot light



Text caps for illuminated pushbuttons and pilot lights

Text/Symbol ^①	Cap color ^②	Suffix	Flush button Catalog No.	Extended button Catalog No.	Pilot light Catalog No.	List Price
→	White	C14	1SFA 616 901 R9006	1SFA 616 902 R9006	1SFA 616 903 R9006	\$.90
O	White	C21	1SFA 616 901 R9004	1SFA 616 902 R9004	1SFA 616 903 R9004	
	Red	C22	1SFA 616 904 R9004	1SFA 616 905 R9004	-	
	Black	C23	1SFA 616 908 R9004	-	-	
I	White	C24	1SFA 616 901 R9002	1SFA 616 902 R9002	1SFA 616 903 R9002	
	Green	C25	1SFA 616 906 R9002	-	-	
	Black	C26	1SFA 616 908 R9002	-	-	
II	White	C27	1SFA 616 901 R9003	1SFA 616 902 R9003	1SFA 616 903 R9003	
	Green	C28	1SFA 616 906 R9003	-	-	
	Black	C29	1SFA 616 908 R9003	-	-	
III	White	C30	1SFA 616 901 R9028	1SFA 616 902 R9028	-	
	Black	C31	1SFA 616 908 R9028	-	-	
+	White	C32	1SFA 616 901 R9011	1SFA 616 902 R9011	-	
	Green	C33	1SFA 616 906 R9011	-	-	
	Black	C34	1SFA 616 908 R9011	-	-	
-	White	C35	1SFA 616 901 R9012	-	-	
	Red	C36	1SFA 616 904 R9012	-	-	
	Black	C37	1SFA 616 908 R9012	-	-	
↑	White	C38	1SFA 616 901 R9005	1SFA 616 902 R9005	1SFA 616 903 R9005	
	Black	C39	1SFA 616 908 R9005	-	-	
↗	White	C40	1SFA 616 901 R9014	1SFA 616 902 R9014	-	
	Black	C41	1SFA 616 908 R9014	-	-	
↔	White	C42	1SFA 616 901 R9015	1SFA 616 902 R9015	-	
	Black	C43	1SFA 616 908 R9015	-	-	
↔	White	C44	1SFA 616 901 R9016	1SFA 616 902 R9016	-	
	Black	C45	1SFA 616 908 R9016	-	-	
▶	White	C46	1SFA 616 901 R9017	1SFA 616 902 R9017	-	
	Black	C47	1SFA 616 908 R9017	-	-	
⊕	White	C47	1SFA 616 901 R9018	1SFA 616 902 R9018	-	
	Black	C48	1SFA 616 908 R9018	-	-	
●	White	C49	1SFA 616 901 R9019	1SFA 616 902 R9019	-	
	Black	C50	1SFA 616 908 R9019	-	-	
⊙	White	C51	1SFA 616 901 R9020	1SFA 616 902 R9020	-	
	Black	C52	1SFA 616 908 R9020	-	-	
✋	White	C53	1SFA 616 901 R9021	1SFA 616 902 R9021	-	
	Black	C54	1SFA 616 908 R9021	-	-	
⚡	White	C55	1SFA 616 901 R9022	1SFA 616 902 R9022	-	
	Black	C56	1SFA 616 908 R9022	-	-	
⚡	White	C57	1SFA 616 901 R9023	1SFA 616 902 R9023	-	
	Black	C58	1SFA 616 908 R9023	-	-	
⚙	White	C59	1SFA 616 901 R9024	1SFA 616 902 R9024	-	
	Black	C60	1SFA 616 908 R9024	-	-	
⬆	White	C61	1SFA 616 901 R9025	1SFA 616 902 R9025	-	
	Black	C62	1SFA 616 908 R9025	-	-	
⬇	White	C63	1SFA 616 901 R9026	1SFA 616 902 R9026	-	
	Black	C64	1SFA 616 908 R9026	-	-	
⚡	White	C65	1SFA 616 901 R9027	1SFA 616 902 R9027	-	
	Black	C66	1SFA 616 908 R9027	-	-	

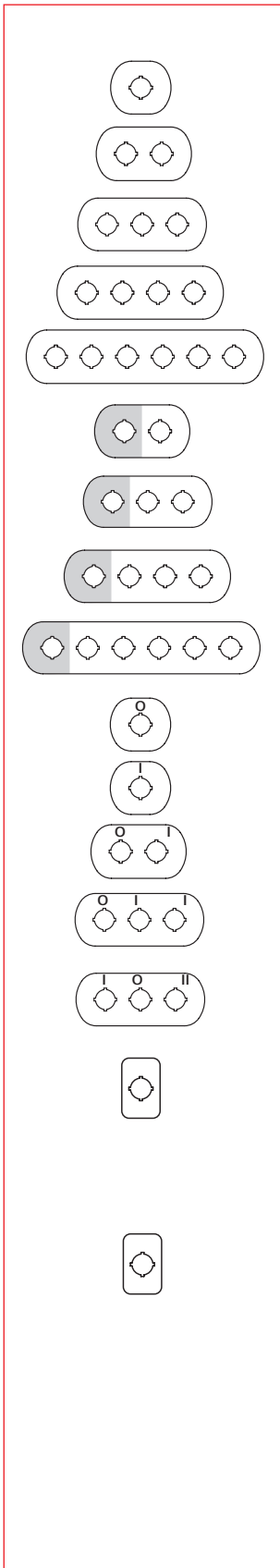
① Use only white caps for illuminated pushbutton and pilot lights.

② Add "E" for extended button or "P" for pilot light.

Special legend plates for plastic enclosures



Legend plates for plastic enclosures For 1, 2, 3, 4 or 6-seat



Description	Catalog No.	List Price
Of silvergrey aluminum.		
1-seat	1SFA 611 930 R1000	\$ 12
2-seat	1SFA 611 930 R1002	15
3-seat	1SFA 611 930 R1003	18
4-seat	1SFA 611 930 R1004	21
6-seat	1SFA 611 930 R1005	27

Of silvergrey aluminum.(Pos. 1 Yellow)		
2-seat	1SFA 611 930 R1006	20
3-seat	1SFA 611 930 R1007	23
4-seat	1SFA 611 930 R1008	26
6-seat	1SFA 611 930 R1009	32

Symbol/Text Pos	Catalog No.	List Price
1 2 3		
Of silvergrey aluminum.		
1-seat OFF	1SFA 611 930 R1012	\$ 17
1-seat ON	1SFA 611 930 R1013	17
2-seat OFF/ON	1SFA 611 930 R1014	20
3-seat OFF/ON/RUN	1SFA 611 930 R1015	23
3-seat HAND/OFF/AUTO	1SFA 611 930 R1016	23

Emergency stop legend plate

Description/Text	Catalog No.	List Price
Black text on an yellow aluminum plate.		
Legend plate without text	1SFA 611 930 R1010	
Legend plate (1SFA 611 930 R1010) with text:		
Nöd stopp	1SFA 611 930 R1017	
Not Aus	1SFA 611 930 R1018	
Emergency Stop	1SFA 611 930 R1019	\$ 15
ARRET D'URGENCE	1SFA 611 930 R1020	
Hätäseis	1SFA 611 930 R1021	
PARADA DE EMERGENCIA	1SFA 611 930 R1022	
Black text on an yellow plastic plate.		
Legend plate without text	1SFA 611 930 R1011	5
Legend plate (1SFA 611 930 R1011) with text:		
Emergency Stop	1SFA 611 930 R1023	10

Notes



Signal towers K70 Signal beacons KSB



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Signal towers K70 and Signal beacons KSB offer a wide range of signal elements in all voltages and a solution for every signalling field.

Signal towers K70

- Fast mounting of signal elements using bayonet fixing.
- Easy changing of bulbs for each module without tools.
- Flexibility of signal element combination.
- Up to 5 elements possible/up to 10 elements with bracket for 2-sided mounting.
- Flashing light elements can be mounted in each module.
- Up to 5 flashing light elements possible.
- High protection rating optical and audible signal elements with IP 54.
- LED elements for long life
- Large variety of different versions
 - Permanent light, 12-240V, AC/DC
 - Blinking light, 24-230V
 - Flashing light, 24-230V
 - Audible 85db continuous or pulsating
 - LED, 24-230V

Signal beacons KSB

- Large variety of different versions:
 - Permanent light, max. 250V
 - Blinking light, 24V, AC/DC
 - Flashing light, 24-230VAC
 - LED light, 24V, AC/DC
- IP65 for outdoor use
- Available in 5 colors
- High impact polycarbonate

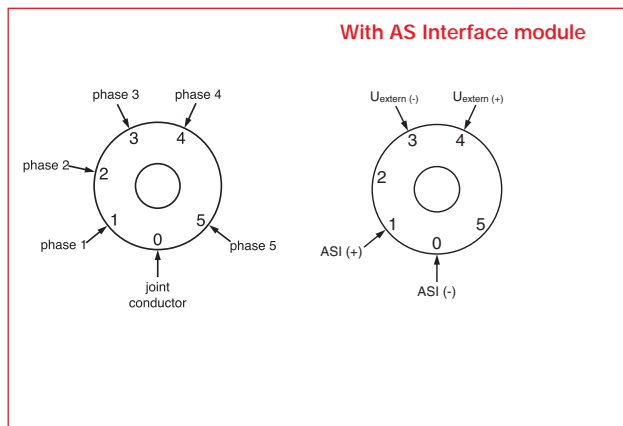
Signal towers K70 Description

Simple fitting with quick fix system

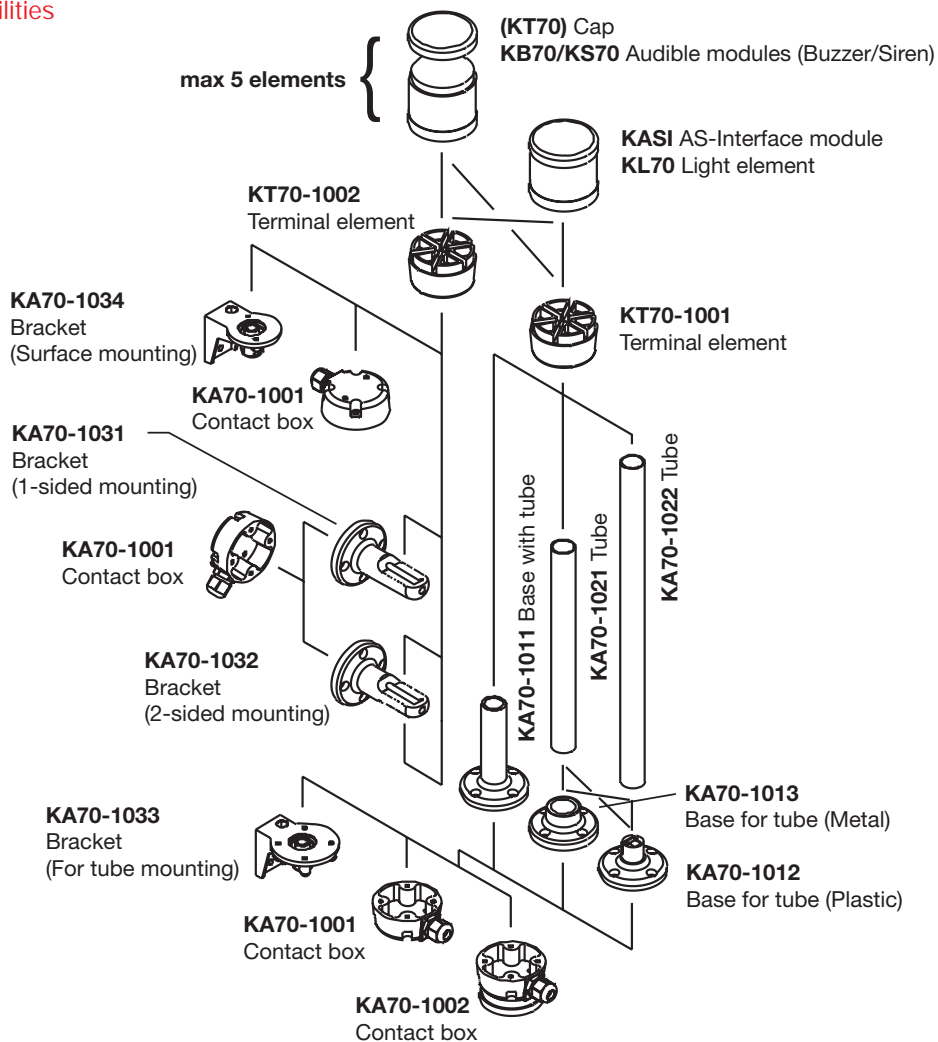
Each K 70 module is equipped with a bayonet fixing with integral contact system. The modules are fastened together by aligning the corresponding white marks then with a gentle twist they are locked into place (see the figures).



Connection plans



Combination possibilities



Signal towers K70



Optical modules

Description	Catalog No.	Ref. Code	List Price
Light element			
Permanent light , 12-240 V AC/DC. For bulb BA15d. Bulb not included.			
Red	KL70-401R	1SFA 616 070 R4011	\$ 36.00
Green	KL70-401G	1SFA 616 070 R4012	
Yellow	KL70-401Y	1SFA 616 070 R4013	
Blue	KL70-401L	1SFA 616 070 R4014	
Clear	KL70-401C	1SFA 616 070 R4018	
Blinking light , 24 V AC/DC. For bulb BA15d. Bulb not included.			
Red	KL70-302R	1SFA 616 070 R3021	100.00
Green	KL70-302G	1SFA 616 070 R3022	
Yellow	KL70-302Y	1SFA 616 070 R3023	
Blue	KL70-302L	1SFA 616 070 R3024	
Clear	KL70-302C	1SFA 616 070 R3028	
Flashing light , 24 V DC. Xenon tube included. Not changeable.			
Red	KL70-203R	1SFA 616 070 R2031	165.00
Green	KL70-203G	1SFA 616 070 R2032	
Yellow	KL70-203Y	1SFA 616 070 R2033	
Blue	KL70-203L	1SFA 616 070 R2034	
Clear	KL70-203C	1SFA 616 070 R2038	
Blinking light , 115 V AC/DC. For bulb BA15d. Bulb not included.			
Red	KL70-312R	1SFA 616 070 R3121	100.00
Green	KL70-312G	1SFA 616 070 R3122	
Yellow	KL70-312Y	1SFA 616 070 R3123	
Blue	KL70-312L	1SFA 616 070 R3124	
Clear	KL70-312C	1SFA 616 070 R3128	
Flashing light , 115 V AC. Xenon tube included. Not changeable.			
Red	KL70-113R	1SFA 616 070 R1131	155.00
Green	KL70-113G	1SFA 616 070 R1132	
Yellow	KL70-113Y	1SFA 616 070 R1133	
Blue	KL70-113L	1SFA 616 070 R1134	
Clear	KL70-113C	1SFA 616 070 R1138	
Blinking light , 230 V AC/DC. For bulb BA15d. Bulb not included.			
Red	KL70-322R	1SFA 616 070 R3221	100.00
Green	KL70-322G	1SFA 616 070 R3222	
Yellow	KL70-322Y	1SFA 616 070 R3223	
Blue	KL70-322L	1SFA 616 070 R3224	
Clear	KL70-322C	1SFA 616 070 R3228	
Flashing light , 230 V AC. Xenon tube included. Not changeable.			
Red	KL70-123R	1SFA 616 070 R1231	155.00
Green	KL70-123G	1SFA 616 070 R1232	
Yellow	KL70-123Y	1SFA 616 070 R1233	
Blue	KL70-123L	1SFA 616 070 R1234	
Clear	KL70-123C	1SFA 616 070 R1238	
LED Permanent light , 24 V AC/DC. LED included. Not changeable.			
Red	KL70-305R	1SFA 616 070 R3051	135.00
Green	KL70-305G	1SFA 616 070 R3052	
Yellow	KL70-305Y	1SFA 616 070 R3053	
Blue	KL70-305L	1SFA 616 070 R3054	
White	KL70-305C	1SFA 616 070 R3058	
LED Blinking light , 24 V AC/DC. LED included. Not changeable.			
Red	KL70-306R	1SFA 616 070 R3061	140.00
Green	KL70-306G	1SFA 616 070 R3062	
Yellow	KL70-306Y	1SFA 616 070 R3063	
Blue	KL70-305L	1SFA 616 070 R3064	
White	KL70-305C	1SFA 616 070 R3068	
LED Rotating light , 24 V AC/DC. LED included. Not changeable.			
Red	KL70-307R	1SFA 616 070 R3071	140.00
Green	KL70-307G	1SFA 616 070 R3072	
Yellow	KL70-307Y	1SFA 616 070 R3073	
Blue	KL70-305L	1SFA 616 070 R3074	
White	KL70-305C	1SFA 616 070 R3078	

Signal towers K70 Accessories

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KA70-1001



KA70-1002



KA70-1012



KA70-1013



KA70-1021



KA70-1011



KA70-1032



KA70-1033

Description	Catalog No.	Ref. Code	List Price
Bulbs for Signal Tower K70 Bulb Ba 15d, 42 mm, Max 7 W For permanent or blinking light.			
24 V, 5 W, AC/DC	1SFA 616 923 R1028	1SFA 616 923 R1028	\$ 8.00
115 V, 5 W, AC/DC	1SFA 616 923 R1118	1SFA 616 923 R1118	
230 V, 5 W, AC/DC	1SFA 616 923 R1148	1SFA 616 923 R1148	

Description	Catalog No.	Ref. Code	List Price
LED bulbs for Signal Tower K70 Ba 15d. For 24 V AC/DC, 40 mA			
Color:			175.00
Red	KA4-1021	1SFA 616 924 R1021	
Green	KA4-1022	1SFA 616 924 R1022	
Yellow	KA4-1023	1SFA 616 924 R1023	
Blue	KA4-1024	1SFA 616 924 R1024	
White	KA4-1025	1SFA 616 924 R1025	

Description	Catalog No.	Ref. Code	List Price
Audible modules			
Buzzer element			
85 dB, continuous or pulsating tone, adjustable			
24 V AC/DC	KB70-3001	1SFA 616 071 R3001	95.00
115 V AC/DC	KB70-3101	1SFA 616 071 R3101	115.00
230 V AC	KB70-1201	1SFA 616 071 R1201	115.00

Description	Catalog No.	Ref. Code	List Price
Siren element			
Multi function, 8 diff. tones adjustable, volume adjustable 100 dB, 115 V AC	KS70-1104	1SFA 616 073 R1104	155.00
Multi function, 8 diff. tones adjustable, volume adjustable 100 dB, 230 V AC	KS70-1204	1SFA 616 073 R1204	155.00
Multi function, 7 diff. tones adjustable, volume adjustable, remote control 100 dB, 24 V DC	KS70-2004	1SFA 616 073 R2004	145.00
Multi function, 8 diff. tones adjustable, volume adjustable, 100 dB, 24 V AC/DC	KS70-3004	1SFA 616 073 R3004	145.00
Continuous tone alternating 108 dB, 24 V DC	KS70-2002	1SFA 616 073 R2002	100.00

Description	Catalog No.	Ref. Code	List Price
AS-Interface Module			
18,5-31,6 V AC/DC for external voltage	KASI-4101	1SFA 616 079 R4101	300.00
18,5-31,6 V AC/DC	KASI-4102	1SFA 616 079 R4102	300.00

Description	Catalog No.	Ref. Code	List Price
Terminal elements			
For tube mounting, including cap	KT70-1001	1SFA 616 075 R1001	40.00
For bracket or base, including cap	KT70-1002	1SFA 616 075 R1002	40.00

Description	Catalog No.	Ref. Code	List Price
Special parts			
Contact box			
Cable exit at side	KA70-1001	1SFA 616 077 R1001	23.00
Magnetic base	KA70-1002	1SFA 616 077 R1002	65.00
Base with tube			
D=25 mm L=110 mm	KA70-1011	1SFA 616 077 R1011	33.00
Base for tube			
D=25 mm, Plastic	KA70-1012	1SFA 616 077 R1012	15.00
D=25 mm, Metal	KA70-1013	1SFA 616 077 R1013	32.00
Tube, anodized aluminum			
D=25 mm L=250 mm	KA70-1021	1SFA 616 077 R1021	20.00
D=25 mm L=400 mm	KA70-1022	1SFA 616 077 R1022	27.00
Bracket			
1-sided mounting	KA70-1031	1SFA 616 077 R1031	20.00
2-sided mounting	KA70-1032	1SFA 616 077 R1032	20.00
For tube mounting	KA70-1033	1SFA 616 077 R1033	20.00
For surface mounting	KA70-1034	1SFA 616 077 R1034	20.00

Signal Beacons KSB



Signal Beacons KSB

Description	Catalog No.	Ref. Code	List Price
Permanent light , 12-240 V AC/DC. For bulb BA15d. Bulb not included.			
Red	KSB-401R	1SFA 616 080 R4011	\$ 55.00
Green	KSB-401G	1SFA 616 080 R4012	
Yellow	KSB-401Y	1SFA 616 080 R4013	
Blue	KSB-401L	1SFA 616 080 R4014	
Clear	KSB-401C	1SFA 616 080 R4018	
Flashing light , 24 V DC. Xenon tube included. Not changeable.			
Red	KSB-203R	1SFA 616 080 R2031	180.00
Green	KSB-203G	1SFA 616 080 R2032	
Yellow	KSB-203Y	1SFA 616 080 R2033	
Blue	KSB-203L	1SFA 616 080 R2034	
Clear	KSB-203C	1SFA 616 080 R2038	
Flashing light , 115 V AC. Xenon tube included. Not changeable.			
Red	KSB-113R	1SFA 616 080 R1131	155.00
Green	KSB-113G	1SFA 616 080 R1132	
Yellow	KSB-113Y	1SFA 616 080 R1133	
Blue	KSB-113L	1SFA 616 080 R1134	
Clear	KSB-113C	1SFA 616 080 R1138	
Flashing light , 230 V AC. Xenon tube included. Not changeable.			
Red	KSB-123R	1SFA 616 080 R1231	155.00
Green	KSB-123G	1SFA 616 080 R1232	
Yellow	KSB-123Y	1SFA 616 080 R1233	
Blue	KSB-123L	1SFA 616 080 R1234	
Clear	KSB-123C	1SFA 616 080 R1238	
LED Permanent light , 24 V AC/DC. LED included. Not changeable.			
Red	KSB-305R	1SFA 616 080 R3051	190.00
Green	KSB-305G	1SFA 616 080 R3052	
Yellow	KSB-305Y	1SFA 616 080 R3053	
LED Blinking light , 24 V AC/DC. LED included. Not changeable.			
Red	K SB-306R	1SFA 616 080 R3061	195.00
Green	K SB-306G	1SFA 616 080 R3062	
Yellow	K SB-306Y	1SFA 616 080 R3063	
LED Rotating light , 24 V AC/DC. LED included. Not changeable.			
Red	KSB-307R	1SFA 616 080 R3071	195.00
Green	KSB-307G	1SFA 616 080 R3072	
Yellow	KSB-307Y	1SFA 616 080 R3073	
Special parts			
Anti-twist device	KASB-100	1SFA 616 087 R1000	8.00
Bulbs for Signal Beacons Max 10 W. For permanent light.			
Bulb Ba15d, 52 mm:			
12 V, 7 W, AC/DC	1SFA 616 922 R1018	1SFA 616 922 R1018	8.00
24 V, 7 W, AC/DC	1SFA 616 922 R1028	1SFA 616 922 R1028	
115 V, 7 W, AC/DC	1SFA 616 922 R1118	1SFA 616 922 R1118	
220-260 V, 7-10 W, AC/DC	1SFA 616 922 R1148	1SFA 616 922 R1148	

Technical data

Signal Towers K70

Signal Beacons KSB

Signal Towers K70

Approvals



Technical specifications

Housing and accessories

Dome

Fixing

Socket

8

Connection

Number of modules possible
2-sided bracket

Polyamide, high impact, black
Polycarbonate, transparent
Base mounting
Tube mounting, for tube ø 25 mm
Bracket mounting
B 15 d, for bulb max. 7W
Screwable connection up to 2.5 mm²
max. 5
max. 10 elements

Degrees of protection

Light elements

Audible elements

IP 54 UL Type 5

IP 54 UL Type 5

Electrical data

Permanent light element

Bulb socket B 15 d, max 7 W

Blinking light element AC/DC

12 - 240 V AC/DC

Bulb not included

<u>24 V</u>	<u>115 V</u>	<u>230 V</u>
AC/DC	AC/DC	AC/DC
Bulb not included		
< 0.5 A		

Starting current

Flashing light element

<u>24 V</u>	<u>115 V</u>	<u>230 V</u>
DC	AC	AC

Flash frequency

1 Hz 1 Hz 1 Hz

Flash energy

2 Ws 2 Ws 2 Ws

Life duration

4 x 10⁶ flashes

Current consumption

125 mA 20 mA 35 mA

reduced for AS-Interface

80 mA

Starting current

< 0.5 A at 24 V

LED Permanent light element

<u>24 V</u>	<u>115 V</u>	<u>230 V</u>
AC/DC	AC	AC

Current consumption

45 mA 25 mA 25 mA

Starting current

< 0.5 A at 24 V

LED Blinking light element

<u>24 V</u>	<u>115 V</u>	<u>230 V</u>
AC/DC	AC	AC

Current consumption

25 mA 25 mA 25 mA

Starting current

< 0.5 A at 24 V

Blink frequency

c. 1 Hz c. 1 Hz c. 1 Hz

LED Rotating light element

24 V, AC/DC

Current consumption

70 mA

Starting current

< 0.5 A at 24 V

Rotation frequency

c. 120 r.p.m.

Temperature

Ambient temperature during operations

-20 to +50 °C

Signal Beacons KSB

Approvals



Technical specifications

Housing and accessories

Dome

Fixing

Bulb socket

Bulb change

PC/ABS-Blend, high impact, black

Polycarbonate, transparent

Installation mounting for ø 37 mm (PG 29)

B 15 d, max. 10 W

via rear access with bayonet mechanism (Bulb not included)

Screwable connection max. 2.5 mm²

Connection

Degrees of protection

IP 65 UL Type 5

Electrical data

Permanent light element

Operating voltage

max. 250 V

Bulb socket B 15 d, max 10 W

Bulb not included

LED version:

Permanent light

24 V, AC/DC

Current consumption

45 mA

Blinking light element

24 V, AC/DC

Current consumption

25 mA

Rotating light element

24 V, AC/DC

Current consumption

70 mA

Starting current

< 0.5 A

Flashing light element

Operating voltage

<u>24 V</u>	<u>115 V</u>	<u>230 V</u>
AC/DC	AC	AC

Flash frequency

1 Hz 1 Hz 1 Hz

Flash energy

2 Ws 2 Ws 2 Ws

Life duration

4 x 10⁶ flashes

Current consumption

125 mA 20 mA 35 mA

Starting current

< 0.5 A < 0.5 A < 0.25 A

Temperature

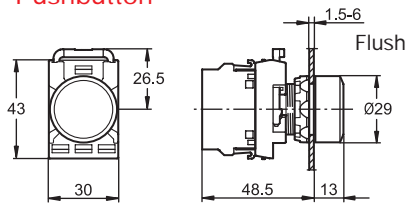
Ambient temperature during operations

-20 to +50 °C

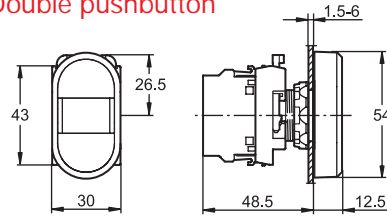
Approximate dimensions Modular range

All dimensions in MM

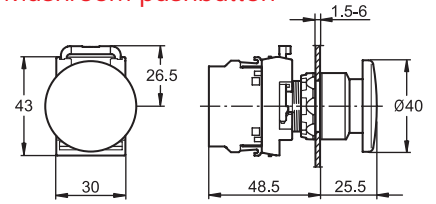
Pushbutton



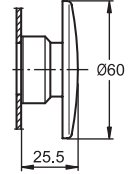
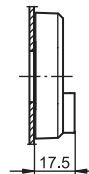
Double pushbutton



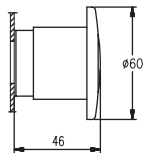
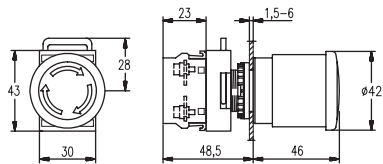
Mushroom pushbutton



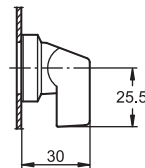
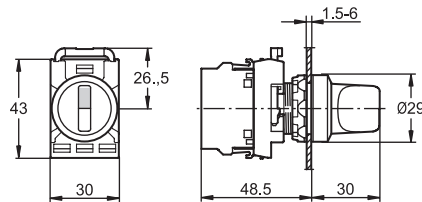
Extended



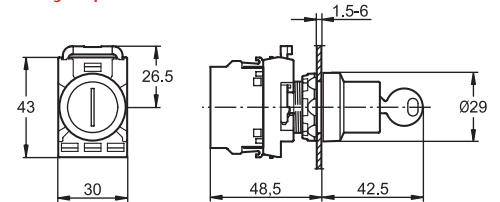
Emergency stop pushbutton



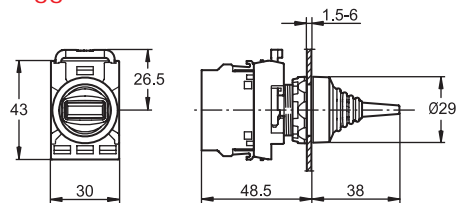
Selector switch



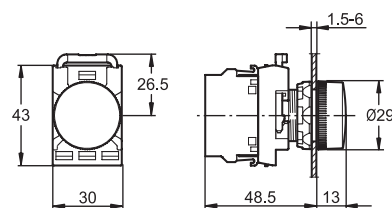
Key-operated selector switch



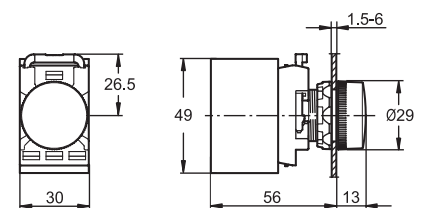
Toggle switch



Pilot light



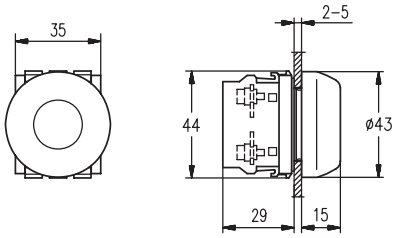
Pilot light with transformer



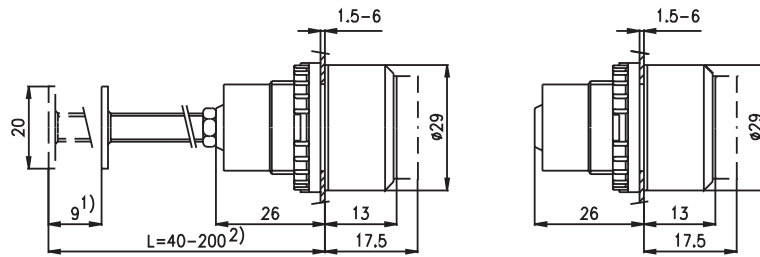
Approximate dimensions and drilling plans Miscellaneous

All dimensions in MM

Definite purpose pushbutton

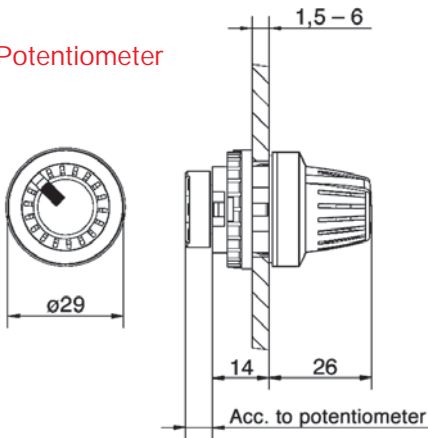


Reset pushbutton

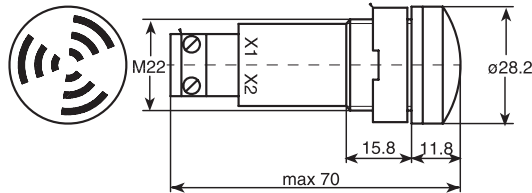


- 1) Length of stroke.
- 2) Can be cut to desired length.

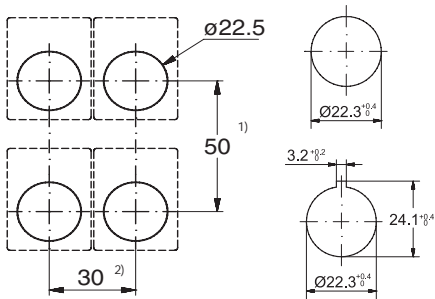
Potentiometer



Buzzer

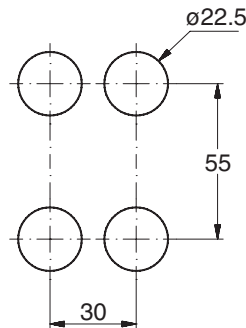


Drilling plans for pushbuttons, switches and pilot lights

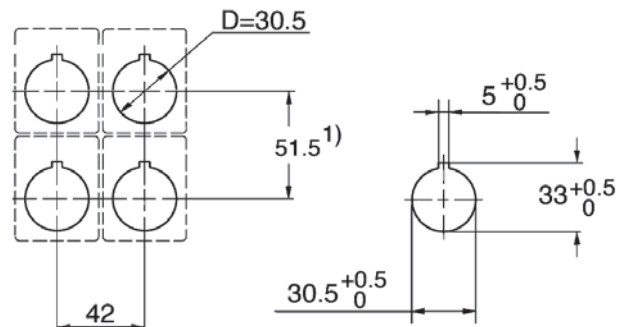


- 1) 55 mm when legend plate H= 44.5 mm is used.
61 mm for mushroom pushbutton with D=60 mm
- 2) 37 mm when legend plate with insert is used,

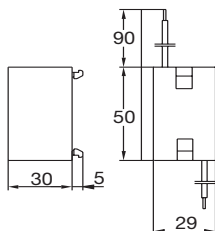
Drilling plan for double pushbutton



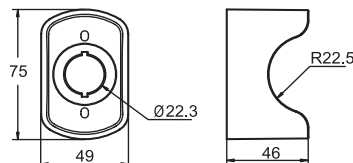
Drilling plan for 30 mm adaptor



Transformer block



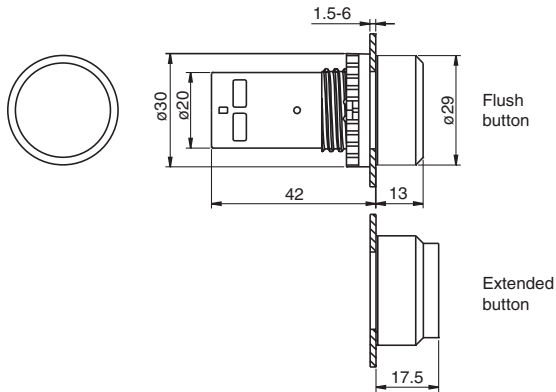
Emergency stop shroud



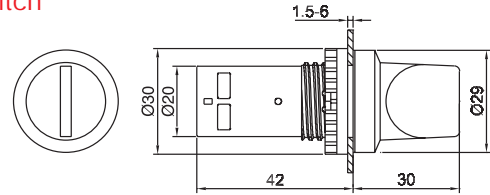
Approximate dimensions Compact range

All dimensions in MM

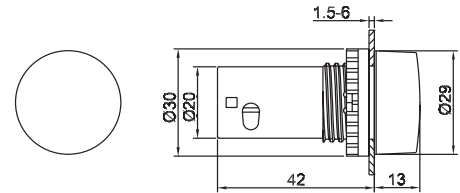
Pushbutton



Selector switch

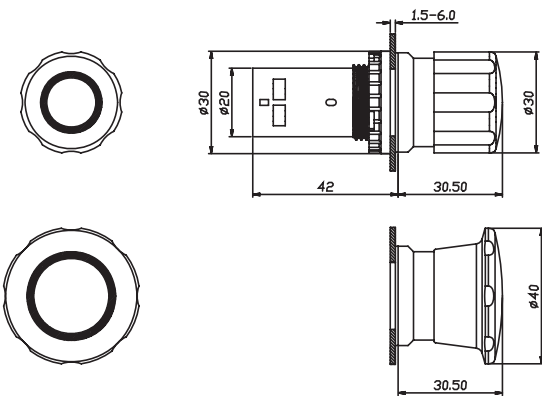


Pilot light

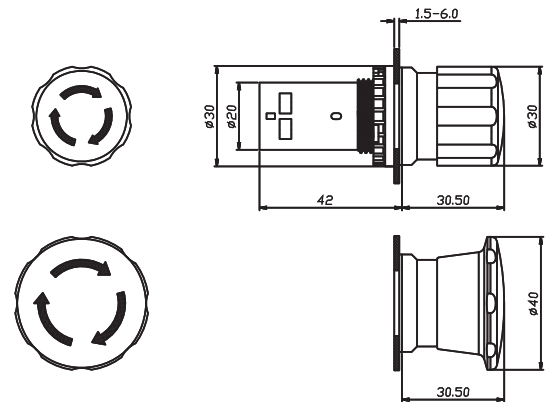


Emergency stop pushbuttons

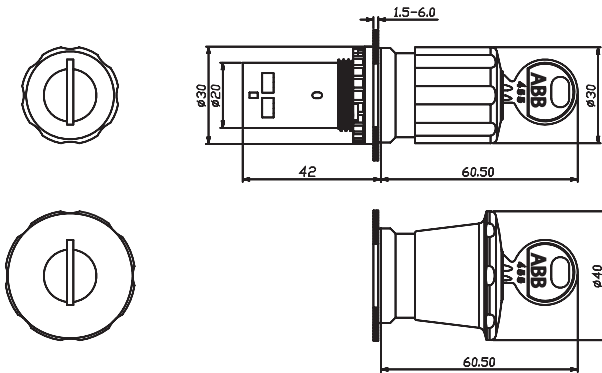
CE3P/CE4P (Pull release)



CE3T/CE4T (Twist release)



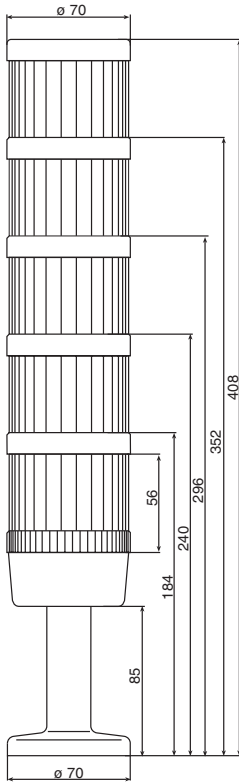
CE3K1/CE4K1



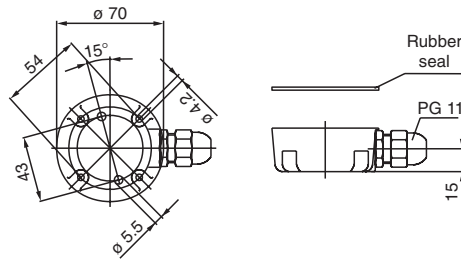
Approximate dimensions and drilling plans Signal Towers/Signal Beacons

All dimensions in MM

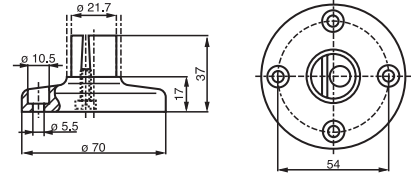
Signal Towers K 70



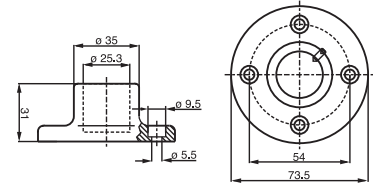
Contact box for cable exit at side



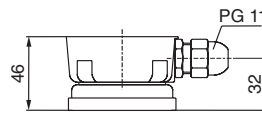
Base for tube, plastic



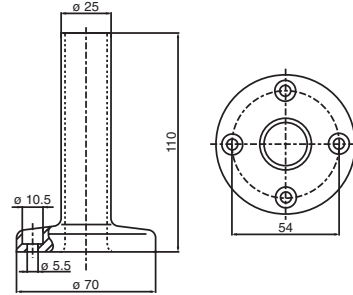
Base for tube, metal



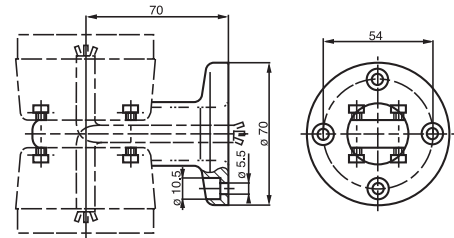
Contact box with magnetic base



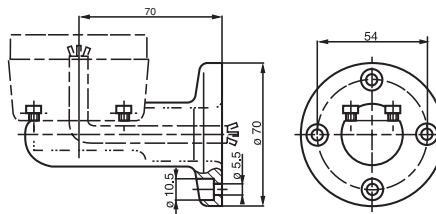
Base with integrated tube



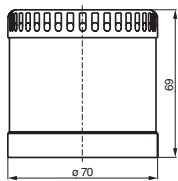
Bracket 2-sided mounting



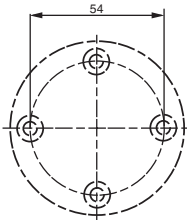
Bracket 1-sided mounting



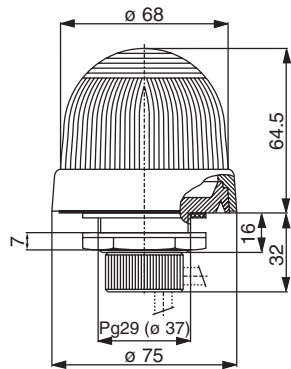
Audible module



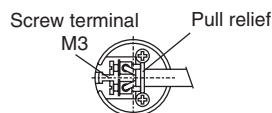
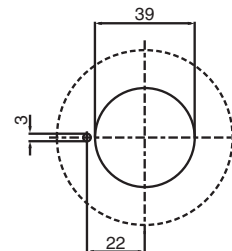
Drilling plan for Signal Towers K 70



Signal Beacons K SB

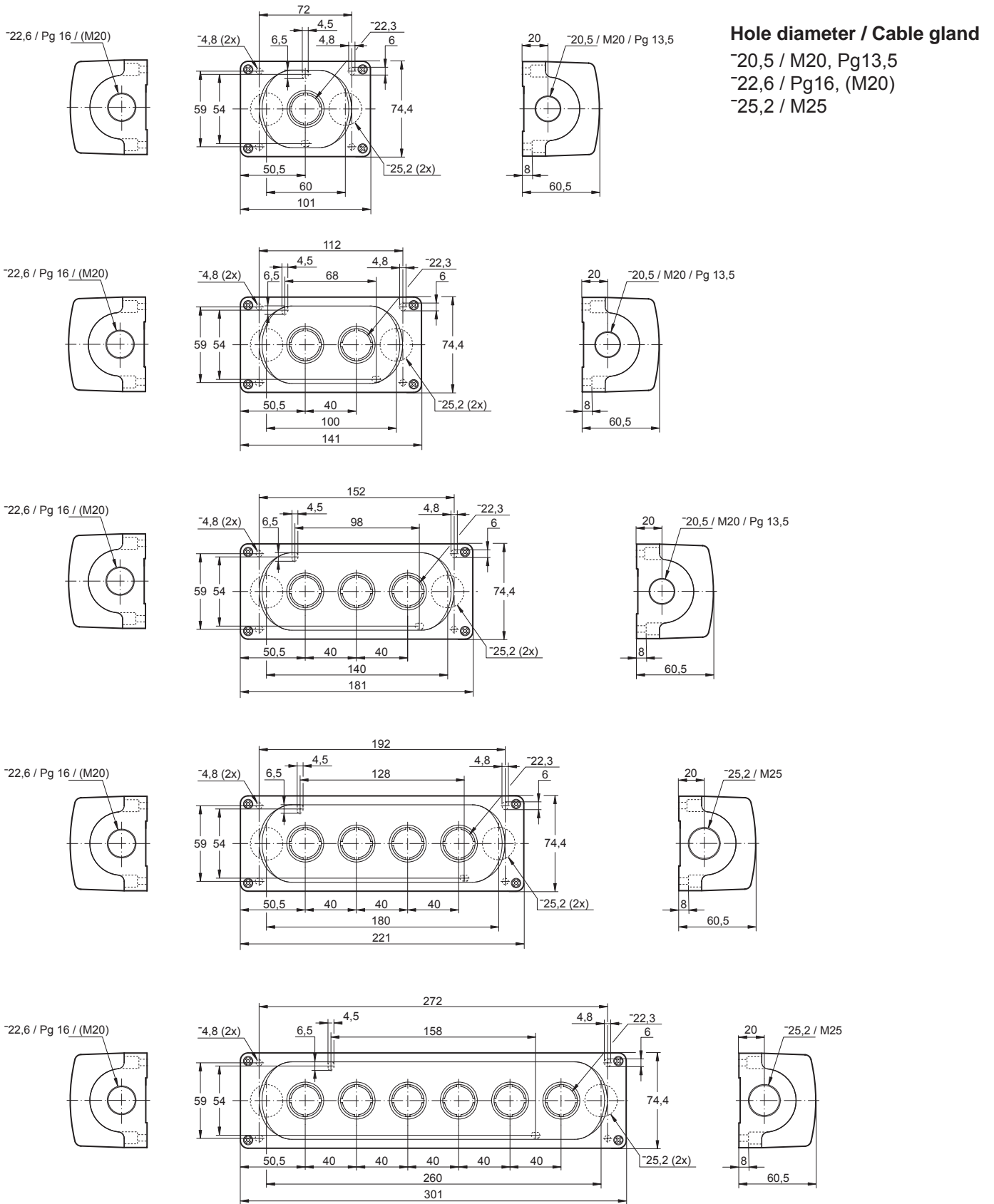


Drilling plan for Signal Beacons KSB



Approximate dimensions Enclosures

All dimensions in MM



Color selection

Color selection according to IEC 60204-1

IEC 60204-1 specifies coding principles for indicators and actuators and gives recommendation regarding the use of colors. An excerpt from the standard is given below. For detailed information, see the standard.

Meaning of colors – General principles

Color	Meaning		
	Safety of persons or environment	Condition of process	State of equipment
RED	Danger	Emergency	Faulty
YELLOW	Warning/caution	Abnormal	Abnormal
GREEN	Safe	Normal	Normal
8 BLUE	Mandatory significance		
WHITE, GREY, BLACK	No specific meaning assigned		

Non-illuminated actuators

Emergency actuators

EMERGENCY-STOP / OFF actuators shall be identified by the color **RED**

STOP / OFF actuators

WHITE, **GREY** and **BLACK** are the preferred colors for STOP / OFF actuators, with the main preference being for **BLACK**. **RED** is also permitted. **GREEN** shall not be used.

START / ON actuators

WHITE, **GREY** and **BLACK** are the preferred colors for START / ON actuators, which cause the closing of switching devices and the equipment to start, with the main preference being for **WHITE**. **GREEN** is also permitted. **RED** shall not be used.

Use of **WHITE** and **BLACK** for specific meanings

Where the colors **WHITE** and **BLACK** are used to distinguish between START / ON and STOP / OFF actuators, then the color **WHITE** shall be used for START / ON actuators and the color **BLACK** shall be used for STOP / OFF actuators.

The same actuators serving for **START** and **STOP** or **ON** and **OFF**

WHITE, **GREY** and **BLACK** are the preferred colors for actuators which, when actuated several times, act alternately as a START / ON and STOP / OFF actuator.

The colors **YELLOW** and **GREEN** shall not be used. The color **RED** shall be used only in cases where the same actuator, other than a push-button, is used for both EMERGENCYSTOP / OFF and normal operation.

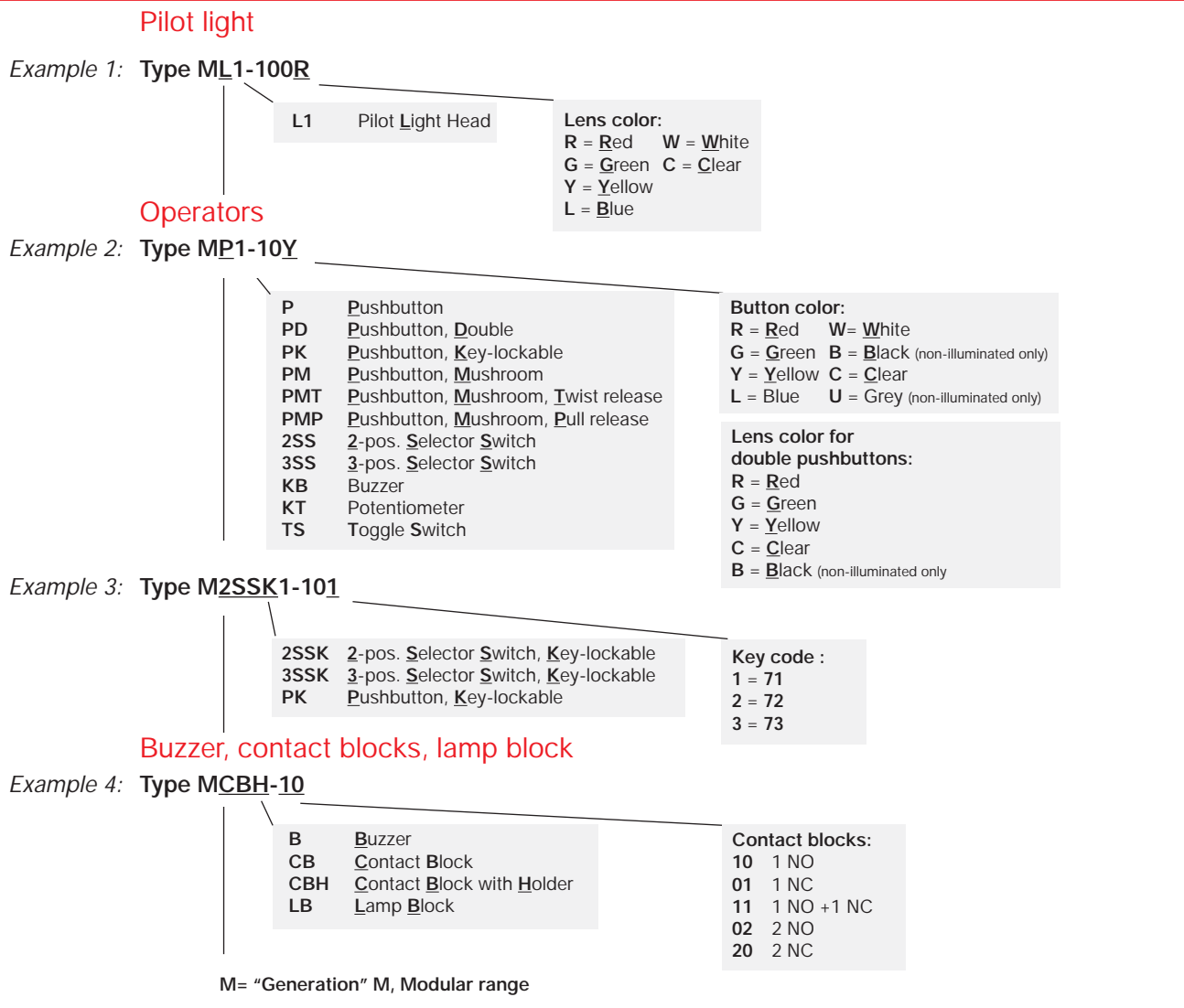
WHITE, **GREY** and **BLACK** are preferred colors for actuators which cause a movement while they are actuated and stop the movement when they are released (such as inching or jogging actuators). **GREEN** is also permitted. **RED** shall not be used.

RESET actuators

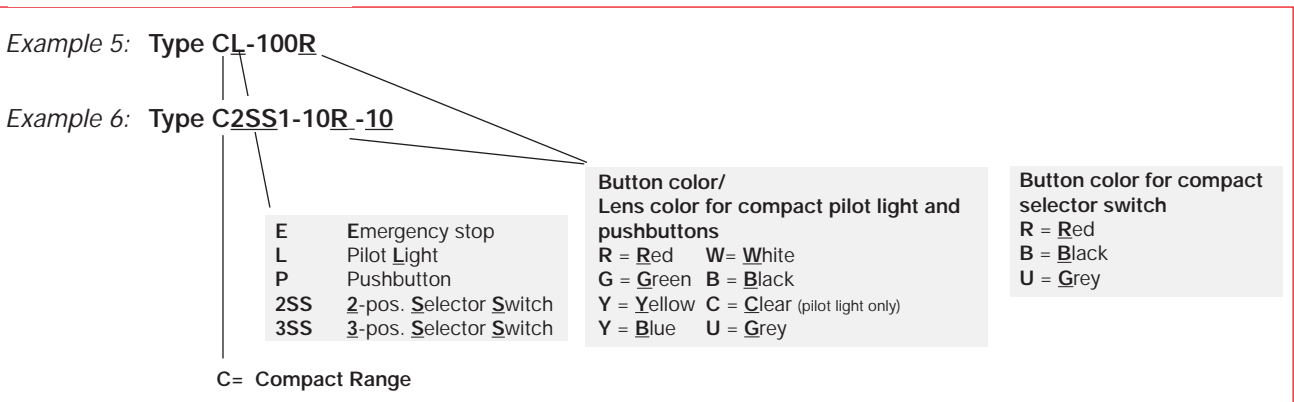
RESET actuators (used, for example, with protective relays) shall be **BLUE**, **WHITE**, **GREY** and **BLACK**, except RESET actuators which also act as STOP / OFF actuators. The color of such STOP / OFF actuators shall be in accordance with **STOP / OFF actuators** above.

Explanation of type codes

Modular Pilot Devices



Compact Pilot Devices





Plastic casing limit switches	9.1 - 9.30
Assembled, 30mm	9.6 - 9.9
Assembled, 40mm	9.14 - 9.18
Components, 30mm	9.10 - 9.13
Components, 40mm	9.19 - 9.24
General information	9.1
General information	9.4 - 9.5
Selection guide	9.2 - 9.3
Technical data	9.25 - 9.30
Metal casing limit switches	9.31 - 9.60
Assembled, 40mm	9.36 - 9.41
Assembled, 60mm	9.48 - 9.53
Components, 40mm	9.42 - 9.47
Components, 60mm	9.54 - 9.59
Description	9.34 - 9.35
General information	9.31
Selection guide	9.32 - 9.33
Technical data	9.60
Safety limit switches	9.61 - 9.100
General information	9.61
Latch & manual reset	9.89 - 9.100
Latch key	9.67 - 9.76
Rotative axis	9.77 - 9.88
Selection guide	9.62 - 9.65
Foot switches	9.101 - 9.108
Components	9.105
Dimensions	9.107 - 9.108
Foot switches	9.103 - 9.104
General information	9.101 - 9.102
Technical data	9.106 - 9.108

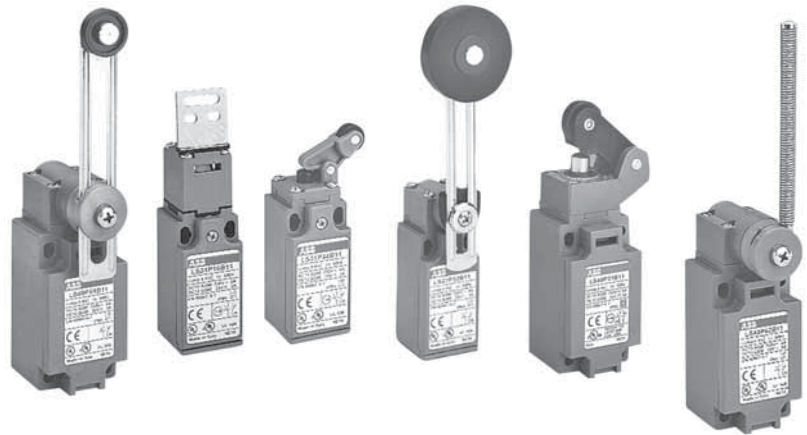


Notes

Plastic Limit switches



Limit Switches
Plastic casing, 30mm & 40mm
Assembled
Components



Description

Limit switches are made of reinforced UL-V0 thermoplastic fiberglass, offer double insulation \square and a degree of protection of IP 65 and UL Type 4.

Casings come in 2 dimensions:

- 30mm width
 - LS35P
- 40mm width
 - LS45P

Applications

Easy to use, electromechanical limit switches offer specific qualities:

- Visible operation
- Electrically separated contacts
- Precise operating points (consistency)
- Immune to electromagnetic disturbances

Limit switches used for these mechanical applications:

- Presence/absence
- Positioning and travel limit
- Objects passing/counting

UL Listed file #E191693

Selection guide

30mm & 40mm, IP65, UL Type 4

30mm width — LS35P



LS35P16

LS35P11

LS35P13

LS35P31

CENELEC conformity

—

EN 50 047

EN 50 047

EN 50 047

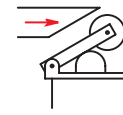
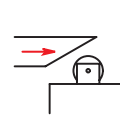
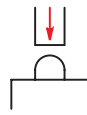
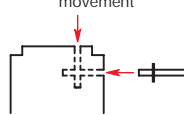
Actuating device and actuation type

Key translation movement

Plain plunger

Roller plunger

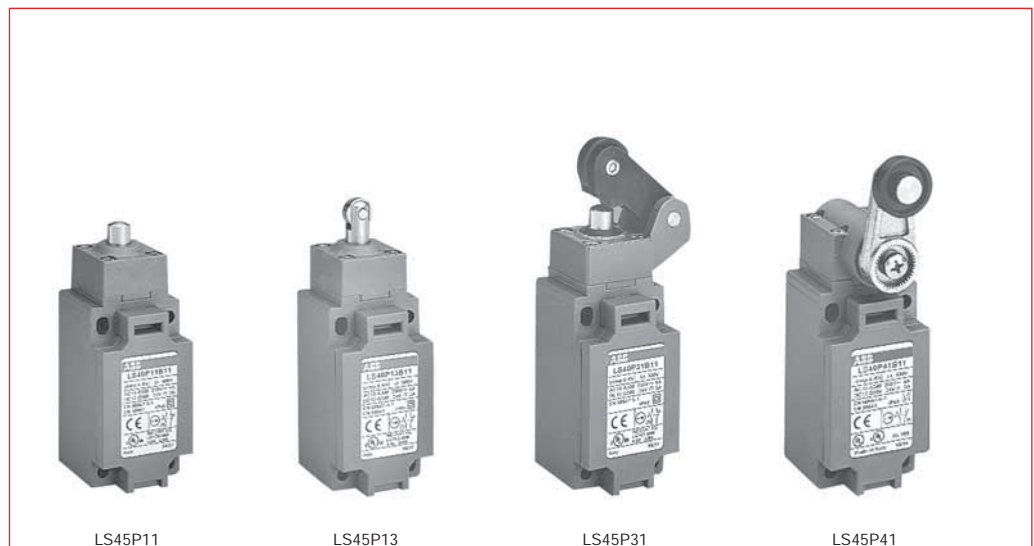
Roller lever



Positive contact opening



40mm width — LS45P



LS45P11

LS45P13

LS45P31

LS45P41

CENELEC conformity

EN 50 041

EN 50 041

—

EN 50 041

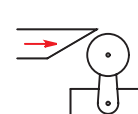
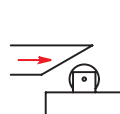
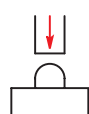
Actuating device and actuation type

Plain plunger

Roller plunger

Roller lever

Roller lever








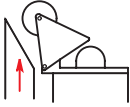
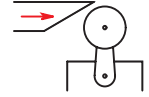
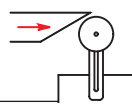

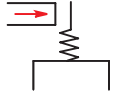


Positive contact opening






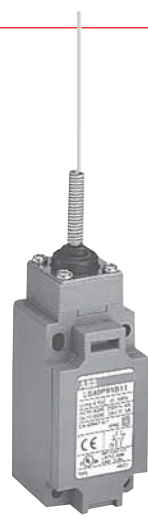
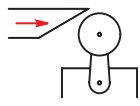
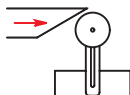
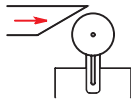
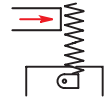
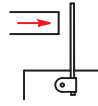
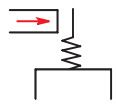


Selection guide

30mm & 40mm, IP65, UL Type 4

Plastic
Limit switches

				
LS35P32	LS35P41	LS35P51	LS35P71	LS35P91
—	EN 50 047	—	—	—
Roller lever	Roller lever	Adjustable roller lever	Adjustable rod lever	Flexible rod
				
		—	—	—

					
LS45P44	LS45P51	LS45P54	LS45P61	LS45P72	LS45P91
—	—	—	—	EN 50 041	—
Roller lever	Adjustable roller levers		Adjustable flexible and rigid rod levers		Flexible rod
					
—	—	—	—	—	—

General information

30mm & 40mm, IP65, UL Type 4

Applications

Easy to use, electromechanical limit switches offer specific qualities:

- Visible operation
- Able to switch strong currents (10 A conventional thermal current)
- Electrically separated contacts
- Precise operating points (consistency)
- Immune to electromagnetic disturbances

Limit switches used for these mechanical applications:

- Presence/absence
- Positioning and travel limit
- Objects passing/counting

Description

Limit switches, which are made of reinforced UL-V0 thermoplastic fiberglass, offer double insulation  and a degree of protection of IP 65 and UL type 4.

Casings come in 2 dimensions:

- 30mm width
 - LS35P
- 40mm width
 - LS45P

9

30 or 40mm width casings with standardized dimensions corresponding to:

- EN 50047 for 30mm width
- EN 50041 for 40mm width

Mounting the casing:

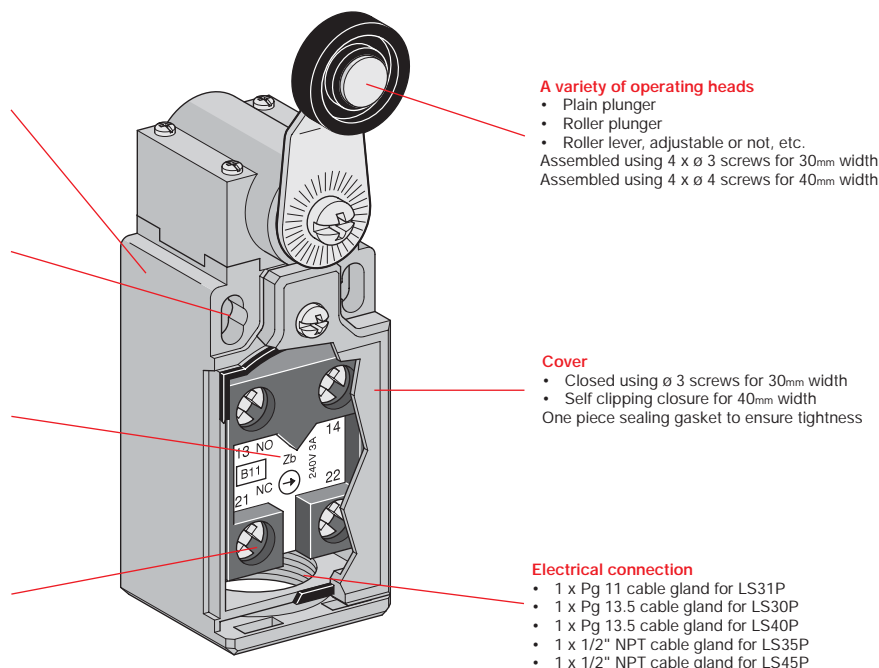
- 2 x M4 screws on top part for 30mm width
- 2 or 4 x M5 screws for 40mm width

Block of 2 contacts:

- Contact configuration: N.O. + N.C., 2 N.O., 2 N.C.
- Positive opening operation
- Snap action or slow action
- Zb shape: the 2 contacts are electrically separated

Connecting terminals:

- M3.5 (+,-) pozidriv 2 screw
- Screw head with captive cable clamp
- Markings conform with IEC 947—1, IEC 947—5—1, EN 50005 and 50013 standards



A variety of operating heads

- Plain plunger
 - Roller plunger
 - Roller lever, adjustable or not, etc.
- Assembled using 4 x ø 3 screws for 30mm width
Assembled using 4 x ø 4 screws for 40mm width

Cover

- Closed using ø 3 screws for 30mm width
 - Self clipping closure for 40mm width
- One piece sealing gasket to ensure tightness

Electrical connection

- 1 x Pg 11 cable gland for LS31P
- 1 x Pg 13.5 cable gland for LS30P
- 1 x Pg 13.5 cable gland for LS40P
- 1 x 1/2" NPT cable gland for LS35P
- 1 x 1/2" NPT cable gland for LS45P

Catalog number explanation

Limit switch

Casing width

- 30 = 30mm width+1 cable inlet for Pg 13.5 cable gland
- 31 = 30mm width+1 cable inlet for Pg 11 cable gland
- 35 = 30mm width+1 cable inlet for 1/2" NPT cable gland
- 40 = 40mm width+1 cable inlet for Pg 13.5 cable gland
- 45 = 40mm width+1 cable inlet for 1/2" NPT cable gland

Plastic casing

Operating heads: codes 10 – 93

LS 35 P 41 B 11

Contact block

- 11: 1 N.O. contact + 1 N.C. contact
- 20: 2 N.O. contacts
- 02: 2 N.C. contacts

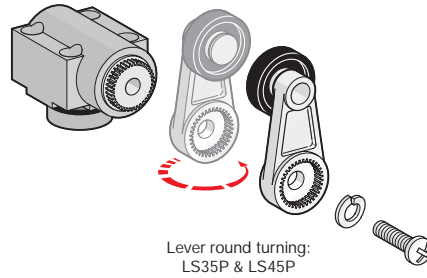
- B: Zb Snap action
- L: Zb Slow action (contact dependent)
- D: Zb Slow action non-overlapping late make
- C: Zb Slow action overlapping early make

General information

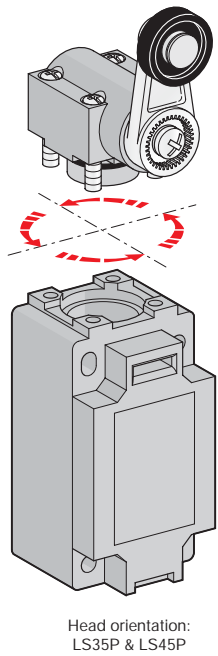
Implementation

30mm & 40mm, IP65, UL Type 4

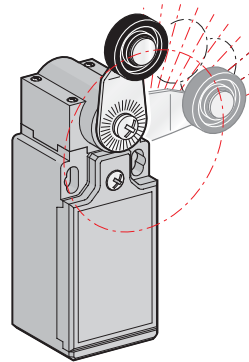
Plastic
Limit switches



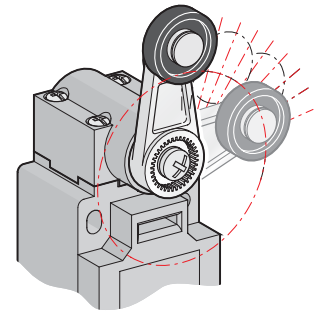
Lever round turning:
LS35P & LS45P



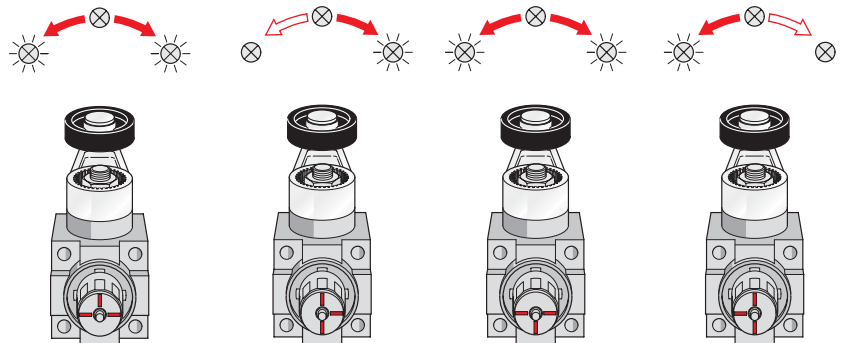
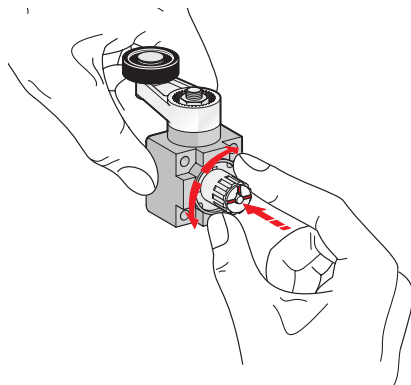
Head orientation:
LS35P & LS45P



Free position adjustment
10 in 10° of lever:
LS35P



Free position adjustment
9 in 9° of lever:
LS45P



Operating mode selection only, LS45P

Assembled 30mm, IP 65, UL Type 4

Movement to be detected

Key translation, on end or lateral

On end



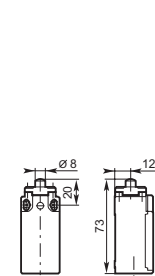
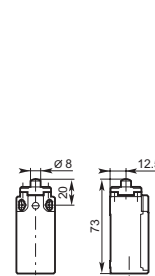
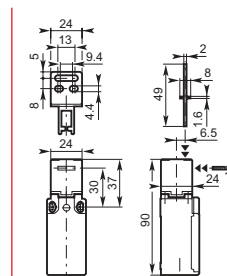
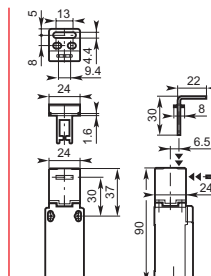
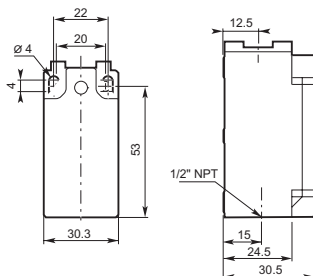
Operating head type

	Right angle key	Straight key	Plain thermoplastic plunger	Plain steel plunger
Conformity / (N.C. contact with positive opening operation)			EN 50 047	EN 50 047
Maximum actuation speed m/s	0.5	0.5	0.5	0.5
Min. force: - actuation N	18	18	9	9
- positive opening operation N	60	60	44	44

9

Snap action contacts	Catalog number	LS35P15B11	LS35P16B11	LS35P10B11	LS35P11B11
List price		\$ 31	\$ 33	\$ 22	\$ 22
Operation diagram					
Non-overlapping Slow action contacts	Catalog number	LS35P15D11	LS35P16D11	LS35P10D11	LS35P11D11
List price		33	35	23	23
Operation diagram					
Overlapping Slow action contacts	Catalog number	LS35P15C11	LS35P16C11	LS35P10C11	LS35P11C11
List price		34	36	24	24
Operation diagram					
Slow action contacts	Catalog number	LS35P15L02	LS35P16L02	LS35P10L02	LS35P11L02
List price		34	36	24	24
Operation diagram					
Slow action contacts	Catalog number	LS35P15L20	LS35P16L20	LS35P10L20	LS35P11L20
List price		34	36	24	24
Operation diagram					
Snap action contacts	Catalog number	LS35P15B02	LS35P16B02	LS35P10B02	LS35P11B02
List price		34	36	24	24
Operation diagram					
Weight (packing per unit)	kg	0.085	0.085	0.065	0.070

Approximate dimensions (mm)



Assembled 30mm, IP 65, UL Type 4

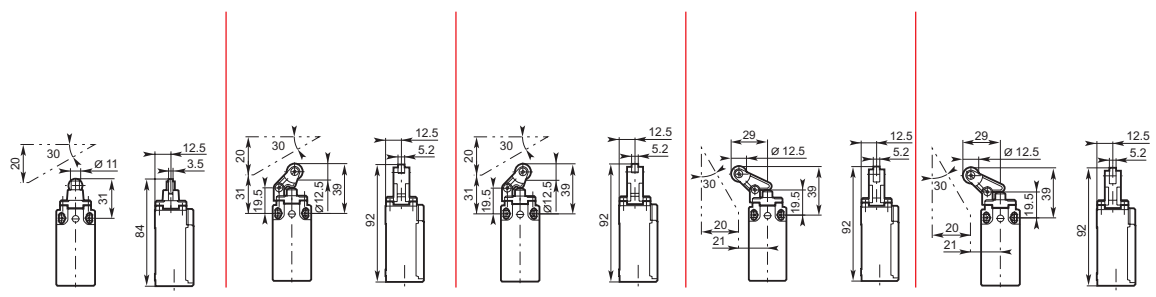


30° Cam Translat. 30° Unidirectional Cam Translation Movement



Plastic roller plunger	Plastic roller lever on plastic plunger	Plastic roller lever on steel plunger	Plastic roller lever on steel plunger	Plastic roller lever on plastic plunger
EN 50 047	EN 50 047	EN 50 047		
0.3	1	1	1	1
12	7	7	3	3
41	24	24	24	24

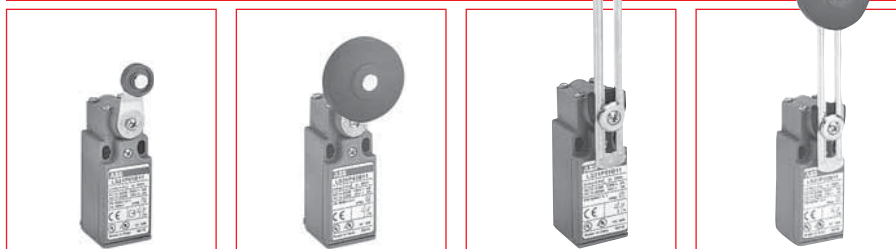
LS35P13B11 \$ 25 0 1.4 3.3 7.8 11.2 mm 	LS35P30B11 \$ 24 0 3.0 7.1 16.9 24.4 mm 	LS35P31B11 \$ 25 0 3.0 7.1 16.9 24.4 mm 	LS35P32B11 \$ 24 0 2.6 6.2 14.7 21.3 mm 	LS35P34B11 \$ 25 0 2.6 6.2 14.7 21.3 mm
LS35P13D11 26 0 2.6 5.1 11.4 mm 4.7 	LS35P30D11 25 0 5.6 10.9 24.4 mm 10.1 	LS35P31D11 26 0 5.6 10.9 24.4 mm 10.1 	LS35P32D11 25 0 4.9 9.4 21.1 mm 8.8 	LS35P34D11 26 0 4.9 9.4 21.1 mm 8.8
LS35P13C11 27 0 4.6 7.0 11.4 mm 2.6 	LS35P30C11 26 0 9.8 15.0 24.4 mm 5.6 	LS35P31C11 27 0 9.8 15.0 24.4 mm 5.6 	LS35P32C11 26 0 8.5 13.0 21.1 mm 4.9 	LS35P34C11 27 0 8.5 13.0 21.1 mm 4.9
LS35P13L02 27 0 2.3 4.7 11.4 mm 	LS35P30L02 26 0 4.9 10.1 24.4 mm 	LS35P31L02 27 0 4.9 10.1 24.4 mm 	LS35P32L02 26 0 4.2 8.8 21.1 mm 	LS35P34L02 27 0 4.2 8.8 21.1 mm
LS35P13L20 27 0 2.3 11.4 mm 	LS35P30L20 26 0 4.9 24.4 mm 	LS35P31L20 27 0 4.9 24.4 mm 	LS35P32L20 26 0 4.2 21.1 mm 	LS35P34L20 27 0 4.2 21.1 mm
LS35P13B02 27 0 1.4 3.3 7.8 11.2 mm 	LS35P30B02 26 0 3.0 7.1 16.9 24.4 mm 	LS35P31B02 27 0 3.0 7.1 16.9 24.4 mm 	LS35P32B02 26 0 2.6 6.2 14.7 21.3 mm 	LS35P34B02 27 0 2.6 6.2 14.7 21.3 mm
0.070	0.065	0.070	0.075	0.070



Assembled 30mm, IP 65, UL Type 4

Movement to be detected

30° Cam translation movement



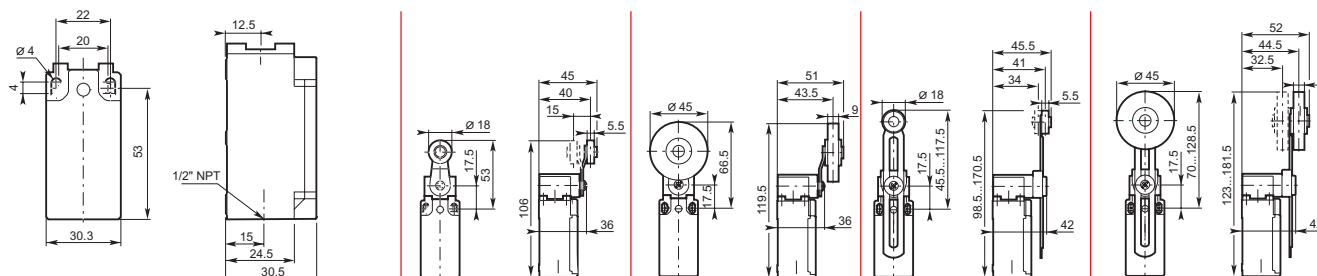
Operating head type

	Ø 18 Polyamide roller lever	Ø 45 Rubber roller lever	Adjustable Ø 18 polyamide roller lever	Adjustable Ø 45 rubber roller lever
Conformity / (N.C. contact with positive opening operation)	EN 50 047			
Maximum actuation speed	m/s 1.5	1.5	1.5	1.5
Min. torque: - actuation	N.m 0.10	0.10	0.10	0.10
- positive opening operation	N.m 0.32	—	—	—

9 Additional technical data

	Catalog number	LS35P41B11	LS35P42B11	LS35P51B11	LS35P52B11
Snap action contacts	List price	\$ 26	\$ 27	\$ 27	\$ 28
	Operation diagram				
Non-overlapping slow action contacts	Catalog number	LS35P41D11	LS35P42D11	LS35P51D11	LS35P52D11
List price		27	29	28	30
	Operation diagram				
Overlapping slow action contacts	Catalog number	LS35P41C11	LS35P42C11	LS35P51C11	LS35P52C11
List price		28	30	29	30
	Operation diagram				
Slow action contacts	Catalog number	LS35P41L02	LS35P42L02	LS35P51L02	LS35P52L02
List price		28	30	29	30
	Operation diagram				
Slow action contacts	Catalog number	LS35P41L20	LS35P42L20	LS35P51L20	LS35P52L20
List price		28	30	29	30
	Operation diagram				
Snap action contacts	Catalog number	LS35P41B02	LS35P42B02	LS35P51B02	LS35P52B02
List price		28	30	29	30
	Operation diagram				
Weight (packing per unit)	kg	0.090	0.120	0.100	0.130

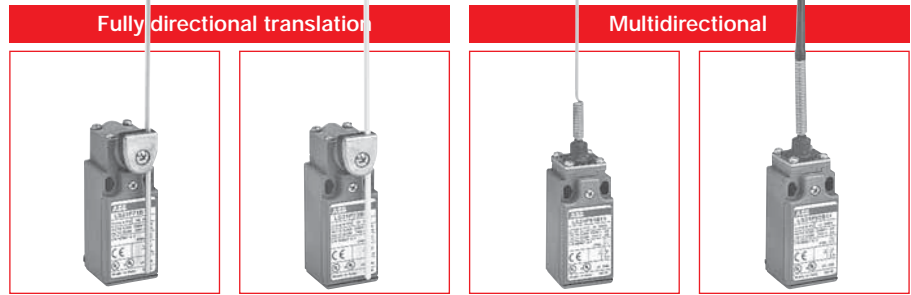
Dimensions (mm)



Assembled 30mm, IP 65, UL Type 4

Plastic
Limit switches

Movement to be detected



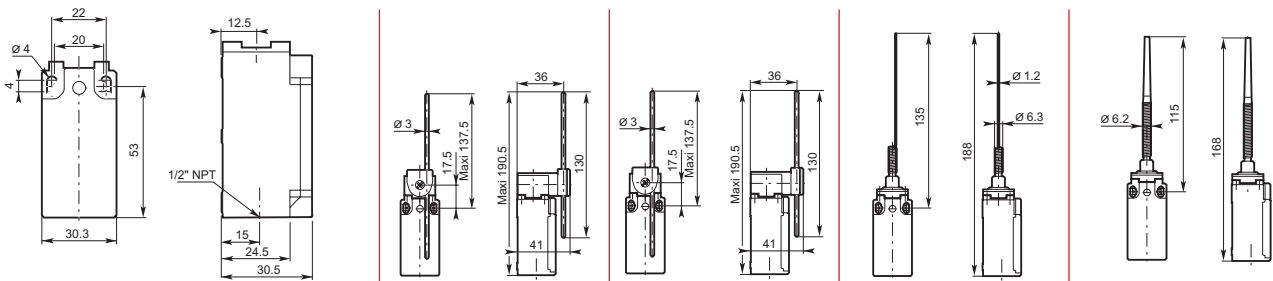
Operating head type

	Adjustable \varnothing 3 stainless steel rod lever	Adjustable \varnothing 3 fiber-glass rod lever	Spring rod	Flexible rod with insulated end
Conformity / N.C. (N.C. contact with positive opening operation)				
Maximum actuation speed	m/s 1.5	m/s 1.5	m/s 1	m/s 1
Min. torque: - actuation	N.m 0.10	N.m 0.10	N.m 0.12	N.m 0.12
- positive opening operation	N.m —	N.m —	N.m —	N.m —

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	Catalog number	LS35P71B11	LS35P72B11	LS35P91B11	LS35P92B11
Snap action contacts	List price	\$ 27	\$ 27	\$ 25	\$ 25
	Operation diagram				
Non-overlapping Slow action contacts	Catalog number	LS35P71D11	LS35P72D11	LS35P91D11	LS35P92D11
List price	28	28	27	27	
	Operation diagram				
Overlapping Slow action contacts	Catalog number	LS35P71C11	LS35P72C11	LS35P91C11	LS35P92C11
List price	29	29	27	27	
	Operation diagram				
Slow action contacts	Catalog number	LS35P71L02	LS35P72L02	LS35P91L02	LS35P92L02
List price	29	29	27	27	
	Operation diagram				
Slow action contacts	Catalog number	LS35P71L20	LS35P72L20	LS35P91L20	LS35P92L20
List price	29	29	27	27	
	Operation diagram				
Snap action contacts	Catalog number	LS35P71B02	LS35P72B02	LS35P91B02	LS35P92B02
List price	29	29	27	27	
	Operation diagram				
Weight (packing per unit)	kg	0.100	0.100	0.080	0.080

Dimensions (mm)



Components

30mm, IP 65, UL Type 4



LS35P40B11



LSA30X41



LSC30XD11

Casings with contact block and angular motion head (without actuator)

	LS	35	P	40	B11	
Limit Switch.....	LS					
Casing width 30 mm		3				
Cable inlet						
1 cable inlet for Pg 13.5 cable gland		0				
1 cable inlet for Pg 11 cable gland		1				
1 cable inlet M16 x 1.5 for ISO 16 cable gland		2				
1 cable inlet M20 x 1.5 for ISO 20 cable gland		3				
1 cable inlet by 1/2" NPT plastic adaptor		5				
Plastic casing			P			
Operating heads (without actuator)						
With angular movement for non-adjustable roller levers				40		
With angular movement for adjustable roller or rod levers				50		
						Contacts
						11
						02
						20
						1 N.O. + 1 N.C. contacts
						2 N.C. contacts
						2 N.O. contacts
						Snap action
						B
						Zb Snap
						Dependent (slow) action
						L
						Zb Slow / Simultaneous
						D
						Zb Non-overlapping late make
						C
						Zb Overlapping early make

Separate actuators (lever, key)

	LS	A	30	X	41	
Limit Switch.....	LS					
Actuator (lever, key)		A				
Casing width: 30 mm			30			
						Reference of actuators
						05, 06
						key
						41, 42
						non-adjustable roller lever
						51, 52
						adjustable roller lever
						71, 72, 73, 74
						adjustable rod lever
						For casing
						M
						Metal
						P
						Plastic
						X
						Plastic or metal

Separate contact blocks

	LS	C	30	X	D	11	
Limit Switch.....	LS						
Contact blocks		C					
Casing width: 30 mm			30				
							Contacts
							11
							02
							20
							1 N.O. + 1 N.C. contacts
							2 N.C. contacts
							2 N.O. contacts
							Snap action
							B
							Zb Snap
							Dependent (slow) action
							L
							Zb Slow / Simultaneous
							D
							Zb Non-overlapping late make
							C
							Zb Overlapping early make

Components

30mm, IP 65, UL Type 4

Plastic
Limit switches

- Casings equipped with angular motion head (without actuator)
- Separate actuators
- Separate contact blocks



LSA30X42



LSA30X41 (A Shape)

Roller levers (non-adjustable)



LSA30X52



LSA30X51

Adjustable roller levers



LSA30X71

LSA30X72

Adjustable rod levers



LSA30X73



LSA30X74



LS35P40 casings equipped with angular motion head for roller levers (non-adjustable)

- LS35P40B11, LS35P40D11, LS35P40C11, LS35P40L02, LS35P40B02
- ✗ LS35P40L20



LS30P50 ... LS35P50 casings equipped with angular motion head for adjustable roller or rod levers

- ✗ LS35P50B11, LS35P50D11, LS35P50C11, LS35P50L02, LS35P50L20, LS35P50B02



Contact blocks

- LSC30XB11, LSC30XD11, LSC30XC11, LSC30XL02, LSC30XB02
- ✗ LSC30XL20

→ Suitable for positive opening operation (IEC 60947-5-1 and EN 50041).

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with → are fitted.

Components

30mm, IP 65, UL Type 4

Casings with angular motion head for non-adjustable roller levers, delivered without actuator

⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LS35P40B11

Contact blocks						Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
B11	D11	C11	L02	L20	B02					
1						⊕	1.5	0.092	LS35P40B11	\$ 23
	1					⊕	1.5	0.092	LS35P40D11	24
		1				⊕	1.5	0.092	LS35P40C11	25
			1			⊕	1.5	0.092	LS35P40L02	25
				1		⊗	1.5	0.092	LS35P40L20	25
					1	⊕	1.5	0.092	LS35P40B02	25

Components

30mm, IP 65, UL Type 4



⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LS35P50B11



LSA30X41



LSA30X42



LSA30X51



LSA30X71



LSA30P05



LSA30P06



LSC30XD11



LSR1305

Casings with angular motion head for adjustable rod or roller levers, delivered without actuator

Contact blocks						Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
B11	D11	C11	L02	L20	B02					
1						⊗	1.5	0.092	LS35P50B11	\$ 23
	1					⊗	1.5	0.092	LS35P50D11	24
		1				⊗	1.5	0.092	LS35P50C11	25
			1			⊗	1.5	0.092	LS35P50L02	25
				1		⊗	1.5	0.092	LS35P50L20	25
					1	⊗	1.5	0.092	LS35P50B02	25

Actuators for LS35P40 (delivered with M3.5 screw)

To be actuated by 30° cam

- ⊕ ⌀ 18mm polyamide roller lever
- ⊗ ⌀ 45mm rubber roller lever

Actuators for LS35P50 (delivered with M3.5 screw and adaptation parts)

To be actuated by 30° cam

- ⊗ ⌀ 18mm adjustable polyamide roller lever
- ⊗ ⌀ 45mm adjustable rubber roller lever

To be actuated by fully directional translation movement

- ⊗ ⌀ 3mm adjustable inox rod lever, 170mm
- ⊗ ⌀ 3mm adjustable fiberglass rod lever, 170mm
- ⊗ ⌀ 6mm adjustable polyamide rod lever, 195mm
- ⊗ ⌀ 6mm adjustable fiberglass rod lever, 195mm

Right angle key for LS35P15

- ⊕ Right angle key (mounting 13mm)

Straight key for LS35P16

- ⊕ Straight key (mounting 13mm)

Separate contact blocks

- ⊕ 1 NC & 1 NO 2-pole snap action
- ⊕ 1 NC & 1 NO 2-pole non-overlapping slow action
- ⊕ 1 NO & 1 NC 2-pole non-overlapping slow action
- ⊕ 2 NC 2-pole simultaneous slow action
- ⊗ 2 NO 2-pole simultaneous slow action
- ⊕ 2 NC 2-pole snap action

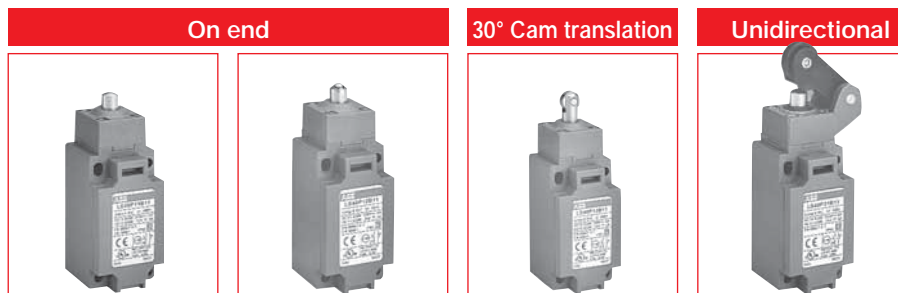
1/2" NPT plastic adaptors

- 1 piece

⊕ Free position adjustment of lever 10° by 10° over 360°.

Assembled 40mm, IP 65, UL Type 4

Movement to be detected



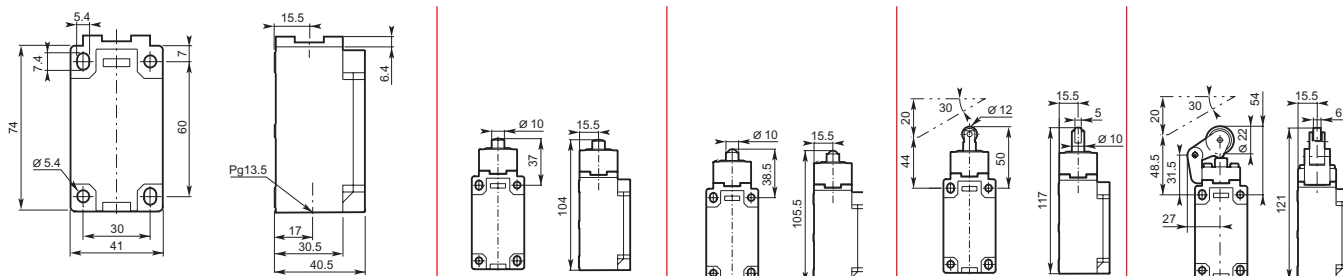
Operating head type

	Steel plain plunger	Steel ball plunger	Steel roller plunger	Polyamide roller lever
Conformity / (N.C. contact with positive opening operation)	EN 50 041	EN 50 041	EN 50 041	
Maximum actuation speed m/s	0.5	0.5	0.5	1
Min. force/torque:				
- actuation	22 N	22 N	16 N	12 N
- positive opening operation	66 N	66 N	48 N	40 N

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Contacts	Catalog number	List price	LS45P11B11	LS45P12B11	LS45P13B11	LS45P31B11
Snap action contacts 	LS45P11B11	\$ 30	0 0.8 1.9 4.5 6.5 mm	0 0.8 1.9 4.5 6.5 mm	0 1.5 3.5 8.4 12.1 mm	0 1.9 4.6 10.9 15.8 mm
Non-overlapping Slow action contacts 	LS45P11D11	32	0 1.5 2.9 6.5 mm	0 1.5 2.9 6.5 mm	0 3.5 6.8 15.2 mm	0 3.0 5.8 13.0 mm
Overlapping Slow action contacts 	LS45P11C11	33	0 2.6 4.0 6.5 mm	0 2.6 4.0 6.5 mm	0 6.1 9.3 15.2 mm	0 5.2 8.0 13.0 mm
Slow action contacts 	LS45P11L02	33	0 1.3 2.7 6.5 mm	0 1.3 2.7 6.5 mm	0 3.0 6.3 15.2 mm	0 2.6 5.4 13.0 mm
Slow action contacts 	LS45P11L20	33	0 1.3 6.5 mm	0 1.3 6.5 mm	0 3.0 15.2 mm	0 2.6 13.0 mm
Snap action contacts 	LS45P11B02	33	0 0.8 1.9 4.5 6.5 mm	0 0.8 1.9 4.5 6.5 mm	0 1.5 3.5 8.4 12.1 mm	0 1.9 4.6 10.9 15.8 mm
Weight (packing per unit)	kg		0.140	0.140	0.145	0.175

Dimensions (mm)









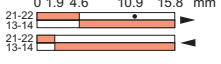
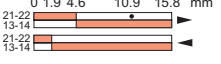
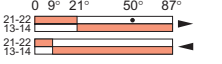
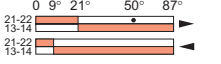
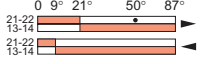
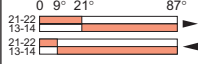
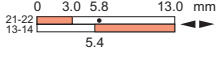
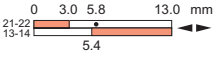
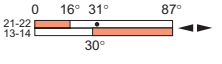
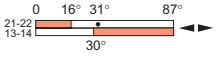
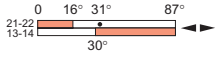
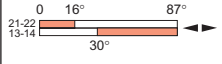
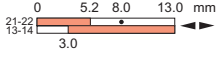
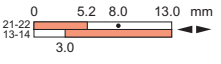
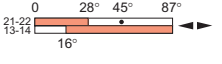
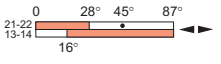
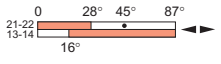
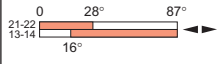






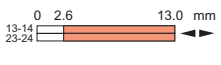
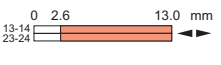
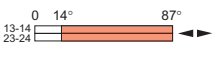
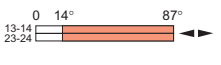
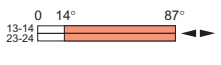
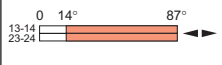
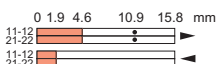

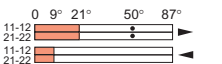
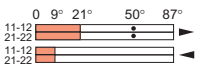
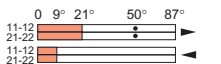
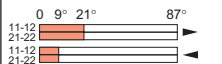
Assembled 40mm, IP 65, UL Type 4

Plastic
Limit switches

30° Cam transl.

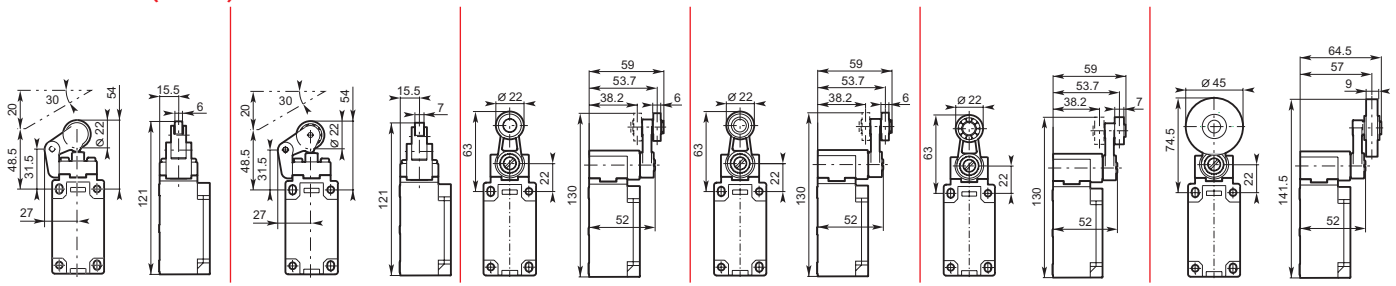
30° Cam translation movement

					
Stainless steel roller lever	Ball-bearing roller lever	Ø 22 Polyamide roller lever	Ø 22 Stainless steel roller lever	Ø 22 Ball-bearing roller lever	Ø 45 Rubber roller lever
1 12 N 40 N	1 12 N 40 N	EN 50 041 1.5 0.15 N.m 0.44 N.m	EN 50 041 1.5 0.15 N.m 0.44 N.m	EN 50 041 1.5 0.15 N.m 0.44 N.m	1.5 0.15 N.m -

LS45P32B11 \$ 39 	LS45P33B11 \$ 36 	LS45P41B11 \$ 39 	LS45P42B11 \$ 47 	LS45P43B11 \$ 42 	LS45P44B11 \$ 41 
LS45P32D11 42 	LS45P33D11 38 	LS45P41D11 42 	LS45P42D11 50 	LS45P43D11 45 	LS45P44D11 44 
LS45P32C11 43 	LS45P33C11 39 	LS45P41C11 43 	LS45P42C11 52 	LS45P43C11 47 	LS45P44C11 45 
LS45P32L02 43 	LS45P33L02 39 	LS45P41L02 43 	LS45P42L02 52 	LS45P43L02 47 	LS45P44L02 45 
LS45P32L20 43 	LS45P33L20 39 	LS45P41L20 43 	LS45P42L20 52 	LS45P43L20 47 	LS45P44L20 45 
LS45P32B02 43 	LS45P33B02 39 	LS45P41B02 43 	LS45P42B02 52 	LS45P43B02 47 	LS45P44B02 45 
0.185	0.185	0.185	0.195	0.195	0.205

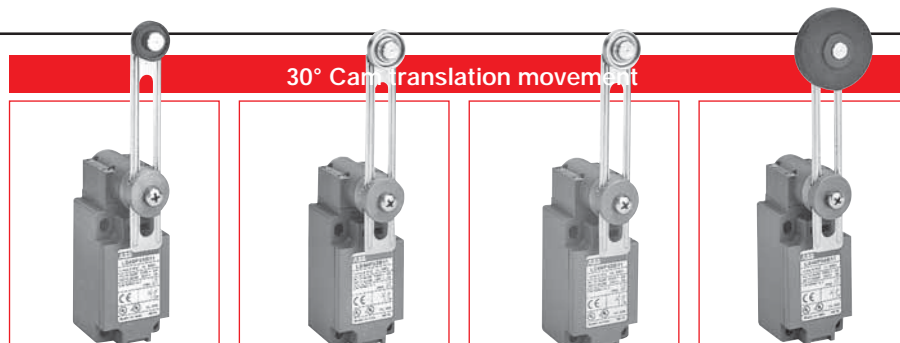
9

Dimensions (in mm)



Assembled 40mm, IP 65, UL Type 4

Movement to be detected



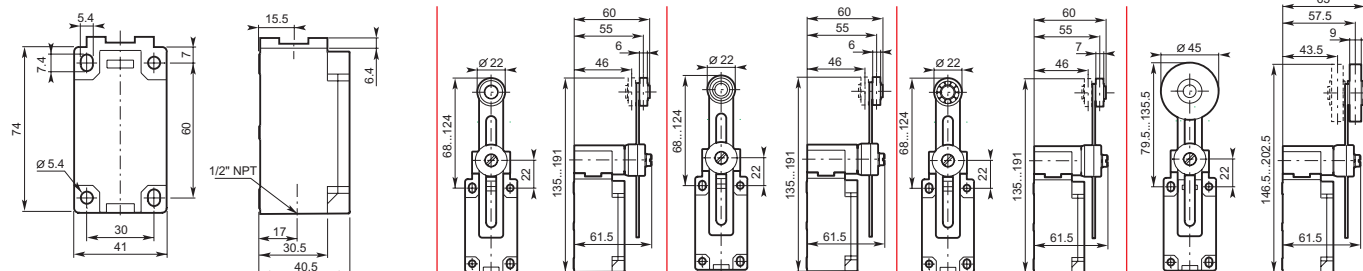
Operating head Catalog number

	Adjustable Ø 22 polyamide roller lever	Adjustable Ø 22 stainless steel roller lever	Adjustable Ø 22 stainless steel ball-bearing roller lever	Adjustable Ø 45 rubber roller lever
Conformity / (N.C. contact with positive opening operation)				
Maximum actuation speed	m/s 1.5	m/s 1.5	m/s 1.5	m/s 1.5
Min. torque: - actuation	N.m 0.15	N.m 0.15	N.m 0.15	N.m 0.15
- positive opening operation	N.m —	N.m —	N.m —	N.m —

9

Snap action contacts	Catalog number	LS45P51B11	LS45P52B11	LS45P53B11	LS45P54B11
Zb	List price	\$ 39	\$ 47	\$ 43	\$ 41
Operation diagram					
Non-overlapping Slow action contacts	Catalog number	LS45P51D11	LS45P52D11	LS45P53D11	LS45P54D11
Zb	List price	42	50	46	44
Operation diagram					
Overlapping Slow action contacts	Catalog number	LS45P51C11	LS45P52C11	LS45P53C11	LS45P54C11
Zb	List price	43	52	47	45
Operation diagram					
Slow action contacts	Catalog number	LS45P51L02	LS45P52L02	LS45P53L02	LS45P54L02
Zb	List price	43	52	47	45
Operation diagram					
Slow action contacts	Catalog number	LS45P51L20	LS45P52L20	LS45P53L20	LS45P54L20
Zb	List price	43	52	47	45
Operation diagram					
Snap action contacts	Catalog number	LS45P51B02	LS45P52B02	LS45P53B02	LS45P54B02
Zb	List price	43	52	47	45
Operation diagram					
Weight (packing per unit)	kg	0.190	0.200	0.200	0.200

Dimensions (in mm)

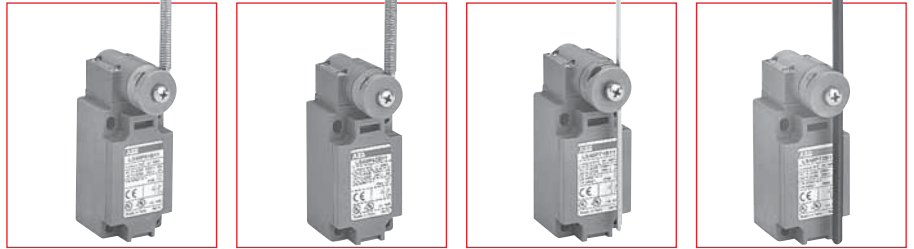


Assembled 40mm, IP 65, UL Type 4

Plastic
Limit switches

Movement to be detected

Fully directional translation movement



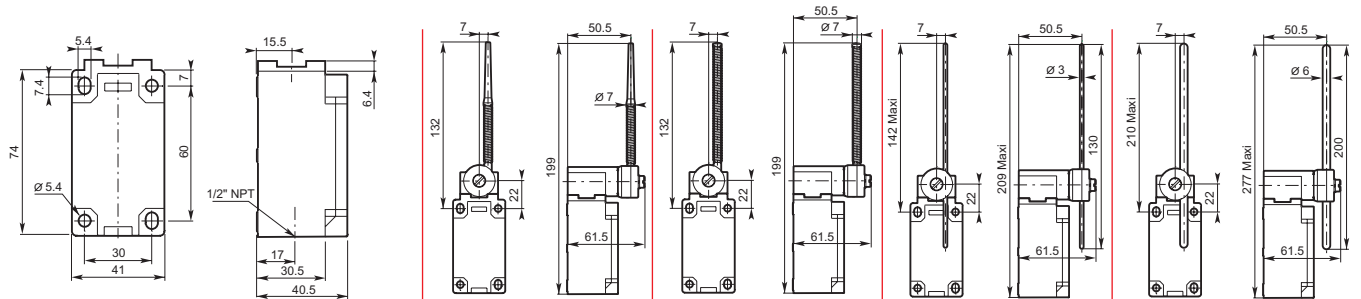
Operating head type

	Flexible lever with insulated end	Coil spring lever	Adjustable Ø 3 stainless steel rod lever	Adjustable ø 6 polyamide rod lever
Conformity / (N.C. contact with positive opening operation)			EN 50 041	EN 50 041
Maximum actuation speed	m/s 1.5	1.5	1.5	1.5
Min. torque: - actuation	N.m 0.15	0.15	0.15	0.15
- positive opening operation	N.m -	-	-	-

Snap action contacts	Catalog number	LS45P61B11	LS45P62B11	LS45P71B11	LS45P72B11
	List price	\$ 41	\$ 41	\$ 38	\$ 38
	Operation diagram				
Non-overlapping Slow action contacts	Catalog number	LS45P61D11	LS45P62D11	LS45P71D11	LS45P72D11
	List price	44	44	41	41
	Operation diagram				
Overlapping Slow action contacts	Catalog number	LS45P61C11	LS45P62C11	LS45P71C11	LS45P72C11
	List price	46	45	43	42
	Operation diagram				
Slow action contacts	Catalog number	LS45P61L02	LS45P62L02	LS45P71L02	LS45P72L02
	List price	46	45	43	42
	Operation diagram				
Slow action contacts	Catalog number	LS45P61L20	LS45P62L20	LS45P71L20	LS45P72L20
	List price	46	45	43	42
	Operation diagram				
Snap action contacts	Catalog number	LS45P61B02	LS45P62B02	LS45P71B02	LS45P72B02
	List price	46	45	43	42
	Operation diagram				
Weight (packing per unit)	kg	0.190	0.190	0.185	0.185

9

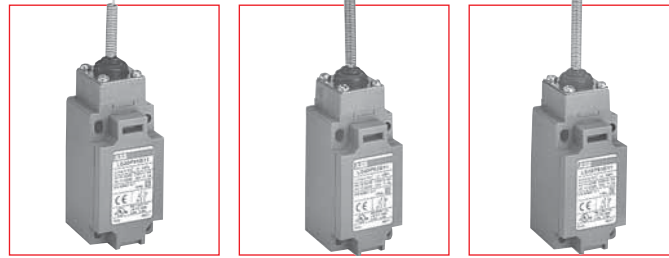
Dimensions (in mm)



Assembled 40mm, IP 65, UL Type 4

Movement to be detected

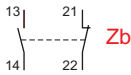
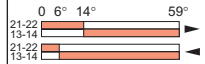
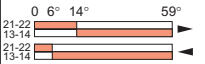
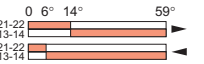
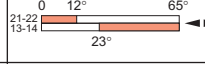
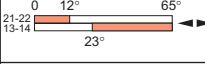
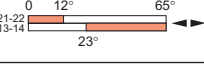
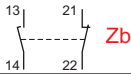
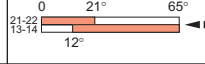
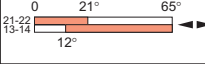
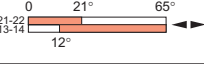
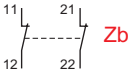

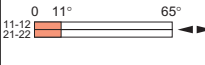
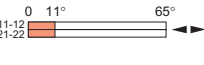
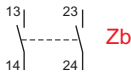
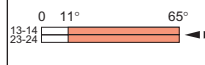

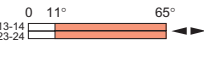
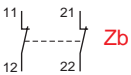
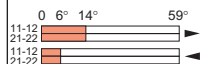


Multidirectional



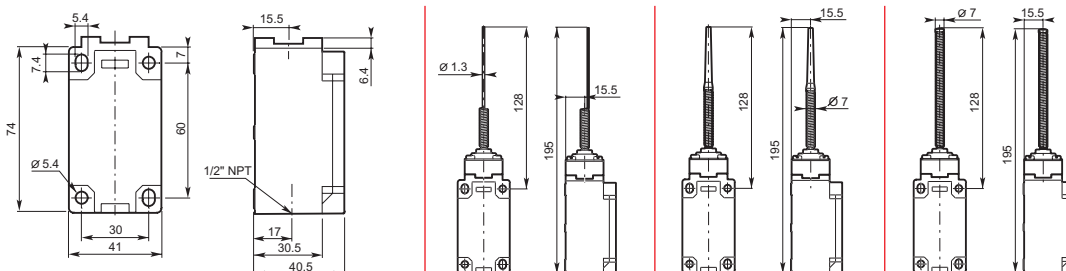
Operating head type

	Spring rod	Flexible rod with insulated end	Coil spring rod
Conformity / \odot (N.C. contact with positive opening operation)			
Maximum actuation speed	1 m/s	1 m/s	1 m/s
Min. torque: - actuation	0.18 N.m	0.18 N.m	0.18 N.m
- positive opening operation	- N.m	- N.m	- N.m

9

Operating head type	Catalog number	LS45P91B11	LS45P92B11	LS45P93B11
Snap action contacts	List price	\$ 32	\$ 35	\$ 33
 Zb	Operation diagram			
Non-overlapping Slow action contacts	Catalog number	LS45P91D11	LS45P92D11	LS45P93D11
List price	34	37	35	
 Zb	Operation diagram			
Overlapping Slow action contacts	Catalog number	LS45P91C11	LS45P92C11	LS45P93C11
List price	35	38	37	
 Zb	Operation diagram			
Slow action contacts	Catalog number	LS45P91L02	LS45P92L02	LS45P93L02
List price	35	38	37	
 Zb	Operation diagram			
Slow action contacts	Catalog number	LS45P91L20	LS45P92L20	LS45P93L20
List price	35	38	37	
 Zb	Operation diagram			
Snap action contacts	Catalog number	LS45P91B02	LS45P92B02	c
List price	35	38	37	
 Zb	Operation diagram			
Weight (packing per unit)	kg	0.135	0.140	0.145

Dimensions (in mm)



Components

40mm, IP 65, UL Type 4



LS45P00B11

Bodies with contact block for rectilinear or angular motion heads

LS 45 P 00 B 11

Limit Switch.....	LS				
Casing width 40 mm		3			
Cable inlet					
1 cable inlet for Pg 13.5 cable gland			0		
1 cable inlet M20 x 1.5 for ISO 20 cable gland			3		
1 cable inlet for 1/2" NPT			5		
Plastic casing.....				P	
Without operating head					00

Contacts

11	1 N.O. + 1 N.C. contacts
02	2 N.C. contacts
20	2 N.O. contacts

Snap action

B	Zb Snap
---------	---------

Dependent (slow) action

L	Zb Slow / Simultaneous
D	Zb Non-overlapping late make
C	Zb Overlapping early make



LSTH41

Operating heads

LS T H 41

Limit Switch.....	LS		
Operating head		T	
For plastic casing 40 mm width			40

References of heads

11 ... 14, 19	with rectilinear movement (plain plunger, steel ball plunger or roller plunger)
31 ... 37	with rectilinear movement (roller lever on steel plunger)
40	with angular movement (without actuator) actuator to be ordered separately
41 ... 44	with angular movement (roller lever)
50	with angular movement (without actuator) actuator to be ordered separately
51 ... 54	with angular movement (adjustable roller lever)
61, 62	flexible lever (spring)
71, 72, 73	adjustable lever (rod)
91 ... 93	multidirectional angular movement (spring rod)



LSA40X51

Separate actuators (roller lever, adjustable roller or rod levers, etc.)

LS A 40 X 51

Limit Switch.....	LS		
Actuator (roller)		A	
Casing width: 40 mm			40

Reference of actuators

41 ... 44	non-adjustable roller lever
51 ... 54	adjustable roller lever
61, 62	flexible lever (spring)
71, 72, 73	adjustable lever (rod)

For casing

M	Metal
P	Plastic
X	Plastic or metal



LSC40XC11

Separate contact blocks

LS C 40 X C 11

Limit Switch.....	LS			
Contact blocks		C		
Casing width: 40 mm			40	
For casing				
Metal.....				M
Plastic.....				P
Plastic or metal.....				X

Contacts

11	1 N.O. + 1 N.C. contacts
02	2 N.C. contacts
20	2 N.O. contacts

Snap action:

B	Zb Snap
---------	---------

Dependent (slow) action:

L	Zb Slow / Simultaneous
D	Zb Non-overlapping late make
C	Zb Overlapping early make

Components

40mm, IP 65, UL Type 4

- Bodies with contact block
- Operating heads with actuator



LSTH37 ⊕



LSTH33 ⊕



LSTH36 ⊕



LSTH12 ⊕
(B Shape)



LSTH32 ⊕



LSTH44 ⊗



LSTH43 ⊕
(A Shape)



LSTH42 ⊕
(A Shape)



LSTH19 ⊕
(C Shape)



LSTH14 ⊕
(B Shape)



LSTH35 ⊕



LSTH41 ⊕
(A Shape)



LSTH13 ⊕
(C Shape)



LSTH11 ⊕
(B Shape)



LSTH31 ⊕



LSTH54 ⊗



LSTH53 ⊗



LSTH52 ⊗



LSTH51 ⊗



LSTH93 ⊗



LSTH92 ⊗



LSTH91 ⊗



LSTH72 ⊗
(D Shape)



LSTH71 ⊗
(D Shape)



LSTH62 ⊗



LSTH61 ⊗

Rectilinear motion

Angular motion

LSTH... rectilinear motion heads

- To be actuated from end.
With plunger (plain or with ball): LSTH11, LSTH12 and LSTH14.
- To be actuated by 30° cam translation.
With roller plunger: LSTH13, LSTH19.
- To be actuated unidirectionally by 30° cam translation.
With roller lever on steel plunger: LSTH31 ... LSTH37.

LSTH... angular motion heads

- To be actuated by 30° cam translation.
With roller lever: LSTH41 ... LSTH54.
- To be actuated by fully directional translation movement.
With rod or spring lever: LSTH61 ... LSTH72.
- To be actuated multidirectionally.
With spring rod: LSTH91 ... LSTH93.



Bodies with contact block

⊕ LS45P00B11, LS45P00D11, LS45P00C11, LS45P00L02, LS45P00B02

⊗ LS45P00L20

Suitable for positive opening operation (IEC 60947-5-1 and EN 50041).

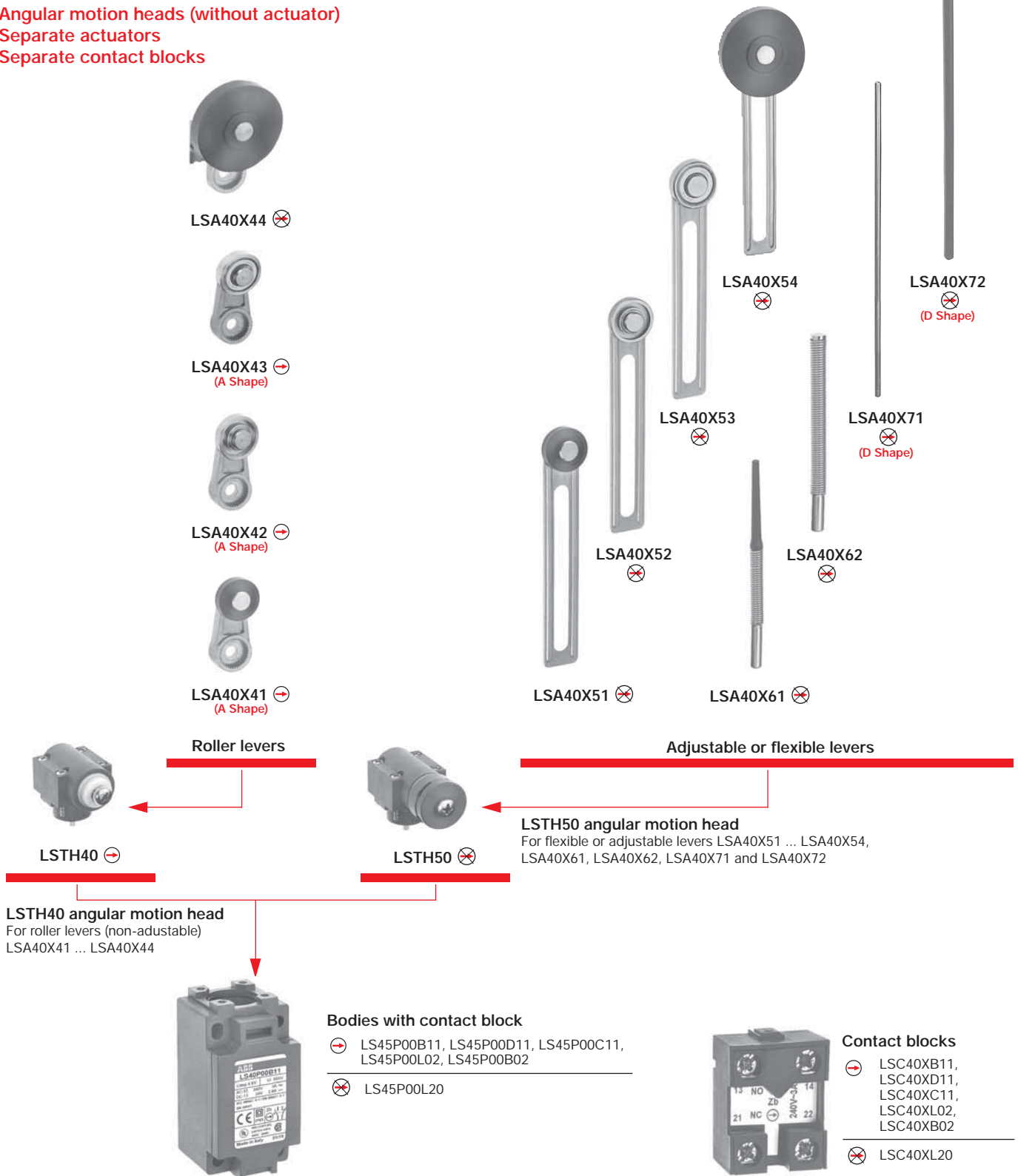
Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.

Components

40mm, IP 65, UL Type 4

Plastic
Limit switches

- Bodies with contact block
- Angular motion heads (without actuator)
- Separate actuators
- Separate contact blocks



9

(+) : Suitable for positive opening operation (IEC 60947-5-1 and EN 50041)
Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with (+) are fitted.

Components

40mm, IP 65, UL Type 4

⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LS45P00B11



LSTH11



LSTH19



LSTH31



LSTH37

Bodies with contact block for rectilinear or angular motion heads

Contact blocks

B11	D11	C11	L02	L20	B02
1					
	1				
		1			
			1		
				1	
					1

Positive opening operation

Actuation speed max. m/s

Unit weight kg (1 pc)

Catalog number

List price

						⊕	—	0.108	LS45P00B11	\$ 23
						⊕	—	0.108	LS45P00D11	24
						⊕	—	0.108	LS45P00C11	25
						⊕	—	0.108	LS45P00L02	25
						⊗	—	0.108	LS45P00L20	25
						⊕	—	0.108	LS45P00B02	25

Rectilinear motion heads with actuator

To be actuated by end

Steel plain plunger (zinc-plated)

⊕

0.5

0.042

LSTH11

9

Steel plain plunger (zinc-plated) and dust protection cup

⊕

0.5

0.043

LSTH14

12

Steel ball plunger

⊕

0.5

0.042

LSTH12

11

To be actuated by 30° cam

Steel roller plunger (zinc-plated)

⊕

0.5

0.048

LSTH13

16

Steel roller plunger (zinc-plated) and dust protection cup

⊕

0.5

0.048

LSTH19

19

To be actuated unidirectionally by 30° cam

ø 22mm polyamide roller lever on steel plunger (zinc-plated)

⊕

1.5

0.046

LSTH31

15

ø 22mm polyamide roller lever on steel plunger (zinc-plated) & dust protection cup

⊕

1.5

0.049

LSTH35

18

ø 22mm stainless steel roller lever on steel plunger (zinc-plated)

⊕

1.5

0.055

LSTH32

20

ø 22mm stainless steel roller lever on steel plunger (zinc-plated) & dust protection cup

⊕

1.5

0.058

LSTH36

23

ø 22mm steel ball-bearing roller lever on steel plunger (zinc-plated)

⊕

1.5

0.057

LSTH33

17

ø 22mm steel ball-bearing roller lever on steel plunger (zinc-plated) & dust protection cup

⊕

1.5

0.060

LSTH37

20

Components

40mm, IP 65, UL Type 4



⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LSTH41



LSTH51



LSTH92



LSTH40



LSA40X41



LSA40X43

Bodies with contact block for rectilinear or angular motion heads

Contact blocks	Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
Angular motion heads with actuator					
To be actuated by 30° cam					
⊕ 22mm polyamide roller lever ①	⊕	1.5	0.082	LSTH41	\$ 20
⊕ 22mm stainless steel roller lever ①	⊕	1.5	0.091	LSTH42	28
⊕ 22mm steel ball-bearing roller lever ①	⊕	1.5	0.093	LSTH43	23
⊕ 45mm rubber roller lever ①	⊗	1.5	0.098	LSTH44	22
⊕ 22mm adjustable polyamide roller lever ①	⊗	1.5	0.088	LSTH51	20
⊕ 22mm adjustable stainless steel roller lever ①	⊗	1.5	0.098	LSTH52	28
⊕ 22mm adjustable steel ball-bearing roller lever ①	⊗	1.5	0.100	LSTH53	24
⊕ 45mm adjustable rubber roller lever ①	⊗	1.5	0.105	LSTH54	22
To be actuated by fully directional translation movement					
⊕ Stainless steel flexible lever with insulated end ①	⊗	1	0.083	LSTH61	22
⊕ Stainless steel coil spring lever ①	⊗	1	0.089	LSTH62	22
⊕ 3mm adjustable stainless steel rod lever, 195mm ①	⊗	1	0.087	LSTH71	19
⊕ 6mm adjustable polyamide rod lever, 195mm ①	⊗	1	0.083	LSTH72	19
⊕ 6mm adjustable fiberglass rod lever, 195mm ①	⊗	1	0.087	LSTH73	20
Multidirectional angular motion heads (to be actuated by fully directional translation movement)					
⊗ Stainless steel spring rod	⊗	1	0.046	LSTH91	13
⊗ Stainless steel flexible rod with insulated end	⊗	1	0.049	LSTH92	16
⊗ Stainless steel coil spring rod	⊗	1	0.055	LSTH93	14
Angular motion head without actuator for non-adjustable roller levers (delivered with M5 screw and washer)					
⊕	⊕	1.5	0.050	LSTH40	14
Actuators for angular motion head LSTH40					
⊕ 22mm polyamide roller lever ①	⊕	—	0.032	LSA40X41	6
⊕ 22mm stainless steel roller lever ①	⊕	—	0.042	LSA40X42	14
⊕ 22mm steel ball-bearing roller lever ①	⊕	—	0.044	LSA40X43	9
⊕ 45mm rubber roller lever ①	⊗	—	0.050	LSA40X44	8

① Free position adjustment of lever 9° by 9° over 360°.

Components

40mm, IP 65, UL Type 4

⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LSTH50



LSA40X72



LSA40X51



LSC40XB11

	Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
Angular motion head without actuator, for flexible or adjustable levers (delivered with M5 screw, washer & adaptation parts)					
	⊕	—	0.058	LSTH50	\$ 15
Actuators for angular motion head LSTH50					
∅ 22mm adjustable polyamide roller lever ①	⊕	—	0.023	LSA40X51	5
∅ 22mm adjustable stainless steel roller lever ①	⊕	—	0.032	LSA40X52	13
∅ 22mm adjustable steel ball-bearing roller lever ①	⊕	—	0.034	LSA40X53	9
∅ 45mm adjustable rubber roller lever ①	⊕	—	0.039	LSA40X54	7
Stainless steel flexible lever with insulated end ①	⊕	—	0.017	LSA40X61	7
Stainless steel coil spring lever ①	⊕	—	0.023	LSA40X62	7
∅ 3mm adjustable stainless steel rod lever, 195mm ①	⊕	—	0.014	LSA40X71	4
∅ 6mm adjustable polyamide rod lever, 195mm ①	⊕	—	0.010	LSA40X72	4
∅ 6mm adjustable fiberglass rod lever, 195mm ①	⊕	—	0.014	LSA40X73	5
Contact blocks (with adaptor)					
1 NC & 1 NO 2-pole snap action	⊕	—	0.032	LSC40XB11	15
1 NC & 1 NO 2-pole non-overlapping slow action	⊕	—	0.032	LSC40XD11	15
1 NO & 1 NC 2-pole overlapping slow action	⊕	—	0.032	LSC40XC11	17
2 NC 2-pole simultaneous slow action	⊕	—	0.032	LSC40XL02	17
2 NO 2-pole simultaneous slow action	⊕	—	0.032	LSC40XL20	17
2 NC 2-pole snap action	⊕	—	0.032	LSC40XB02	17

① Free position adjustment of lever 9° by 9° over 360°.

Technical data

IP 65, UL Type 4



General technical data

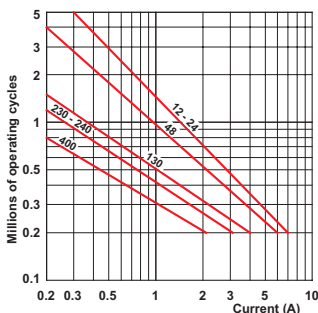
Standards	Devices conform with international IEC 947-5-1 and European EN 60 947-5-1 standards	
Certifications - Approvals	UL & CSA	
Air temperature near the device (IEC)	°C	- 25 ... + 70
- during operation		- 30 ... + 80
- for storage	°C	
Climatic withstand	According to IEC 68-2-3 and salty mist according to IEC 68-2-11	
Mounting positions	All positions are authorized	
Shock withstand (according to IEC 68-2-27 and EN 60 068-2-27)	50g ① (1/2 sinusoidal shock for 11 ms) no change in contact position	
Resistance to vibrations (acc. to IEC 68-2-6 and EN 60 068-2-6)	25g (10 – 500 Hz) no change in position of contacts greater than 100 µs	
Protection against electrical shocks (acc. to IEC 536)	Class II	
Degree of protection	UL Type 4 & IP 65	
Consistency (measured over 1 million operations)	0.1 mm (upon closing point)	
Minimum actuation speed	m/s	Slow action contacts 0.060 / Snap action contacts 0.001

Electrical Data

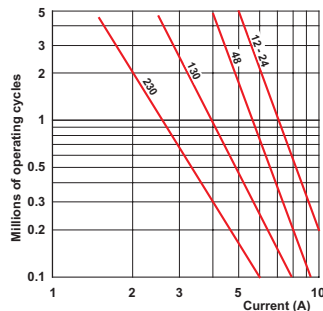
Rated insulation voltage U_i - according to IEC 947-1 and EN 60-947-1 - according to UL 508 and CSA C22-2 n° 14	500 V (degree of pollution 3) A 600, Q 600	
Rated impulse withstand voltage U_{imp} (according to IEC 947-1 and EN 60 947-1)	kV	6
Conventional free air thermal current I_{th} (according to IEC 947-5-1) $q \leq 40$ °C	A	10
Short-circuit protection $U_o \leq 500$ V a.c. - gG (gI) type fuses	A	10
Rated operational current I_e / AC-15 (according to IEC 947-5-1)	24 V - 50/60 Hz A 130 V - 50/60 Hz A 230 V - 50/60 Hz A 240 V - 50/60 Hz A 400 V - 50/60 Hz A	10 5.5 3.1 3 1.8
I_e / DC-13 (according to IEC 947-5-1)	24 V - d.c. A 110 V - d.c. A 250 V - d.c. A	2.8 0.6 0.27
Switching frequency	Cycles/h	3600
Load factor		0.5
Resistance between contacts	mW	25
Connecting terminals	M3.5 (+, -) pozidriv 2 screw with cable clamp	
Terminal for protective conductor	- M3.5 (+, -) pozidriv 2 screw with cable clamp	
Connecting capacity	1 or 2 x mm ²	0.5 ... 2.5
Terminal marking	According to EN 50 013	
Mechanical durability	Millions of operations	15 } 10 } LS 5 } 30 > 1 } 31 P 40 } 10 - 12; 30 - 34 13; 41 - 44; 51 - 54; 61 - 72 91 - 93 15; 16
Electrical durability (according to IEC 947-5-1)	Utilization categories AC-15 and DC-13 (Load factor of 0.5 according to curves below)	

9

AC-15 — Snap action



AC-15 — Slow action



DC-13	Snap action		Slow action	
	Power breaking for a durability of 5 million operating cycles			
Voltage	24 V	9.5 W	12 W	
Voltage	48 V	6.8 W	9 W	
Voltage	110 V	3.6 W	6 W	

① except for LS30/31/35 (P42): 25g

Double insulation


Class II materials, according to IEC 536, are designed with double insulation. This measure consists in doubling the functional insulation with an additional layer of insulation so as to eliminate the risk of electric shock and thus not having to protect elsewhere. No conductive part of "double insulated" material should be connected to a protective conductor.

Positive opening operation

A control switch, with one or more break-contact elements, has a positive opening operation when the switch actuator ensures full contact opening of the break-contact. For the part of travel that separates the contacts, there must be a positive drive, with no resilient member (e.g. springs), between the moving contacts and the point of the actuator to which the actuating force is applied.

The positive opening operation does not deal with N.O. contacts.

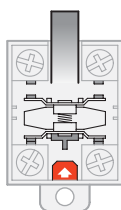
Control switches with positive opening operation may be provided with either snap action or slow action contact elements. To use several contacts on the same control switch with positive opening operation, they must be electrically separated from each other, if not, only one may be used.

Every control switch with positive opening operation must be indelibly marked on the outside with the symbol: .

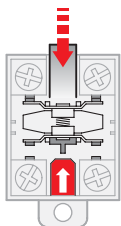
Snap action

Snap action contacts are characterized by a release position that is distinct from the operating position (differential travel). Snap breaking of moving contacts is independent of the switch actuator's speed and contributes to regular electric performance even for slow switch actuator speeds.

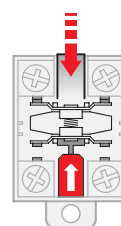
9



State of rest



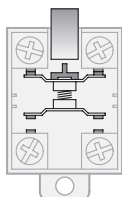
Contact change



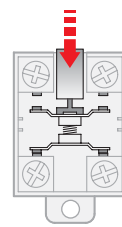
Positive opening

Slow action

Slow action contacts are characterized by a release position that is the same as the operating position. The switch actuator's speed directly conditions the travel speed of contacts.



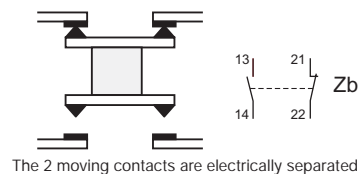
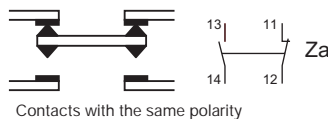
State of rest



Completely closed

Contact shape according to IEC 947-5-1.

Change-over contact elements with 4 terminals must be indelibly marked with the corresponding **Za** or **Zb** symbol as in the diagrams below.



Utilization category

AC-15: switching of electromagnetic loads of electromagnets using an alternating current (>72 VA).

DC-13: switching of electromagnets using a direct current.

Terminals

Limit switches with metal casings must have a terminal, for a protective conductor, that is placed inside the casing very close to the cable inlet and must be indelibly marked.

Minimum actuation force/torque

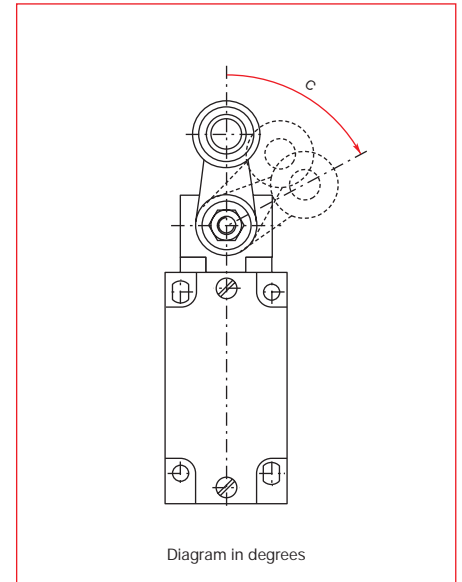
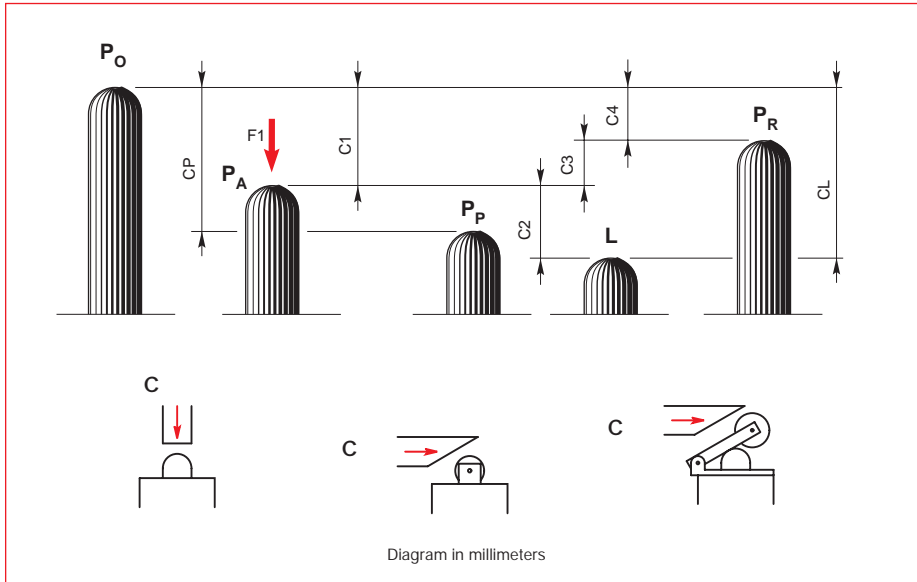
The minimum amount of force/torque that is to be applied to the switch actuator to produce a change in contact position.

Minimum force/torque to achieve positive opening operation

The minimum amount of force/torque that is to be applied to the switch actuator to ensure positive opening operation of the N.C. contact.

Technical data

Travel and operation diagrams



P₀ Free position
Position of the switch actuator when no external force is exerted on it.

P_A Operating position
Position of the switch actuator, under the effect of force F₁, when the contacts leave their initial free position.

P_P Positive opening position
Position of the switch actuator from which positive opening is ensured.

L Max. travel position
Maximum acceptable travel position of the switch actuator under the effect of a force F₁.

P_R Release position
Position of the switch actuator when the contacts return to their initial free position.

C₁ Pre-travel
Distance between the free position P₀ and the operating position P_A.

C_p Positive opening travel
Minimum travel of the switch actuator, from the free position, to ensure positive opening operation of the normally closed contact.

C₂ Over-travel
Distance between the operating position P_A and the max. travel position L.

C_L Max. travel
Distance between the free position P₀ and the max. travel position L.

C₃ Differential travel (C₁-C₄)
Travel difference of the switch actuator between the operating position P_A and the release position P_R.

C₄ Release travel
Distance between the release position P_R and the free position P₀.

Diagram for snap action contacts:

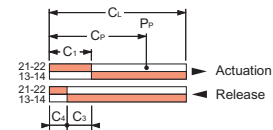
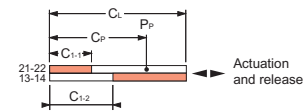


Diagram for non-overlapping slow action contacts:



Note: for slow action contacts, C₃ = 0, C₁₋₁ = pre-travel of contact 21-22, C₁₋₂ = pre-travel of contact 13-14.

Examples:

LS45M13B11
(snap action contacts)

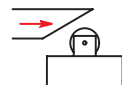
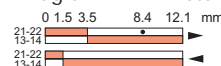


Diagram in millimeters/cam travel



LS45M41B11
(snap action contacts)

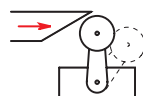
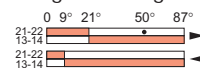


Diagram in degrees/lever rotation



LS45M11D11
(non-overlapping slow action contacts)

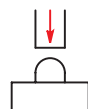
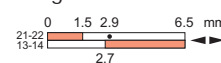
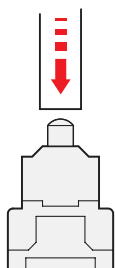


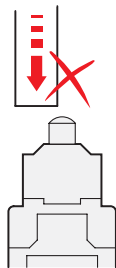
Diagram in millimeters/plunger travel



Plain plunger

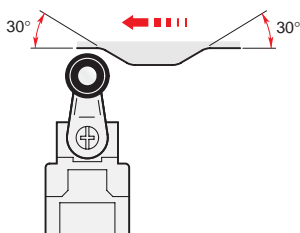


Correct

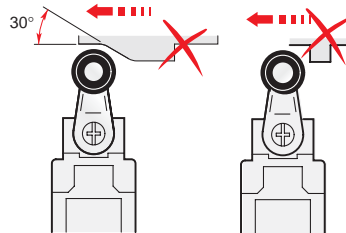


Incorrect

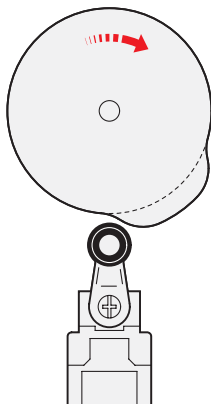
Roller plunger or roller lever



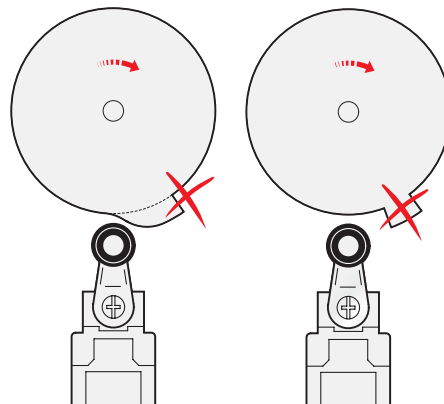
Correct



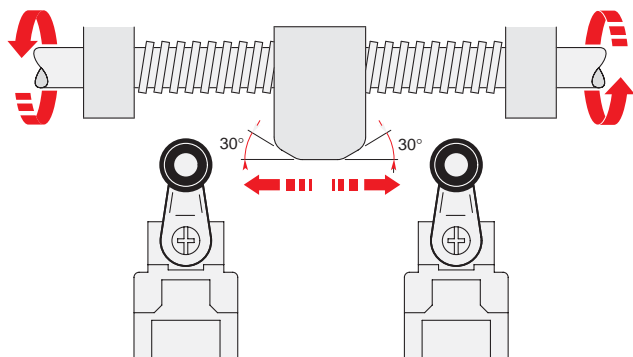
Incorrect



Correct



Incorrect



For a relatively slow movement of the switch actuator, a limit switch with a snap action contact block is preferred.

Technical data

EN 50047 standard

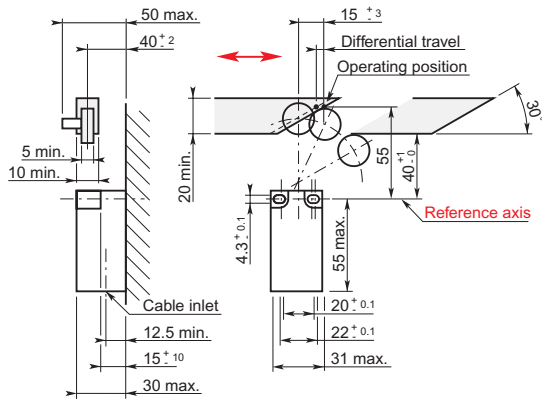


The European Committee for Electrotechnical Standardization (CENELEC), which groups together 18 European countries, publishes EN standards.

The present standard defines dimensions and mechanical data for limit switches (30 x 55mm).

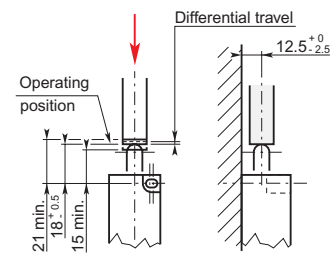
A Shape

Roller lever operating heads



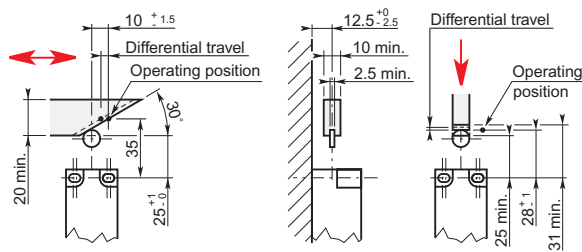
B Shape

Rounded plunger operating heads



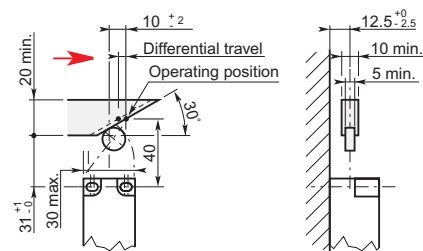
C Shape

Roller plunger operating heads



E Shape

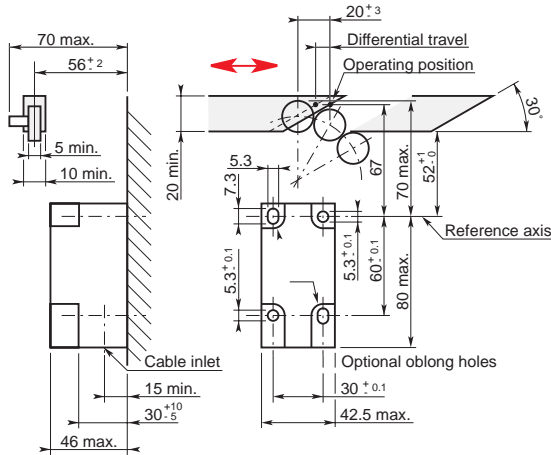
Roller lever operating heads



The European Committee for Electrotechnical Standardization (CENELEC), which groups together 18 European countries, publishes EN standards.

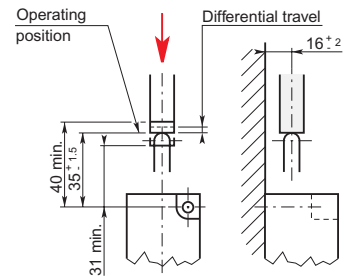
A Shape

Roller lever operating heads



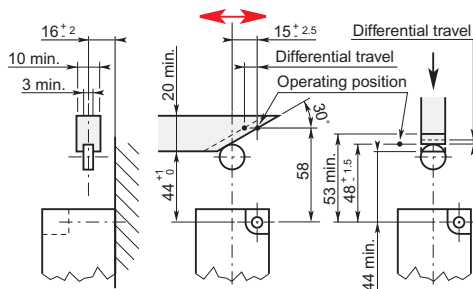
B Shape

Rounded plunger operating heads



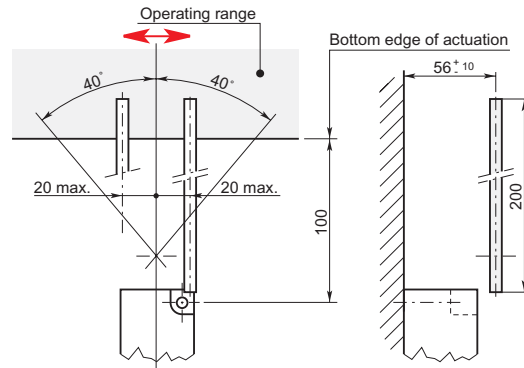
C Shape

Roller plunger operating heads



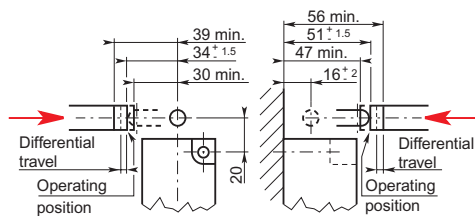
D Shape

Rod operating heads



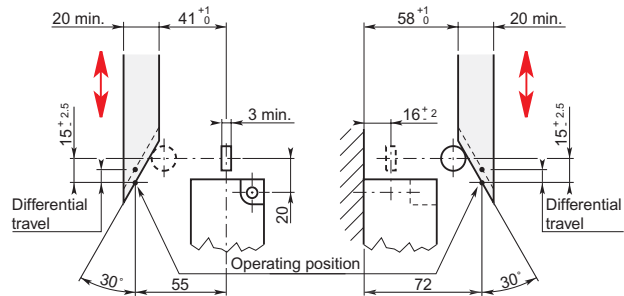
F Shape

Rounded lateral plunger operating heads

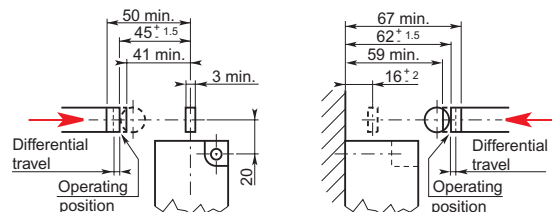


G Shape

Lateral roller plunger operating heads - Lateral actuation



Lateral roller plunger operating heads - Front actuation

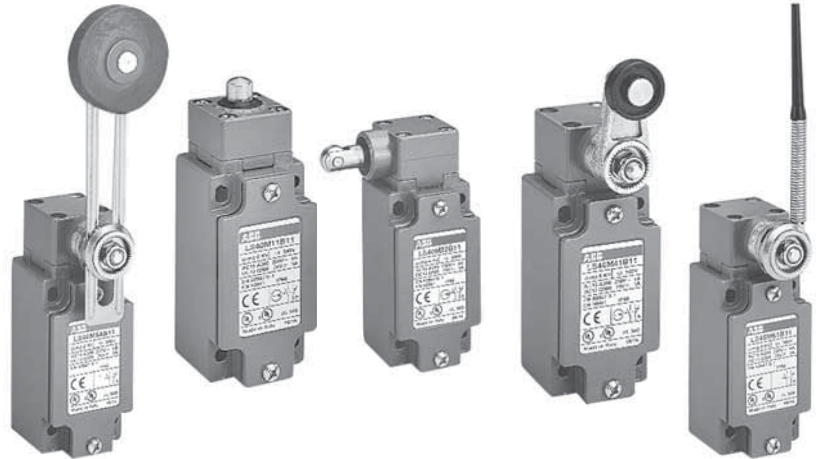


Metal Limit switches



Limit Switches

Metal casing, 40mm & 60mm
Assembled
Components



Description

Limit switches are made of aluminum alloy and have a degree of protection of IP 66 and UL type 4X.

The casings come in 2 dimensions:

- LS45M, 40mm width.
- LS65M, 60mm width.

UL Listed #E191693

Applications

Easy to use, electromechanical limit switches offer specific qualities:

- Visible operation.
- Able to switch strong currents (10 A conventional thermal current).
- Electrically separated contacts.
- Precise operating points (consistency).
- Immune to electromagnetic disturbances.

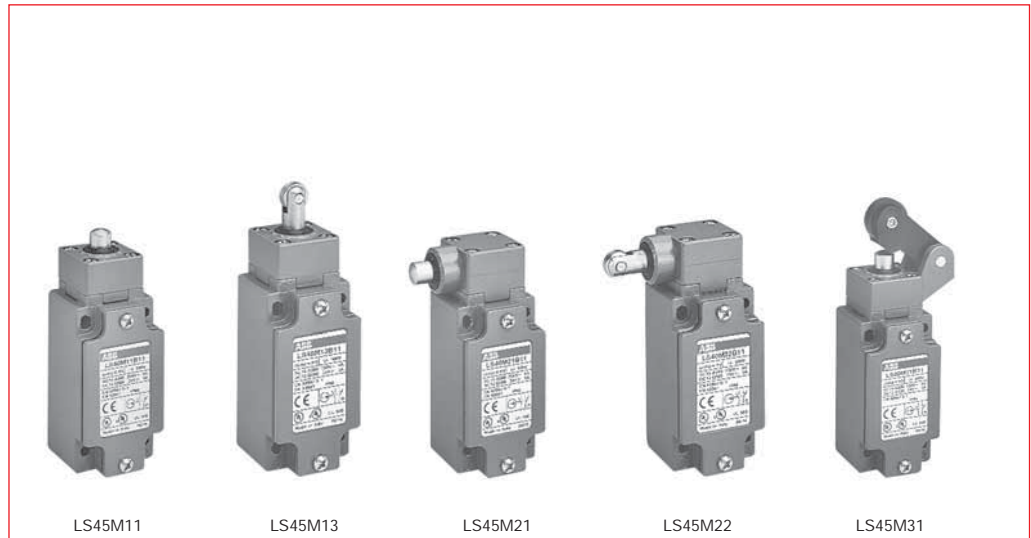
Limit switches used for these mechanical applications:

- Presence/absence.
- Positioning and travel limit.
- Objects passing/counting.

Selection guide

IP 66, UL Type 4X
40mm & 60mm

40mm width — LS45M



LS45M11

LS45M13

LS45M21

LS45M22

LS45M31

CENELEC conformity

EN 50 041

EN 50 041

EN 50 041

EN 50 041

—

Actuating device and actuation type

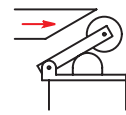
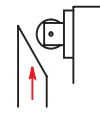
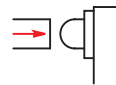
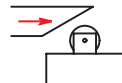
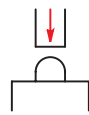
Plain plunger

Roller plunger

Plain plunger

Roller plunger

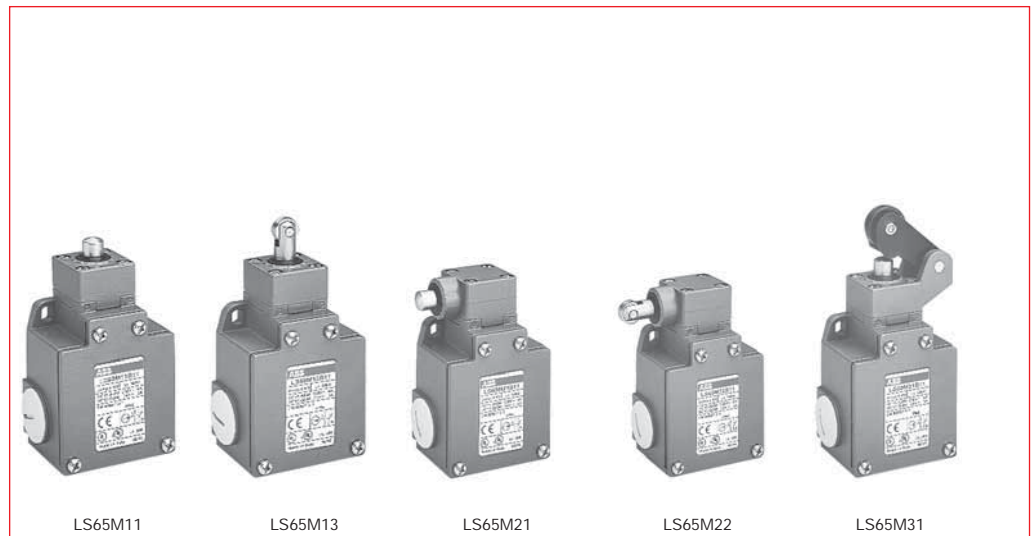
Roller lever



Positive contact opening



60mm width — LS65M



LS65M11

LS65M13

LS65M21

LS65M22

LS65M31

Actuating device and actuation type

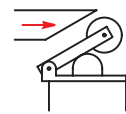
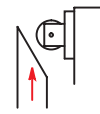
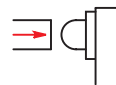
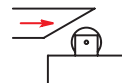
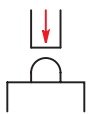
Plain plunger

Roller plunger

Plain plunger

Roller plunger

Roller lever



Positive contact opening




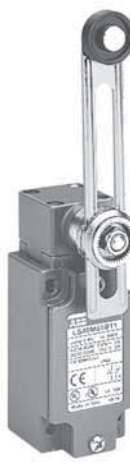




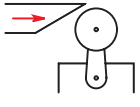
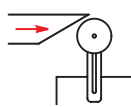
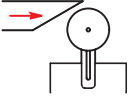
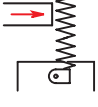
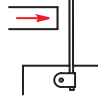
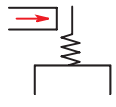

Selection guide







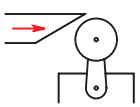
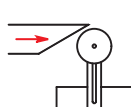
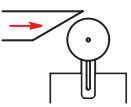
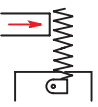
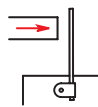
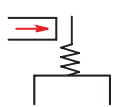

IP 66, UL Type 4X

40mm & 60mm

Metal
Limit switches

9

					
LS45M41	LS45M51	LS45M54	LS45M61	LS45M72	LS45M91
EN 50 041	—	—	—	EN 50 041	—
Roller lever	Adjustable roller levers		Adjustable flexible and rigid rod levers		Flexible rod
					
	—	—	—	—	—

					
LS65M41	LS65M51	LS65M54	LS65M61	LS65M72	LS65M91
Roller lever	Adjustable roller levers		Adjustable flexible and rigid rod levers		Flexible rod
					
	—	—	—	—	—

General information

IP66, UL Type 4X

40mm & 60mm

Applications

Easy to use, electromechanical limit switches offer specific qualities:

- Visible operation.
- Able to switch strong currents (10 A conventional thermal current).
- Electrically separated contacts.
- Precise operating points (consistency).
- Immune to electromagnetic disturbances.

Limit switches used for these mechanical applications:

- Presence/absence.
- Positioning and travel limit.
- Objects passing/counting.

Description

Limit switches, which are made of aluminum alloy, have a degree of protection of IP 66 and UL Type 4X.

The casings come in 2 dimensions:

- 40mm width
 - LS40M
 - LS45M
- 60mm width
 - LS65M

9

Casing

- 40mm width with standardized dimensions according to EN 50041
- 60mm width

Mounting the casing

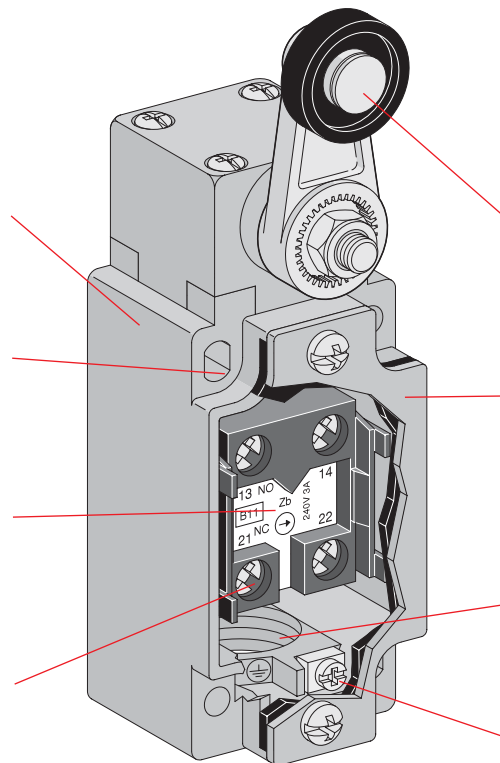
- 2 or 4 x M5 screws for 40mm width
- 2 x M5 screws for 60mm width

Block of 2 contacts

- Contact configuration: N.O. + N.C., 2 N.O., 2 N.C.
- Positive opening operation
- Snap action or slow action
- Zb shape: the 2 contacts are electrically separated

Connecting terminals

- M3.5 (+, -) pozidriv 2 screw
- Screw heads with captive cable clamp
- Markings conform with IEC 947-1, IEC 947-5-1, EN 50005 and 50013 standards



A variety of operating heads

- Plain plunger
 - Roller plunger
 - Roller lever, adjustable or not, etc.
- Assembled using 4 x M4 screws for 40 & 60mm widths

Cover

- Closed using 2 x M4 screws for 40mm width
 - Closed using 4 x M4 screws for 60mm width
- One piece sealing gasket to ensure tightness

Electrical connection

- 1 x pg 13.5 cable gland for 40mm width – LS40M
- 1 x 1/2" NPT cable gland – LS45M
- 3 x pg 13.5 cable glands for 60mm width – LS60M
- 3 x 1/2" NPT cable glands for 60mm width – LS65M

Terminal for protective conductor placed near the cable inlet and marked

- M3.5 (+, -) pozidriv 2 screw
- Screw head with captive cable clamp

Catalog number explanation

Limit switch

Casing width

- 40 = 40mm width+1 cable inlet for Pg13.5 cable gland
- 45 = 40mm width+1/2" NPT cable gland
- 60 = 60mm width+3 cable inlets for Pg13.5 cable glands
- 65 = 60mm width+3 1/2" NPT cable glands

Metal casing

Operating heads: codes 11 – 93

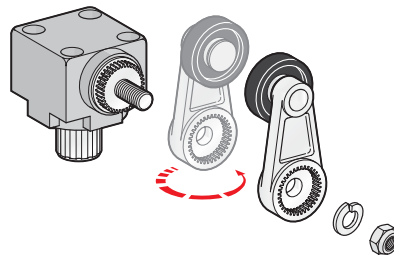
LS 45 M 41 B 11

Contact block

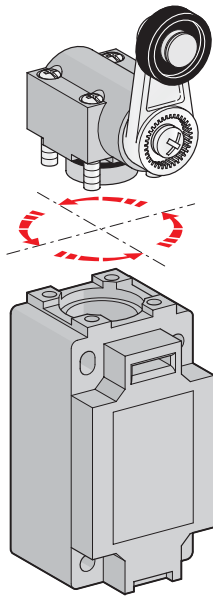
- 11: 1 N.O. contact + 1 N.C. contact
- 20: 2 N.O. contacts
- 02: 2 N.C. contacts

- B: Zb Snap action
- L: Zb Slow action (contact dependent)
- D: Zb Slow action non—overlapping late make
- C: Zb Slow action overlapping early make

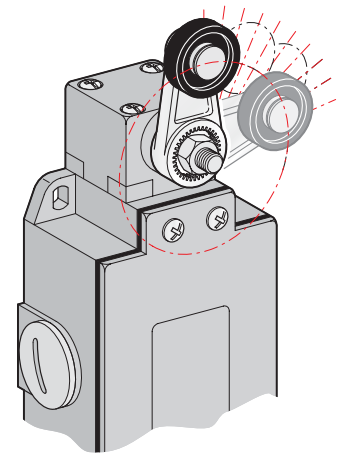
General information
Implementation
 IP66, UL Type 4X, 40mm & 60mm



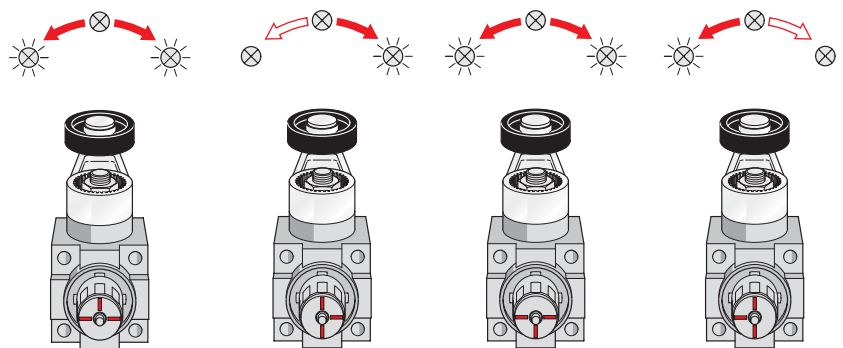
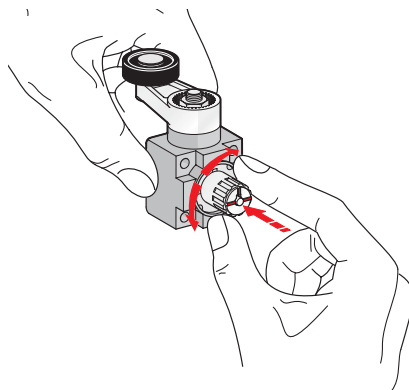
Lever round turning
 LS40M, LS45M, LS60M & LS65M



Head orientation



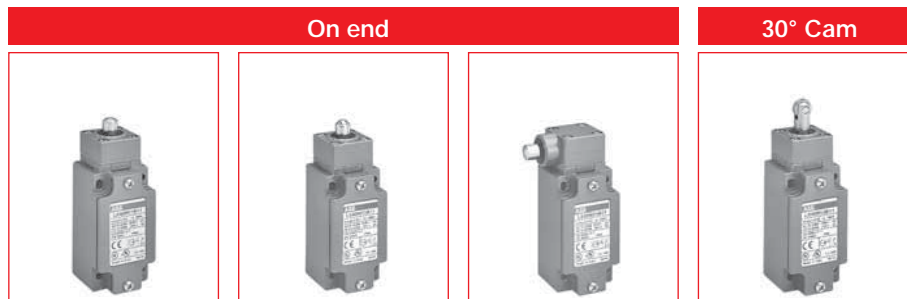
Free position adjustment 9 in 9° of lever



Operating mode selection

Assembled IP66, UL Type 4X 40mm

Movement to be detected



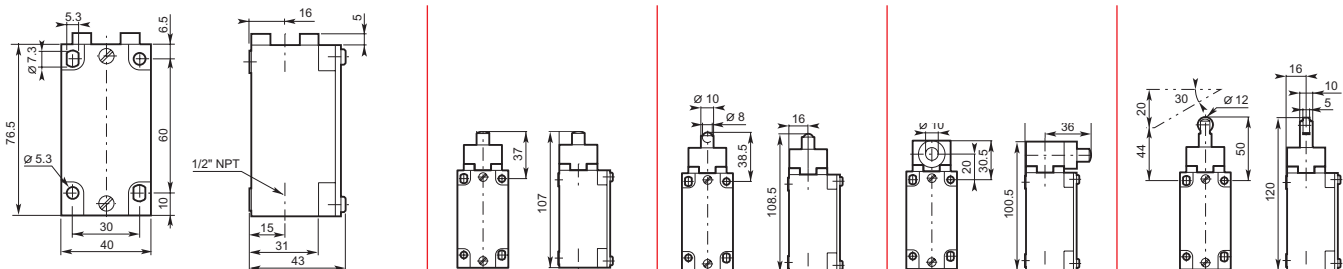
Operating head type

	Stainless steel plain plunger	Stainless steel ball plunger	Stainless steel lateral plain plunger	Stainless steel roller plunger
Conformity / (N.C. contact with positive opening operation)	EN 50 041	EN 50 041	EN 50 041	EN 50 041
Maximum actuation speed	0.5 m/s	0.5 m/s	0.5 m/s	0.5 m/s
Min. force: - actuation	22 N	22 N	30 N	16 N
- positive opening operation	66 N	66 N	70 N	48 N

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Snap action contacts	Catalog number	LS45M11B11	LS45M12B11	LS45M21B11	LS45M13B11
	List price	\$ 38	\$ 41	\$ 41	\$ 44
	Operation diagram				
Non-overlapping Slow action contacts	Catalog number	LS45M11D11	LS45M12D11	LS45M21D11	LS45M13D11
	List price	41	44	44	48
	Operation diagram				
Overlapping Slow action contacts	Catalog number	LS45M11C11	LS45M12C11	LS45M21C11	LS45M13C11
	List price	42	45	45	49
	Operation diagram				
Slow action contacts	Catalog number	LS45M11L02	LS45M12L02	LS45M21L02	LS45M13L02
	List price	42	45	45	49
	Operation diagram				
Slow action contacts	Catalog number	LS45M11L20	LS45M12L20	LS45M21L20	LS45M13L20
	List price	42	45	45	49
	Operation diagram				
Snap action contacts	Catalog number	LS45M11B02	LS45M12B02	LS45M21B02	LS45M13B02
	List price	42	45	45	49
	Operation diagram				
Weight (packing per unit)	kg	0.240	0.240	0.260	0.240

Dimensions (mm)

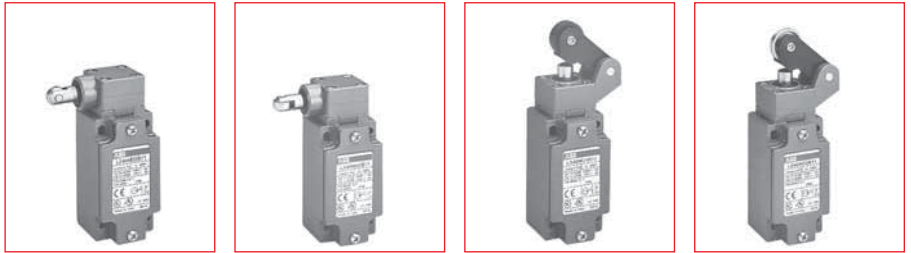


Assembled IP66, UL Type 4X 40mm

Metal
Limit switches

Movement to be detected

30° Cam translation movement

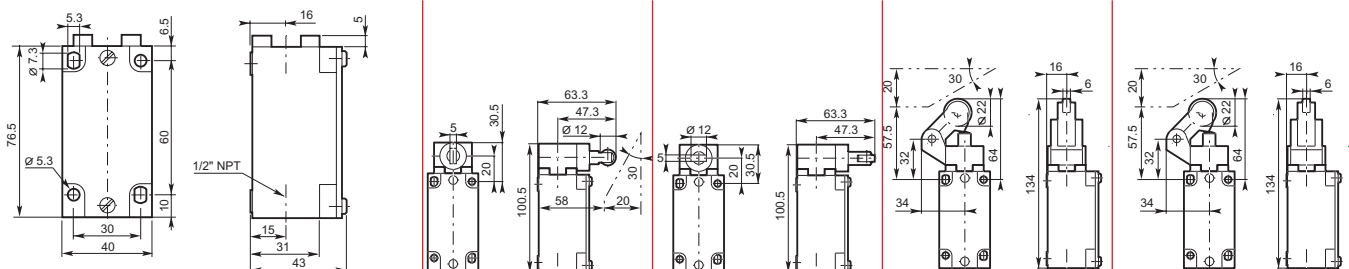


Operating head type

	Lateral plunger with vertical roller	Lateral plunger with horizontal roller	ø 22 Polyamide roller lever	ø 22 Stainless steel roller lever
Conformity / (N.C. contact with positive opening operation)	EN 50 041	EN 50 041		
Maximum actuation speed m/s	0.5	0.5	1.5	1.5
Min. force: - actuation	N 30	N 30	N 12	N 12
- positive opening operation	N 70	N 70	N 40	N 40

	LS45M22B11	LS45M23B11	LS45M31B11	LS45M32B11
Snap action contacts	LS45M22B11 List price \$ 45	LS45M23B11 List price \$ 45	LS45M31B11 List price \$ 43	LS45M32B11 List price \$ 50
Operation diagram				
Non-overlapping Slow action contacts	LS45M22D11 List price 48	LS45M23D11 List price 48	LS45M31D11 List price 46	LS45M32D11 List price 53
Operation diagram				
Overlapping Slow action contacts	LS45M22C11 List price 50	LS45M23C11 List price 50	LS45M31C11 List price 47	LS45M32C11 List price 55
Operation diagram				
Slow action contacts	LS45M22L02 List price 50	LS45M23L02 List price 50	LS45M31L02 List price 47	LS45M32L02 List price 55
Operation diagram				
Slow action contacts	LS45M22L20 List price 50	LS45M23L20 List price 50	LS45M31L20 List price 47	LS45M32L20 List price 55
Operation diagram				
Snap action contacts	LS45M22B02 List price 50	LS45M23B02 List price 50	LS45M31B02 List price 47	LS45M32B02 List price 55
Operation diagram				
Weight (packing per unit)	kg 0.265	kg 0.265	kg 0.275	kg 0.280

Dimensions (mm)



Assembled IP66, UL Type 4X 40mm

Movement to be detected

Unidirectional

30° Cam translation movement



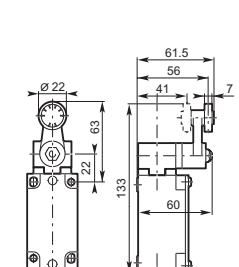
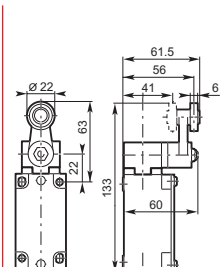
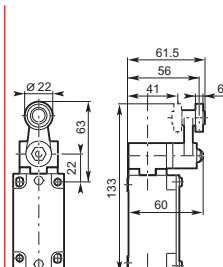
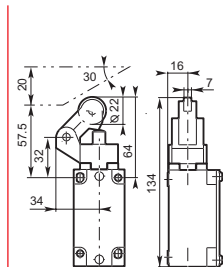
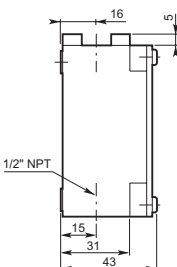
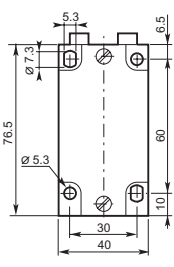
Operating head type

	ø 22 Ball-bearing roller lever	ø 22 Polyamide roller lever	ø 22 Stainless steel roller lever	ø 22 Ball-bearing roller lever
Conformity / \rightarrow (N.C. contact with positive opening operation)		EN 50 041	EN 50 041	EN 50 041
Maximum actuation speed m/s	1.5	1.5	1.5	1.5
Min. force/torque:				
- actuation	12 N	0.15 N.m	0.15 N.m	0.15 N.m
- positive opening operation	40 N	0.44 N.m	0.44 N.m	0.44 N.m

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	LS45M33B11	LS45M41B11	LS45M42B11	LS45M43B11
Snap action contacts	LS45M33B11 \$ 45	LS45M41B11 \$ 50	LS45M42B11 \$ 57	LS45M43B11 \$ 53
Operation diagram				
Non-overlapping slow action contacts	LS45M33D11 49	LS45M41D11 53	LS45M42D11 61	LS45M43D11 57
Operation diagram				
Overlapping slow action contacts	LS45M33C11 50	LS45M41C11 55	LS45M42C11 63	LS45M43C11 58
Operation diagram				
Slow action contacts	LS45M33L02 50	LS45M41L02 55	LS45M42L02 63	LS45M43L02 58
Operation diagram				
Slow action contacts	LS45M33L20 50	LS45M41L20 55	LS45M42L20 63	LS45M43L20 58
Operation diagram				
Snap action contacts	LS45M33B02 50	LS45M41B02 55	LS45M42B02 63	LS45M43B02 58
Operation diagram				
Weight (packing per unit)	kg 0.280	kg 0.280	kg 0.280	kg 0.280

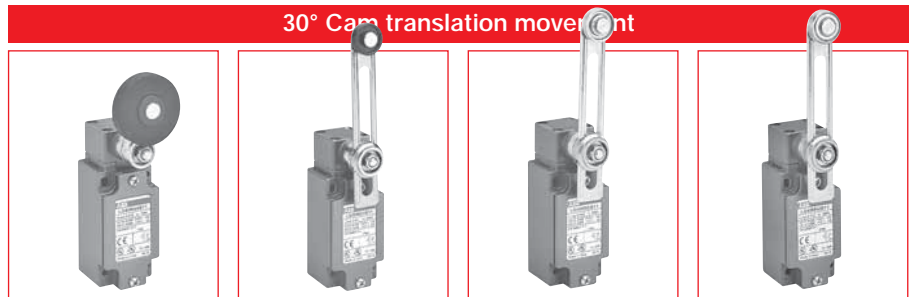
Dimensions (mm)



Assembled IP66, UL Type 4X 40mm

Metal
Limit switches

Movement to be detected

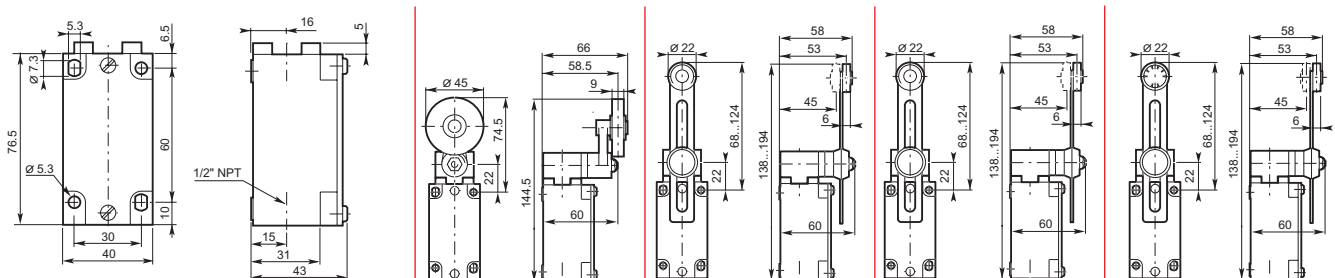


Operating head type

	ø 45 Rubber roller lever	Adjustable ø 22 polyamide roller lever	Adjustable ø 22 stainless steel roller lever	Adjustable ø 22 stainless steel ball-bearing roller lever
Conformity / (N.C. contact with positive opening operation)				
Maximum actuation speed	m/s 1.5	1.5	1.5	1.5
Min. torque: - actuation	N.m 0.15	0.15	0.15	0.15
- positive opening operation	N.m -	-	-	-

	Catalog number	LS45M44B11	LS45M51B11	LS45M52B11	LS45M53B11
Snap action contacts	List price	\$ 51	\$ 51	\$ 59	\$ 55
	Operation diagram				
Non-overlapping slow action contacts	List price	55	55	63	59
	Operation diagram				
Overlapping slow action contacts	List price	57	57	65	61
	Operation diagram				
Slow action contacts	List price	57	57	65	61
	Operation diagram				
Slow action contacts	List price	57	57	65	61
	Operation diagram				
Snap action contacts	List price	57	57	65	61
	Operation diagram				
Weight (packing per unit)	kg	0.310	0.290	0.300	0.300

Dimensions (mm)

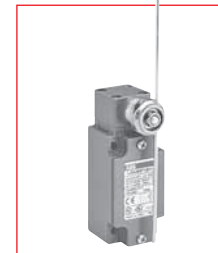
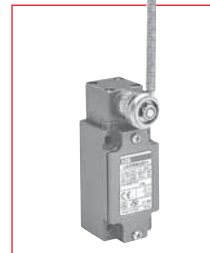
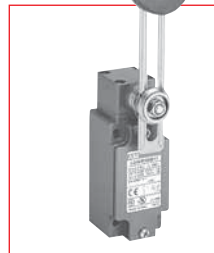


Assembled IP66, UL Type 4X 40mm

Movement to be detected

30° Cam

Fully directional translation movement



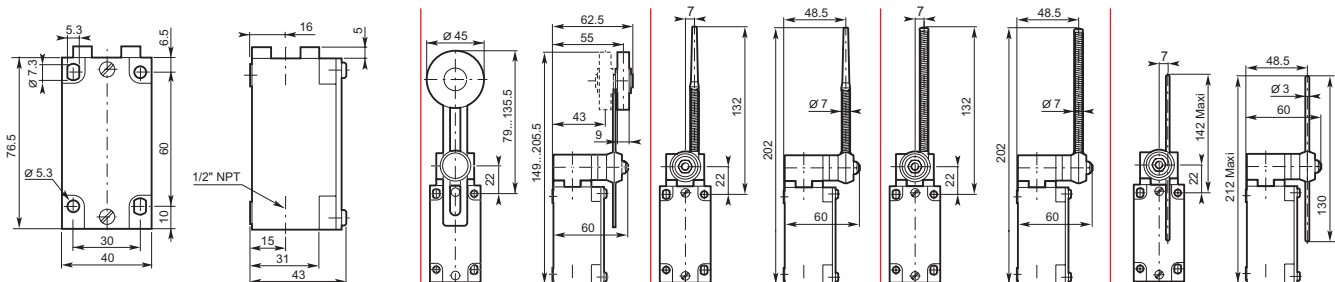
Operating head type

	Adjustable \varnothing 45 rubber roller lever	Flexible lever with insulated end	Coil spring lever	Adjustable \varnothing 3 stainless steel rod lever
Conformity / \odot (N.C. contact with positive opening operation)				EN 50 041
Maximum actuation speed	m/s 1.5	1.5	1.5	0.5
Min. torque:	N.m 0.15	0.15	0.15	0.15
- actuation		-	-	-
- positive opening operation	N.m -			

9

	Catalog number	LS45M54B11	LS45M61B11	LS45M62B11	LS45M71B11
Snap action contacts	List price	\$ 53	\$ 50	\$ 50	\$ 47
	Operation diagram				
Non-overlapping Slow action contacts	Catalog number	LS45M54D11	LS45M61D11	LS45M62D11	LS45M71D11
List price	57	53	53	51	
	Operation diagram				
Overlapping Slow action contacts	Catalog number	LS45M54C11	LS45M61C11	LS45M62C11	LS45M71C11
List price	58	55	55	53	
	Operation diagram				
Slow action contacts	Catalog number	LS45M54L02	LS45M61L02	LS45M62L02	LS45M71L02
List price	58	55	55	53	
	Operation diagram				
Slow action contacts	Catalog number	LS45M54L20	LS45M61L20	LS45M62L20	LS45M71L20
List price	58	55	55	53	
	Operation diagram				
Snap action contacts	Catalog number	LS45M54B02	LS45M61B02	LS45M62B02	LS45M71B02
List price	58	55	55	53	
	Operation diagram				
Weight (packing per unit)	kg	0.315	0.290	0.295	0.285

Dimensions (mm)



Assembled IP66, UL Type 4X 40mm

Metal
Limit switches

Movement to be detected

Translation (cont.)



Multidirectional

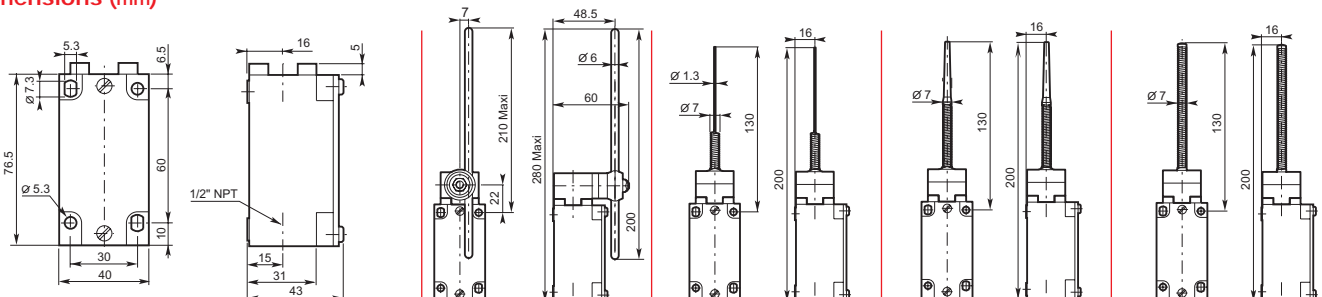


Operating head type

	Adjustable Ø 6 polyamide rod lever	Spring rod	Flexible rod with insulated end	Coil spring rod
Conformity / (N.C. contact with positive opening operation)	EN 50 041			
Maximum actuation speed	m/s 1.5	1	1	1
Min. torque: - actuation	N.m 0.15	0.18	0.18	0.18
- positive opening operation	N.m -	-	-	-

	LS45M72B11 \$ 47	LS45M91B11 \$ 41	LS45M92B11 \$ 43	LS45M93B11 \$ 42
Snap action contacts 13 21 14 22 Zb	Catalog number List price	Catalog number List price	Catalog number List price	Catalog number List price
Operation diagram	0 9° 21° 87° 21-22 13-14 21-22 13-14	0 6° 14° 59° 21-22 13-14 21-22 13-14	0 6° 14° 59° 21-22 13-14 21-22 13-14	0 6° 14° 59° 21-22 13-14 21-22 13-14
Non-overlapping Slow action contacts 13 21 14 22 Zb	Catalog number List price	Catalog number List price	Catalog number List price	Catalog number List price
Operation diagram	0 16° 87° 21-22 13-14 30°	0 12° 65° 21-22 13-14 23°	0 12° 65° 21-22 13-14 23°	0 12° 65° 21-22 13-14 23°
Overlapping Slow action contacts 13 21 14 22 Zb	Catalog number List price	Catalog number List price	Catalog number List price	Catalog number List price
Operation diagram	0 28° 87° 21-22 13-14 16°	0 21° 65° 21-22 13-14 12°	0 21° 65° 21-22 13-14 12°	0 21° 65° 21-22 13-14 12°
Slow action contacts 11 21 12 22 Zb	Catalog number List price	Catalog number List price	Catalog number List price	Catalog number List price
Operation diagram	0 14° 87° 11-12 21-22	0 11° 65° 11-12 21-22	0 11° 65° 11-12 21-22	0 11° 65° 11-12 21-22
Slow action contacts 13 23 14 24 Zb	Catalog number List price	Catalog number List price	Catalog number List price	Catalog number List price
Operation diagram	0 14° 87° 13-14 23-24	0 11° 65° 13-14 23-24	0 11° 65° 13-14 23-24	0 11° 65° 13-14 23-24
Snap action contacts 11 21 12 22 Zb	Catalog number List price	Catalog number List price	Catalog number List price	Catalog number List price
Operation diagram	0 9° 21° 87° 11-12 21-22 11-12 21-22 11-12 21-22	0 6° 14° 59° 11-12 21-22 11-12 21-22 11-12 21-22	0 6° 14° 59° 11-12 21-22 11-12 21-22 11-12 21-22	0 6° 14° 59° 11-12 21-22 11-12 21-22 11-12 21-22
Weight (packing per unit)	kg 0.285	0.235	0.235	0.235

Dimensions (mm)



Components

IP66, UL Type 4X

40mm



LS45M00B11

Bodies with contact block for rectilinear or angular motion heads

	LS	45	M	00	B	11
Limit Switch	LS					
Casing width: 40 mm		4				
Cable inlet:						
1 cable inlet for Pg 13.5 cable gland			0			
1 cable inlet M20 x 1.5 for ISO 20 cable gland			3			
1 cable inlet for 1/2" NPT			5			
Metal casing			M			
Without operating head				00		

Contacts	
11	1 N.O. + 1 N.C. contacts
02	2 N.C. contacts
20	2 N.O. contacts

Snap action	
B	Zb Snap

Dependent (slow) action	
L	Zb Slow / Simultaneous
D	Zb Non-overlapping late make
C	Zb Overlapping early make

Operating heads

	LS	T	E	41
Limit Switch	LS			
Operating head		T		
For Metal casing 40 mm or 60 mm width			E	

References of heads:	
11 ... 13	with rectilinear movement (plain plunger, steel ball plunger or roller plunger)
21 ... 23	with rectilinear movement (with lateral plain or roller plunger)
31 ... 33	with rectilinear movement (with roller lever on steel plunger)
40	with angular movement (without actuator) actuator to be ordered separately
41 ... 44	with angular movement (roller lever)
50	with angular movement (without actuator)
51 ... 54	with angular movement (adjustable roller lever)
61, 62	flexible lever (spring)
71, 72, 73	adjustable lever (rod)
91 ... 93	multidirectional angular movement (spring rod)



LSTE41

Separate actuators (Roller lever, adjustable roller or rod levers, etc.)

	LS	A	40	X	54
Limit Switch	LS				
Actuator (roller)		A			
Casing width: 40 mm			40		

Reference of actuators:	
41 ... 44	non-adjustable roller lever
51 ... 54	adjustable roller lever
61, 62	flexible lever (spring)
71, 72, 73	adjustable lever (rod)

For casing:	
M	Metal
P	Plastic
X	Plastic or metal



LSA40X54

Separate contact blocks

	LS	C	40	X	B	11
Limit Switch	LS					
Contact blocks		C				
Casing width: 40 mm			40			

Contacts	
11	1 N.O. + 1 N.C. contacts
02	2 N.C. contacts
20	2 N.O. contacts

Snap action:	
B	Zb Snap

Dependent (slow) action:	
L	Zb Slow / Simultaneous
D	Zb Non-overlapping late make
C	Zb Overlapping early make



LSC40XB11

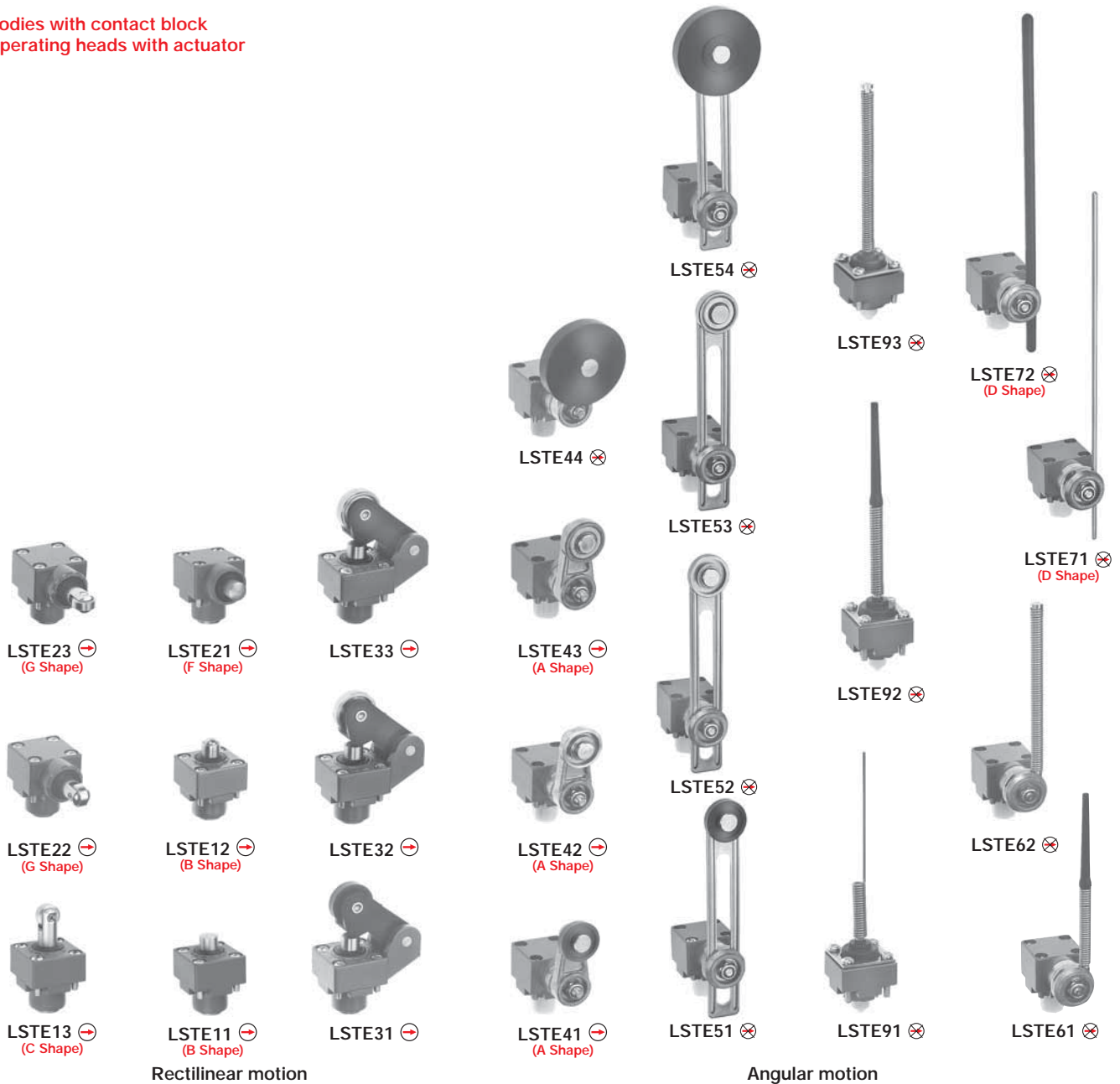
Components

IP66, UL Type 4X

40mm

Metal
Limit switches

- Bodies with contact block
- Operating heads with actuator



9

LSTE... rectilinear motion heads

- To be actuated from end. With plunger (plain, lateral plain or ball): LSTE11, LSTE12 and LSTE21.
- To be actuated by 30° cam translation. With roller plunger: LSTE13, LSTE22 and LSTE23.
- To be actuated unidirectionally by 30° cam translation. With roller lever on stainless steel plunger: LSTE31 ... LSTE33.

LSTE... angular motion heads

- To be actuated by 30° cam translation. With roller lever: LSTE41 ... LSTE54.
- To be actuated by fully directional translation movement. With rod or spring lever: LSTE61 ... LSTE72.
- To be actuated multidirectionally. With spring rod: LSTE91 ... LSTE93.



Bodies with contact block

- ⊕ LS45M00B11, LS45M00D11, LS45M00C11, LS45M00L02, LS45M00B02
- ⊗ LS45M00L20

⊕ : Suitable for positive opening operation (IEC 60947-5-1 and EN 50041).

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.

Components

IP66, UL Type 4X
40mm

- Bodies with contact blocks
- Angular motion heads (without actuator)
- Separate actuators
- Separate contact blocks



LSA40X44 ⊗



LSA40X43 ⊕



LSA40X42 ⊕



LSA40X41 ⊕



LSA40X54 ⊗



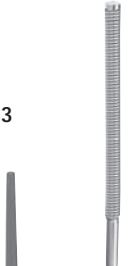
LSA40X53 ⊗



LSA40X52 ⊗



LSA40X51 ⊗



LSA40X62 ⊗



LSA40X61 ⊗



LSA40X71 ⊗



LSA40X72 ⊗



LSTE40 ⊕

Roller levers



LSTE50 ⊗

Adjustable or flexible levers

LSTE50 angular motion head

For flexible or adjustable levers LSA40X51 ... LSA40X54, LSA40X61, LSA40X62, LSA40X71 and LSA40X72.

LSTE40 angular motion head

For roller levers (non-adjustable)
LSA40X41 ... LSA40X44



Bodies with contact block

⊕ LS45M00B11, LS45M00D11, LS45M00C11, LS45M00L02, LS45M00B02

⊗ LS45M00L20



Contact blocks

⊕ LSC40XB11, LSC40XD11, LSC40XC11, LSC40XL02, LSC40XB02

⊗ LSC40XL20

⊕ : Suitable for positive opening operation (IEC 60947-5-1)

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.

Components

IP66, UL Type 4X

40mm

⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LS40M00B11



LSTE11



LSTE21



LSTE13

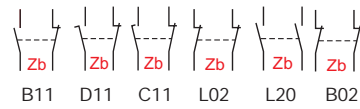


LSTE22



LSTE32

Contact blocks



Contact blocks	Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
B11 D11 C11 L02 L20 B02					
Bodies with contact block for rectilinear or angular motion heads					
1	⊕	—	0.168	LS45M00B11	\$ 28
1	⊕	—	0.168	LS45M00D11	29
1	⊕	—	0.168	LS45M00C11	30
1	⊕	—	0.168	LS45M00L02	30
1	⊗	—	0.168	LS45M00L20	30
1	⊕	—	0.168	LS45M00B02	30
Rectilinear motion heads with actuator					
To be actuated from end					
Stainless steel plain plunger	⊕	0.5	0.077	LSTE11	14
Stainless steel ball plunger	⊕	0.5	0.076	LSTE12	17
Stainless steel lateral plain plunger	⊕	0.5	0.093	LSTE21	17
To be actuated by 30° cam					
Stainless steel roller plunger	⊕	0.5	0.084	LSTE13	20
Stainless steel lateral plunger with vertical roller	⊕	0.5	0.098	LSTE22	21
Stainless steel lateral plunger with horizontal roller	⊕	0.5	0.098	LSTE23	21
To be actuated unidirectionally by 30° cam					
∅ 22mm polyamide roller lever on stainless steel plunger	⊕	1.5	0.111	LSTE31	19
∅ 22mm stainless steel roller lever on stainless steel plunger	⊕	1.5	0.121	LSTE32	26
∅ 22mm steel ball-bearing roller lever on stainless steel plunger	⊕	1.5	0.122	LSTE33	21

Components

IP66, UL Type 4X

40mm

⊕ "N.C." contact with positive opening operation or element (sub-assembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LSTE41



LSTE52



LSTE72 LSTE91



LSTE40



LSA40X41

	Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
Angular motion heads with actuator					
To be actuated by 30° cam					
∅ 22mm polyamide roller lever ①	⊕	1.5	0.134	LSTE41	\$ 26
∅ 22mm stainless steel roller lever ①	⊕	1.5	0.142	LSTE42	34
∅ 22mm steel ball-bearing roller lever ①	⊕	1.5	0.145	LSTE43	29
∅ 45mm rubber roller lever ①	⊕	1.5	0.162	LSTE44	28
∅ 22mm adjustable polyamide roller lever ①	⊗	1.5	0.152	LSTE51	27
∅ 22mm adjustable stainless steel roller lever ①	⊗	1.5	0.161	LSTE52	35
∅ 22mm adjustable steel ball-bearing roller lever ①	⊗	1.5	0.163	LSTE53	31
∅ 45mm adjustable rubber roller lever ①	⊗	1.5	0.168	LSTE54	29
To be actuated by fully directional translation movement					
Stainless steel flexible lever with insulated end ①	⊗	1	0.145	LSTE61	29
Stainless steel coil spring lever ①	⊗	1	0.152	LSTE62	29
∅ 3mm stainless steel rod lever, 195mm ①	⊗	1	0.150	LSTE71	26
∅ 6mm polyamide rod lever, 195mm ①	⊗	1	0.145	LSTE72	26
∅ 6mm fiberglass rod lever, 195mm ①	⊗	1	0.149	LSTE73	27
Multidirectional angular motion heads (to be actuated by fully directional translation movement)					
Stainless steel spring rod	⊗	1	0.066	LSTE91	17
Stainless steel flexible rod with insulated end	⊗	1	0.068	LSTE92	19
Stainless steel coil spring rod	⊗	1	0.075	LSTE93	18
Angular motion head without actuator, for non-adjustable roller levers (delivered with M5 nylon stop nut)					
	⊕	1.5	0.102	LSTE40	20
Actuators for angular motion head LSTE40					
∅ 22mm polyamide roller lever ①	⊕	—	0.032	LSA40X41	6
∅ 22mm stainless steel roller lever ①	⊕	—	0.042	LSA40X42	14
∅ 22mm steel ball-bearing roller lever ①	⊕	—	0.044	LSA40X43	9
∅ 45mm rubber roller lever ①	⊗	—	0.050	LSA40X44	8

① Free position adjustment of lever 9° by 9° over 360°

Components

IP66, UL Type 4X

40mm

⊕ "N.C." contact with positive opening operation or element (sub-assembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LSTE41



LSTE52



LSTE72 LSTE91



LSTE40



LSA40X41

	Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
Angular motion heads with actuator					
To be actuated by 30° cam					
⊕ 22mm polyamide roller lever ①	⊕	1.5	0.134	LSTE41	\$ 26
⊕ 22mm stainless steel roller lever ①	⊕	1.5	0.142	LSTE42	34
⊕ 22mm steel ball-bearing roller lever ①	⊕	1.5	0.145	LSTE43	29
⊗ 45mm rubber roller lever ①	⊗	1.5	0.162	LSTE44	28
⊗ 22mm adjustable polyamide roller lever ①	⊗	1.5	0.152	LSTE51	27
⊗ 22mm adjustable stainless steel roller lever ①	⊗	1.5	0.161	LSTE52	35
⊗ 22mm adjustable steel ball-bearing roller lever ①	⊗	1.5	0.163	LSTE53	31
⊗ 45mm adjustable rubber roller lever ①	⊗	1.5	0.168	LSTE54	29
To be actuated by fully directional translation movement					
⊗ Stainless steel flexible lever with insulated end ①	⊗	1	0.145	LSTE61	29
⊗ Stainless steel coil spring lever ①	⊗	1	0.152	LSTE62	29
⊗ 3mm stainless steel rod lever, 195mm ①	⊗	1	0.150	LSTE71	26
⊗ 6mm polyamide rod lever, 195mm ①	⊗	1	0.145	LSTE72	26
⊗ 6mm fiberglass rod lever, 195mm ①	⊗	1	0.149	LSTE73	27
Multidirectional angular motion heads (to be actuated by fully directional translation movement)					
⊗ Stainless steel spring rod	⊗	1	0.066	LSTE91	17
⊗ Stainless steel flexible rod with insulated end	⊗	1	0.068	LSTE92	19
⊗ Stainless steel coil spring rod	⊗	1	0.075	LSTE93	18
Angular motion head without actuator, for non-adjustable roller levers (delivered with M5 nylon stop nut)					
⊕	⊕	1.5	0.102	LSTE40	20
Actuators for angular motion head LSTE40					
⊕ 22mm polyamide roller lever ①	⊕	—	0.032	LSA40X41	6
⊕ 22mm stainless steel roller lever ①	⊕	—	0.042	LSA40X42	14
⊕ 22mm steel ball-bearing roller lever ①	⊕	—	0.044	LSA40X43	9
⊗ 45mm rubber roller lever ①	⊗	—	0.050	LSA40X44	8

① Free position adjustment of lever 9° by 9° over 360°

Components

IP66, UL Type 4X

40mm

⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LSTE50



LSA40X52



LSA40X71



LSA40X61



LSC40XB11

	Positive opening operation	Actuation speed max. m/s	Unit weight kg (1 pc)	Catalog number	List price
Angular motion head without actuator, for flexible or adjustable levers (delivered with M5 nylon stop nut & adaptation parts)					
	⊗	1 - 1.5 ②	0.121	LSTE50	\$ 22
Actuators for angular motion head LSTE50					
∅ 22mm adjustable polyamide roller lever ①	⊗	—	0.023	LSA40X51	5
∅ 22mm adjustable stainless steel roller lever ①	⊗	—	0.032	LSA40X52	13
∅ 22mm adjustable steel ball-bearing roller lever ①	⊗	—	0.034	LSA40X53	9
∅ 45mm adjustable rubber roller lever ①	⊗	—	0.039	LSA40X54	7
Stainless steel flexible lever with insulated end ①	⊗	—	0.017	LSA40X61	7
Stainless steel coil spring lever ①	⊗	—	0.023	LSA40X62	7
∅ 3mm adjustable stainless steel rod lever, 195mm ①	⊗	—	0.014	LSA40X71	4
∅ 6mm adjustable polyamide rod lever, 195mm ①	⊗	—	0.010	LSA40X72	4
∅ 6mm adjustable fiberglass rod lever, 195mm ①	⊗	—	0.014	LSA40X73	5
Contact blocks (with adaptor)					
1 NC & 1 NO 2-pole snap action	⊕	—	0.032	LSC40XB11	15
1 NC & 1 NO 2-pole non-overlapping slow action	⊕	—	0.032	LSC40XD11	15
1 NO & 1 NC 2-pole overlapping slow action	⊕	—	0.032	LSC40XC11	17
2 NC 2-pole simultaneous slow action	⊕	—	0.032	LSC40XL02	17
2 NO 2-pole simultaneous slow action	⊗	—	0.032	LSC40XL20	17
Bipolar 2 NC 2-pole snap action	⊕	—	0.032	LSC40XB02	17

① Free position adjustment of lever 9° by 9° over 360°

② According to lever.

Assembled IP66, UL Type 4X 60mm

Metal
Limit switches

Movement to be detected

On end

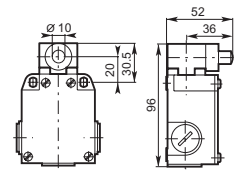
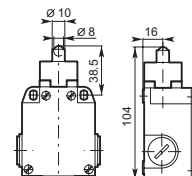
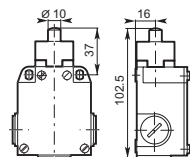
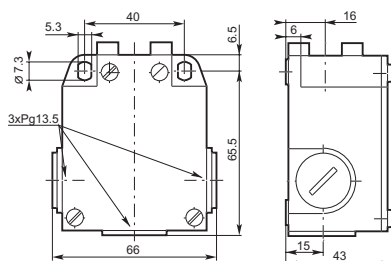


Operating head type

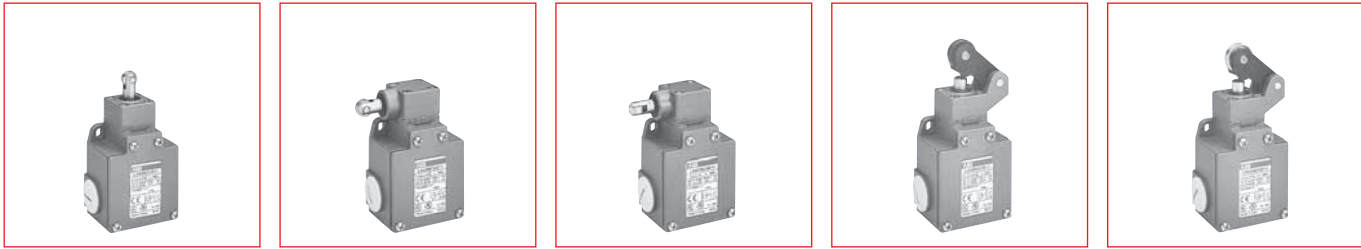
	Stainless steel plain plunger	Stainless steel ball plunger	Stainless steel lateral plain plunger
Conformity / \ominus (N.C. contact with positive opening operation)			
Maximum actuation speed	m/s 0.5	0.5	0.5
Min. force: - actuation	N 22	22	30
- positive opening operation	N 66	66	70






		LS65M11B11 \$ 40	LS65M12B11 \$ 42	LS65M21B11 \$ 42
Snap action contacts	Catalog number List price	LS65M11B11 \$ 40	LS65M12B11 \$ 42	LS65M21B11 \$ 42
	Operation diagram			
Non-overlapping Slow action contacts	Catalog number List price	LS65M11D11 43	LS65M12D11 45	LS65M21D11 45
	Operation diagram			
Overlapping Slow action contacts	Catalog number List price	LS65M11C11 44	LS65M12C11 47	LS65M21C11 47
	Operation diagram			
Slow action contacts	Catalog number List price	LS65M11L02 44	LS65M12L02 47	LS65M21L02 47
	Operation diagram			
Slow action contacts	Catalog number List price	LS65M11L20 44	LS65M12L20 47	LS65M21L20 47
	Operation diagram			
Snap action contacts	Catalog number List price	LS65M11B02 44	LS65M12B02 47	LS65M21B02 47
	Operation diagram			
Weight (packing per unit)	kg	0.265	0.265	0.280

Dimensions (mm)



30° Cam translation movement

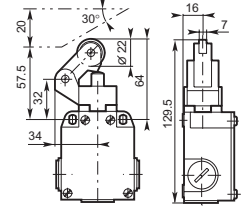
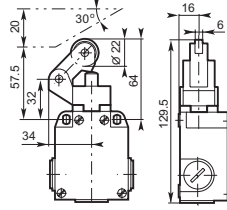
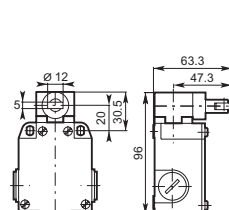
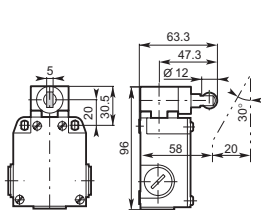
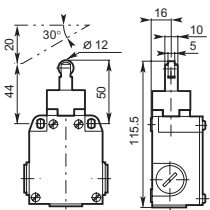


Stainless steel roller plunger	Lateral plunger with vertical roller	Lateral plunger with horizontal roller	ø 22 Polyamide roller lever	ø 22 Stainless steel roller lever
 0.5 16 48	 0.5 30 70	 0.5 30 70	 1.5 12 40	 1.5 12 40

9

LS65M13B11 \$ 46 0 1.5 3.5 8.4 12.1 mm 21-22 13-14 21-22 13-14	LS65M22B11 \$ 47 0 1.6 3.8 9.0 13.0 mm 21-22 13-14 21-22 13-14	LS65M23B11 \$ 47 0 1.6 3.8 9.0 13.0 mm 21-22 13-14 21-22 13-14	LS65M31B11 \$ 44 0 1.9 4.6 10.9 15.8 mm 21-22 13-14 21-22 13-14	LS65M32B11 \$ 51 0 1.9 4.6 10.9 15.8 mm 21-22 13-14 21-22 13-14
LS65M13D11 49 0 3.5 6.8 15.2 mm 21-22 13-14 6.3	LS65M22D11 50 0 4.2 8.1 18.1 mm 21-22 13-14 7.5	LS65M23D11 50 0 4.2 8.1 18.1 mm 21-22 13-14 7.5	LS65M31D11 47 0 3.0 5.8 13.0 mm 21-22 13-14 5.4	LS65M32D11 55 0 3.0 5.8 13.0 mm 21-22 13-14 5.4
LS65M13C11 51 0 6.1 9.3 15.2 mm 21-22 13-14 3.5	LS65M22C11 52 0 7.2 11.1 18.1 mm 21-22 13-14 4.2	LS65M23C11 52 0 7.2 11.1 18.1 mm 21-22 13-14 4.2	LS65M31C11 49 0 5.2 8.0 13.0 mm 21-22 13-14 3.0	LS65M32C11 57 0 5.2 8.0 13.0 mm 21-22 13-14 3.0
LS65M13L02 51 0 3.0 6.3 15.2 mm 11-12 21-22	LS65M22L02 52 0 3.6 7.5 18.1 mm 11-12 21-22	LS65M23L02 52 0 3.6 7.5 18.1 mm 11-12 21-22	LS65M31L02 49 0 2.6 5.4 13.0 mm 11-12 21-22	LS65M32L02 57 0 2.6 5.4 13.0 mm 11-12 21-22
LS65M13L20 51 0 3.0 15.2 mm 13-14 23-24	LS65M22L20 52 0 3.6 18.1 mm 13-14 23-24	LS65M23L20 52 0 3.6 18.1 mm 13-14 23-24	LS65M31L20 49 0 2.6 13.0 mm 13-14 23-24	LS65M32L20 57 0 2.6 13.0 mm 13-14 23-24
LS65M13B02 51 0 1.5 3.5 8.4 12.1 mm 11-12 21-22 11-12 21-22	LS65M22B02 52 0 1.6 3.8 9.0 13.0 mm 11-12 21-22 11-12 21-22	LS65M23B02 52 0 1.6 3.8 9.0 13.0 mm 11-12 21-22 11-12 21-22	LS65M31B02 49 0 1.9 4.6 10.9 15.8 mm 11-12 21-22 11-12 21-22	LS65M32B02 57 0 1.9 4.6 10.9 15.8 mm 11-12 21-22 11-12 21-22
0.270	0.280	0.280	0.290	0.300

Dimensions (mm)






Assembled IP66, UL Type 4X 60mm

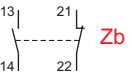
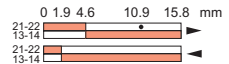
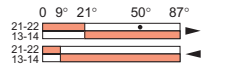
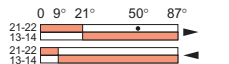
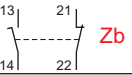
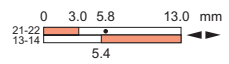
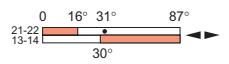
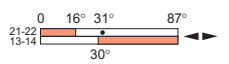

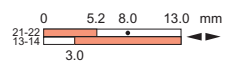
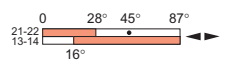
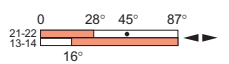
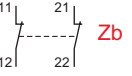



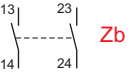
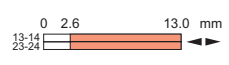
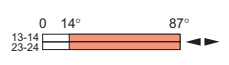
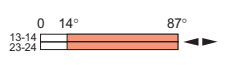
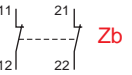
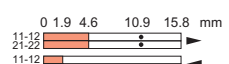
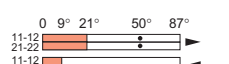
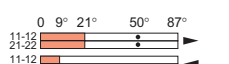
Metal
Limit switches

Movement to be detected

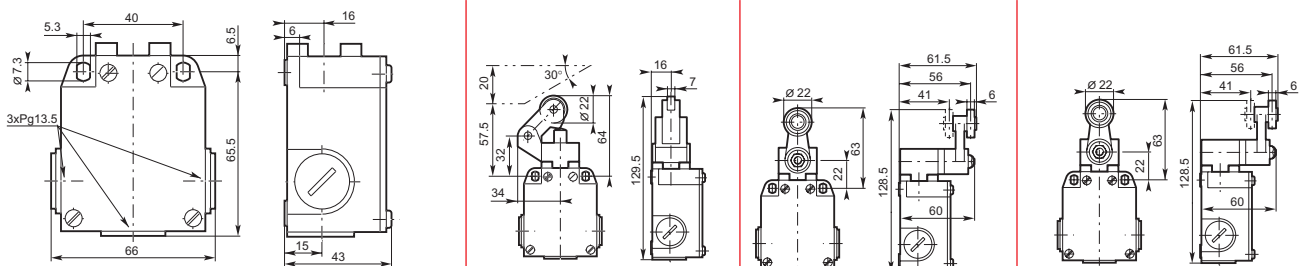


Operating head type

	Ball-bearing roller lever	∅ 22 Polyamide roller lever	∅ 22 Stainless steel roller lever
Conformity / \ominus (N.C. contact with positive opening operation)			
Maximum actuation speed m/s	1.5	1.5	1.5
Min. force/torque	12 N	0.15 N.m	0.15 N.m
- positive opening operation	40 N	0.44 N.m	0.44 N.m

		LS65M33B11 \$ 47	LS65M41B11 \$ 51	LS65M42B11 \$ 58
Snap action contacts	Catalog number	LS65M33B11	LS65M41B11	LS65M42B11
	List price	\$ 47	\$ 51	\$ 58
	Operation diagram			
Non-overlapping Slow action contacts	Catalog number	LS65M33D11	LS65M41D11	LS65M42D11
	List price	51	55	63
	Operation diagram			
Overlapping Slow action contacts	Catalog number	LS65M33C11	LS65M41C11	LS65M42C11
	List price	52	57	65
	Operation diagram			
Slow action contacts	Catalog number	LS65M33L02	LS65M41L02	LS65M42L02
	List price	52	57	65
	Operation diagram			
Slow action contacts	Catalog number	LS65M33L20	LS65M41L20	LS65M42L20
	List price	52	57	65
	Operation diagram			
Snap action contacts	Catalog number	LS65M33B02	LS65M41B02	LS65M42B02
	List price	52	57	65
	Operation diagram			
Weight (packing per unit)	kg	0.300	0.300	0.305

Dimensions (mm)



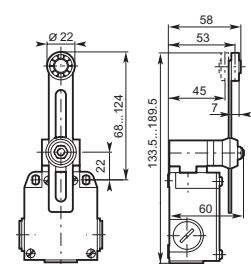
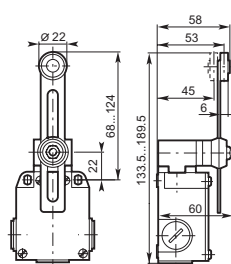
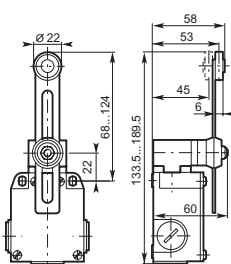
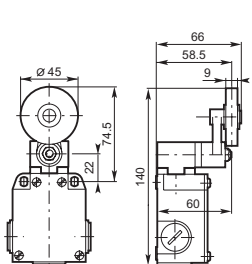
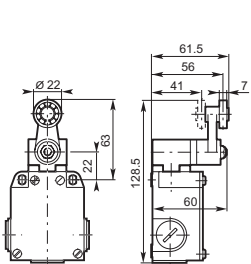
30° Cam translation movement



<p>ø 22 Ball-bearing roller lever</p> <p>1.5 0.15 N.m 0.44 N.m</p>	<p>ø 45 Rubber roller lever</p> <p>1.5 0.15 N.m -</p>	<p>Adjustable ø 22 polyamide roller lever</p> <p>1.5 0.15 N.m -</p>	<p>Adjustable ø 22 stainless steel roller lever</p> <p>1.5 0.15 N.m -</p>	<p>Adjustable ø 22 stainless steel ball-bearing roller lever</p> <p>1.5 0.15 N.m -</p>
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9

<p>LS65M43B11 \$ 54</p>	<p>LS65M44B11 \$ 53</p>	<p>LS65M51B11 \$ 53</p>	<p>LS65M52B11 \$ 60</p>	<p>LS65M53B11 \$ 56</p>
<p>LS65M43D11 58</p>	<p>LS65M44D11 56</p>	<p>LS65M51D11 57</p>	<p>LS65M52D11 65</p>	<p>LS65M53D11 60</p>
<p>LS65M43C11 60</p>	<p>LS65M44C11 58</p>	<p>LS65M51C11 59</p>	<p>LS65M52C11 67</p>	<p>LS65M53C11 62</p>
<p>LS65M43L02 60</p>	<p>LS65M44L02 58</p>	<p>LS65M51L02 59</p>	<p>LS65M52L02 67</p>	<p>LS65M53L02 62</p>
<p>LS65M43L20 60</p>	<p>LS65M44L20 58</p>	<p>LS65M51L20 59</p>	<p>LS65M52L20 67</p>	<p>LS65M53L20 62</p>
<p>LS65M43B02 60</p>	<p>LS65M44B02 58</p>	<p>LS65M51B02 59</p>	<p>LS65M52B02 67</p>	<p>LS65M53B02 62</p>
0.305	0.330	0.315	0.325	0.325



Assembled IP66, UL Type 4X 60mm

Metal
Limit switches

Movement to be detected

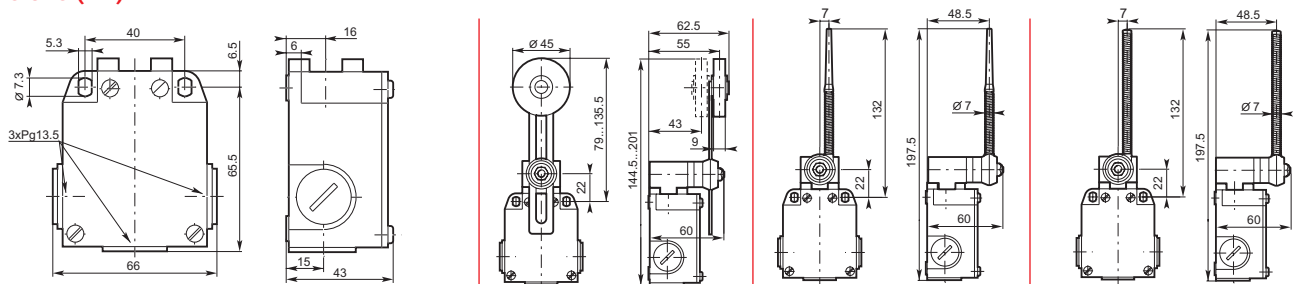


Operating head type

		Adjustable \varnothing 45 rubber roller lever	Flexible lever with insulated end	Coil spring lever
Conformity / \ominus (N.C. contact with positive opening operation)		■	■	■
Maximum actuation speed	m/s	1.5	1.5	1.5
Min. torque: - actuation	N.m	0.15	0.15	0.15
- positive opening operation	N.m	-	-	-

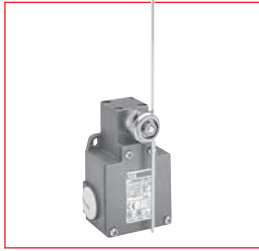
		LS65M54B11 \$ 54	LS65M61B11 \$ 52	LS65M62B11 \$ 51
Snap action contacts	Catalog number	LS65M54B11	LS65M61B11	LS65M62B11
	List price	\$ 54	\$ 52	\$ 51
	Operation diagram			
Non-overlapping Slow action contacts	Catalog number	LS65M54D11	LS65M61D11	LS65M62D11
	List price	58	55	55
	Operation diagram			
Overlapping Slow action contacts	Catalog number	LS65M54C11	LS65M61C11	LS65M62C11
	List price	60	57	57
	Operation diagram			
Slow action contacts	Catalog number	LS65M54L02	LS65M61L02	LS65M62L02
	List price	60	57	57
	Operation diagram			
Slow action contacts	Catalog number	LS65M54L20	LS65M61L20	LS65M62L20
	List price	60	57	57
	Operation diagram			
Snap action contacts	Catalog number	LS65M54B02	LS65M61B02	LS65M62B02
	List price	60	57	57
	Operation diagram			
Weight (packing per unit)	kg	0.335	0.320	0.325

Dimensions (mm)

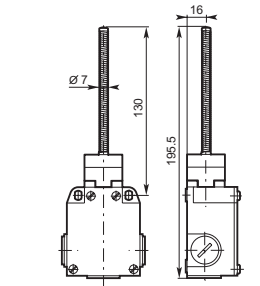
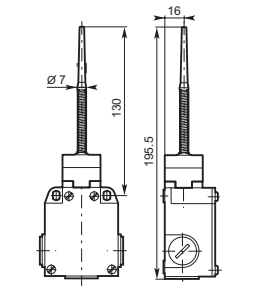
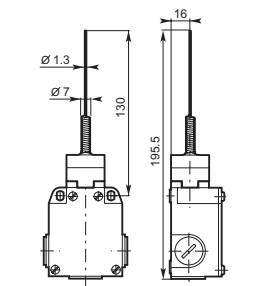
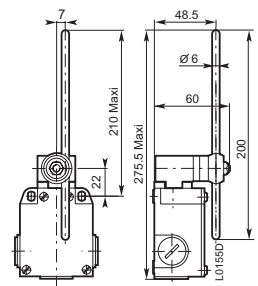
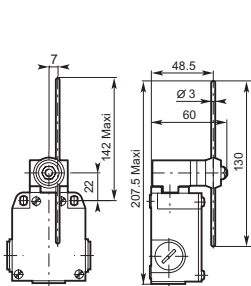


Fully directional translation movement

Multidirectional



Adjustable \varnothing 3 stainless steel rod lever	Adjustable \varnothing 6 polyamide rod lever	Spring rod	Flexible rod with insulated end	Coil spring rod
1.5 0.15 -	1 0.15 -	1 0.18 -	1 0.18 -	1 0.18 -
LS65M71B11 \$ 49	LS65M72B11 \$ 49	LS65M91B11 \$ 42	LS65M92B11 \$ 44	LS65M93B11 \$ 44
LS65M71D11 53	LS65M72D11 52	LS65M91D11 45	LS65M92D11 47	LS65M93D11 47
LS65M71C11 54	LS65M72C11 54	LS65M91C11 47	LS65M92C11 49	LS65M93C11 48
LS65M71L02 54	LS65M72L02 54	LS65M91L02 47	LS65M92L02 49	LS65M93L02 48
LS65M71L20 54	LS65M72L20 54	LS65M91L20 47	LS65M92L20 49	LS65M93L20 48
LS65M71B02 54	LS65M72B02 54	LS65M91B02 47	LS65M92B02 49	LS65M93B02 48
0.315	0.315	0.255	0.260	0.255



Components

IP66, UL Type 4X

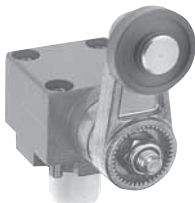
60mm



LS65M00B11

Bodies with contact block for rectilinear or angular motion heads

	LS	65	M	00	B11	
Limit Switch.....	LS					Contacts
Casing width: 60 mm		6				11 1 N.O. + 1 N.C. contacts
Cable inlet:						02 2 N.C. contacts
3 cable inlets for Pg 13.5 cable gland				0		20 2 N.O. contacts
3 cable inlets M20 x 1.5 for ISO 20 cable gland.....				3		
3 cable inlets for 1/2" NPT.....				5		
Metal casing			M			Snap action:
Without operating head				00		B Zb Snap
						Dependent (slow) action:
						L Zb Slow / Simultaneous
						D Zb Non-overlapping late make
						C Zb Overlapping early make



LSTE41

Operating heads

	LS	T	E	41	
Limit Switch.....	LS				References of heads:
Operating head		T			11 ... 13with rectilinear movement (plain plunger, steel ball plunger and roller plunger)
For Metal casing: 40 mm or 60 mm width			E		21 ... 23with rectilinear movement (with lateral plain or roller plunger)
					31 ... 33with rectilinear movement (with roller lever on steel plunger)
					40with angular movement (without actuator) actuator to be ordered separately
					41 ... 44with angular movement (roller lever)
					50with angular movement (without actuator)
					51 ... 54with angular movement (adjustable roller lever)
					61, 62flexible lever (spring)
					71, 72, 73adjustable lever (rod)
					91 ... 93multidirectional angular movement (spring rod)



LSA40X51

Separate actuators (Roller lever, adjustable roller or rod levers, etc.)

	LS	A	40	X	51	
Limit Switch.....	LS					Reference of actuators:
Actuator (roller)		A				41 ... 44non-adjustable roller lever
Casing width: 40 mm			40			51 ... 54adjustable roller lever
The reference 40 is common to all casings (LS40P, LS40M and LS60M)						61, 62flexible lever (spring)
						71, 72, 73adjustable lever (rod)
						For casing:
						M Metal
						P Plastic
						X Plastic or metal



LSC40XD11

Separate contact blocks

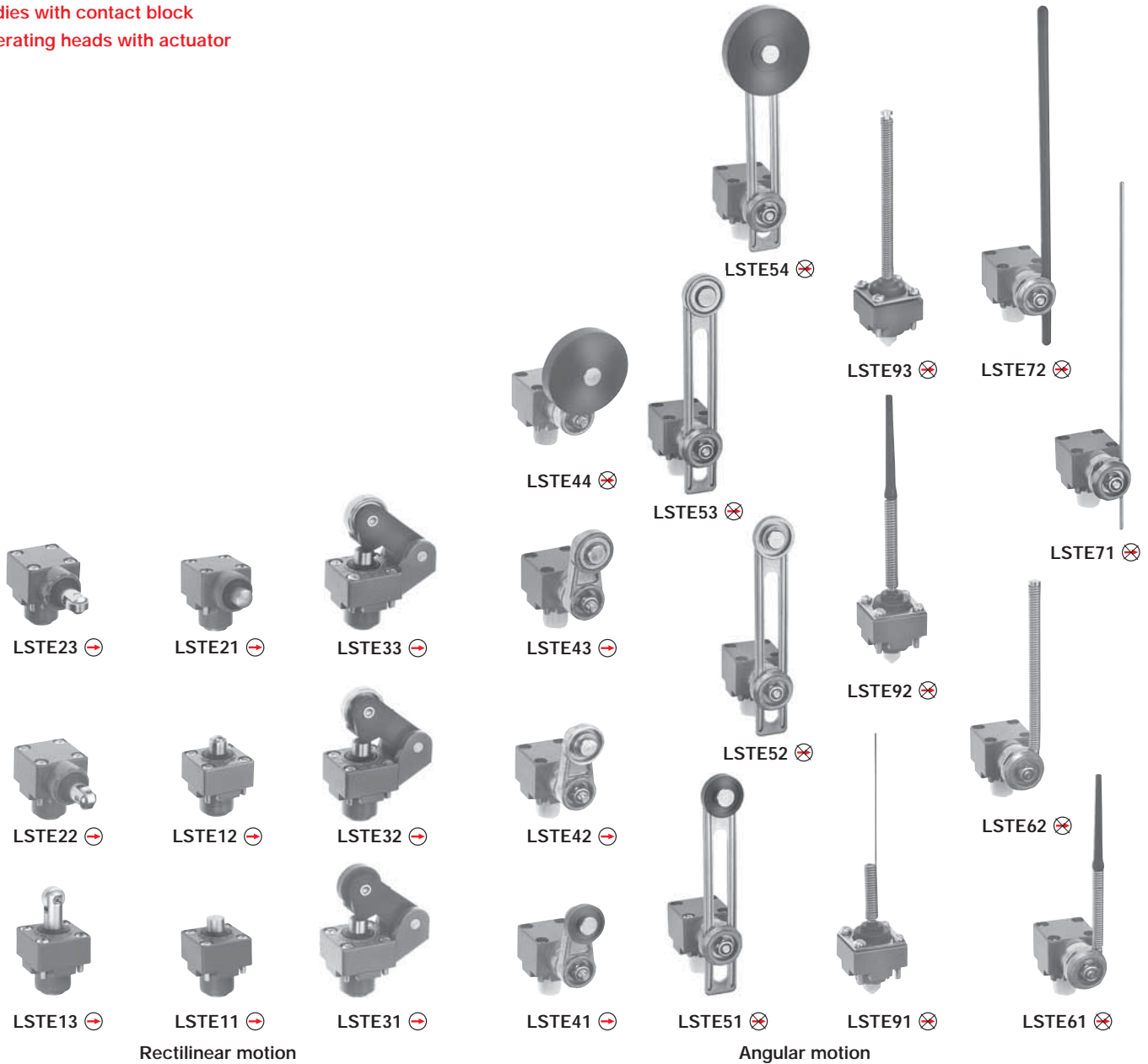
	LS	C	40	X	D	11	
Limit Switch.....	LS						Contacts
Contact blocks		C					11 1 N.O. + 1 N.C. contacts
Casing width: 40 mm			40				02 2 N.C. contacts
The reference 40 is common to all casings (LS40P, LS40M and LS60M)							20 2 N.O. contacts
For casing:							Snap action:
Metal.....				M			B Zb Snap
Plastic				P			Dependent (slow) action:
Plastic or metal				X			L Zb Slow / Simultaneous
							D Zb Non-overlapping late make
							C Zb Overlapping early make

Components

IP66, UL Type 4X
60mm

- Bodies with contact block
- Operating heads with actuator

9



LSTE... rectilinear motion heads

- To be actuated from end. With plunger (plain, lateral plain or ball): LSTE11, LSTE12 and LSTE21.
- To be actuated by 30° cam translation.
With roller plunger: LSTE13, LSTE22 and LSTE23.
- To be actuated unidirectionally by 30° cam translation.
With roller lever on stainless steel plunger: LSTE31 ... LSTE33.

LSTE... angular motion heads

- To be actuated by 30° cam translation.
With roller lever: LSTE41 ... LSTE54.
- To be actuated by fully directional translation movement.
With rod or spring lever: LSTE61 ... LSTE72.
- To be actuated multidirectionally.
With spring rod: LSTE91 ... LSTE93.



Bodies with contact block

- (with arrow) LS65M00B11, LS65M00D11, LS65M00C11, LS65M00L02, LS65M00B02
- (with X) LS65M00L20

(with arrow): Suitable for positive opening operation (IEC 60947-5-1).

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with (with arrow) are fitted.

Components

IP66, UL Type 4X

60mm



- Bodies with contact blocks
- Angular motion heads (without actuator)
- Separate actuators
- Separate contact blocks



LSA40X44 ⊗



LSA40X43 ⊕



LSA40X42 ⊕



LSA40X41 ⊕

Roller levers



LSTE40 ⊕

LSTE40 angular motion head
For roller levers (non-adjustable)
LSA40X41 ... LSA40X44



Bodies with contact block

- ⊕ LS65M00B11, LS65M00D11, LS65M00C11, LS65M00L02, LS65M00B02
- ⊗ LS65M00L20



LSA40X54 ⊗



LSA40X53 ⊗



LSA40X52 ⊗



LSA40X51 ⊗



LSA40X61 ⊗



LSA40X62 ⊗



LSA40X71 ⊗



LSA40X72 ⊗

Adjustable or flexible levers

LSTE50 angular motion head
For flexible or adjustable levers LSA40X51 ... LSA40X54, LSA40X61, LSA40X62, LSA40X71 and LSA40X72.



Contact blocks

- ⊕ LSC40XB11, LSC40XD11, LSC40XC11, LSC40XL02, LSC40XB02
- ⊗ LSC40XL20

⊕ : Suitable for positive opening operation (IEC 60947-5-1)

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.

Components

IP66, UL Type 4X

60mm

⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LS60M00B11



LSTE11 LSTE13



LSTE12 LSTE23

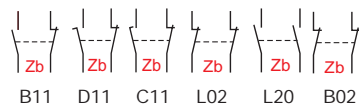


LSTE31 LSTE42



LSTE54 LSTE52

Contact blocks



Positive opening operation

Actuation speed max. m/s

Unit weight kg (1 pc)

Catalog number

List price

Bodies with contact block for rectilinear or angular motion heads

1	1	1	1	1	1	⊕	—	0.198	LS65M00B11	\$ 30
	1					⊕	—	0.198	LS65M00D11	31
		1				⊕	—	0.198	LS65M00C11	32
			1			⊕	—	0.198	LS65M00L02	32
				1		⊗	—	0.198	LS65M00L20	32
					1	⊕	—	0.198	LS65M00B02	32

Rectilinear motion heads

To be actuated from end

Stainless steel plain plunger	⊕	0.5	0.077	LSTE11	14
Stainless steel ball plunger	⊕	0.5	0.076	LSTE12	17
Stainless steel lateral plain plunger	⊕	0.5	0.093	LSTE21	17

To be actuated by 30° cam

Stainless steel roller plunger	⊕	0.5	0.084	LSTE13	20
Stainless steel lateral plunger with vertical roller	⊕	0.5	0.098	LSTE22	21
Stainless steel lateral plunger with horizontal roller	⊕	0.5	0.098	LSTE23	21

To be actuated unidirectionally by 30° cam

∅ 22mm polyamide roller lever on stainless steel plunger	⊕	1.5	0.111	LSTE31	19
∅ 22mm stainless steel roller lever on stainless steel plunger	⊕	1.5	0.121	LSTE32	26
∅ 22mm steel ball-bearing roller lever on stainless steel plunger	⊕	1.5	0.122	LSTE33	21

Angular motion heads with actuator

To be actuated by 30° cam

∅ 22mm polyamide roller lever ①	⊕	1.5	0.134	LSTE41	26
∅ 22mm stainless steel roller lever ①	⊕	1.5	0.142	LSTE42	34
∅ 22mm steel ball-bearing roller lever ①	⊕	1.5	0.145	LSTE43	29
∅ 45mm rubber roller lever ①	⊗	1.5	0.162	LSTE44	28
∅ 22mm adjustable polyamide roller lever ①	⊗	1.5	0.152	LSTE51	27
∅ 22mm adjustable stainless steel roller lever ①	⊗	1.5	0.161	LSTE52	35
∅ 22mm steel ball-bearing roller lever ①	⊗	1.5	0.163	LSTE53	31
∅ 45mm adjustable rubber roller lever ①	⊗	1.5	0.168	LSTE54	29

① Free position adjustment of lever 9° by 9° over 360°.

Components

IP66, UL Type 4X

60mm

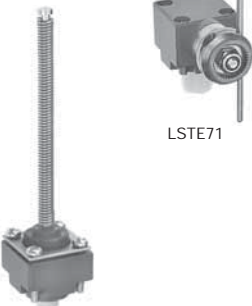
Metal
Limit switches

⊖ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊖ are fitted.



LSTE61



LSTE71

LSTE93



LSTE40

LSA40X42



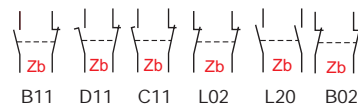
LSTE50



LSA40X53

LSA40X62

Contact blocks



Positive opening operation

Actuation speed max. m/s

Unit weight kg (1 pc)

Catalog number

List price

To be actuated by fully directional translation movement

Stainless steel flexible lever with insulated end ①	⊖	1	0.145	LSTE61	\$ 29
Stainless steel coil spring lever ①	⊖	1	0.152	LSTE62	29
∅ 3mm adjustable stainless steel rod lever, 195mm ①	⊖	1	0.150	LSTE71	26
∅ 3mm adjustable polyamide rod lever, 195mm ①	⊖	1	0.145	LSTE72	26
∅ 6mm adjustable fiberglass rod lever, 195mm ①	⊖	1	0.149	LSTE73	27

Multidirectional angular motion head (to be actuated by fully directional translation movement)

Stainless steel spring rod	⊗	1	0.066	LSTE91	17
Stainless steel flexible rod with insulated end	⊗	1	0.068	LSTE92	19
Stainless steel coil spring rod	⊗	1	0.075	LSTE93	18

Angular motion head without actuator, for non-adjustable roller levers (delivered with M5 nylostop nut)

	⊖	1.5	0.102	LSTE40	20
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Actuator for angular motion head LSTE40

∅ 22mm polyamide roller lever ①	⊖	—	0.032	LSA40X41	6
∅ 22mm stainless steel roller lever ①	⊖	—	0.042	LSA40X42	14
∅ 22mm steel ball-bearing roller lever ①	⊖	—	0.044	LSA40X43	9
∅ 45mm rubber roller lever ①	⊗	—	0.050	LSA40X44	8

Angular motion head without actuator for flexible or adjustable levers (delivered with M5 nylostop nut & adaptation parts)

	⊗	1 - 1.5 ②	0.121	LSTE50	22
--	---	-----------	-------	--------	----

Actuators for angular motion head LSTE50

∅ 22mm adjustable polyamide roller lever ①	⊗	—	0.023	LSA40X51	5
∅ 22mm adjustable stainless steel roller lever ①	⊗	—	0.032	LSA40X52	13
∅ 45mm adjustable steel ball-bearing roller lever ①	⊗	—	0.034	LSA40X53	9
∅ 45mm adjustable rubber roller lever ①	⊗	—	0.039	LSA40X54	7
Stainless steel flexible lever with insulated end ①	⊗	—	0.017	LSA40X61	7
Stainless steel coil spring lever ①	⊗	—	0.023	LSA40X62	7
∅ 3mm adjustable stainless steel rod lever, 195mm ①	⊗	—	0.014	LSA40X71	4
∅ 6mm adjustable polyamide rod lever, 195mm ①	⊗	—	0.010	LSA40X72	4
∅ 6mm adjustable fiberglass rod lever, 195mm ①	⊗	—	0.014	LSA40X73	5

① Free position adjustment of lever 9° by 9° over 360°.

② According to lever.

Components

IP66, UL Type 4X

60mm

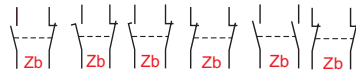
⊕ "N.C." contact with positive opening operation or element (subassembly, head, lever) suitable for positive opening operation.

Warning! The positive opening operation of limit switch is only guaranteed if the elements noted with ⊕ are fitted.



LSC40XB11

Contact blocks



B11 D11 C11 L02 L20 B02

Positive opening operation

Actuation speed max. m/s

Unit weight kg (1 pc)

Catalog number

List price

Contact blocks (with adaptor)

1 NC & 1 NO 2-pole snap action	⊕	—	0.032	LSC40XB11	\$ 15
1 NC & 1 NO 2-pole non-overlapping slow action	⊕	—	0.032	LSC40XD11	15
1 NO & 1 NC 2-pole overlapping slow action	⊕	—	0.032	LSC40XC11	17
2 NC 2-pole simultaneous slow action	⊕	—	0.032	LSC40XL02	17
2 NO 2-pole simultaneous slow action	⊗	—	0.032	LSC40XL20	17
2 NC 2-pole snap action	⊕	—	0.032	LSC40XB02	17

① Free position adjustment of lever 9° by 9° over 360°.

Technical data

IP 65, UL Type 4

Metal
Limit switches

General technical data

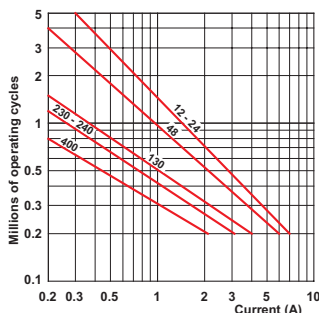
Standards	Devices conform with international IEC 947-5-1 and European EN 60 947-5-1 standards	
Certifications - Approvals	UL & CSA	
Air temperature near the device (IEC)	°C	- 25 ... + 70
- during operation		- 30 ... + 80
- for storage	°C	
Climatic withstand	According to IEC 68-2-3 and salty mist according to IEC 68-2-11	
Mounting positions	All positions are authorized	
Shock withstand (according to IEC 68-2-27 and EN 60 068-2-27)	50g ^① (1/2 sinusoidal shock for 11 ms) no change in contact position	
Resistance to vibrations (acc. to IEC 68-2-6 and EN 60 068-2-6)	25g (10 – 500 Hz) no change in position of contacts greater than 100 μs	
Protection against electrical shocks (acc. to IEC 536)	Class I	
Degree of protection	UL Type 4X & IP 66	
Consistency (measured over 1 million operations)	0.05 mm (upon closing point)	
Minimum actuation speed	m/s	Slow action contacts 0.060 / Snap action contacts 0.001

Electrical Data

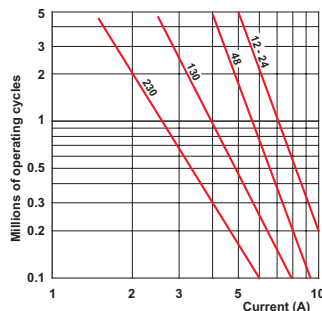
Rated insulation voltage U_i - according to IEC 947-1 and EN 60-947-1 - according to UL 508 and CSA C22-2 n° 14	500 V (degree of pollution 3) A 600, Q 600	
Rated impulse withstand voltage U_{imp} (according to IEC 947-1 and EN 60 947-1)	kV	6
Conventional free air thermal current I_{th} (according to IEC 947-5-1) $q \leq 40$ °C	A	10
Short-circuit protection $U_e \leq 500$ V a.c. - gG (gl) type fuses	A	10
Rated operational current I_e / AC-15 (according to IEC 947-5-1)	24 V - 50/60 Hz A 130 V - 50/60 Hz A 230 V - 50/60 Hz A 240 V - 50/60 Hz A 400 V - 50/60 Hz A	10 5.5 3.1 3 1.8
I_e / DC-13 (according to IEC 947-5-1)	24 V - d.c. A 110 V - d.c. A 250 V - d.c. A	2.8 0.6 0.27
Switching frequency	Cycles/h	3600
Load factor		0.5
Resistance between contacts	mW	25
Connecting terminals	M3.5 (+, -) pozidriv 2 screw with cable clamp	
Terminal for protective conductor	M3.5 (+, -) pozidriv 2 screw with cable clamp	
Connecting capacity	1 or 2 x mm ²	0.5 ... 2.5
Terminal marking	According to EN 50 013	
Mechanical durability	Millions of operations	30 } LS 40 } M { 11 – 13; 21 – 23; 31 – 33 25 } 60 } { 41 – 44; 51 – 54; 61 – 72 10 } { 91 – 93
Electrical durability (according to IEC 947-5-1)	Utilization categories AC-15 and DC-13 (Load factor of 0.5 according to curves below)	

9

AC-15 — Snap action



AC-15 — Slow action



DC-13	Snap action	Slow action
	Power breaking for a durability of 5 million operating cycles	
Voltage	24 V	12 W
Voltage	48 V	9 W
Voltage	110 V	6 W

① except for LS30/31/35 (P42): 25g

Limit switches

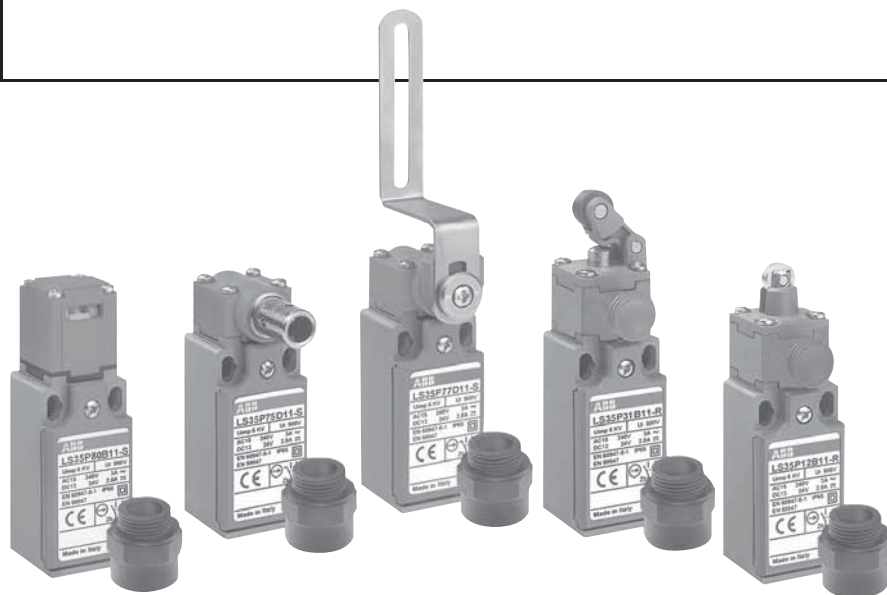


Safety limit switches

Latch key

Rotative axis

Latch & manual reset



Description of Red Safety Range

30mm limit switches for safety applications, conforming to the IEC/EN 60947-5-1, EN1088 and EN954-1 standards, are available with a red casing in three types:

- **Latch key** – The key being straight or with a right angle, with or without shock absorber.
- **Stainless steel rotative axis** – Some limit switches come with a flush mounting lever. They offer double insulation with plastic casing (UL Type 4 (IP65)) and mechanical positive drive.
- **Latch & manual reset range** – These models offer double insulation with a grey plastic casing (UL type 4 (IP65)). Available actuators include plunger, roller plunger, roller lever on plunger and rotary lever.

Selection guide IP65, UL Type 4 30mm Plastic casing

30mm width — LS35P

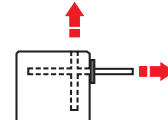
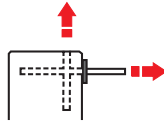


LS35P80...-S

LS35P81...-S

Translation with small latch
(key) and adjustable head

Translation with small latch
(key) and pivoting head



9 CENELEC conformity
Actuating device and actuation type

Positive contact opening



30mm width — LS35P

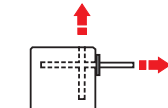
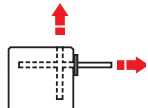


LS35P80...-S

LS35P81...-S

Galvanized steel rotative axis

Stainless steel rotative axis



CENELEC conformity
Actuating device and actuation type

Positive contact opening



Selection guide

IP65, UL Type 4

30mm Plastic casing

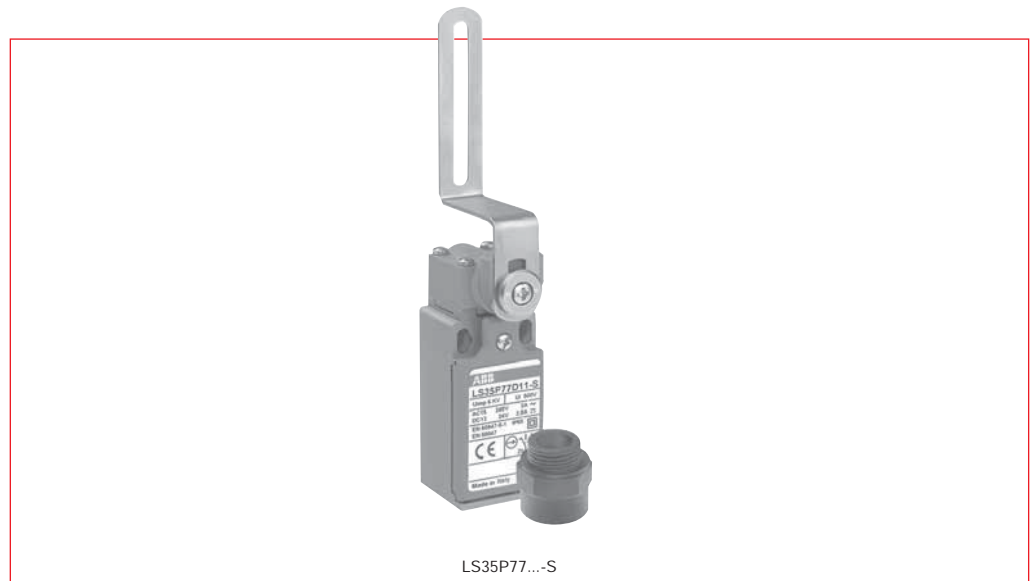


30mm width — LS35P

LSA30P03	LSA30P04	LSA30P05	LSA30P06	LSA30P07	LSA30P08	LSA30P09
Right angle key	Straight key	Right angle key	Straight key	Right angle key shock absorber	Straight key shock absorber	Adjustable angle key
22mm	22mm	13mm	13mm	15mm	15mm	40mm

CENELEC conformity

30mm width — LS35P

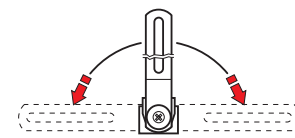


LS35P77...-S

Galvanized steel flush mounting right angle lever

CENELEC conformity

Actuating device and actuation type



Positive contact opening



Selection guide

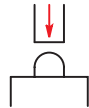
IP65, UL Type 4, latch & manual reset
30mm Plastic casing

30mm width — LS35P



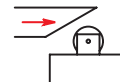
LS35P11...-R

Galvanized steel
plain plunger



LS35P12...-R

Galvanized steel
roller plunger



9

CENELEC conformity

Actuating device and actuation type

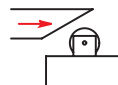
Positive contact opening

30mm width — LS35P



LS35P13...-R

Galvanized steel
plain plunger



CENELEC conformity

Actuating device and actuation type

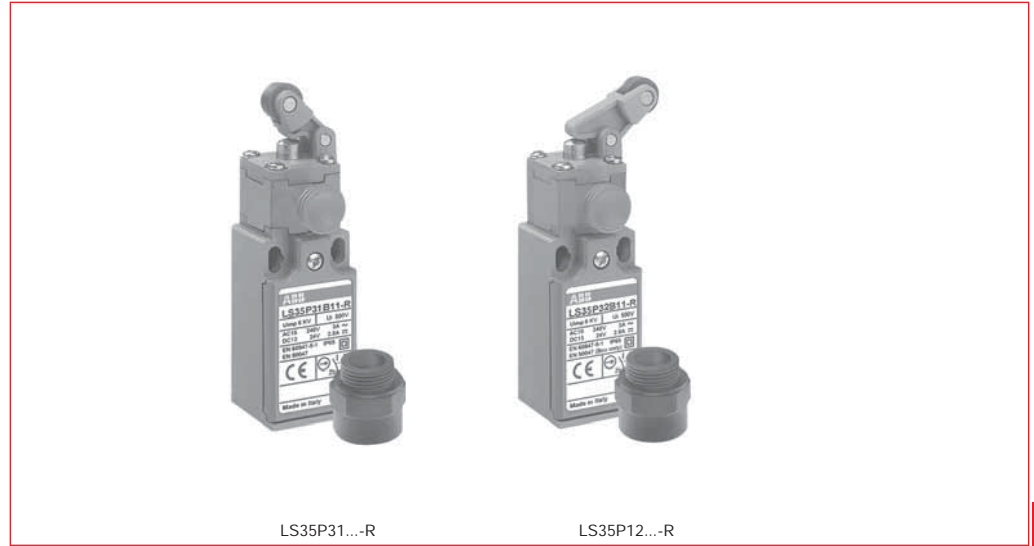
Positive contact opening

Selection guide

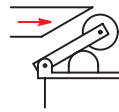
IP65, UL Type 4, latch & manual reset

30mm Plastic casing

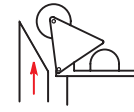
30mm width — LS35P



LS35P31...-R
Plastic roller on galvanized steel plunger



LS35P12...-R
Plastic roller lever on galvanized steel plunger



CENELEC conformity

Actuating device and actuation type

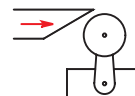
Positive contact opening



30mm width — LS35P



LS35P13...-R
Galvanized steel plain plunger



CENELEC conformity

Actuating device and actuation type

Positive contact opening





Notes



Latch key safety limit switches

Description

Safety limit switches with small latch (key), made of fibre-glass reinforced UL-V0 thermoplastic material, offer double insulation and a degree of protection IP65. They are equipped with 1 N.C. + 1 N.O. or 2 N.C. contact blocks with dependent action and positive opening operation of the "N.C." contact(s).

Applications

Easy to use, the limit switches with small latch (key) offer specific qualities:

- Visible operation.
- Capability for strong current switching (conventional thermal current 10 A).
- Opening guaranteed of the "N.C." contact(s) when the small latch is withdrawn from the limit switch.
- Contact blocks with dependent action and positive opening operation of the "N.C." normally closed contact(s) (symbol \ominus).
- Electrically separated contacts (Zb shape).
- Precision on operation positions (consistency).
- Immunity to electromagnetic disturbances.

These specific features make the limit switches ideal for monitoring and protection of industrial machines without inertia in which downtime is less than access time to the dangerous area. Use on sliding or pivoting protectors (covers, cases, doors, grids, etc.).

- They contribute to protection of operators working on dangerous machines, by opening the control circuit. Withdrawal of the small latch (key) by opening the mobile protector causes immediate stopping of the machine drive.
- Associated with other standard limit switches and safety switching devices, they produce automatic control circuits meeting standard EN 954-1.
- They comply with the requirements of European Directives (Low Voltage, Machines and Electromagnetic Compatibility) and are conform to European and international standards.

2 operating head options:

- Adjustable every 90° (4 x ø 3 screws with (+,-) pozidriv 1 head)
- Pivoting from 0° to 360° (1 x M3 screw with Phillips head No. 1)

Casing

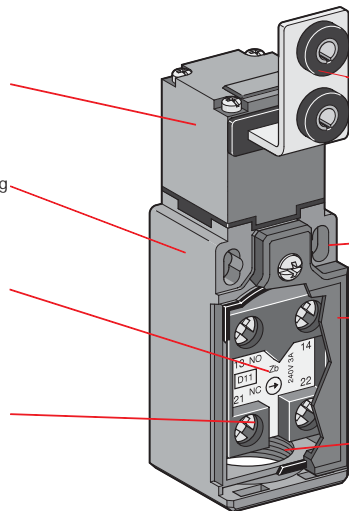
- 30 mm wide with standardised dimensions corresponding to EN 50047

Blocks of 2 contacts

- Contact configuration: 1 N.O. + 1 N.C. or 2 N.C.
- Positive opening operation \ominus
- Contact dependent action
- Zb shape: the 2 contacts are electrically separated

Connecting terminals

- M3.5 screw with (+,-) pozidriv 2 head
- Screw heads with captive cable clamps
- Marking conform to IEC 60947-1, IEC 60947-5-1, EN 50005 and EN 50013 standards



7 small latch (key) options to be ordered separately:

- Right angle key (13 or 22 mm fixing)
- Straight key (13 or 22 mm fixing)
- Straight key or right angle key with shock absorber
- Adjustable right angle key

Casing fixing

- 2 x M4 screws in the top part

Cover

- Closure by 1 x ø 3 screw with (+,-) pozidriv 1 head
- Gasket made in one part to prevent tightness breaks

Electrical connection in various options:

- 1 x Pg 13.5 cable gland for LS30P
- 1 x Pg 11 cable gland for LS31P
- 1 x 1/2" NPT adaptor delivered not mounted for LS35P

Catalog explanation

Example : **LS 35 P 80 D11 - S**

Limit Switch	LS						S	Safety device
Casing width: 30 mm		3						
Cable inlet:								
1 cable inlet for Pg 13.5 cable gland						0		
1 cable inlet for Pg 11 cable gland						1		
1 x 1/2" NPT (adaptor) cable inlet						5		
Plastic casing			P					
Operating heads:								
Adjustable every 90°				80				
Continuously pivoting from 0° to 360°				81				
								Contact types:
								11
								1 N.O. + 1 N.C. contacts
								02
								2 N.C. contacts
								Snap action:
								B
								Zb Snap
								Dependent (slow) action:
								L
								Zb Slow / Simultaneous
								D
								Zb Non-overlapping late make
								C
								Zb Overlapping early make



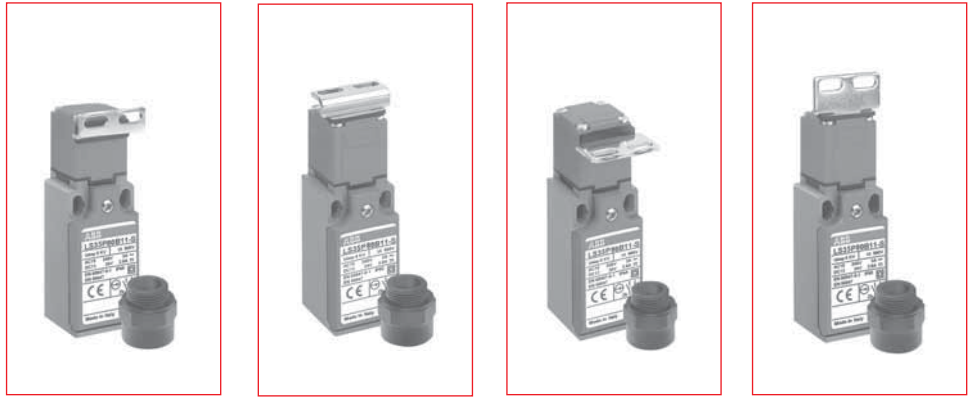
Latch key safety limit switches 30mm

Movement to be detected

Small Latch (Key), Front or Vertical Translation

Casing

- Plastic
- 30 mm width
- Degree of protection IP65



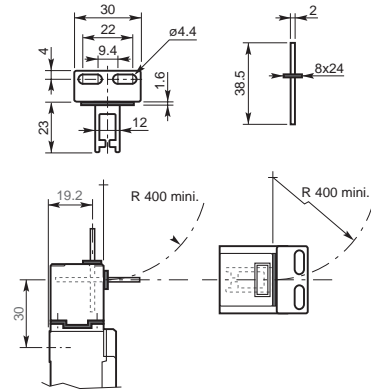
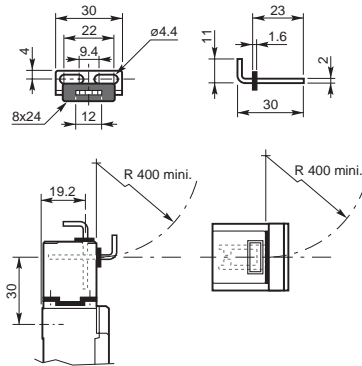
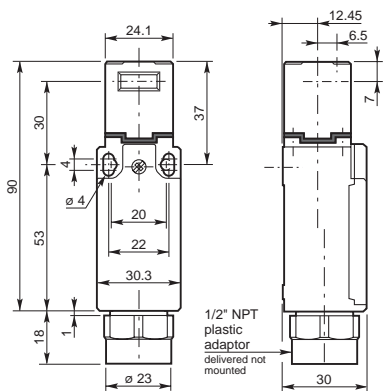
Actuator

9

		Right angle key (22 mm mounting)	Straight key (22 mm mounting)
NC contact with positive opening operation		⊖	⊖
Actuation speed: maximal / minimal		0.5 / 0.01	0.5 / 0.01
Min. force: - for insertion of the key		15	15
- for extraction of the key		10	10
- positive opening operation		30	30
Non-overlapping slow action contacts	Catalog number List price	LS35P80D11-S \$ 43	LS35P80D11-S \$ 43
	Operation diagram		
Overlapping slow action contacts	Catalog number List price	LS35P80C11-S 43	LS35P80C11-S 43
	Operation diagram		
Simultaneous slow action contacts	Catalog number List price	LS35P80L02-S 43	LS35P80L02-S 43
	Operation diagram		
Weight with 1/2" NPT adaptor (packing per unit)		kg 0.087	kg 0.087
Small Latch (Key)			
To order separately	Catalog number List price	LSA30P03 5	LSA30P04 5
Weight (packing per unit)		kg 0.009	kg 0.009

Accessories, special contact arrangement or particular function: please consult us.

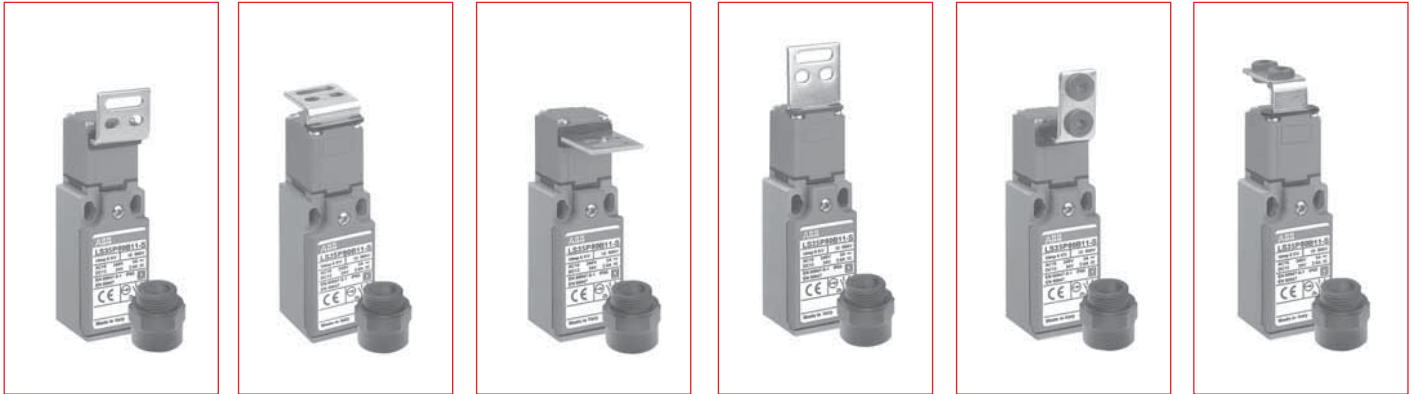
Dimensions (in mm)




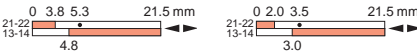


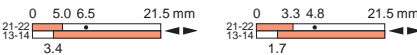







Latch key safety limit switches 30mm

Safety
limit switches

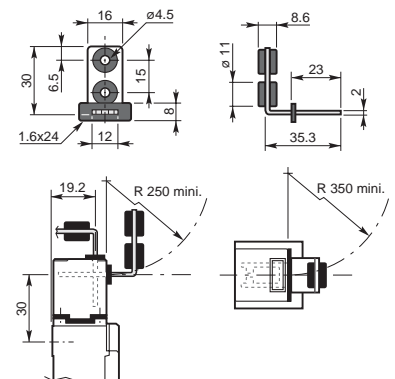
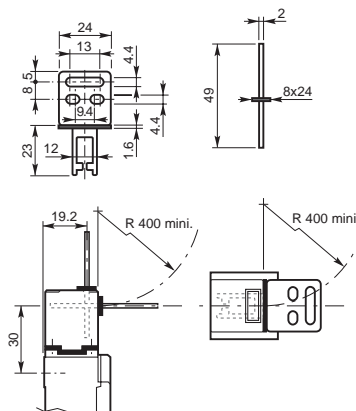
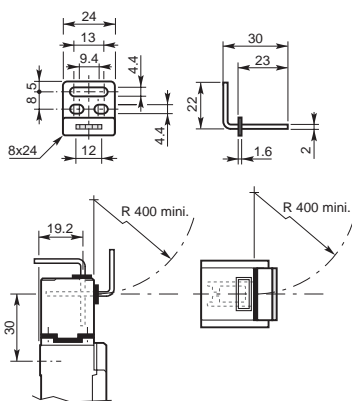
Small latch (key), front or vertical translation



Right angle key (13mm mounting)	Straight key (13mm mounting)	Right angle key with shock absorber
 0.5 / 0.01 15 10 30	 0.5 / 0.01 15 10 30	 0.5 / 0.01 15 10 30
LS35P80D11-S \$ 43	LS35P80D11-S \$ 43	LS35P80D11-S \$ 43
		
LS35P80C11-S 43	LS35P80C11-S 43	LS35P80C11-S 43
		
LS35P80L02-S 43	LS35P80L02-S 43	LS35P80L02-S 43
		
0.087	0.011	0.014
LSA30P05 5	LSA30P06 5	LSA30P07 9
0.011	0.011	0.014

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)





Latch key safety limit switches 30mm

Movement to be detected

Small Latch (Key), Front or Vertical Translation

Casing

- Plastic
- 30 mm width
- Degree of protection IP65



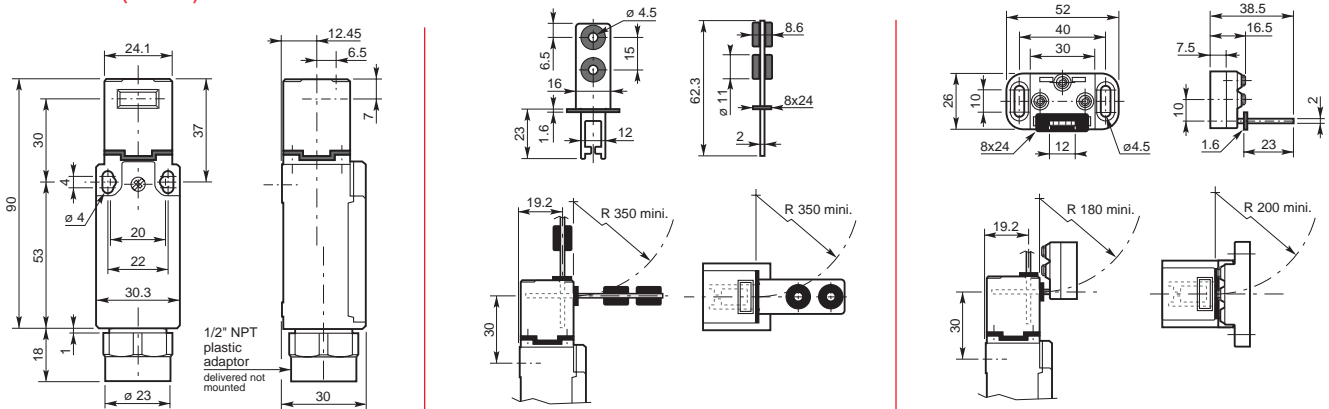
Actuator

9

		Right angle key (22 mm mounting)	Straight key (22 mm mounting)
NC contact with positive opening operation		⊕	⊕
Actuation speed: maximal / minimal		0.5 / 0.01	0.5 / 0.01
Min. force: - for insertion of the key		15	15
- for extraction of the key		10	10
- positive opening operation		30	30
Non-overlapping slow action contacts		LS35P80D11-S \$ 43	LS35P80D11-S \$ 43
Overlapping slow action contacts		LS35P80C11-S 43	LS35P80C11-S 43
Simultaneous slow action contacts		LS35P80L02-S 43	LS35P80L02-S 43
Weight with 1/2" NPT adaptor (packing per unit)		0.087	0.087
Small Latch (Key)			
To order separately		LSA30P08 9	LSA30P09 11
Weight (packing per unit)		0.014	0.022

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)



Notes





Latch key safety limit switches 30mm

Movement to be detected

Small Latch (Key), Front or Vertical Translation

Casing

- Plastic
- 30 mm width
- Degree of protection IP65

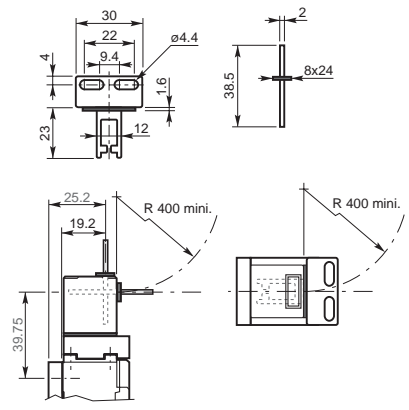
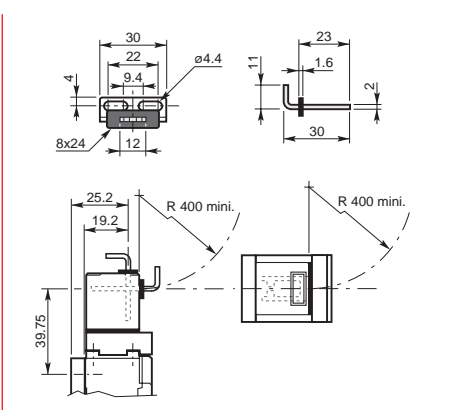
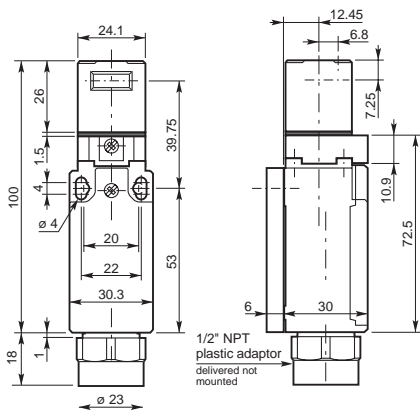


Actuator

		Right angle key (22 mm mounting)	Straight key (22 mm mounting)
9 "N.C." contact with positive opening operation	Actuation speed: maximal / minimal	0.5 / 0.01	0.5 / 0.01
	Min. force: - for insertion of the key	15	15
	- for extraction of the key	10	10
	- positive opening operation	30	30
Non-overlapping slow action contacts	Catalog number	LS35P81D11-S	LS35P81D11-S
	List price	\$ 52	\$ 52
	Operation diagram		
	Catalog number	LS35P81C11-S	LS35P81C11-S
	List price	52	52
	Operation diagram		
	Catalog number	LS35P81L02-S	LS35P81L02-S
	List price	52	52
	Operation diagram		
	Weight with 1/2" NPT adaptor (packing per unit)	kg	0.097
Small Latch (Key)	Catalog number	LSA30P03	LSA30P04
	List price	5	5
Weight (packing per unit)	kg	0.009	0.009

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)








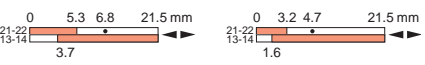






Latch key safety limit switches 30mm

Safety
limit switches

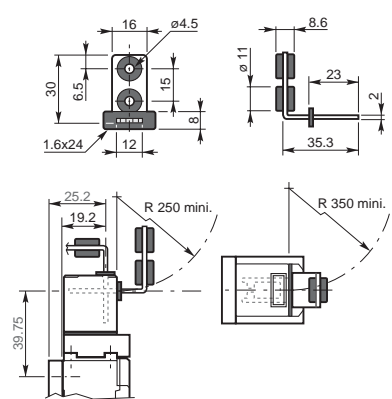
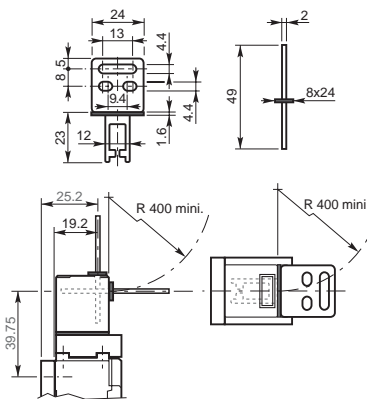
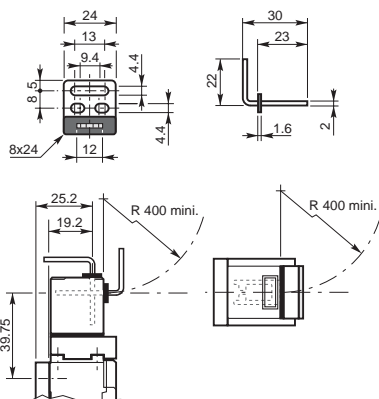
Small Latch (Key), Front or Vertical Translation



Right angle key (13 mm fixing)	Straight key (13 mm fixing)	Right angle key with shock absorber
 0.5 / 0.01 15 10 30	 0.5 / 0.01 15 10 30	 0.5 / 0.01 15 10 30
LS35P81D11-S \$ 52	LS35P81D11-S \$ 52	LS35P81D11-S \$ 52
		
LS35P81C11-S 52	LS35P81C11-S 52	LS35P81C11-S 52
		
LS35P81L02-S 52	LS35P81L02-S 52	LS35P81L02-S 52
		
0.097	0.097	0.097
LSA30P05 5	LSA30P06 5	LSA30P07 9
0.011	0.011	0.014

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)





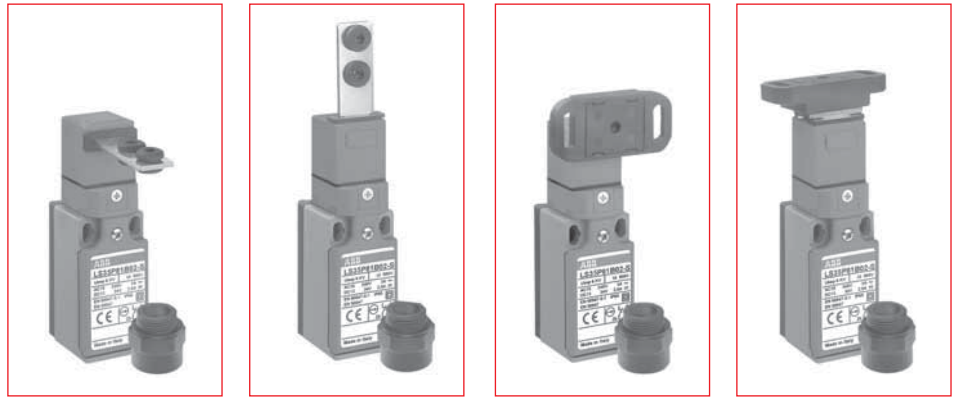
Latch key safety limit switches 30mm

Movement to be detected

Small Latch (Key), Front or Vertical Translation

Casing

- Plastic
- 30 mm width
- Degree of protection IP65



Actuator

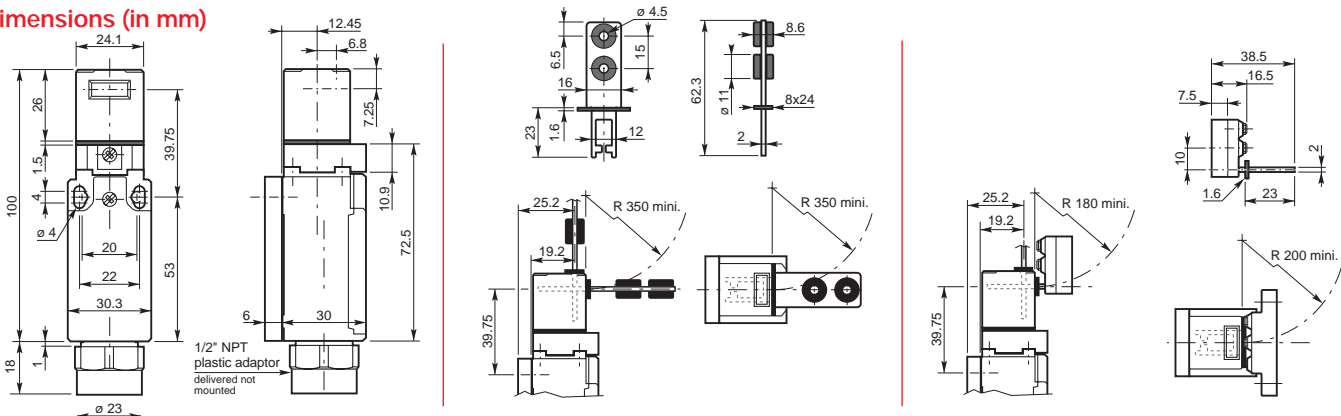
Straight key with shock absorber

Adjustable angle key

9 "N.C." contact with positive opening operation	Actuation speed: maximal / minimal	m/s	0.5 / 0.01	0.5 / 0.01
	Min. force: – for insertion of the key	N	15	15
	– for extraction of the key	N	10	10
	– positive opening operation	N	30	30
Non-overlapping slow action contacts	Catalog number		LS35P81D11-S	LS35P81D11-S
	List price		\$ 52	\$ 52
	Operation diagram			
Overlapping slow action contacts	Catalog number		LS35P81C11-S	LS35P81C11-S
	List price		52	52
	Operation diagram			
Simultaneous slow action contacts	Catalog number		LS35P81L02-S	LS35P81L02-S
	List price		52	52
	Operation diagram			
Weight with 1/2" NPT adaptor (packing per unit)	kg		0.097	0.097
Small Latch (Key)				
To order separately	Catalog number		LSA30P08	LSA30P09
	List price		9	11
Weight (packing per unit)	kg		0.014	0.022

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)



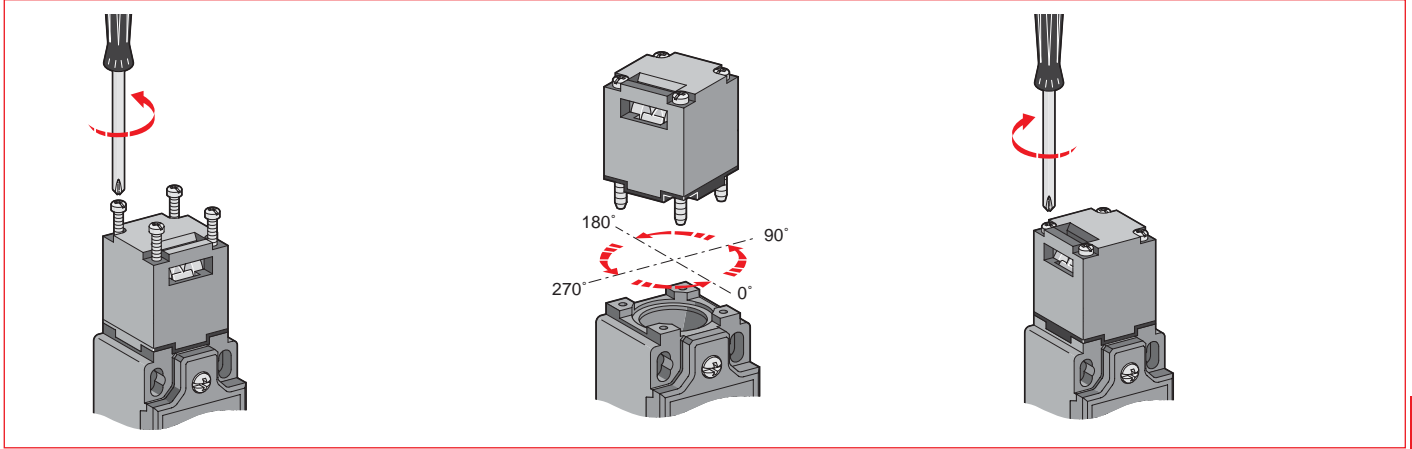
Latch key safety limit switches

Technical data

Implementation

Limit switches with small latch (key) LS30P80...-S, LS31P80...-S and LS35P80...-S

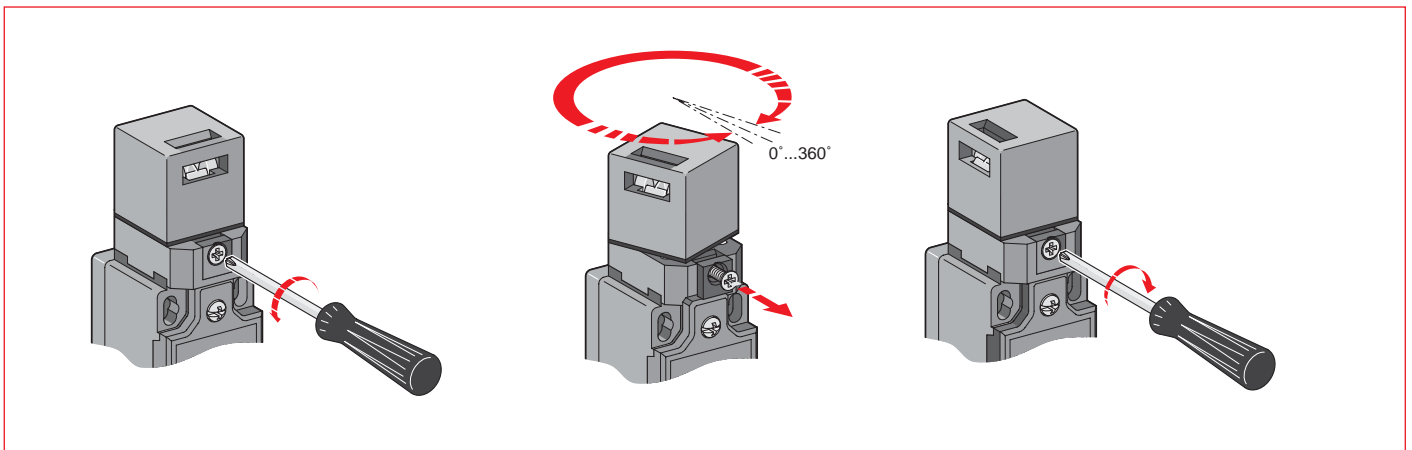
- Head adjustment every 90°.



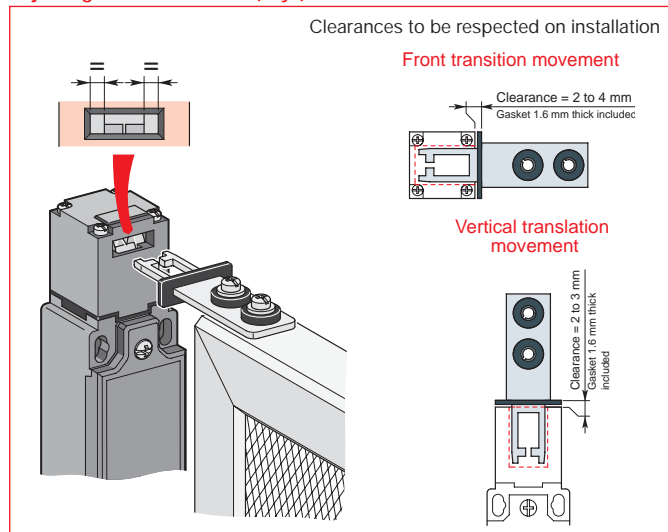
9

Limit switches with small latch (key) LS30P81...-S, LS31P81...-S and LS35P81...-S

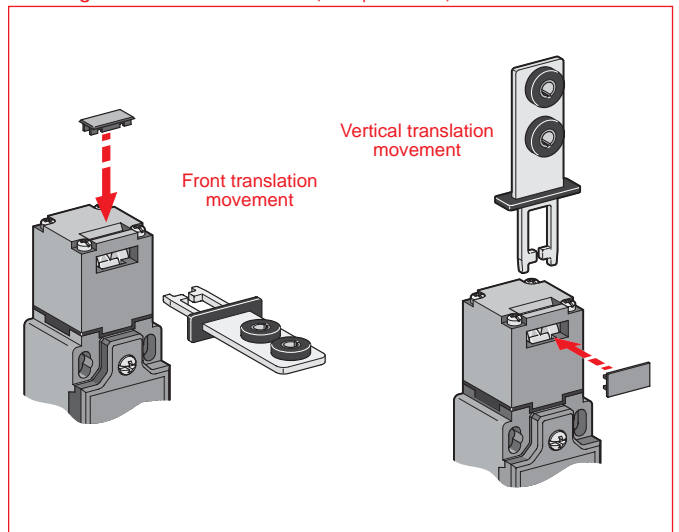
- Pivoting head continuous between 0° to 360°.



Adjusting the small latches (keys)



Blanking off the window not used (IP4x protection)





Notes



Rotative axis limit switches

Description

Safety limit switches made of fibre-glass reinforced UL-V0 thermoplastic material, with rotative axis or flush mounting right angle lever, offer double insulation and a degree of protection IP65. They are equipped with 1 N.C. + 1 N.O. or 2 N.C. contact blocks with dependent action and positive opening operation of the "N.C." contact(s).

Applications

Easy to use, the limit switches with rotative axis or lever offer specific qualities:

- Visible operation.
- Capability for strong current switching (conventional thermal current 10 A).
- Opening of the "N.C." contact(s) for a very small rotation angle: 7°.
- Contact blocks with dependent action and positive opening operation of the "N.C." normally closed contact(s) (symbol \oplus).
- Electrically separated contacts (Zb shape).

- Precision on operating positions (consistency).
- Immunity to electromagnetic disturbances.

These specific features make the limit switches ideal for monitoring and protection of light industrial machines without inertia equipped with angular movement protectors (doors, hinged grids, rotative covers or cases, etc.). Detection by the rotative axis or by means of a lever.

- Opening of the mobile protector guarantees operator protection by immediately stopping the machine drive.
- These switches are suitable for conformity of the existing installed machine base, as they can be mounted on protection devices already installed.
- Associated with other standard limit switches and safety switching devices, they produce automatic control circuits meeting standard EN 954-1.
- They comply with the requirements of European Directives (Low Voltage, Machines and Electromagnetic Compatibility) and are conform to European and international standards.

9

Casing

- 30 mm wide with standardised dimensions corresponding to EN 50047

Casing fixing

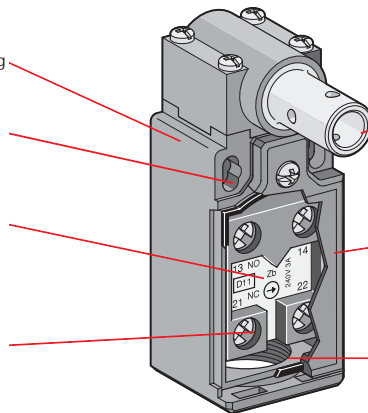
- 2 x M4 screws in the top part

Blocks of 2 contacts

- Contact configuration: 1 N.O. + 1 N.C. or 2 N.C.
- Positive opening operation \oplus
- Contact dependent action
- Zb shape: the 2 contacts are electrically separated

Connecting terminals

- M3.5 screw with (+,-) pozidriv 2 head
- Screw heads with captive cable clamps
- Marking conform to IEC 60947-1, IEC 60947-5-1, EN 50005 and EN 50013 standards



3 operating head options:

- Galvanised steel rotative axis
 - Stainless steel rotative axis
 - Galvanised steel flush mounting right angle lever
- Assembly by 4 x ϕ 3 screws with (+,-) pozidriv 1 head

Cover

- Closure by 1 x ϕ 3 screw with (+,-) pozidriv 1 head
- Gasket made in one part to prevent tightness breaks

Electrical connection in various options:

- 1 x Pg 13.5 cable gland for LS30P
- 1 x Pg 11 cable gland for LS31P
- 1 x 1/2" NPT adaptor delivered not mounted for LS35P

Catalog number explanation

Example : **LS 35 P 75 D11 S**

Limit Switch.....	LS						S.....	Safety device	
Casing width: 30 mm.....		3							
Cable inlet:									
1 cable inlet for Pg 13.5 cable gland.....							0		
1 cable inlet for Pg 11 cable gland.....							1		
1 x 1/2" NPT (adaptor) cable inlet.....							5		
Plastic casing.....			P						
Operating heads:									
Galvanised steel rotative axis.....							75		
Stainless steel rotative axis.....							76		
Galvanised steel flush mounting right angle lever.....							77		
								Contact types:	
								11.....	1 N.O. + 1 N.C. contacts
								02.....	2 N.C. contacts
									Snap action:
								B.....	Zb Snap
									Dependent (slow) action:
								L.....	Zb Slow / Simultaneous
								D.....	Zb Non-overlapping late make
								C.....	Zb Overlapping early make

Rotative axis safety limit switches 30mm

Movement to be detected

Angular Around Rotative Axis

Casing

- Plastic
- 30 mm width
- Degree of protection IP65



9

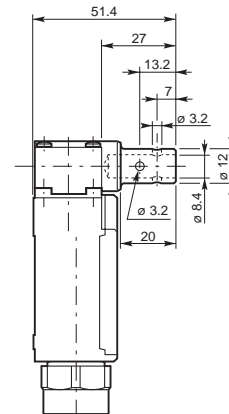
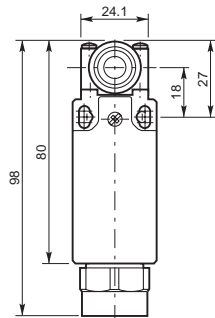
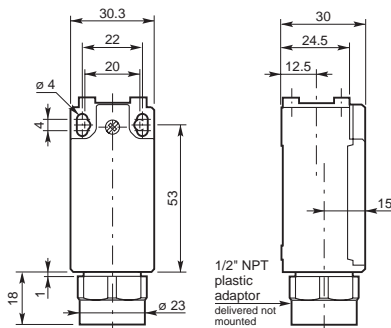
Actuator

"N.C." contact with positive opening operation \rightarrow
 Actuation speed: maximal / minimal m/s
 Min. torque: - actuation N.m
 - positive opening operation N.m

		Galvanized steel rotative axis	Stainless steel rotative axis
		0.5 / 0.01	0.5 / 0.01
		0.12	0.12
		0.60	0.60
Non-overlapping slow action contacts	Catalog number List price	LS35P75D11-S \$ 51	LS35P76D11-S \$ 57
	Operation diagram		
Overlapping slow action contacts	Catalog number List price	LS35P75C11-S 51	LS35P76C11-S \$ 57
	Operation diagram		
Simultaneous slow action contacts	Catalog number List price	LS35P75L02-S 51	LS35P76L02-S \$ 57
	Operation diagram		
Weight with 1/2" NPT adaptor (packing per unit) kg		0.097	0.097

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)



Rotative axis safety limit switches 30mm

Safety
limit switches

Movement to be detected

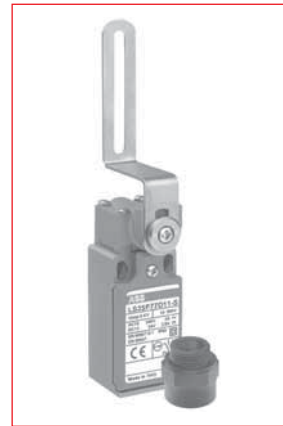
Angular with Lever

Casing

- Plastic
- 30 mm width
- Degree of protection IP65



Lever adjusted to the left
(by user)



Lever in central position
(factory assembled)



Lever adjusted to the right
(by user)

Actuator

Galvanized steel flush mounting right angle lever

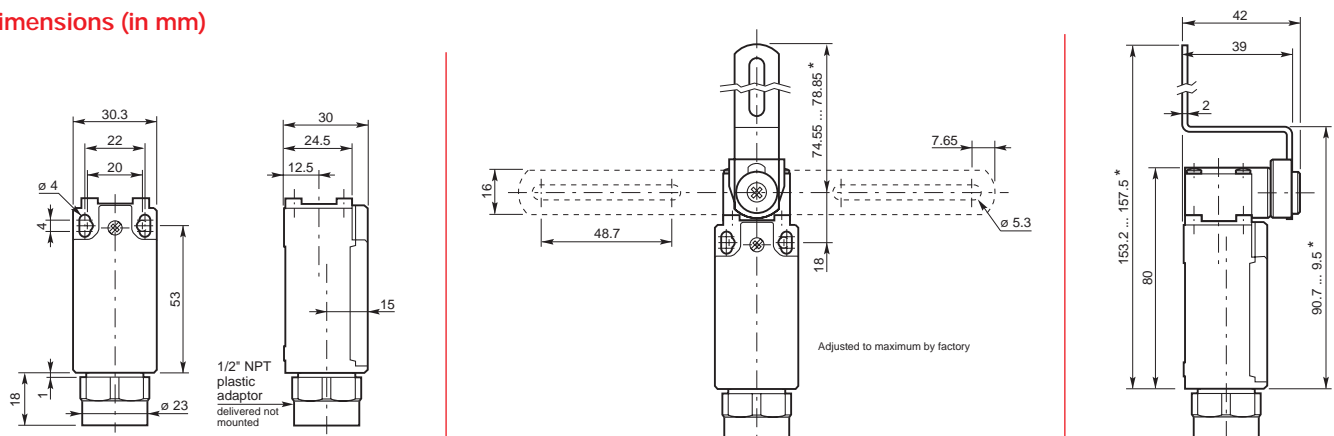
"N.C." contact with positive opening operation \rightarrow
 Actuation speed: maximal / minimal m/s
 Min. torque: - actuation N.m
 - positive opening operation N.m

\rightarrow
 0.5 / 0.01
 0.12
 0.60

	Catalog number	List price	Operation diagram
Non-overlapping slow action contacts	LS35P77D11-S	\$ 52	
Overlapping slow action contacts	LS35P77C11-S	52	
Simultaneous slow action contacts	LS35P77L02-S	52	
Weight with 1/2" NPT adaptor (packing per unit) kg		0.117	

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)





Rotative axis safety limit switches

Technical data

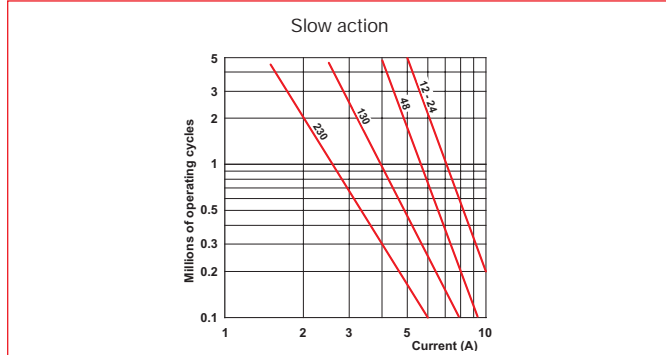
General Data

Standards	IEC 60947-1, IEC 60947-5-1, EN 60947-1, EN 60947-5-1, UL 508, and CSA C22-2 No. 14	
Certifications - Approvals	UL and CSA	
Air temperature near the device	°C	-25 ... +70
- during operation	°C	-30 ... +80
- for storage		
Climatic withstand	According to IEC 68-2-3 and salty mist according to IEC 68-2-11	
Mounting positions	All positions are authorised	
Shock withstand (according to IEC 68-2-27 and EN 60068-2-27) (1/2 sinusoidal shock for 11 ms) no change in contact position	g	Limit switch with small latch (key): 10 g Limit switch with rotative axis or lever: 40 g
Resistance to vibrations	g	5 g (10 ... 500 Hz) no change in position of contacts > 100 µs
Protection against electrical shocks (acc. to IEC 536)	Class II	
Degree of protection (according to IEC 529 and EN 60529)	UL Type 4 & IP65	
Minimum actuation speed	m/s	Slow action contacts 0.060 / Snap action contacts 0.001

9 Electrical Data

Rated insulation voltage U_i - according to IEC 60947-1 and EN 60947-1 - according to UL 508, CSA C22-2 No. 14	V	690 (degree of pollution 3) A600, Q600	
Rated impulse withstand voltage U_{imp} (according to IEC 60947-1 and EN 60947-1)	kV	6	
Conventional free air thermal current I_{th} (according to IEC 60947-5-1 and EN 60947-5-1) ($0 \leq 40 \text{ }^\circ\text{C}$)	A	10	
Short-circuit protection - gG type fuses	A	10	
Rated operational current			
I_e / AC-15 - acc. to IEC 60947-5-1			
24 V - 50/60 Hz	A	10	
130 V - 50/60 Hz	A	5.5	
230 V - 50/60 Hz	A	3.1	
240 V - 50/60 Hz	A	3	
400 V - 50/60 Hz	A	1.8	
- according to UL 508, CSA C22 No.14		A600	
I_e / DC-13 - acc. to IEC 60947-5-1			
24 V - d.c.	A	2.8	
110 V - d.c.	A	0.6	
250 V - d.c.	A	0.27	
- according to UL 508, CSA C22 No.14	Q600		
Positivity	Contacts with positive opening operation as per IEC 60947-5-1 chapter 3 and EN 60947-5-1		
Resistance between contacts	mΩ	25	
Mechanical durability	Millions of operations	> 1 million of operating cycles	
Max. switching frequency	Cycles/h	600	
Electrical durability (according to IEC 60947-5-1 appendice C)	Utilization categories AC-15 and DC-13 (see curves and values below)		
- Max. switching frequency	Cycles/h	3600	
- Load factor		0.5	

Electrical durability for AC-15 utilization category



Electrical durability for DC-13 utilization category

Slow action Power breaking for a durability of 5 million operating cycles		
Voltage	24 V	12 W
Voltage	48 V	9 W
Voltage	110 V	6 W

Rotative axis safety limit switches

Technical data

Specifications, directives, standards & EC conformity

Safety
limit switches

Definitions

The ABB limit switches listed in this catalogue are developed and manufactured according to the rules set out in IEC international publications and EN European standards. In most countries, the devices are not subject to further obligation for approval. In some countries, however, the law stipulates obligation for approval.

Specifications

• International Specifications

The International Electrotechnical Commission, IEC, which is part of the International Standards Organization, ISO, publishes IEC publications which act as a basis for the world market.

• European Specifications

The European Committee for Electrotechnical Standardization (CENELEC), grouping 18 European countries, publishes EN standards for low voltage industrial apparatus. These European standards vary very little from IEC international standards and use a similar numbering system. The same is true of national standards. Contradicting national standards are withdrawn.

• Harmonized European Specifications

The European Committees for Standardization (CEN and CENELEC), grouping 18 European countries, publish EN standards relating to safety of machinery.

• Specifications in Canada and the USA

These are equivalent, but differ markedly from IEC, UTE, VDE and BS specifications.

UL Underwriters Laboratories (USA)

CSA Canadian Standards Association (Canada)

Remark concerning the label issued by the UL (USA). Two levels of acceptance between devices must be distinguished:

"Recognized"

Authorized to be included in equipment, if the equipment in question has been entirely mounted and wired by qualified personnel. They are not valid for use as "General purpose products" as their possibilities are limited.

They bear the mark: **LR**

"Listed"

Authorized to be included in equipment and for separate sale as "General purpose products" components in the USA.

They bear the mark: 

European Directives

The guarantee of free movement of goods within the European Community assumes elimination of any regulatory differences between the member states. European Directives set up common rules that are included in the legislation of each state while contradictory regulations are cancelled.

There are three main directives:

• **Low Voltage Directive 73/23/EEC**, amended by Directive 93/68/EEC concerning electrical equipment from 50 to 1000 V a.c. and from 75 to 1500 VDC. This specifies that compliance with the requirements that it sets out is acquired once the equipment conforms to the standards harmonized at European level: EN 60947-1 and EN 60947-5-1 for limit switches.

• **Machines Directives - 89/392/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC** - defining main safety and health requirements concerning design and manufacture of the machines and other equipment including safety components in European Union countries.

• **Electromagnetic Compatibility Directive 89/336/EEC**, amended by Directive 92/31/EEC and Directive 93/68/EEC concerning all electrical devices likely to create electromagnetic disturbances.

Signification of CE marking:

CE marking must not be confused with a quality label.

CE marking placed on a product is proof of conformity with the European Directives concerning the product.

CE marking is part of an administrative procedure and guarantees free movement of the product within the European Community.

Standards

• International standards

IEC 60947-1 Low-voltage switchgear and controlgear – Part 1: General Rules (NFC 63-001).

IEC 60947-5-1 Low-voltage switchgear and controlgear – Part 5: Control circuit devices and switching elements – Section 1: Electromechanical control circuit devices (NFC 63-146) – Chapter 3: Special requirements for control switches with positive opening operation.

IEC 60204-1 Electrical equipment of industrial machines – Part 1: General requirements (= NFC 79-130).

IEC 60204-2 Electrical equipment of industrial machines – Part 2: Item designation and examples of drawings, diagrams, tables and instructions (Appendices D and E of Publications

IEC 60204-1).

• European Standards

EN 50005 Low-voltage switchgear and controlgear for industrial use – Terminal marking and distinctive number: General rules (NFC 63-030).

EN 50013 Low-voltage switchgear and controlgear for industrial use – Terminal marking and distinctive number for particular control switches (NFC 63-033).

EN 50041 Low-voltage switchgear and controlgear for industrial use – Control switches – Position switches 42.5 x 80 – Dimensions and characteristics.

EN 50047 Low-voltage switchgear and controlgear for industrial use – Control switches – Position switches 30 x 55 – Dimensions and characteristics.

EN 60947-1 Low-voltage switchgear and controlgear for industrial use – Part 1: General rules (NFC 63-001).

EN 60947-5-1 Low-voltage switchgear and controlgear for industrial use – Part 5: Control circuit devices and switching elements – Section 1: Electromechanical control circuit devices (NFC 63-146) – Chapter 3: Special requirements for control switches with positive opening operation.

• Harmonized European Standards

These standards are common to all European Union and EFTA (European Free Trade Association) countries. They were prepared (prEN project) and written (EN final text) by the European standardization committees CEN or CENELEC.

Harmonized European standards were drawn up to allow definition of the rules and technical means to be used to satisfy the main safety requirements on machines and thus guarantee conformity with the Machines Directive.

Compliance with a harmonized European standard is presumption of conformity with the relevant Directive.

European standards relating to machine safety are divided into groups (A, B and C types).

Type A standards: basic standards: setting out design principles and the general aspects valid for all machine types.

EN 292-1 Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology.

EN 292-2 and Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles and specifications.

EN 292-2/A1

EN 1050 Safety of machinery – Principles for risk assessment.

Type B standards: group standards:

B1: dealing with specific safety aspects.

EN 60204-1 Safety of machinery – Electrical equipment of machines – Part 1: General requirements.

EN 954-1 Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design.

B2: dealing with components and devices determining safety.

EN 1088 Safety of machinery – Interlocking devices associated with guards – Principles for design and selection.

Type C standards: specific standards or standards per machine family giving detailed safety specifications applicable to a machine or to a group of machines.

EN 81-1 Safety rules for the construction and installations of lifts – Part 1: Electric lifts.

Content of the "EC" Declaration of Conformity for Safety Components

The "EC" Declaration of Conformity is intended to certify that the safety component complies with the main safety and health requirements of Machines Directive 89/392/EEC.

It must contain the following information:

– the name and address of the manufacturer or his representative established in the European Community,

– the description of the safety component (brand, type, serial number, etc.),

– the safety function performed by the safety component if this is not obvious from the description,

– when needed, the name and address of the notified organisation and the number of the type "CE" certificate,

– when needed, the name and address of the notified organisation to which the file has been sent as per article 8, paragraph 2, point c), first hyphen,

– when needed, the name and address of the notified organisation who performed the check referred to in article 8, paragraph 2, point c), second hyphen,

– when needed, the reference to the harmonized standards,

– when needed, the national technical standards and specifications used,

– identification of the signatory authorized to hire the manufacturer or his representative established in the European Community.

Rotative axis safety limit switches

Technical data

Risk assessment & determination of control system categories

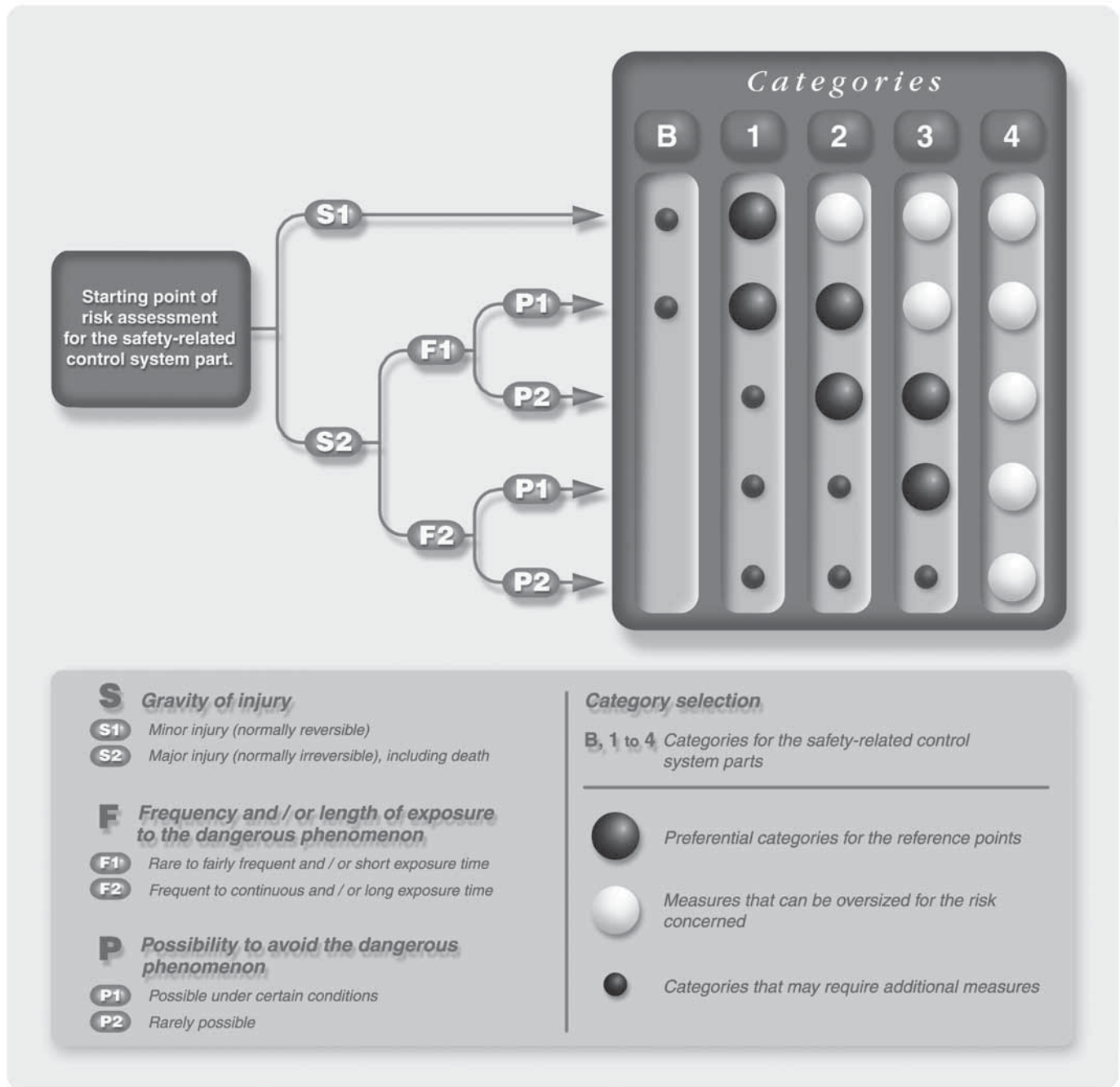
Classification of a machine into categories to EN 954-1

Pursuant to the Machinery Directive 89/392/EEC, every machine must comply with the relevant Directives and standards. Measures must be taken to keep the risk to persons below a tolerable extent.

In the first step, the project planner performs a risk evaluation to EN 1050 "Risk Assessment". This must take into consideration the machine's ambient conditions for instance. Any overall risk must then be assessed. This risk assessment must be conducted in such a form as to allow documentation of the procedure and the result

achieved. The risk, dangers and possible technical measures to reduce risks and dangers must be stipulated in this risk assessment. After stipulating the extent on the risk, the category on the basis of which the safety circuits are to be designed is determined with the aid of EN 954-1 "Safety-Related Components of Controls". This determined category defines the technical requirements applicable to the design of the safety equipment. There are five categories (B, 1, 2, 3 and 4) whereby B (standing for basic category) defines the lowest risk and, thus, also the minimum requirements applicable to the controller.

9



Rotative axis safety limit switches

Technical data

Control system categories as per EN 954-1



The main aim of all machine designers is to guarantee that the faults on safety-related control system parts or external disturbances cannot result in a dangerous situation or a dangerous event on the machine.

The summarising table below determines the category of the safety-related control system parts.

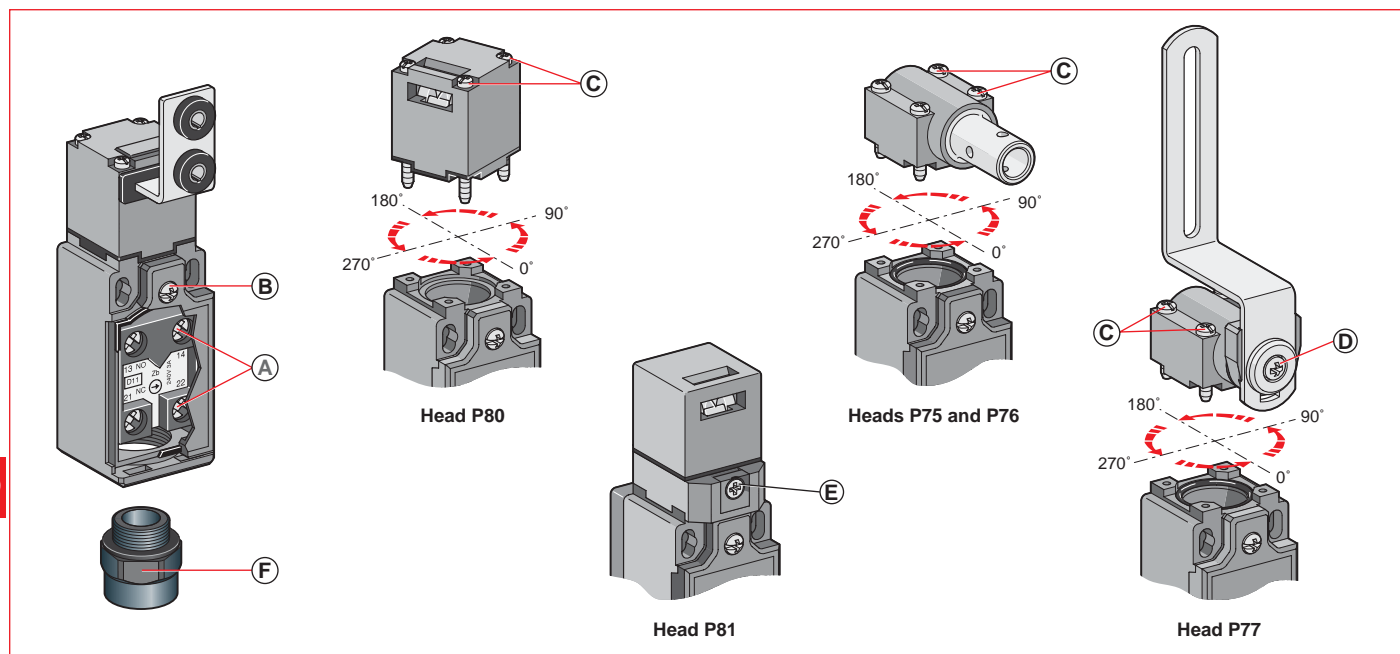
Categories	Summary of control system requirements	Control system behavior	Main principle for ensuring safety
B	The parts of the safety-related control system and / or its devices must be designed, manufactured, selected, mounted and combined according to proper procedures so as to withstand expected influences.	If a fault occurs, it may lead to possible loss of the safety function.	By selection of components conforming to relevant standards.
1	The requirements formulated in category B are combined with use of tried and tested safety components and principles.	– Occurrence of a fault may lead to possible loss of the safety function, but this is less probable than in category B.	By choice and use of safety components and principles.
2	The requirements formulated in category B and use of tried and tested safety principles apply. The safety function(s) must be tested regularly by the machine control system. Test frequency must be adapted to the machine and to its application.	– Occurrence of a fault may lead to possible loss of the safety function between the periodic test intervals. – Loss of the safety function is detected at each test.	By improvement of safety circuit structure.
3	The requirements formulated in category B and use of tried and tested safety principles apply. The control system must be designed so that: a) a single fault in the control does not lead to loss of the safety function and... (see paragraph b). b) if this is reasonably feasible, the single fault must be detected by appropriate technical means.	– When a single fault occurs, the safety function is always guaranteed. – Some faults will be detected, but not all. – Accumulation of undetected faults may lead to loss of the safety function.	By improvement of safety circuit structure.
4	The requirements formulated in category B and use of tried and tested safety principles must be applied. The control system must be designed so that: a) a single fault in the control does not lead to loss of the safety function and... (see paragraph b). b) if possible the single fault must be detected as soon as or before the next tripping of the safety function or... (see paragraph c). c) if this was not possible, an accumulation of faults must not lead to loss of the safety function.	– When faults occur, the safety function is always guaranteed. – The faults will be detected in time to prevent loss of the safety function.	By improvement of safety circuit structure.

Important: The safety categories apply to the entire control system and not to the individually considered safety components.

Rotative axis safety limit switches

Technical data

Tightening torques



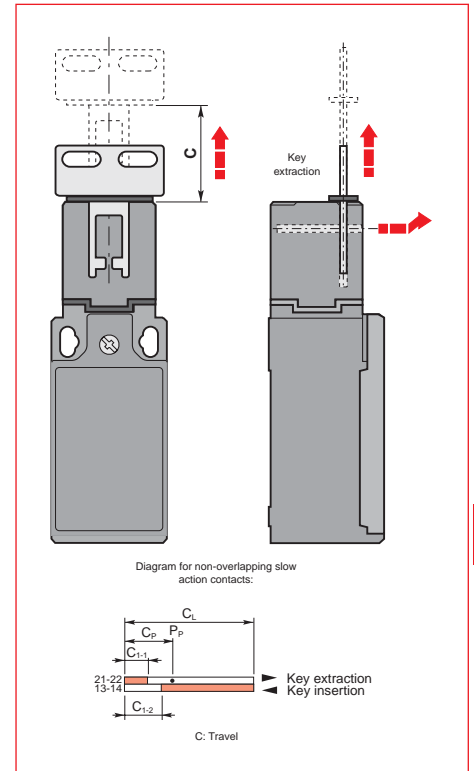
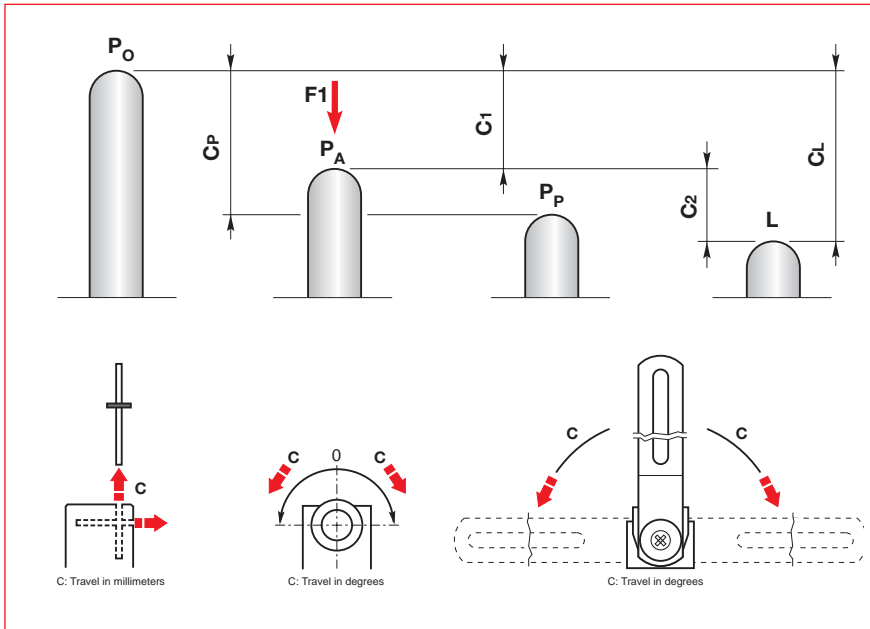
	A		B		C		D		E		F	
	Contact block connecting terminals		Closing the cover		Assembling the operating head		Assembling the flush mounting right angle lever		Adjusting the pivoting head		Cable inlet by 1/2" NPT adaptor	
Screws	M3.5 ± pozidriv 2		ø3 ± pozidriv 1		ø3 ± pozidriv 1		M3.5 pozidriv 2		M3 Philips No. 1		-	
Tightening torque	Recommended	Max.	Recommended	Max.	Recommended	Max.	Recommended	Max.	Recommended	Max.	Recommended	Max.
	N.m / lb.in	N.m	N.m / lb.in	N.m	N.m / lb.in	N.m	N.m / lb.in	N.m	N.m / lb.in	N.m	N.m / lb.in	N.m
Limit switches												
LS35P80...-S	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	-	-	17 / 150	18
LS35P81...-S	0.8 / 7	0.9	0.5 / 4.3	0.8	-	-	-	-	0.3 / 2.63	0.5	17 / 150	18
LS35P75...-S	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	-	-	17 / 150	18
LS35P76...-S	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	-	-	17 / 150	18
LS35P77...-S	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	17 / 150	18

Connecting data of contact blocks

Connecting terminals	M3.5 (+,-) pozidriv 2 screw with cable clamp	
Connecting capacity	1 or 2 x mm ² / AWG	0.5 mm ² / AWG 20 to 2.5 mm ² / AWG 14
Terminal marking	According to EN 50013	

Rotative axis safety limit switches

Technical data



P_0 Free position:
position of the switch actuator when no external force is exerted on it.

P_A Operating position:
position of the switch actuator, under the effect of force F_1 , when the contacts leave their initial free position.

P_P Positive opening position:
position of the switch actuator from which positive opening is ensured.

L Max. travel position:
maximum acceptable travel position of the switch actuator under the effect of a force F_1 .

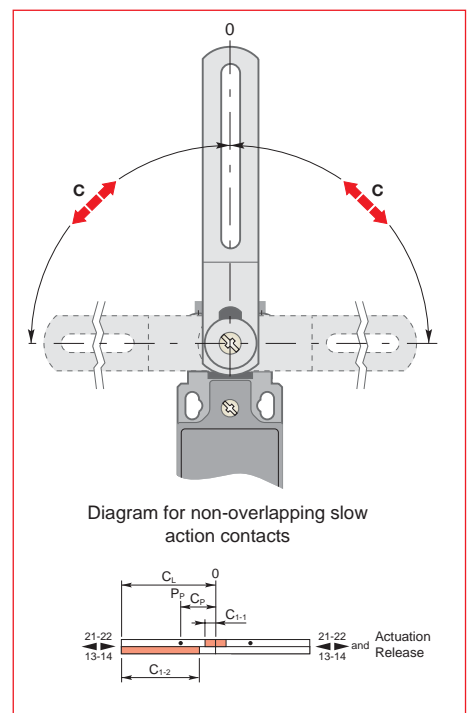
C_1 Pre-travel (average travel):
distance between the free position P_0 and the operating position P_A .

C_p Positive opening travel:
minimum travel of the switch actuator, from the free position, to ensure positive opening operation of the normally closed contact (N.C.).

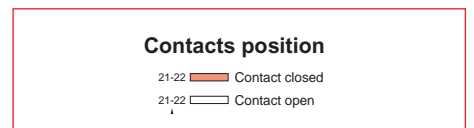
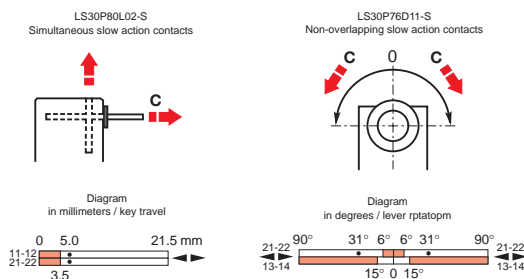
C_2 Over-travel (average travel):
distance between the operating position P_A and the max. travel position L .

C_L Max. travel (maximum travel):
distance between the free position P_0 and the max. travel position L .

Note: C_{1-1} = pre-travel of contact 21-22,
 C_{1-2} = pre-travel of contact 13-14.



Examples:



Rotative axis safety limit switches

Technical data

Terminology

Double Insulation

Class II materials, according to IEC 536, are designed with double insulation. This measure consists in doubling the functional insulation with an additional layer of insulation so as to eliminate the risk of electric shock and thus not having to protect elsewhere. No conductive part of "double insulated" material should be connected to a protective conductor.

Positive Opening Operation

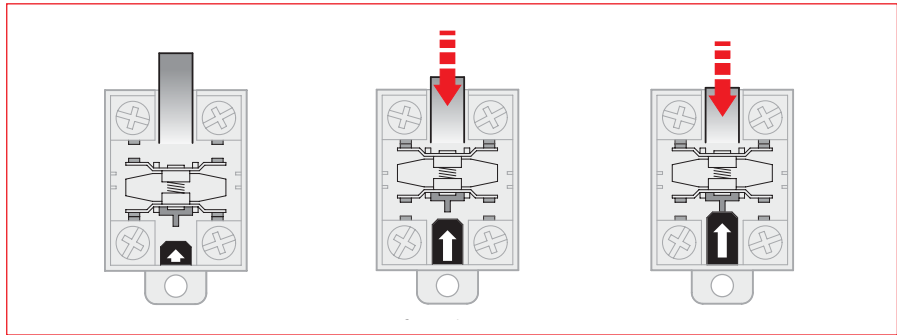
A control switch, with one or more break-contact elements, has a positive opening operation when the switch actuator ensures full contact opening of the break-contact. For the part of travel that separates the contacts, there must be a positive drive, with no resilient member (e.g. springs), between the moving contacts and the point of the actuator to which the actuating force is applied.

Control switches with positive opening operation may be provided with either snap action or slow action contact elements. To use several contacts on the same control switch with positive opening operation, they must be electrically separated from each other, if not, only one may be used.

Every control switch with positive opening operation must be indelibly marked on the outside with the symbol:

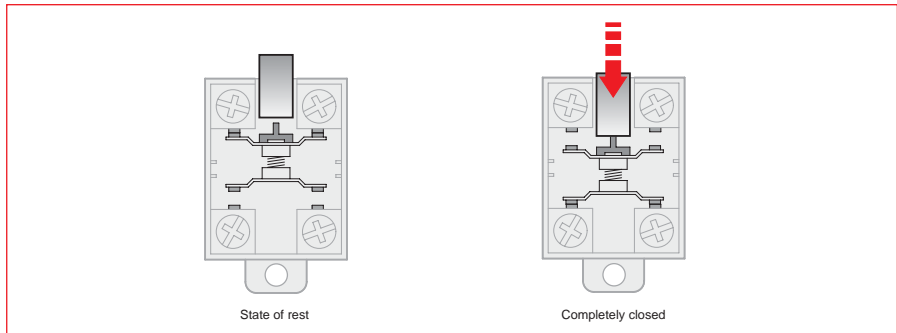
Snap Action

Snap action contacts are characterised by a release position that is distinct from the operating position (differential travel). Snap breaking of moving contacts is independent of the switch actuator's speed and contributes to regular electric performance even for slow switch actuator speeds.

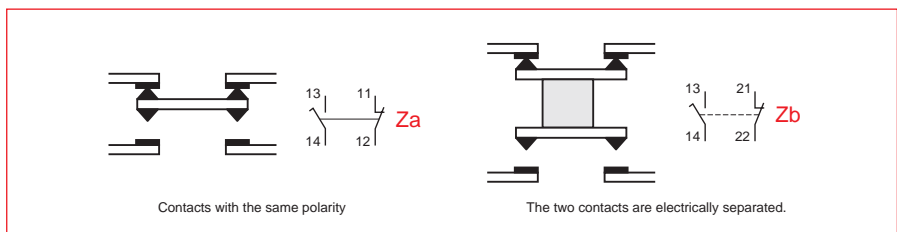


Slow Action

Slow action contacts are characterised by a release position that is the same as the operating position. The switch actuator's speed directly conditions the travel speed of contacts.



Contact shape according to IEC 60947-5-1. Change-over contact elements with 4 terminals must be indelibly marked Za or Zb. See figure opposite for contact representation.



Utilization category

AC-15: switching of electromagnetic loads of electromagnets using an alternating current (>72 VA).

DC-13: switching of electromagnets using a direct current.

Minimum actuation force / torque

The minimum amount of force/torque that is to be applied to the switch actuator to produce a change in contact position.

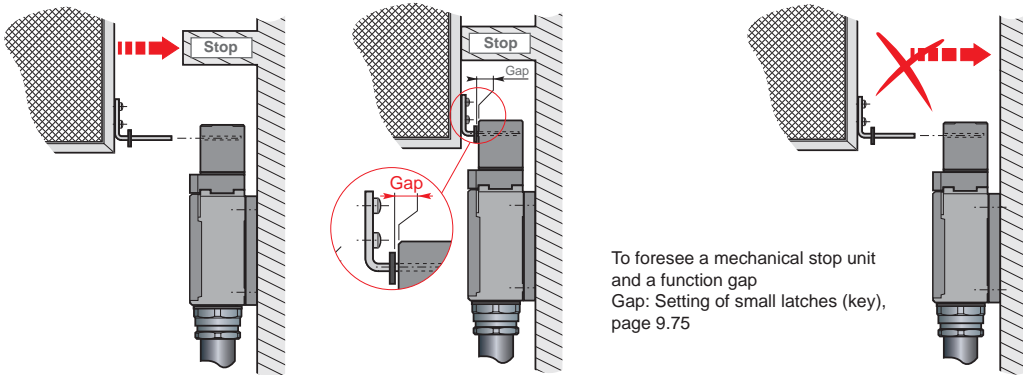
Minimum force / torque to achieve positive opening operation

The minimum amount of force/torque that is to be applied to the switch actuator to ensure positive opening operation of the N.C. contact.

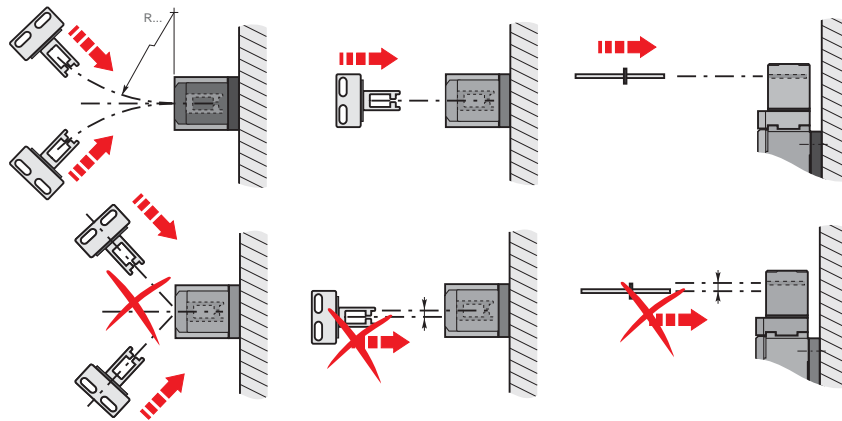
Rotative axis safety limit switches

Technical data

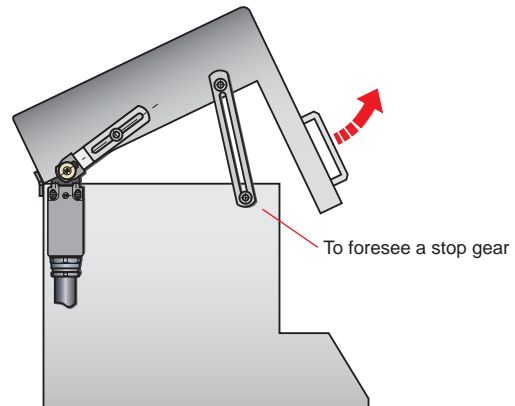
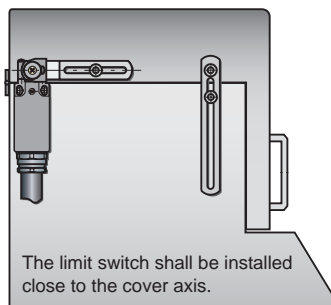
Utilization cautions



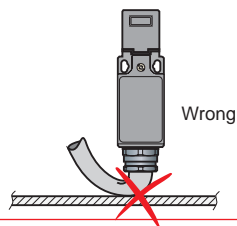
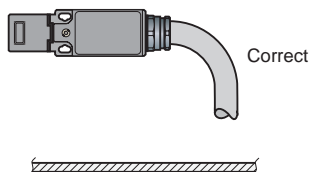
The small latch (key) shall be presented in the axis of the control head.



9



Curve of connecting cable



Cable gland orientation



Rotative axis safety limit switches

Technical data

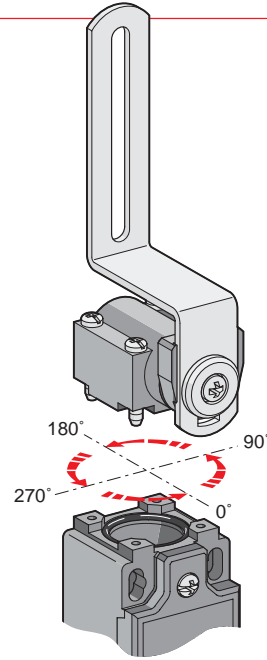
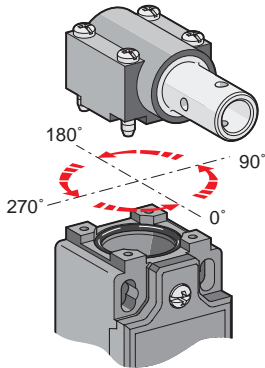
Implementation

Limit switches with rotative axis
LS35P75...-S, LS35P76...-S

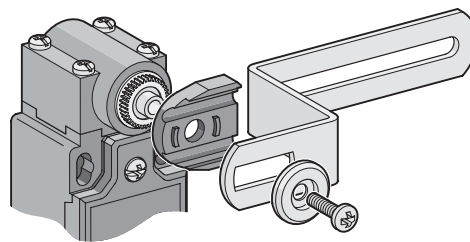
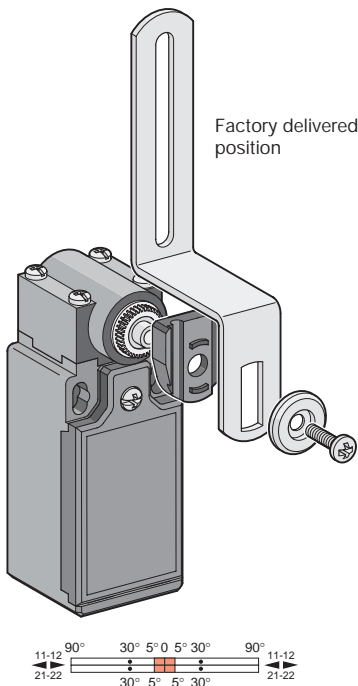
- Head adjustment every 90°

Limit switches with flush mounting right angle lever
LS35P77...-S

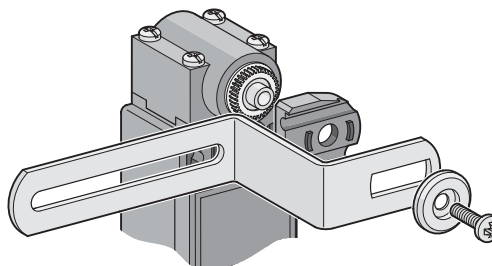
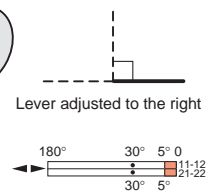
- Head adjustment every 90°



Each lever adjustment has a specific operation diagram.
(In these examples, the diagrams correspond to an L02 contact block.)



Lever adjustment by the user





Latch & manual reset Safety limit switches

Description

Limit switches with latch and manual reset are equipped with operating heads with plunger, roller plunger or roller lever, used to detect rectilinear or angular movements. Made of fibre-glass reinforced UL-V0 thermoplastic material, they offer double insulation and a degree of protection IP65. Limit switches with latch and manual reset are equipped with 1 N.C. + 1 N.O. or 2 N.C. contact blocks with positive opening operation of the "N.C." contact(s). After actuating the control device and overshooting the latching point, the N.C. safety contact(s) remain in the open position. Return to the initial operating state takes place by voluntary action on the reset button.

Applications

Easy to use, the limit switches for safety applications with latch and manual reset offer specific qualities:

- Visible operation (fault memorisation).
- Capability for strong current switching (conventional thermal current 10 A).

- Contact blocks with positive opening operation of the "N.C." normally closed contact(s) (symbol \ominus).
- Electrically separated contacts (Zb shape).
- Precision on operating positions (consistency).
- Immunity to electromagnetic disturbances.

These specific features make the limit switches ideal for detection and monitoring of faults in hoisting machines, electric lifts, freight elevators, escalators, conveyor belts, etc.

Limit switches with latch and manual reset comply with the requirements of standard EN 81-1: safety rules for the construction and installations of electric lifts. In this application they detect or monitor: cabin overtravel, cabin speed by means of a speed limiting device, energisation of the parachute block on detection of excessive speed with respect to the set-point value, etc.

They comply with the requirements of European Directives (Low Voltage, Machines and Electromagnetic Compatibility) and are conform to European and international standards.

Casing

- 30 mm wide with standardized dimensions corresponding to EN 50047

Casing fixing

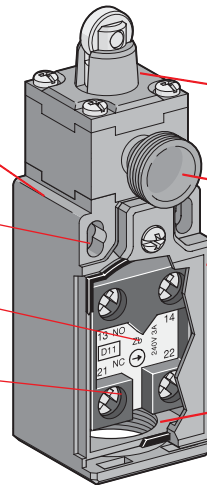
- 2 M4 screws in the top part

Blocks of 2 contacts

- Contact configuration: 1 N.O. + 1 N.C. or 2 N.C.
- Positive opening operation \ominus
- Snap or dependent action
- Zb shape: the 2 contacts are electrically separated

Connecting terminals

- M3.5 screw with (+,-) pozidriv 2 head
- Screw heads with captive cable clamps
- Marking conform to IEC 60947-1, IEC 60947-5-1, EN 50005 and EN 50013 standards



4 operating head options:

- Plain plunger
- Roller plunger
- Roller lever on plunger
- Rotative roller lever

Assembly by 4 x \varnothing 3 screws with (+,-) pozidriv 1 head

Blue manual reset button

Cover

- Closure by 1x \varnothing 3 screw with (+,-) pozidriv 1 head
- Gasket made in one part to prevent tightness breaks

Electrical connection in various options:

- 1 x Pg 13.5 cable gland for LS30P
- 1 x Pg 11 cable gland for LS31P
- 1 x 1/2" NPT adaptor delivered not mounted for LS35P

Catalog number explanation

Example: **LS 35 P 13 D11 R**

Limit Switch.....LS RReset Device

Casing width: 30 mm.....3

Cable inlet:

1 cable inlet for Pg 13.5 cable gland.....0
 1 cable inlet for Pg 11 cable gland1
 1 x 1/2" NPT (adaptor) cable inlet5

Plastic casing.....P

Operating heads:

Galvanised steel plain plunger..... 11 Plastic roller lever on plunger (hori. act.).....31
 Galvanised steel roller plunger 12 Plastic roller lever on plunger (ver. act.).....32
 Plastic roller plunger 13 Rotative lever with plastic roller.....41

Contact types:

11 1 N.O. + 1 N.C. contacts
 02 2 N.C. contacts

Snap action:

BZb Snap

Dependent (slow) action:

LZb Slow / Simultaneous
 DZb Non-overlapping late make
 CZb Overlapping early make

Latch & manual reset 30mm

Movement to be detected

On End

On End or 30° Cam Translation



Casing

- Plastic
- 30 mm width
- Degree of protection IP65

Actuator

9

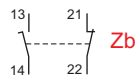
"N.C." contact with positive opening operation
 Maximum actuation speed m/s
 Min. force: - actuation N
 - positive opening operation N

Galvanized steel
plain plunger

Galvanized steel
roller plunger

Plastic
roller plunger

Non-overlapping
slow action contacts



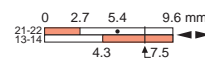
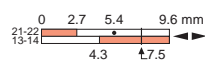
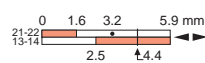
Catalog number
List price

LS35P11D11-R
\$ 39

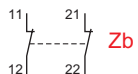
LS35P12D11-R
\$ 43

LS35P13D11-R
\$ 41

Operation
diagram



Simultaneous
slow action contacts



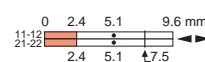
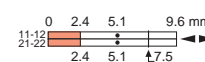
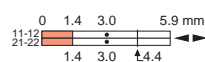
Catalog number
List price

LS35P11L02-R
39

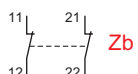
LS35P12L02-R
43

LS35P13L02-R
41

Operation
diagram



Snap action
contacts



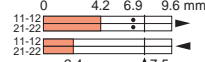
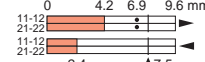
Catalog number
List price

LS35P11B02-R
39

LS35P12B02-R
43

LS35P13B02-R
41

Operation
diagram



Weight (packing per unit)

kg

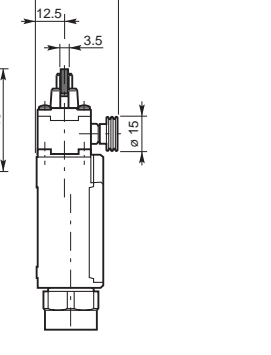
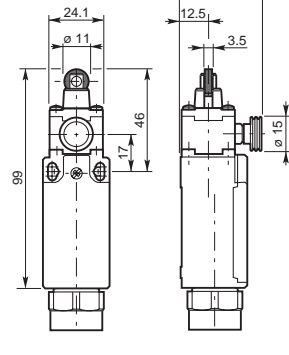
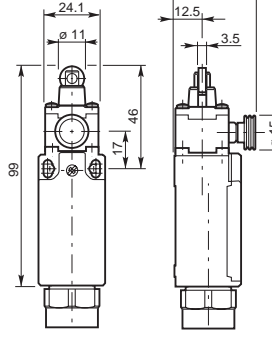
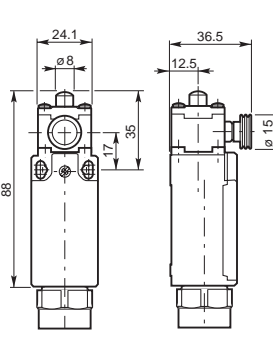
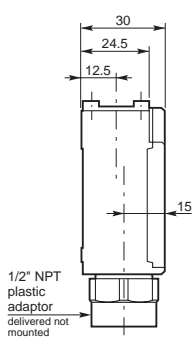
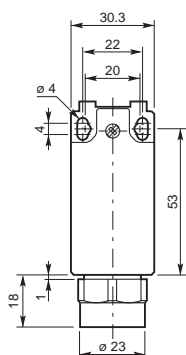
0.097

0.102

0.097

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)



Latch & manual reset 30mm

Safety
limit switches

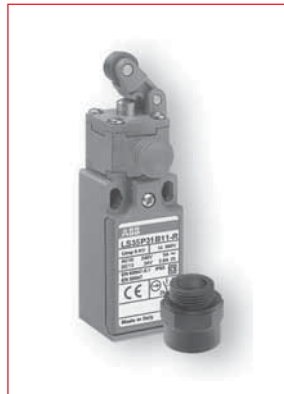
Movement to be detected

30° Unidirectional Cam Translation Movement

30° Cam Translation

Casing

- Plastic
- 30 mm width
- Degree of protection IP65



Actuator

Plastic roller lever
on galvanized steel plunger

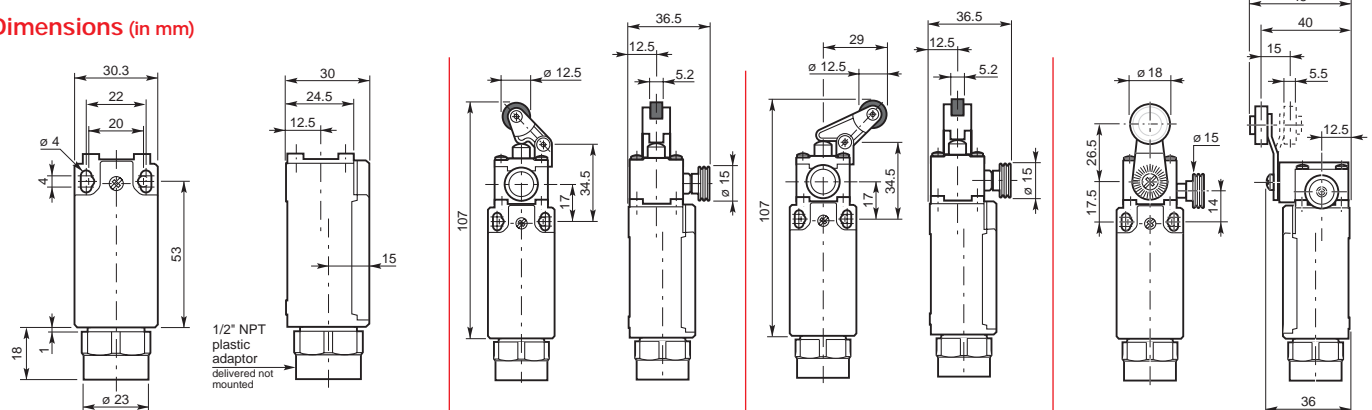
Plastic roller lever
on galvanized steel plunger

Rotary lever
with plastic roller

"N.C." contact with positive opening operation				
Maximum actuation speed m/s		1	1	1.5
Min. force / torque:				
- actuation		7 N	3 N	0.10 N.m
- positive opening operation		24 N	24 N	0.32 N.m
Non-overlapping slow action contacts	Catalog number List price	LS35P31D11-R \$ 43	LS35P32D11-R \$ 43	LS35P41D11-R \$ 43
	Operation diagram			
Simultaneous slow action contacts	Catalog number List price	LS35P31L02-R 43	LS35P32L02-R 43	LS35P41L02-R 43
	Operation diagram			
Snap action contacts	Catalog number List price	LS35P31B02-R 43	LS35P32B02-R 43	LS35P41B02-R 43
	Operation diagram			
Weight with 1/2" NPT adaptor (packing per unit)	kg	0.102	0.102	0.102

Accessories, special contact arrangement or particular function: please consult us.

Dimensions (in mm)





Latch & manual reset

Technical data

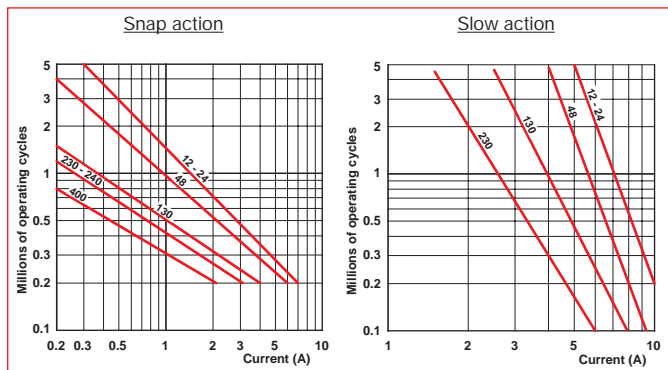
General Data

Standards	IEC 60947-1, IEC 60947-5-1, EN 60947-1, EN 60947-5-1, UL 508, CSA C22-2 No.14	
Certifications - Approvals	UL and CSA	
Air temperature near the device	°C	-25 ... +70
– during operation	°C	-30 ... +80
– for storage		
Climatic withstand	According to IEC 68-2-3 and salty mist according to IEC 68-2-11	
Mounting positions	All positions are authorised	
Shock withstand (according to IEC 68-2-27 and EN 60068-2-27)	g	50 g (1/2 sinusoidal shock for 11 ms) no change in contact position
Resistance to vibrations (acc. to IEC 68-2-6 and EN 60068-2-6)	g	25 g (10 ... 500 Hz) no change in position of contacts > 100 µs
Protection against electrical shocks (acc. to IEC 536)		Class II
Degree of protection (according to IEC 529 et EN 60529)		IP65
Consistency		0.1 mm upon closing points
Minimum actuation speed	m/s	Slow action contacts 0.060 / Snap action contacts 0.001

Electrical Data

Rated insulation voltage U_i	V	690 (degree of pollution 3) A600, Q600	
– according to IEC 60947-1 and EN 60947-1			
– according to UL 508, CSA C22-2 No.14			
Rated impulse withstand voltage U_{imp} (according to IEC 60947-1 and EN 60947-1)	kV	6	
Conventional free air thermal current I_{th} (according to IEC 60947-5-1 and EN 60947-5-1) ($\varnothing \leq 40$ °C)	A	10	
Short-circuit protection gG type fuses	A	10	
Rated operational current			
I_e / AC-15 – acc. to IEC 60947-5-1			
24 V - 50/60 Hz	A	10	
130 V - 50/60 Hz	A	5.5	
230 V - 50/60 Hz	A	3.1	
240 V - 50/60 Hz	A	3	
400 V - 50/60 Hz	A	1.8	
– according to UL 508, CSA C22 No.14		A600	
I_e / DC-13 – according to IEC 60947-5-1			
24 V - d.c.	A	2.8	
110 V - d.c.	A	0.6	
250 V - d.c.	A	0.27	
– according to UL 508, CSA C22 No.14	Q600		
Positivity		Contacts with positive opening operation as per IEC 60947-5-1 chapter 3 and EN 60947-5-1	
Resistance between contacts	mΩ	25	
Mechanical durability	Millions of operations	> 1 million of operating cycles	
Max. switching frequency	Cycles/h	600	
Electrical durability (according to IEC 60947-5-1 appendice C)		Utilization categories AC-15 and DC-13 (see curves and values below)	
– Max. switching frequency	Cycles/h	3600	
– Load factor		0.5	

Electrical durability for AC-15 utilization category



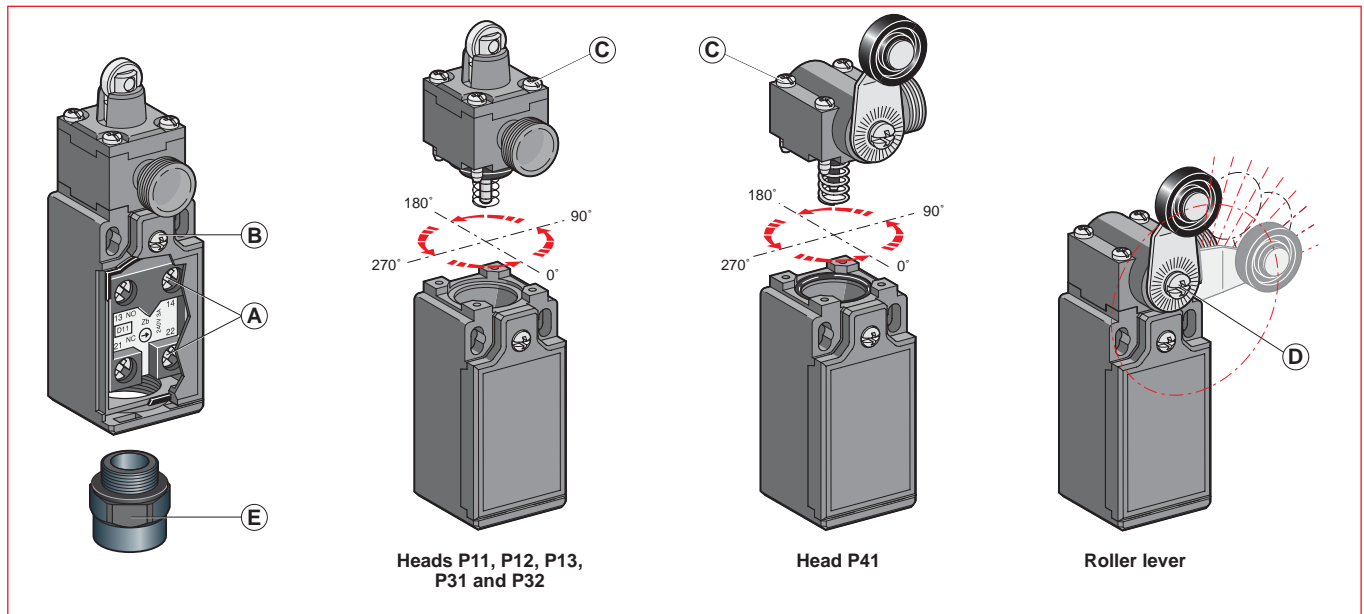
Electrical durability for DC-13 utilization category

	Snap action	Slow action	
Power breaking for a durability of 5 million operating cycles			
Voltage	24 V	9.5 W	12 W
Voltage	48 V	6.8 W	9 W
Voltage	110 V	3.6 W	6 W

Latch & manual reset

Technical data

Tightening Torques



	A		B		C		D		E	
	Contact block connecting terminals		Closing the cover		Assembling the operating head		Assembling or adjusting the lever with plastic roller		Cable inlet by 1/2" NPT adaptor	
Screws	M3.5 ± pozidriv 2		ø3 ± pozidriv 1		ø3 ± pozidriv 1		ø4 ± Philips No. 2		-	
Tightening torque	Recommended N.m / lb.in	Max. N.m	Recommended N.m / lb.in	Max. N.m	Recommended N.m / lb.in	Max. N.m	Recommended N.m / lb.in	Max. N.m	Recommended N.m / lb.in	Max. N.m
Limit switches										
LS35P11...-R	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	17 / 150	18
LS35P12...-R	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	17 / 150	18
LS35P13...-R	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	17 / 150	18
LS35P31...-R	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	17 / 150	18
LS35P32...-R	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	-	-	17 / 150	18
LS35P41...-R	0.8 / 7	0.9	0.5 / 4.3	0.8	0.5 / 4.3	0.8	0.5 / 4.3	0.8	17 / 150	18

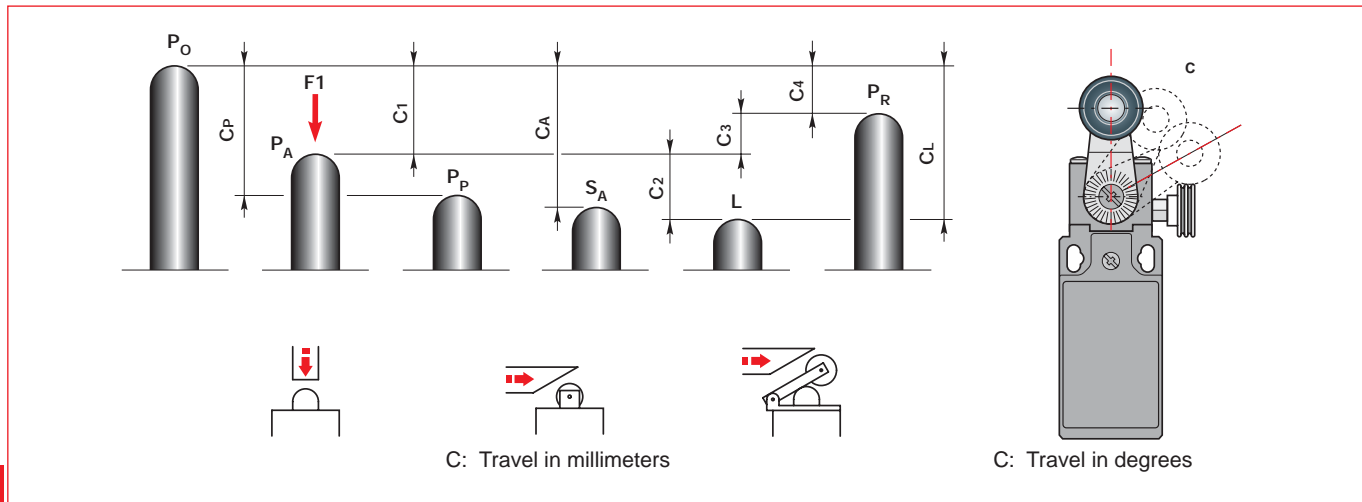
Connecting data of contact blocks

Connecting terminals	M3.5 (+,-) pozidriv 2 screw with cable clamp	
Connecting capacity	1 or 2 x mm ² / AWG	0.5 mm ² / AWG 20 to 2.5 mm ² / AWG 14
Terminal marking	According to EN 50013	

Latch & manual reset

Technical data

Travel and operation diagrams



P_o Free position:

position of the switch actuator when no external force is exerted on it.

P_A Operating position:

position of the switch actuator, under the effect of force F1, when the contacts leave their initial free position.

P_p Positive opening position:

position of the switch actuator from which positive opening is ensured.

S_A Latching point:

point of no return of the switch actuator beyond which the opened status of the (N.C.) contact(s) is maintained. Unlocking will only occur after deliberate action on the reset button.

L Max. travel position:

maximum acceptable travel position of the switch actuator under the effect of a force F1.

P_R Release position:

position of the switch actuator when the contacts return to their initial free position.

C₁ Pre-travel (average travel):

distance between the free position P_o and the operating position P_A.

C_p Positive opening travel:

minimum travel of the switch actuator, from the free position, to ensure positive opening operation of the normally closed contact (N.C.).

C_A Latching travel (average travel):

distance between the free position P_o and the latching point S_A.

C₂ Over-travel (average travel):

distance between the operating position P_A and the max. travel position L.

C_L Max. travel (maximum travel):

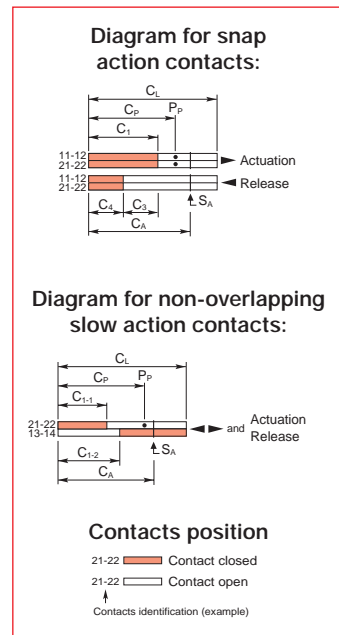
distance between the free position P_o and the max. travel position L.

C₃ Differential travel (C₁-C_p) (average travel):

travel difference of the switch actuator between the operating position P_A and the release position P_R.

C₄ Release travel (average travel):

distance between the release position P_R and the free position P_o.



Note: for slow action contacts, C₃ = 0, C₁₋₁ = pre-travel of contact 21-22, C₁₋₂ = pre-travel of contact 13-14.

Examples:

LS30P13D11-R
non-overlapping slow action contacts

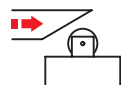
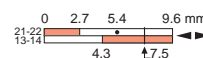


Diagram in millimetres / cam travel



LS30P41L02-R
simultaneous slow action contacts

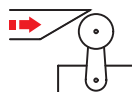
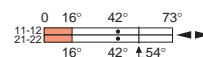


Diagram in degrees / lever rotation



LS30P11B02-R
snap action contacts

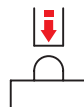
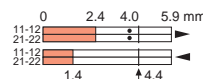


Diagram in millimetres / plunger travel



Latch & manual reset

Technical data

Terminology



Double Insulation

Class II materials, according to IEC 536, are designed with double insulation. This measure consists in doubling the functional insulation with an additional layer of insulation so as to eliminate the risk of electric shock and thus not having to protect elsewhere. No conductive part of "double insulated" material should be connected to a protective conductor.

Positive Opening Operation

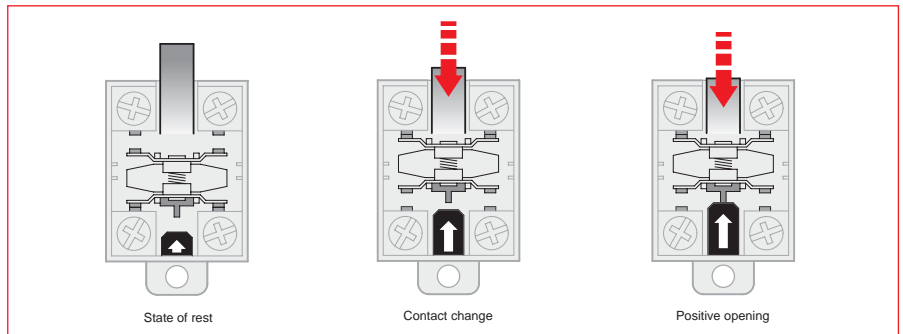
A control switch, with one or more break-contact elements, has a positive opening operation when the switch actuator ensures full contact opening of the break-contact. For the part of travel that separates the contacts, there must be a positive drive, with no resilient member (e.g. springs), between the moving contacts and the point of the actuator to which the actuating force is applied.

Control switches with positive opening operation may be provided with either snap action or slow action contact elements. To use several contacts on the same control switch with positive opening operation, they must be electrically separated from each other, if not, only one may be used.

Every control switch with positive opening operation must be indelibly marked on the outside with the symbol:

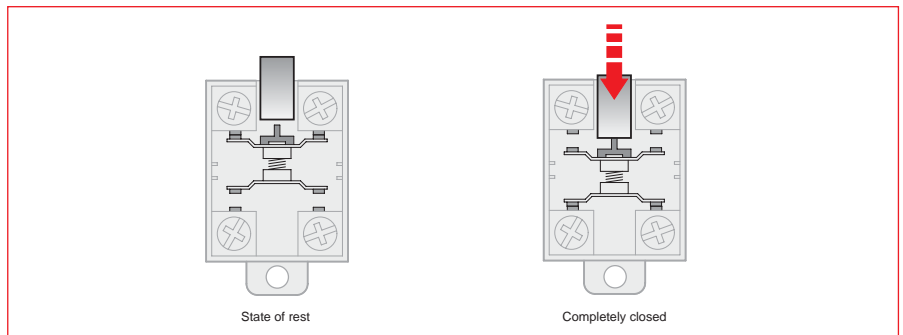
Snap Action

Snap action contacts are characterised by a release position that is distinct from the operating position (differential travel). Snap breaking of moving contacts is independent of the switch actuator's speed and contributes to regular electric performance even for slow switch actuator speeds.

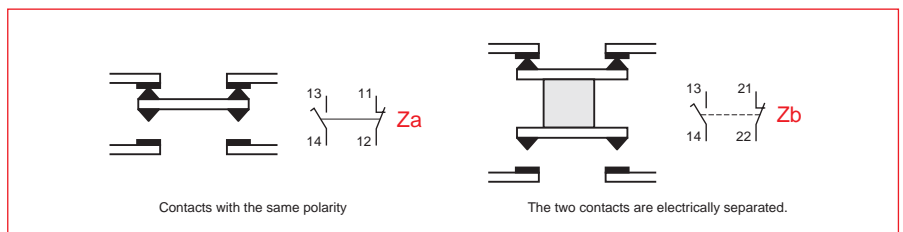


Slow Action

Slow action contacts are characterised by a release position that is the same as the operating position. The switch actuator's speed directly conditions the travel speed of contacts.



Contact shape according to IEC 60947-5-1. Change-over contact elements with 4 terminals must be indelibly marked Za or Zb. See figure opposite for contact representation.



Utilization category

AC-15: switching of electromagnetic loads of electromagnets using an alternating current (>72 VA).
 DC-13: switching of electromagnets using a direct current.

Minimum actuation force / torque

The minimum amount of force/torque that is to be applied to the switch actuator to produce a change in contact position.

Minimum force / torque to achieve positive opening operation

The minimum amount of force/torque that is to be applied to the switch actuator to ensure positive opening operation of the N.C. contact.

Latch & manual reset

Technical data

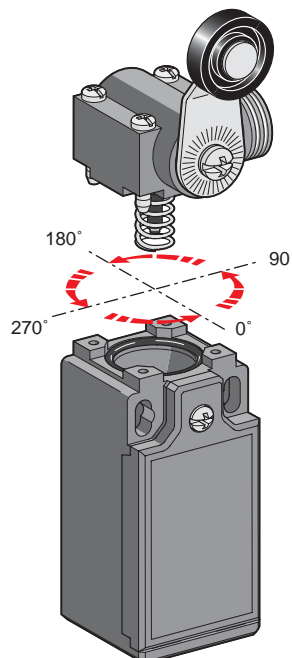
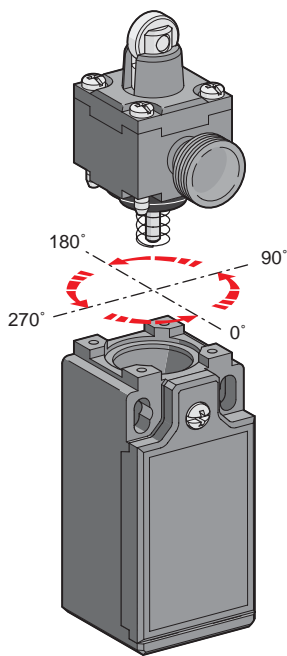
Implementation

Implementation

Limit switches with latch and manual reset
LS35P...-R.

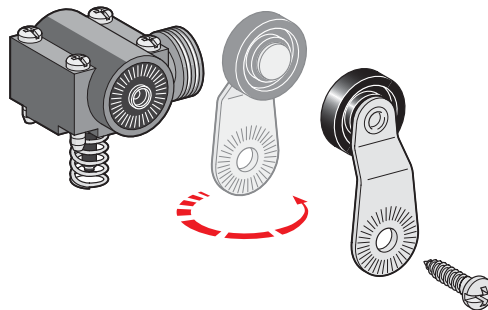
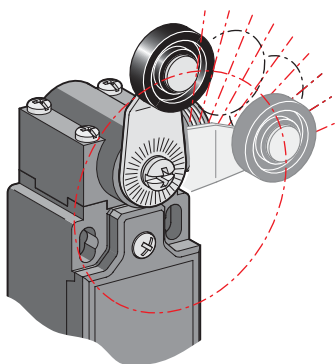
● Adjustment of the heads reference P11, P12, P13, P31 and P32.

● Adjustment of the head reference P41.



● Angular adjustment 10° in 10° of the lever on head P41.

● Lever round turning on head P41.



Latch & manual reset

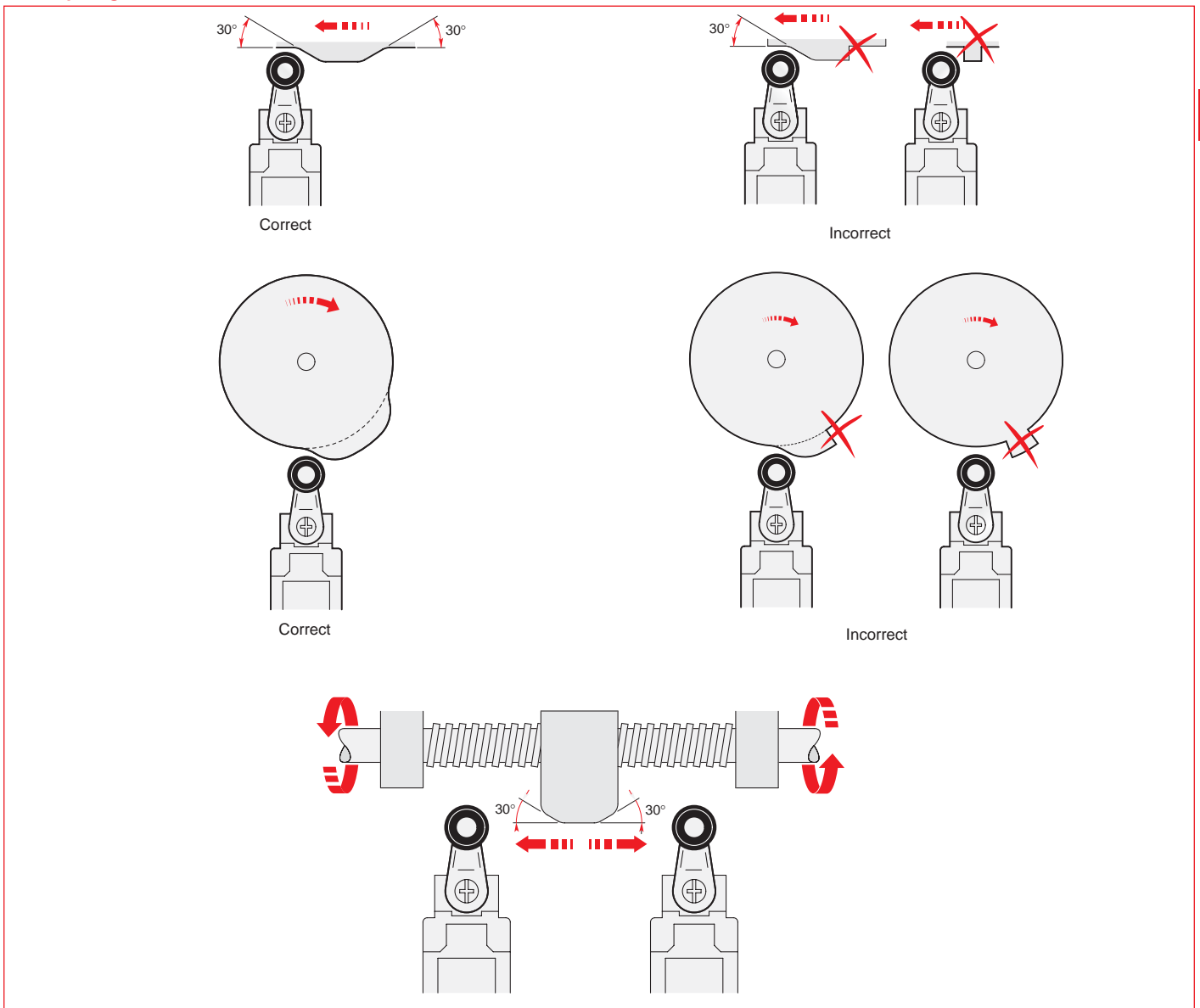
Technical data

Utilization precautions

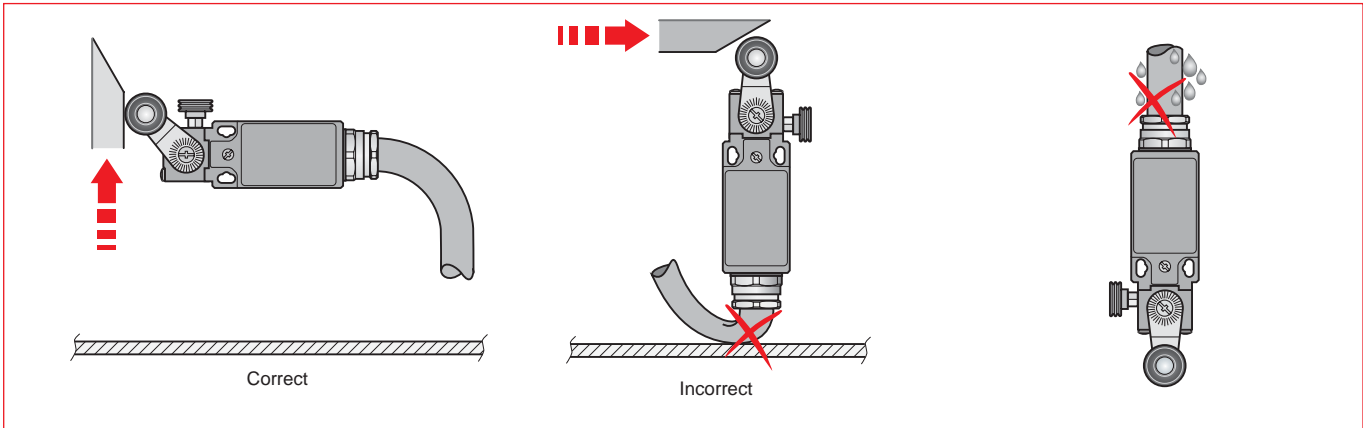
Plain plunger



Roller plunger or roller lever



Curve of connecting cable / cable gland orientation



Latch & manual reset

Technical data

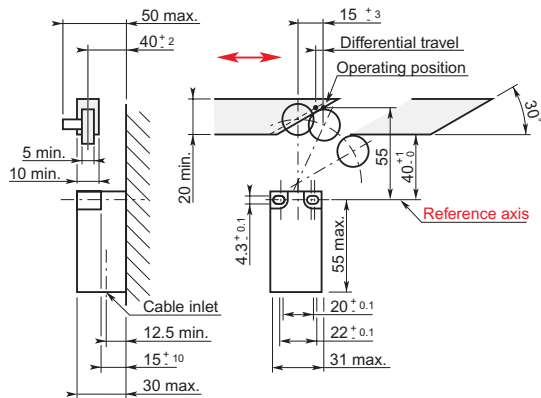
EN 50047 standard



The European Committee for Electrotechnical Standardization (CENELEC), which groups together 18 European countries, publishes EN standards. The present standard defines dimensions and mechanical data for limit switches (30mm x 55mm).

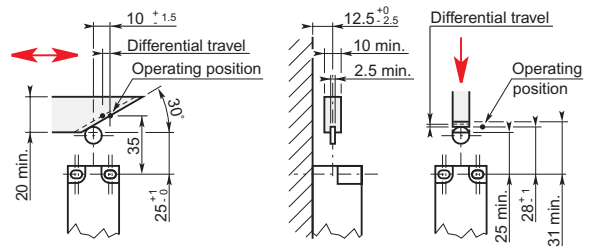
A Shape

Roller lever operating heads



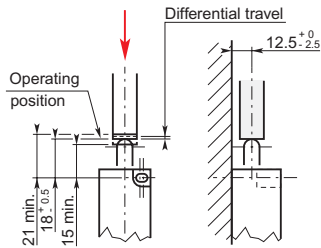
C Shape

Roller plunger operating heads



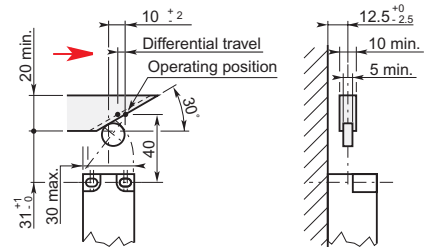
B Shape

Rounded plunger operating heads



E Shape

Roller lever operating heads



Latch & manual reset

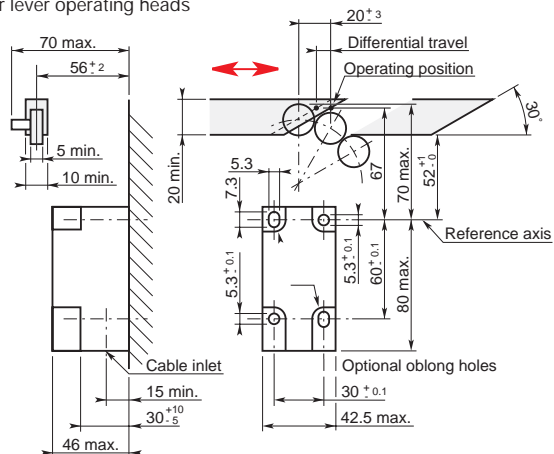
Technical data

EN 50041 standard

The European Committee for Electrotechnical Standardization (CENELEC), which groups together 18 countries, publishes EN standards. The present standard defines dimensions and mechanical data for limit switches (42.5 x 80 mm).

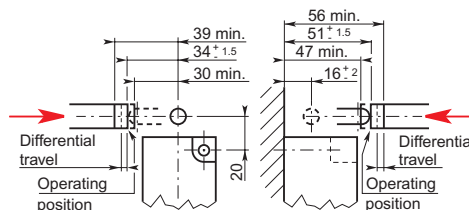
A Shape

Roller lever operating heads



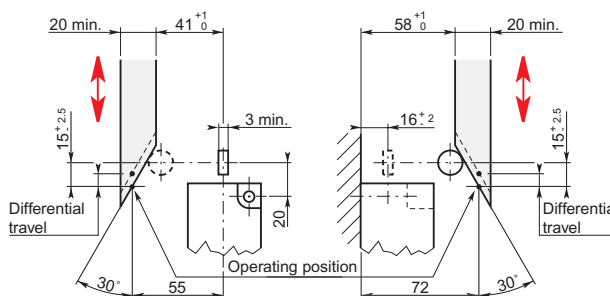
F Shape

Rounded lateral plunger operating heads

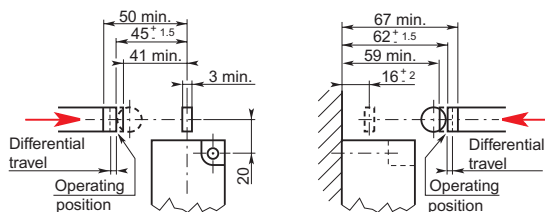


G Shape

Lateral roller plunger operating heads – Lateral actuation

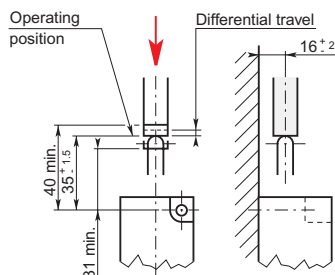


Lateral roller plunger operating heads – Front actuation



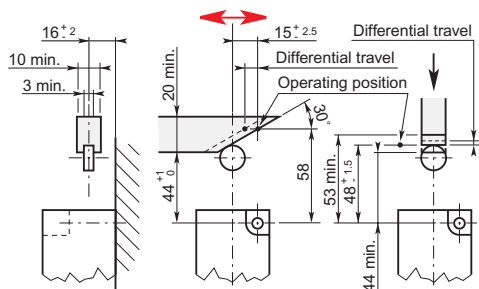
B Shape

Rounded plunger operating heads



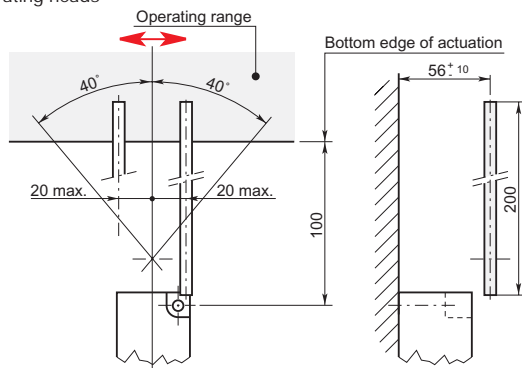
C Shape

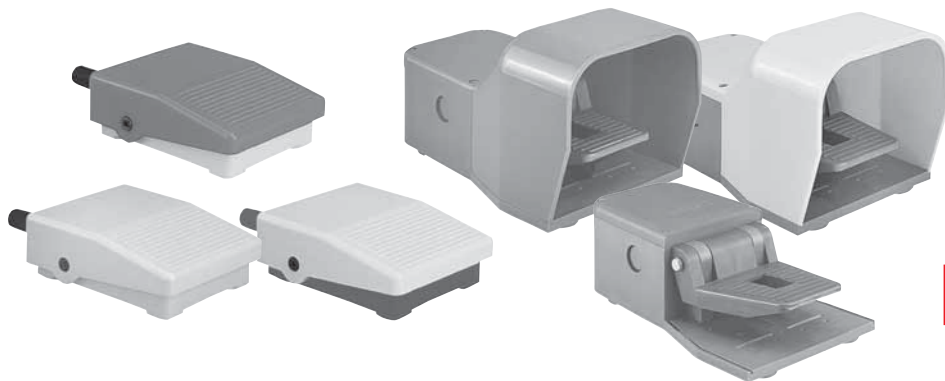
Roller plunger operating heads



D Shape

Rod operating heads





9

Description of Mini foot switches

- Reduced dimensions: 100 x 75 x 34 mm.
- Materials: cover and base made of self-extinguishing ABS.
- Color choice: black or grey base; black, grey, yellow or red cover.

Description of foot switches with covers

- Dimensions: 285 x 140 x 145.
- Materials: base, cover and pedal made of shock resistant Bayblend® FR 90 material (alloyed polycarbonate and ABS).
- Color choice: grey base; grey, yellow or red cover.
- Variations: grey base, half-red cover. Especially used for emergency stop function.

Note: this emergency stop function must never contain the «locked in neutral position» device.

UL Listed file #E191693

Application

Foot switch-operated machines such as: shearing machines, folding machines, spinning lathes, machine tools, wrapping machines, riveting presses, etc.

Foot switches with covers come in three operation formats:

- **Free movement:** contact position follows pedal movement: actuated when the pedal is pushed down, released when pedal is in a state of rest.
- **Foot switch locked in neutral position:** same operation as above, after unlocking the pedal with the end of the foot.
- **Foot switch latched in low position:** same operation as free movement, except that a state of rest is obtained only after having unlatched the pedal with the end of the foot.

General information

IPM Mini foot switches, IPS Foot switches with covers

Description

Application

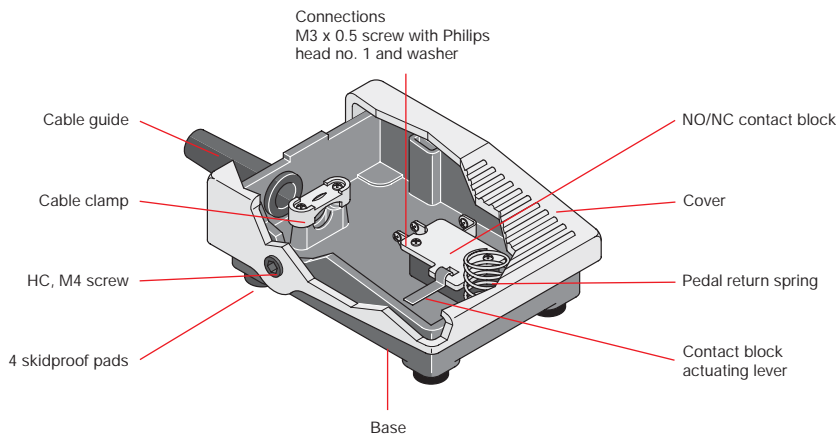
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- Reduced dimensions: 100 x 75 x 34 mm.
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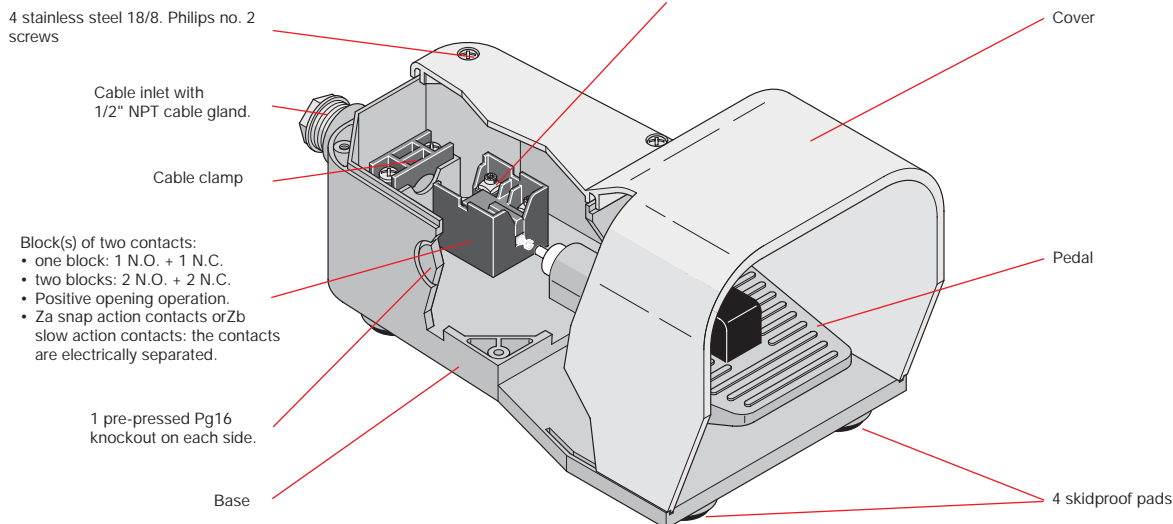


Description of foot switches with covers

- Dimensions: 285 x 140 x 145.
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- Color choice: grey base; grey, yellow or red cover.
- Variations: grey base, half-red cover. Especially used for emergency stop function.

Note: this emergency stop function must never contain the «locked in neutral position» device.

- Connecting terminals
- M 3.5 (+, -) Phillips no. 1 screw
 - Screw head with captive cable clamp.
 - Markings conform with IEC 947-1, IEC 947-5-1, EN 50 005 and 50 013 standards.



Comment: Foot switches with covers can be assembled on a plate and equipped with a transportation handle. Upon request, instead of the handle an emergency stop button can be installed above a tube that allows for connection cable passage.

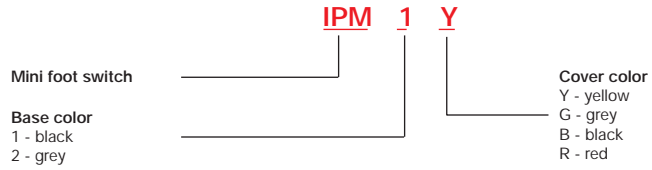
Foot switches

Mini foot switches

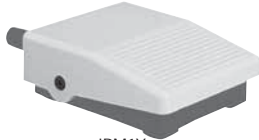
IPM Mini foot switches

	NC C	NO	N.O. + N.C. contact block	Cover color	Unit weight in kg Packing 1 piece	Catalog number	List price
Black base							
	1			Yellow	0.130	IPM1Y	\$ 28
	1			Grey	0.130	IPM1G	
	1			Black	0.130	IPM1B	
	1			Red	0.130	IPM1R	
Grey base							
	1			Yellow	0.130	IPM2Y	28
	1			Grey	0.130	IPM2G	
	1			Black	0.130	IPM2B	
	1			Red	0.130	IPM2R	

Catalog number explanation



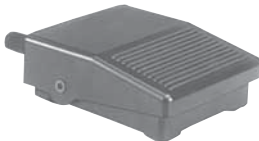
IPM1R



IPM1Y



IPM1G



IPM1B



IPM1R

Foot switches

Foot switches with covers



IPSY1A11



IPSR1A11



IPSG1A11



IPSZ1A11

IPS foot switches

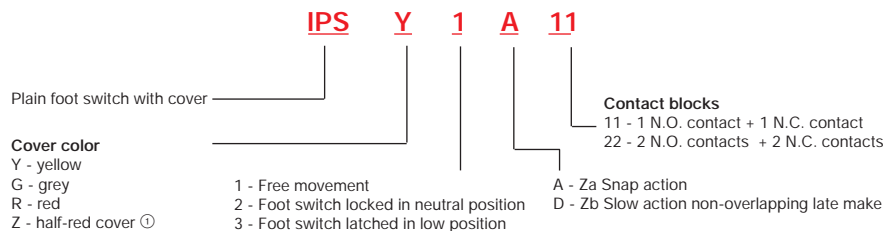
Contact blocks				Unit weight in kg	Catalog number	List price
Snap action		Non-overlapping slow action				
Za	Za	Zb	Zb	Packing 1 piece		
Free movement						
1	—	—	—	1.100	IPS★1A11	\$ 76
—	—	1	—	1.100	IPS★1D11	76
—	1 + 1	—	—	1.100	IPS★1A22	88
—	—	—	1 + 1	1.100	IPS★1D22	88
Locked in neutral position						
1	—	—	—	1.100	IPS★2A11	83
—	—	1	—	1.100	IPS★2D11	83
—	1 + 1	—	—	1.100	IPS★2A22	91
—	—	—	1 + 1	1.100	IPS★2D22	91
Latched in low position						
1	—	—	—	1.100	IPS★3A11	81
—	—	1	—	1.100	IPS★3D11	81
—	1 + 1	—	—	1.100	IPS★3A22	93
—	—	—	1 + 1	1.100	IPS★3D22	93
Free movement foot switch with half-red cover						
1	—	—	—	0.800	IPSZ1A11	85
—	—	1	—	0.800	IPSZ1D11	85
—	1 + 1	—	—	0.800	IPSZ1A22	97
—	—	—	1 + 1	0.800	IPSZ1D22	97
Foot switch latched in low position with half-red cover						
1	—	—	—	0.800	IPSZ3A11	90
—	—	1	—	0.800	IPSZ3D11	90
—	1 + 1	—	—	0.800	IPSZ3A22	102
—	—	—	1 + 1	0.800	IPSZ3D22	102

Color code

To select a foot switch color, substitute the appropriate color code for the ★ in the catalog number

Yellow	Y
Grey	G
Red	R

Catalog number explanation



① Incompatible with locked in neutral position function.

Components

Double Insulation - Protection Cover in ABS - IP65

⊕ "N.C." contact with positive opening operation.



IPSXG



IPSXZ



IPXCA11



IPXCD11

Contact blocks



B11



D11



C11

Protection cover for foot switch

Grey cover
Yellow cover
Red cover
Half red cover

Contact block for IPS... foot switches

1NC & 1NO (Za) snap action

1 — —

1NC & 1NO (Zb) slow action non-overlapping late make

— 1 —

Positive opening operation

Catalog number

List price

	Positive opening operation	Catalog number	List price
Protection cover for foot switch			
Grey cover	—	IPSXG	\$ 28
Yellow cover	—	IPSXY	
Red cover	—	IPSXR	
Half red cover	—	IPSXZ	
Contact block for IPS... foot switches			
1NC & 1NO (Za) snap action			
1 — —	⊕	IPXCA11	17
1NC & 1NO (Zb) slow action non-overlapping late make			
— 1 —	⊕	IPXCD11	17

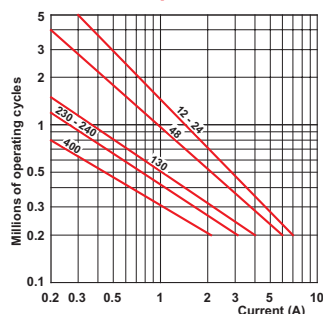
General technical data

		Mini foot switch	Foot switch with cover
Standards		IEC 1058-1	IEC 947-5-1
Certifications & Approvals		—	UL - CSA - BG
Air temperature near the device			
– during operation	°C	– 10 ... + 70	– 10 ... + 70
– for storage	°C	– 25 ... + 80	– 30 ... + 80
Climatic withstand		—	according to IEC 68-2-3 and salty mist according to IEC 68-2-11
Shock withstand (according to IEC 68-2-27 and EN 60 068-2-27)	g	—	50g (1/2 sinusoidal shock for 11 ms) no change in contact position
Degree of protection (according to IEC 529 and EN 60 529)		IP 40	IP 65
Actuation torque	N.m	1.2	0.25
Operating angle	Degree	2 to 4	15
Cable inlet		Cable guide ø min. 6mm; ø max. 8.5 mm	Pg 16

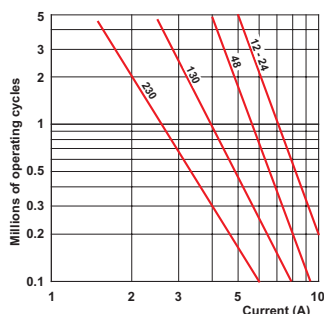
Electrical data

Rated insulation voltage U_i	V	250	500 (according to IEC 947-1 and EN 60-947-1) Degree of pollution 3
Rated impulse withstand voltage U_{imp} (according to IEC 947-1 and EN 60 947-1)	kV	1	6
Conventional free air thermal current I_{th} ($q < 40$ °C)	A	15	10 (according to IEC 947-1)
Short-circuit protection $U_e < 500$ V a.c. - gG (gI) type fuses	A	10	10
Rated operational current	A	3 (250 V a.c.) 0.06 (230 V d.c.)	A 600 (according to UL 508 and CSA C22-2 n° 14) Q 600 (according to UL 508 and CSA C22-2 n° 14)
AC-15 acc. to IEC 947-5-1	24 V 130 V 230 V 240 V 400 V	A A A A A	10 5.5 3.1 3 1.8
DC-13 acc. to IEC 947-5-1	24 V 110 V 250 V	A A A	2.8 0.6 0.27
Resistance between contacts	mΩ	30	25
Connecting terminals		M3 x 0.5 screw with Philips head no. 1 and washer	M3.5 (+, -) screw with Philips head no. 1 with cable clamp
Positive opening operation (according to IEC 947-5-1)		—	⊕
Connecting capacity	1 or 2 x mm ²	—	0.5 – 2.5
Terminal marking		—	According to EN 50 013
Mechanical durability	Millions of operations	10	30
Electrical durability	Operations	100,000	According to IEC 947-5-1, utilization categories AC-15 and DC-13 (Load factor of 0.5 according to curves below)

AC-15 — Snap action



AC-15 — Slow action



DC-13		Snap action	Slow action
		Power breaking for a durability of 5 million operating cycles	
Voltage	24 V	9.5 W	12 W
Voltage	48 V	6.8 W	9 W
Voltage	110 V	3.6 W	6 W

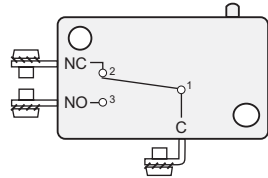
Technical data & approximate dimensions

Mini-footswitches

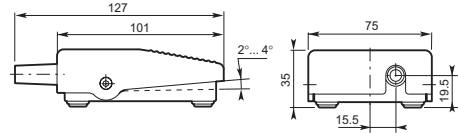
IPM Mini foot switches

Base color		Yellow cover	Grey cover	Black cover	Red cover
Black base	Catalog number	IPM1Y	IPM1G	IPM1B	IPM1R
Grey base	Catalog number	IPM2Y	IPM2G	IPM2B	IPM2R
Weight (packing per unit)	kg	0.130	0.130	0.130	0.130

N.O. + N.C. Contact block



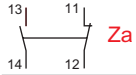
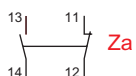
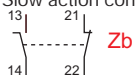
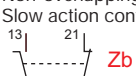
Dimensions (mm)



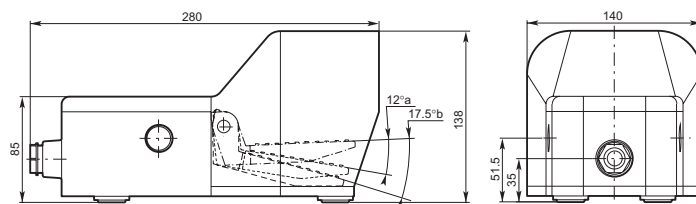
Technical data & approximate dimensions

Foot switches with covers

IPS Foot switches

		Free movement	Locked in neutral position	Latched in low position
Snap action contacts 	Catalog number ⊖ (Positive opening operation of the N.C. contact)	IPS1A11 ⊖	IPS2A11 ⊖	IPS3A11 ⊖
Snap action contacts 	Catalog number ⊖ (Positive opening operation of the N.C. contact)	IPS1A22 ⊖	IPS2A22 ⊖	IPS3A22 ⊖
Non-overlapping Slow action contacts 	Catalog number ⊖ (Positive opening operation of the N.C. contact)	IPS1D11 ⊖	IPS2D11 ⊖	IPS3D11 ⊖
Non-overlapping Slow action contacts 	Catalog number ⊖ (Positive opening operation of the N.C. contact)	IPS1D22 ⊖	IPS2D22 ⊖	IPS3D22 ⊖
Weight (packing per unit)	kg	1.10	1.10	1.10

Dimensions (mm)



Plain foot switch
 a = pre-travel
 b = total travel

Accessories	10.54
Capacitive.....	10.4
Connectors & cables.....	10.55 - 10.70
C1 Micro style	10.56 - 10.63
3 Wire 90°	10.57
3 Wire 90° PNP, NPN.....	10.58
3 Wire straight	10.56
3 Wire straight	10.64
4 Wire 90°	10.60
4 Wire straight	10.59
5 Wire 90°	10.62
5 Wire straight	10.61
Custom wire straight	10.63
C2 Micro style	10.64 - 10.65
3 Wire 90°	10.65
3 Wire straight	10.64
C7 Mini style.....	10.66 - 10.67
3 Wire 90°	10.67
3 Wire straight	10.66
C8 Nano style.....	10.68 - 10.70
3 Wire 90°	10.69
3 Wire 90° PNP, NPN.....	10.70
3 Wire straight	10.68
Catalog numbering system	10.54
Inductive.....	10.2 - 10.4
Photoelectric	10.5
Technical data & dimensions.....	10.6 - 10.44, 10.47 - 10.53
Inductive sensors	10.6 - 10.31
Capacitive sensors.....	10.32
Photoelectric sensors.....	10.33 - 10.44
Ultrasonic sensors.....	10.47 - 10.53
OPUS Software set	10.46
Tuning on target object, Series B45.....	10.45
Ultrasonic	10.5
Wireless proximity switches	10.71 - 10.79
Catalog numbering system	10.72
General information.....	10.72
Ordering information.....	10.73
Technical data.....	10.74 - 10.79



Notes



Sensors

Inductive sensors



SIF 1,5-M8N-V2-PO

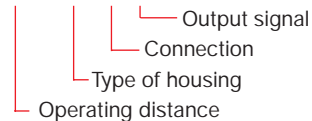


SIN4-M12N-C1-PO

Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
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Inductive Sensors

SIF0,8-Z4N-V2-PO	1SAF 104 211 R 1000	1	0.020
SIF0,8-Z4N-C8-PO	1SAF 104 411 R 1000	1	0.010
SIF1,5-Z6N-U2-PO	1SAF 106 211 R 1000	1	0.030
SIF1,5-Z6N-C8-PO	1SAF 106 411 R 1000	1	0.010
SIF1,5-M8N-V2-PO	1SAF 108 111 R 1000	1	0.050
SIF1,5-M8N-V2-NO	1SAF 108 111 R 3000	1	0.044
SIF1,5-M8S-U2-PO	1SAF 109 211 R 1000	1	0.040
SIF1,5-M8S-C1-PO	1SAF 108 511 R 1000	1	0.030
SIF1,5-M8E-C1-PO	1SAF 108 511 R 1001	1	0.035
SIF1,5-M8E-C1-NO	1SAF 108 511 R 3001	1	0.035
SIN2-M8N-V2-PO	1SAF 108 122 R 1000	1	0.040
SIN2-M8N-V2-NO	1SAF 108 122 R 3000	1	0.040
SIN2-M8S-U2-PO	1SAF 109 222 R 1000	1	0.040
SIN2-M8N-C1-PO	1SAF 108 522 R 1000	1	0.030
SIN2-M8N-C1-NO	1SAF 108 522 R 3000	1	0.030
SIN3-M8N-V2-PO	1SAF 108 123 R 1000	1	0.050
SIN3-M8N-C8-PO	1SAF 108 423 R 1000	1	0.030
SIF2-M12N-V2-PO	1SAF 112 111 R 1000	1	0.030
SIF2-M12N-V2-PK	1SAF 112 111 R 1200	1	0.074
SIF2-M12N-V2-NO	1SAF 112 111 R 3000	1	0.030
SIF2-M12N-V2-NK	1SAF 112 111 R 3200	1	0.074
SIF2-M12N-V2-DO	1SAF 112 111 R 5000	1	0.040
SIF2-M12N-V2-AO	1SAF 112 111 R 6000	1	0.085
SIF2-M12S-V2-PO	1SAF 113 211 R 1000	1	0.030
SIF2-M12N-C1-PO	1SAF 112 511 R 1000	1	0.020
SIF2-M12N-C1-NO	1SAF 112 511 R 3000	1	0.020
SIF2-M12S-C1-PO	1SAF 113 511 R 1000	1	0.020
SIF2-M12E-C1-PO	1SAF 112 511 R 1001	1	0.065
SIF2-M12E-V2-AC	1SAF 112 111 R 6100	1	0.125
SIN4-M12N-V2-PO	1SAF 112 122 R 1000	1	0.030
SIN4-M12N-V2-PK	1SAF 112 122 R 1200	1	0.074
SIN4-M12N-V2-NO	1SAF 112 122 R 3000	1	0.030
SIN4-M12N-V2-NK	1SAF 112 122 R 3200	1	0.074
SIN4-M12N-V2-DO	1SAF 112 122 R 5000	1	0.040
SIN4-M12S-V2-PO	1SAF 113 122 R 1000	1	0.030
SIN4-M12N-V2-AO	1SAF 112 122 R 6000	1	0.085
SIN4-M12N-C1-PO	1SAF 112 522 R 1000	1	0.020
SIN4-M12S-C1-PO	1SAF 113 522 R 1000	1	0.020
SIN4-M12N-C1-NO	1SAF 112 522 R 3000	1	0.020
SIN6-M12N-V2-PO	1SAF 112 123 R 1000	1	0.090
SIN6-M12N-C1-PO	1SAF 112 523 R 1000	1	0.020



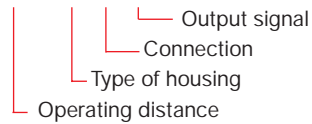
Inductive sensors



SIF5-M18N-V2-PO

SIF5-M18N-C1-PO

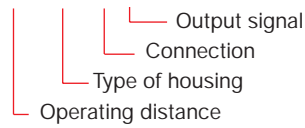
Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
Inductive Sensors			
SIF5-M18N-V2-PO	1SAF 118 111 R 1000	1	0.100
SIF5-M18N-V2-NO	1SAF 118 111 R 3000	1	0.100
SIF5-M18N-V2-NK	1SAF 118 111 R 3200	1	0.120
SIF5-M18N-V2-PK	1SAF 118 111 R 1200	1	0.120
SIF5-M18N-V2-DO	1SAF 118 111 R 5000	1	0.120
SIF5-M18N-V2-AO	1SAF 118 111 R 6000	1	0.130
SIF5-M18N-V2-AC	1SAF 118 111 R 6100	1	0.130
SIF5-M18N-C1-PO	1SAF 118 511 R 1000	1	0.060
SIF5-M18N-C1-NO	1SAF 118 511 R 3000	1	0.060
SIF5-M18E-C1-PO	1SAF 118 511 R 1001	1	0.125
SIF5-M18E-C1-NO	1SAF 118 511 R 3001	1	0.125
SIN8-M18N-V2-PO	1SAF 118 122 R 1000	1	0.100
SIN8-M18N-V2-PK	1SAF 118 122 R 1200	1	0.120
SIN8-M18N-V2-NO	1SAF 118 122 R 3000	1	0.100
SIN8-M18N-V2-NK	1SAF 118 522 R 3200	1	0.120
SIN8-M18N-V2-DO	1SAF 118 122 R 5000	1	0.120
SIN8-M18N-V2-AO	1SAF 118 122 R 6000	1	0.130
SIN8-M18N-V2-AC	1SAF 118 122 R 6100	1	0.130
SIN8-M18N-C1-PO	1SAF 118 522 R 1000	1	0.060
SIN8-M18N-C1-NO	1SAF 118 522 R 3000	1	0.060
SIN8-M18E-C1-PO	1SAF 118 522 R 1001	1	0.235
SIN12-M18N-V2-PO	1SAF 118 123 R 1000	1	0.120
SIN12-M18N-C1-PO	1SAF 118 523 R 1000	1	0.060
SIF10-M30N-V2-PO	1SAF 130 111 R 1000	1	0.120
SIF10-M30N-V2-PK	1SAF 130 111 R 1200	1	0.130
SIF10-M30N-V2-NO	1SAF 130 111 R 3000	1	0.120
SIF10-M30N-V2-NK	1SAF 130 111 R 3200	1	0.130
SIF10-M30N-V2-DO	1SAF 130 111 R 5000	1	0.200
SIF10-M30N-V2-AO	1SAF 130 111 R 6000	1	0.280
SIF10-M30N-V2-AC	1SAF 130 111 R 6100	1	0.280
SIF10-M30N-C1-PO	1SAF 130 511 R 1000	1	0.130
SIF10-M30N-C1-NO	1SAF 130 511 R 3000	1	0.130
SIF10-M30E-C1-PO	1SAF 130 511 R 1001	1	0.129
SIN15-M30N-V2-PO	1SAF 130 122 R 1000	1	0.120
SIN15-M30N-V2-PK	1SAF 130 122 R 1200	1	0.130
SIN15-M30N-V2-NO	1SAF 130 122 R 3000	1	0.120
SIN15-M30N-V2-NK	1SAF 130 122 R 3200	1	0.130
SIN15-M30N-V2-AO	1SAF 130 122 R 6000	1	0.280
SIN15-M30N-V2-AC	1SAF 130 122 R 6100	1	0.280
SIN15-M30N-C1-PO	1SAF 130 522 R 1000	1	0.120
SIN15-M30N-C1-NO	1SAF 130 522 R 3000	1	0.120
SIN15-M30E-C1-PO	1SAF 130 522 R 1001	1	0.131





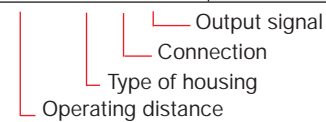
SIF15-Q40N-T-PO

Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
Inductive Sensors			
SIF2-B28N-V0,1-PO	1SAF 123 111 R 1000	1	0.010
SIF2-B28N-V0,1-N0	1SAF 123 111 R 3000	1	0.010
SIF6-B45N-U2-PO	1SAF 125 111 R 1000	1	0.100
SIF15-Q40N-T-PO	1SAF 144 811 R 1000	1	0.280
SIF15-Q40N-T-PK	1SAF 144 811 R 1200	1	0.280
SIF15-Q40N-T-NO	1SAF 144 811 R 3000	1	0.280
SIF15-Q40N-C1-PO	1SAF 144 511 R 1000	1	0.280
SIF20-Q40N-T-PO	1SAF 144 822 R 1000	1	0.280
SIN20-Q40N-T-AK	1SAF 144 822 R 6200	1	0.280
SIN30-Q40N-T-PO	1SAF 144 823 R 1000	1	0.280
SIN30-Q40N-T-PK	1SAF 144 823 R 1200	1	0.280
SIN30-Q40N-T-AK	1SAF 144 823 R 6200	1	0.280
SIF20-Q40S-C1-PO	1SAF 145 812 R 1000	1	0.140
SIF20-Q40T-C1-PO	1SAF 146 812 R 1000	1	0.140
SIF20-Q40T-C1-PK	1SAF 146 812 R 1200	1	0.140
SIN30-Q40S-C1-PO	1SAF 145 823 R 1000	1	0.140
SIN30-Q40T-C1-PK	1SAF 146 823 R 1200	1	0.140
SIF40-Q80N-T-PK	1SAF 148 811 R 1200	1	0.460
SIN50-Q80N-T-PO	1SAF 148 822 R 1000	1	0.415
SIN50-Q80N-T-PK	1SAF 148 822 R 1200	1	0.415
SIF5-M18N-V2-M	1SAF 118 112 R 8000	1	0.170



SCF10-M30N-V2-AO

Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
Capacitive Sensors			
SCF10-M30N-V2-PO	1SAF 230 111 R 1000	1	0.280
SCF10-M30N-C1-PO	1SAF 230 511 R 1000	1	0.148
SCF10-M30N-V2-AO	1SAF 230 111 R 6000	1	0.270
SCF10-M30N-V2-PK	1SAF 230 111 R 1200	1	0.240
SCF10-M30N-C1-PK	1SAF 230 511 R 1200	1	0.140

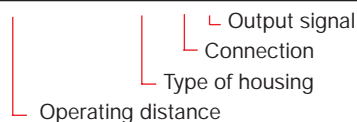


Photoelectric & ultrasonic sensors



SOD500-B45N-C1-PKS

Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
Photoelectric Sensors			
SOT 20M - B75N-T-KK	1SAF 320 750 R 1100	1	0.190
SOR 1500 - M18N-C1-PO	1SAF 318 542 R 1001	1	0.100
SOR 4000 - M18N-C1-PO	1SAF 318 542 R 1002	1	0.110
SOD 200 - M18N-C1-PO	1SAF 318 553 R 1000	1	0.070
SOR 2000 - B26N-U2-PO	1SAF 323 242 R 1000	1	0.070
SOD 400 - B26N-U2-PO	1SAF 323 253 R 1000	1	0.100
SOR 5000 - B75N-T-POS	1SAF 328 842 R 1000	1	0.200
SOR 5000 - B75N-T-KK	1SAF 328 842 R 1100	1	0.110
SOD 500 - B45N-C1-PKS	1SAF 325 553 R 1210	1	0.060
SOD 500 - B45N-C1-NKS	1SAF 325 553 R 3210	1	0.060
SOR 6000 - B45N-C1-PKS	1SAF 325 545 R 1210	1	0.060
SOR 6000 - B45N-C1-NKS	1SAF 325 545 R 3210	1	0.060
SOT 15M - B45N- C1-PKS	1SAF 325 586 R 1210	1	0.120
SOT 15M - B45N- C1-NKS	1SAF 325 586 R 3210	1	0.120
SORG 2000 - B45N- C1-PKS	1SAF 325 543 R 1210	1	0.060
SORG 2000 - B45N- C1-NKS	1SAF 325 543 R 3210	1	0.060
SOD 800 - B75N-T-POS	1SAF 328 853 R 1000	1	0.200
SOD 2000 - B75N-T-KK	1SAF 328 853 R 1100	1	0.110



Photoelectric Sensors with Waveguides

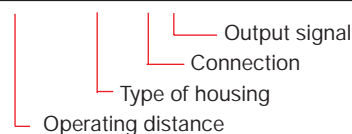
Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
SOLX- B50N-C8-PKS	1SAF 325 160 R 1000	1	0.120
SOLD 50- B50N-PVM6	1SAF 325 152 R 0001	1	0.020
SOLD15- B50N-PVM3	1SAF 325 151 R 0001	1	0.020
SOLT150- B50N-PVM4	1SAF 325 163 R 0001	1	0.011
SOLT150- B50N-PVM3	1SAF 325 163 R 0002	1	0.011

Ultrasonic Sensors



SUD500-M30N-C1-M

Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
SUD 500-M30N-C1-POS	1SAF 430 651 R 1002	1	0.200
SUD2000-M30N-C1-POS	1SAF 430 653 R 1002	1	0.200
SUD4000-M30N-C1-POS	1SAF 430 654 R 1002	1	0.210
SUD6000-M30N-C1-POS	1SAF 430 655 R 1002	1	0.400
SUD 500-M30N-C1-NOS	1SAF 430 651 R 3002	1	0.200
SUD2000-M30N-C1-NOS	1SAF 430 653 R 3002	1	0.200
SUD4000-M30N-C1-NOS	1SAF 430 654 R 3002	1	0.210
SUD6000-M30N-C1-NOS	1SAF 430 655 R 3002	1	0.400
SUD 500-M30N-C1-M	1SAF 430 551 R 8002	1	0.220
SUD2000-M30N-C1-M	1SAF 430 553 R 8002	1	0.220
SUD4000-M30N-C1-M	1SAF 430 554 R 8002	1	0.300
SUD6000-M30N-C1-M	1SAF 430 555 R 8002	1	0.400



Technical data & Approximate dimensions

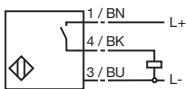
Inductive sensors, small & cylindrical

Inductive Sensors, small, cylindrical

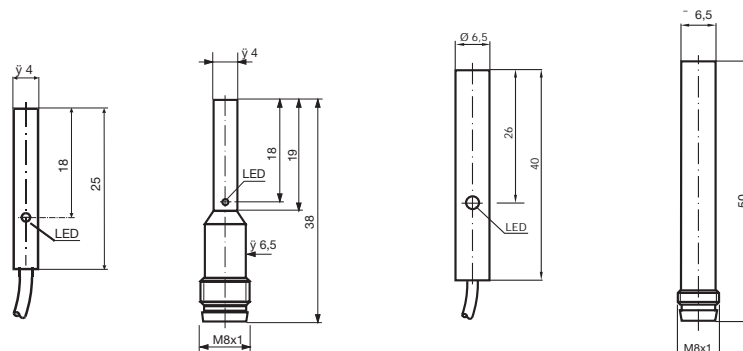
Operating distance S_{n^*} mounting		0.8 mm flush	0.8 mm flush	1.5 mm flush	1.5 mm flush
PNP	NO	SIF0,8-Z4N-V2-PO	SIF0,8-Z4N-C8-PO	SIF1,5-Z6N-U2-PO	SIF1,5-Z6N-C8-PO
	NC				
	Antivalent				
NPN	NO				
	Antivalent				
DC 2-wire	NO				
AC	NO				
	NC				
	Antivalent				
Switching distance	[mm]	0 ... 0.648	0 ... 0.648	0 ... 1.215	0 ... 1.215
Reduction factor r_{V2A}	0.850.850.70.7				
r_{AL}	0.450.450.250.25				
r_{Cu}	0.40.40.20.2				
Operating voltage	[V]	10 ... 30	10 ... 30	10 ... 60	10 ... 60
Operating current	[mA]	200	200	100	100
Switching frequency	[Hz]	3000	3000	500	500
Idle current / residual current	[mA]	10	10	15	15
Line voltage drop	[V]	22233			
Short circuit protection		clocking	clocking	clocking	clocking
Inverse polarity protection		yes	yes	yes	yes
Indication	output signal	LED yellow	LED yellow	LED yellow	-
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2	EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67	IP67	IP67
Connection type		2 m, PVC-cable	Connector M8	2 m, PUR-cable	Connector M8
Conductor diameter		0.14 mm ²	-	0.14 mm ²	-
Housing material		stainless steel	stainless steel	stainless steel	stainless steel
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		LS008002	LS000001	FZ015003	FZ015004

Output signals

Output PO



Dimensions in mm



Technical data & Approximate dimensions

Inductive sensors, M 8 x 1 thread



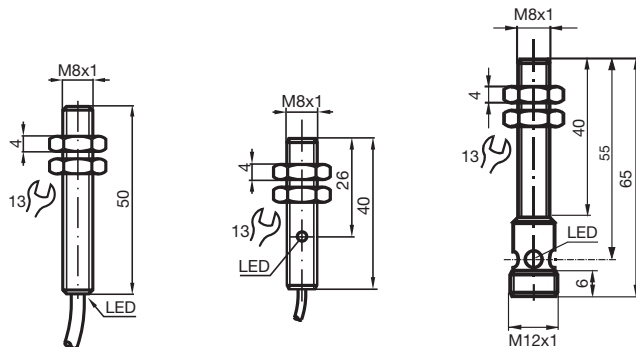
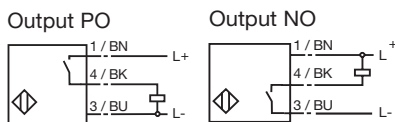
Inductive Sensors, with thread M 8 x 1

Operating distance S_n , mounting		1.5 mm flush	1.5 mm flush	1.5 mm flush
PNP	NO	SIF1,5-M8N-V2-PO	SIF1,5-M8S-U2-PO	SIF1,5-M8S-C1-PO
	NC			
	Antivalent			
NPN	NO	SIF1,5-M8N-V2-NO		
	Antivalent			
DC 2-wire	NO			
AC	NO			
	NC			
	Antivalent			
Switching distance	[mm]	0 ... 1.215	0 ... 1.215	0 ... 1.215
Reduction factor	r_{V2A}	0.75	0.7	0.75
	r_{AL}	0.45	0.25	0.45
	r_{Cu}	0.35	0.2	0.35
Operating voltage	[V]	10 ... 30	10 ... 60	10 ... 30
Operating current	[mA]	100	100	100
Switching frequency	[Hz]	1500	500	1500
Idle current / residual current	[mA]	15	15	15
Line voltage drop	[V]	3	3	3
Short circuit protection		clocking	clocking	clocking
Inverse polarity protection		yes	yes	yes
Indication	output signal	LED yellow	LED yellow	LED yellow
	voltage	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67	IP67
Connection type		2 m, PVC-cable	2 m, PUR-cable	Connector M12
Conductor diameter		0,14 mm ²	0,14 mm ²	-
Housing material		nickel-plated brass	stainless steel	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ015013	FZ015015	FZ015009

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Output signals

Dimensions in mm



Technical data & Approximate dimensions

Inductive sensors, M 8 x 1 thread

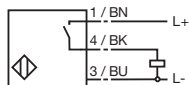
Inductive Sensors, with thread M 8 x 1

Operating distance $S_{n'}$, mounting		1.5 mm flush	1.5 mm flush
PNP	NO	SIF1,5-M8E-C1-PO	
	NC		
	Antivalent		
NPN	NO		SIF1,5-M8E-C1-NO
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		
	Antivalent		
Switching distance	[mm]	0 ... 1.215	0 ... 1.215
Reduction factor	r_{V2A}	0.7	0.67
	r_{AL}	0.25	0.24
	r_{Cu}	0.2	0.21
Operating voltage [V]		10 ... 60	10 ... 60
Operating current [mA]		100	100
Switching frequency	[Hz]	500	5000
Idle current / residual current	[mA]	15	10
Line voltage drop	[V]	3	2.6
Short circuit protection		clocking	clocking
Inverse polarity protection		yes	yes
Indication	output signal	LED yellow	LED yellow
	voltage	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67
Connection type		Connector M12	Connector M12
Conductor diameter		-	-
Housing material		stainless steel	stainless steel
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		EZ015009	EZ015020

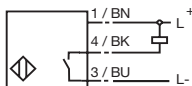
10

Output signals

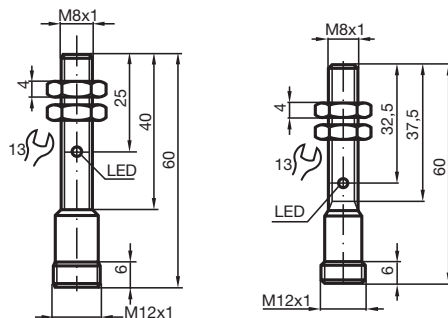
Output PO



Output NO



Dimensions in mm



Technical data & Approximate dimensions

Inductive sensors, M 8 x 1 thread



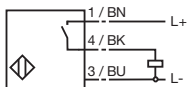
Inductive sensors, with thread M 8 x 1

Operating distance S_n , mounting		2 mm non-flush	2 mm non-flush	2 mm non-flush	3 mm quasi flush
PNP	NO	SIN2-M8N-V2-PO	SIN2-M8S-U2-PO	SIN2-M8N-C1-PO	SIN3-M8N-V2-PO
	NC				
	Antivalent				
NPN	NO	SIN2-M8N-V2-NO		SIN2-M8N-C1-NO	
	Antivalent				
DC 2-wires	NO				
AC	NO				
	NC				
	Antivalent				
Switching distance	[mm]	0 ... 1.62	0 ... 1.62	0 ... 1.62	0 ... 2.43
Reduction factor	r_{V2A}	0.75	0.7	0.75	0.77
	r_{AL}	0.45	0.4	0.45	0.36
	r_{Cu}	0.35	0.35	0.35	0.27
Operating voltage	[V]	10 ... 30	10...60	10 ... 30	10 ... 30
Operating current	[mA]	100	100	100	200
Switching frequency	[Hz]	1500	400	1500	1000
Idle current / residual current	[mA]	15	15	15	10
Line voltage drop	[V]	3	3	3	2
Short circuit protection		clocking	clocking	clocking	no
Inverse polarity protection		yes	yes	yes	yes
Indication	output signal	LED yellow	LED yellow	Multi-hole-LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2	EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67	IP67	IP67
Connection type		2 m, PVC-cable	2 m, PUR-cable	Connector M12	2 m, PVC-cable
Conductor diameter		0.14 mm ²	0.14 mm ²	-	0.14 mm ²
Housing material		nickel-plated brass	stainless steel	nickel-plated brass	chrome-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ020038	FZ020002	FZ015032	FZ030001

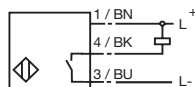
10

Output signals

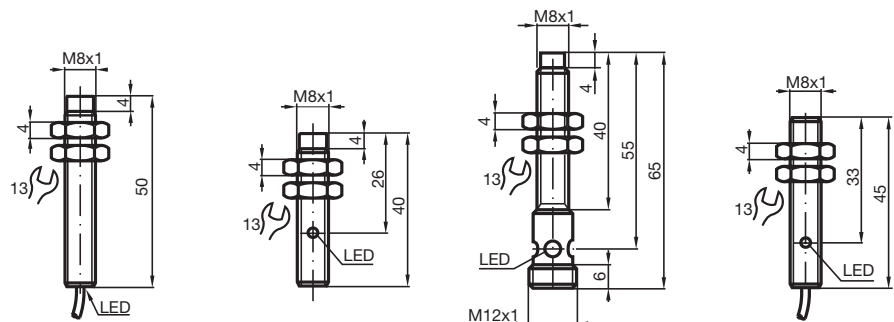
Output PO



Output NO



Dimensions in mm



Technical data & Approximate dimensions

Inductive sensors, M 8 x 1 thread

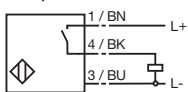
Inductive sensors, with thread M 8 x 1

Operating distance S_n , mounting		3 mm quasi flush
PNP	NO	SIN3-M8N-C8-PO
	NC	
	Antivalent	
NPN	NO	
	Antivalent	
DC 2-wire	NO	
AC	NO	
	NC	
	Antivalent	
Switching distance	[mm]	0 ... 2.43
Reduction factor	r_{V2A}	0.77
	r_{AL}	0.36
	r_{Cu}	0.27
Operating voltage	[V]	10 ... 30
Operating current	[mA]	200
Switching frequency	[Hz]	1000
Idle current / residual current	[mA]	10 / -
Line voltage drop [V]		2
Short circuit protection		no
Inverse polarity protection		yes
Indication	output signal	LED yellow
	voltage	-
Operating temperature range	[°C]	-25 ... 70
In compliance with		EN60947-5-2
Protection class acc. to IEC 60529		IP67
Connection type		Connector M8
Conductor diameter		-
Housing material		chrome-plated brass
Front face		PBT (Crastin)
Drawing No.		FZ030002

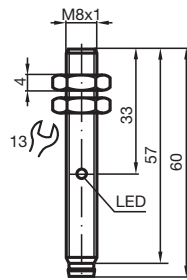
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Output signals

Output PO



Dimensions in mm



Technical data & Approximate dimensions

Inductive sensors, M 12 x 1 thread



Inductive sensors, with thread M 12 x 1

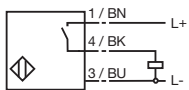
Operating distance S_n , mounting		2 mm flush	2 mm flush	2 mm flush
PNP	NO	SIF2-M12N-V2-PO		
	NC			
	Antivalent		SIF2-M12N-V2-PK	
NPN	NO	SIF2-M12N-V2-NO		
	Antivalent		SIF2-M12N-V2-NK	
DC 2-wire	NO			SIF2-M12N-V2-DO
AC	NO			
	NC			
	Antivalent			
Switching distance	[mm]	0 ... 1.62	0 ... 1.62	0 ... 1.62
Reduction factor	r_{V2A}	0.7	0.66	0.67
	r_{AL}	0.3	0.25	0.18
	r_{CU}	0.2	0.15	0.12
Operating voltage	[V]	10 ... 30	10 ... 30	6 ... 60
Operating current	[mA]	200	200	4 ... 100
Switching frequency	[Hz]	1500	1000	2000
Idle current / residual current	[mA]	17	20	0.7
Line voltage drop	[V]	3	3	6
Short circuit protection		clocking	clocking	no
Inverse polarity protection		yes	yes	yes
Indication	output signal	LED yellow	LED yellow	LED yellow
	voltage	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67	IP67
Connection type		2 m, PVC-Kabel	2 m, PVC-Kabel	2 m, PVC-Kabel
Conductor diameter		0.14 mm ²	0.14 mm ²	0.,14 mm ²
Housing material		nickel-plated brass	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ020010	FZ020044	FZ020020

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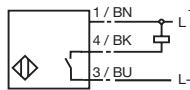
Output signals

Dimensions in mm

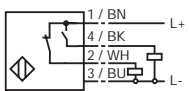
Output PO



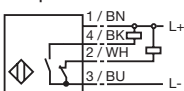
Output NO



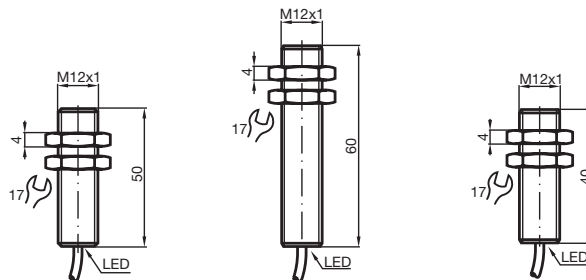
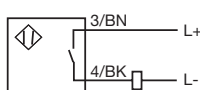
Output PK



Output NK



Output DO



Technical data & Approximate dimensions

Inductive sensors, M 12 x 1 thread

Inductive sensors, with thread M 12 x 1

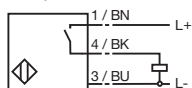
Operating distance S_n , mounting		2 mm flush	2 mm flush
PNP	NO	SIF2-M12E-C1-PO	
	NC		
	Antivalent		
NPN	NO		
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		SIF2-M12E-V2-AC
	Antivalent		
Switching distance	[mm]	0 ... 1.62	0 ... 1.62
Reduction factor	r_{V2A}	0.7	0.65
	r_{AL}	0.23	0.15
	r_{Cu}	0.21	0.1
Operating voltage	[V]	10 ... 60	20 ... 253
Operating current	[mA]	200	
Switching frequency	[Hz]	300025	
Idle current / residual current	[mA]	11	0,8
Line voltage drop	[V]	3	5
Short circuit protection		clocking	no
Inverse polarity protection		yes	no
Indication	output signal	LED yellow	LED red
	voltage	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67
Connection type		Connector M12	2 m, PVC-cable
Conductor diameter		-	0.34 mm ²
Housing material		stainless steel	stainless steel
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		EZ020014	FZ020014

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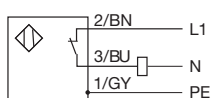
Output signals

Dimensions in mm

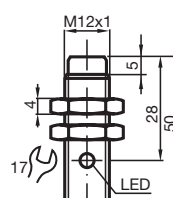
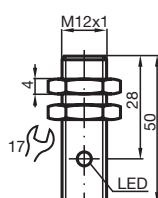
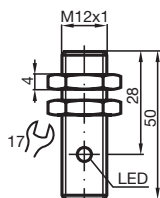
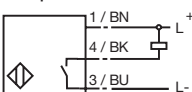
Output PO



Output AC



Output NO



Technical data & Approximate dimensions

Inductive sensors, M 12 x 1 thread



Inductive Sensors, with thread M 12 x 1

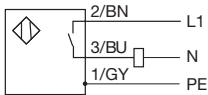
Operating distance S_n , mounting		2 mm flush	2 mm flush	2 mm flush	2 mm flush
PNP	NO		SIF2-M12S-V2-PO	SIF2-M12N-C1-PO	SIF2-M12S-C1-PO
	NC				
	Antivalent				
NPN	NO			SIF2-M12N-C1-NO	
	Antivalent				
DC 2-wire	NO				
AC	NO				
	NC	SIF2-M12N-V2-AO			
	Antivalent				
Switching distance	[mm]	0 ... 1.62	0 ... 1.62	0 ... 1.62	0 ... 1.62
Reduction factor	r_{VZA}	0.65	0.7	0.7	0.7
	r_{AL}	0.15	0.3	0.3	0.3
	r_{Cu}	0.1	0.2	0.2	0.2
Operating voltage	[V]	20 ... 253	10 ... 301	0 ... 301	0 ... 30
Operating current	[mA]	5 ... 200	100	200	100
Switching frequency	[Hz]	2510001	500	1000	
Idle current / residual current	[mA]	0,815 / -17 / -15 / -			
Line voltage drop	[V]	5	3	3	3
Short circuit protection		no	clocking	clocking	clocking
Inverse polarity protection		no	yes	yes	yes
Indication	output signal	LED red	LED yellow	Multi-hole LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2	EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67	IP67	IP67
Connection type		2 m, PVC-cable	2 m, PVC-cable	Connector M12	Connector M12
Conductor diameter			0.34 mm ²	0.14 mm ²	- -
Housing material		stainless steel	nickel-plated brass	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	
Drawing No.		FZ0200017	WZ000003	FZ020046	WZ060002

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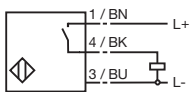
Output signals

Dimensions in mm

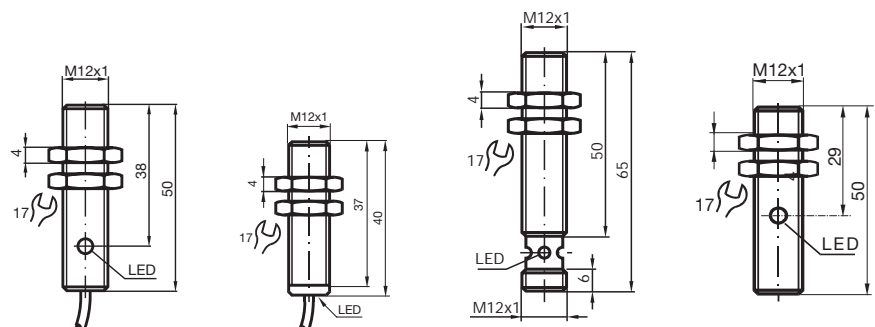
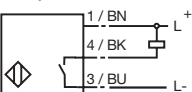
Output AO



Output PO



Output NO



Technical data & Approximate dimensions

Inductive sensors, M 12 x 1 thread

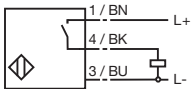
Inductive Sensors, with thread M 12 x 1

Operating distance S_n , mounting		4 mm non-flush	4 mm non-flush	4 mm non-flush	4 mm non-flush
PNP	NO	SIN4-M12N-V2-PO			SIN4-M12S-V2-PO
	NC				
	Antivalent		SIN4-M12N-V2-PK		
NPN	NO	SIN4-M12N-V2-NO			
	Antivalent		SIN4-M12N-V2-NK		
DC 2-wire	NO			SIN4-M12N-V2-DO	
AC	NO				
	NC				
	Antivalent				
Switching distance	[mm]	0 ... 3.24	0 ... 3.24	0 ... 3.24	0 ... 3.24
Reduction factor	r_{V2A}	0.8	0.75	0.74	0.75
	r_{AL}	0.5	0.45	0.37	0.45
	r_{Cu}	0.4	0.4	0.36	0.4
Operating voltage	[V]	10 ... 30	10 ... 30	6 ... 60	10 ... 30
Operating current	[mA]	200	200	4 ... 100	200
Switching frequency	[Hz]	1200	1000	2000	1500
Idle current / residual current	[mA]	17	20	--	0.715
Line voltage drop	[V]	3	3	6	3
Short circuit protection		clocking	clocking	no	clocking
Inverse polarity protection		yes	yes	yes	yes
Indication	output signal	LED yellow	LED yellow	LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2	EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67	IP67	IP67
Connection type		2 m, PVC-cable	2 m, PVC-cable	2 m, PVC-cable	2 m, PVC-cable
Conductor diameter		0.14 mm ²	0.14 mm ²	0.14 mm ²	0.14 mm ²
Housing material		nickel-plated brass	nickel-plated brass	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ040005	FZ040021	FZ040013	WZ000002

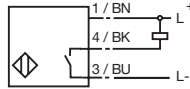
Output signals

Dimensions in mm

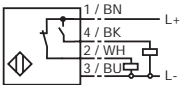
Output PO



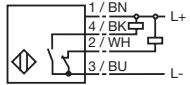
Output NO



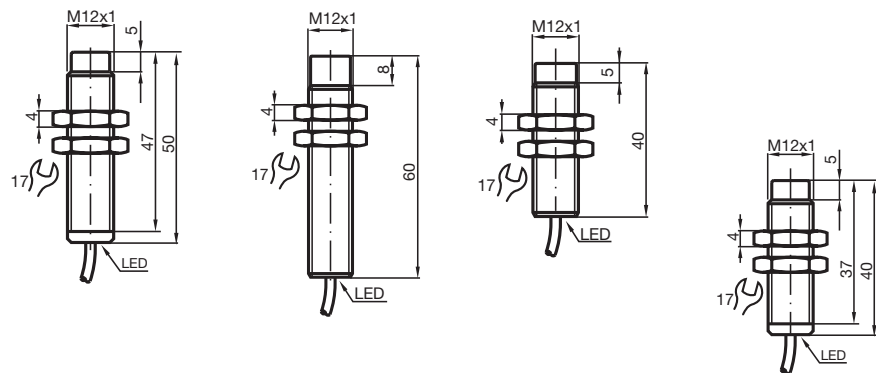
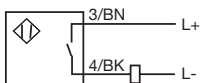
Output PK



Output NK



Ausgang DO



Technical data, Approximate dimensions

Inductive sensors, M 12 x 1 thread



Inductive Sensors, with thread M 12 x 1

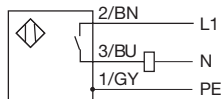
Operating distance S_n , mounting		4 mm non-flush	4 mm non-flush	4 mm non-flush
PNP	NO		SIN4-M12N-C1-PO	SIN4-M12S-C1-PO
	NC			
	Antivalent			
NPN	NO		SIN4-M12N-C1-NO	
	Antivalent			
DC 2-wire	NO			
AC	NO	SIN4-M12N-V2-AO		
	NC			
	Antivalent			
Switching distance	[mm]	0 ... 3.24	0 ... 3.24	0 ... 3.24
Reduction factor	r_{V2A}	0.8	0.8	0.75
	r_{AL}	0.45	0.5	0.45
	r_{Cu}	0.4	0.4	0.4
Operating voltage	[V]	20 ... 253	10 ... 301	0 ... 30
Operating current	[mA]	5 ... 200	200	100
Switching frequency	[Hz]	251	200	800
Idle current / residual current	[mA]	- / 0.8	17 / -	15 / -
Line voltage drop	[V]	5	3	3
Short circuit protection		no	taktend	taktend
Inverse polarity protection		no	yes	yes
Indication	output signal	LED red	Multi-hole LED yellow	LED yellow
	voltage	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN60947-5-2	EN60947-5-2	EN60947-5-2
Protection class acc. to IEC 60529		IP67	IP67	IP67
Connection type		2 m, PVC-cable	Connector M12	Connector M12
Conductor diameter		0.34 mm ²	-	-
Housing material		stainless steel	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ040009	FZ040028	FZ040008

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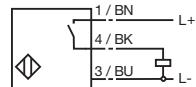
Output signals

Dimensions in mm

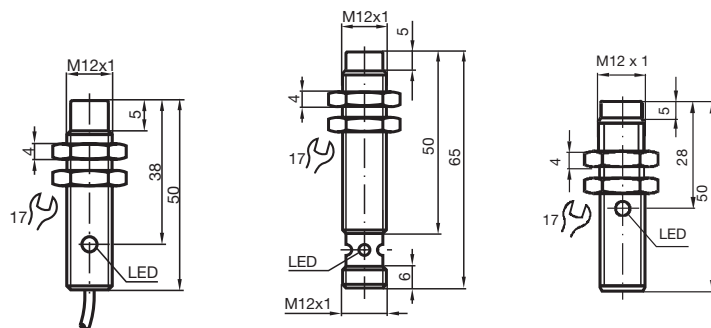
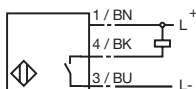
Output AO



Output PO



Output NO



Technical data, Approximate dimensions

Inductive sensors, M 12 x 1 thread

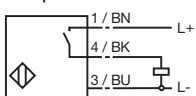
Inductive sensors, with thread M 12 x 1

Operating distance S_n , mounting		6 mm quasi flush	6 mm quasi flush
PNP	NO	SIN6-M12N-V2-PO	SIN6-M12N-C1-PO
	NC		
	Antivalent		
NPN	NO		
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		
	Antivalent		
Switching distance	[mm]	0 ... 4.86	0 ... 4.86
Reduction factor	r_{V2A}	0.67	0.67
	r_{AL}	0.28	0.28
	r_{Cu}	0.2	0.2
Operating voltage	[V]	10 ... 30	10 ... 30
Operating current	[mA]	200	200
Switching frequency	[Hz]	800	800
Idle current / residual current	[mA]	10	10
Line voltage drop	[V]	22	
Short circuit protection		no	no
Inverse polarity protection		yes	yes
Indication	output signal	LED yellow	LED yellow
	voltage	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2
Protection class acc. to IEC 60529		IP 67	IP 67
Connection type		2 m, PVC-cable	Connector M12
Conductor diameter		0.34 mm ²	-
Housing material		chrome-plated brass	chrome-plated brass
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ060001	FZ060002

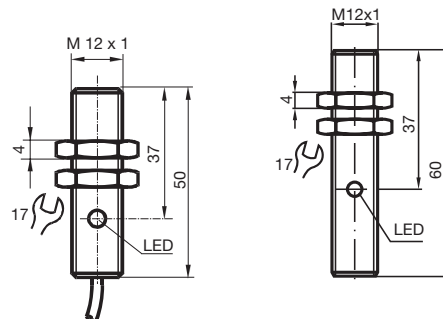
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Output signals

Output PO



Dimensions in mm



Technical data, Approximate dimensions

Inductive sensors, M 18 x 1 thread



Inductive sensors, with thread M 18 x 1

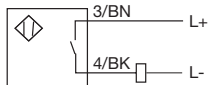
Operating distance S_n , mounting		5 mm flush	5 mm flush	5 mm flush	5 mm flush
PNP	NO	SIF5-M18N-V2-PO			
	NC				
	Antivalent		SIF5-M18N-V2-PK		
NPN	NO	SIF5-M18N-V2-NO			
	Antivalent		SIF5-M18N-V2-NK		
DC 2-wire	NO			SIF5-M18N-V2-DO	
AC	NO				SIF5-M18N-V2-AO
	NC				SIF5-M18N-V2-AC
	Antivalent				
Switching distance	[mm]	0 ... 4.05	0 ... 4.05	0 ... 4.05	0 ... 4.05
Reduction factor	r_{V2A}	0.7	0.66	0.72	0.62
	r_{AL}	0.3	0.25	0.34	0.2
	r_{Cu}	0.3	0.15	0.31	0.15
Operating voltage	[V]	10 ... 30	10 ... 30	6 ... 60	20 ... 253
Operating current	[mA]	200	200	4...100	200
Switching frequency	[Hz]	800	800	1500	20
Idle current / residual current	[mA]	20 / -	20 / -	- / 0,7	- / 1,7
Line voltage drop	[V]	3	3	6	8
Short circuit protection		clocking	clocking	no	no
Inverse polarity protection		yes	yes	yes	no
Indication	output signal	LED yellow	LED yellow	LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Protection class acc. to IEC 60529		IP 67	IP 67	IP 67	IP 67
Connection type		2 m, PVC-cable	2 m, PVC-cable	2 m, PVC-cable	2 m, PVC-cable
Conductor diameter		0.14 mm ²	0.34 mm ²	0.34 mm ²	0.34 mm ²
Housing material		nickel-plated brass	nickel-plated brass	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ050008	FZ050020	FZ050008	FZ050020

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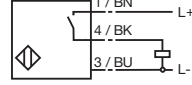
Output signals

Dimensions in mm

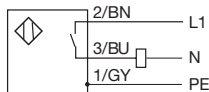
Output DO



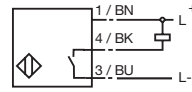
Output PO



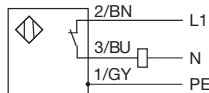
Output AO



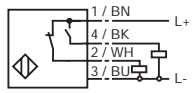
Output NO



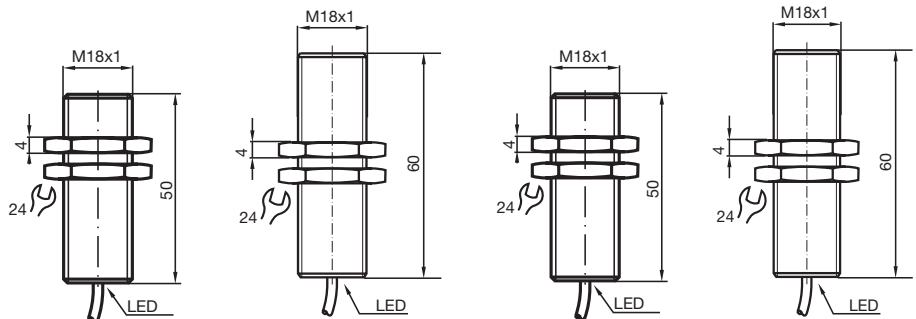
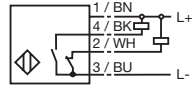
Output AC



Output PK



Output NK



Technical data, Approximate dimensions

Inductive sensors, M 18 x 1 thread

Inductive sensors, with thread M 18 x 1

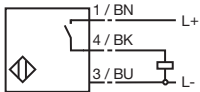
Operating distance S_n , mounting		5 mm flush	8 mm non-flush	8 mm non-flush
PNP	NO	SIF5-M18N-C1-PO	SIN8-M18N-V2-PO	
	NC			
	Antivalent			SIN8-M18N-V2-PK
NPN	NO	SIF5-M18N-C1-NO	SIN8-M18N-V2-NO	
	Antivalent			SIN8-M18N-V2-NK
DC 2-wire	NO			
AC	NO			
	NC			
	Antivalent			
Switching distance	[mm]	0 ... 4.05	0 ... 6.48	0 ... 6.48
Reduction factor	r_{V2A}	0.7	0.7	0.75
	r_{AL}	0.3	0.5	0.45
	r_{Cu}	0.3	0.4	0.4
Operating voltage	[V]	10 ... 30	10 ... 30	10 ... 30
Operating current	[mA]	200	200	200
Switching frequency	[Hz]	800	500	700
Idle current / residual current	[mA]	20	18	20
Line voltage drop	[V]	3	3	3
Short circuit protection		clocking	clocking	
Inverse polarity protection		yes	yes	yes
Indication	output signal	Mult-hole LED yellow	LED yellow	LED yellow
	voltage	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67	IP 67
Connection type		Connector M12	2m, PVC-cable	2m, PVC-cable
Conductor diameter		-	0.34 mm ²	0.34 mm ²
Housing material		nickel-plated brass	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ050032	FZ080003	FZ080013

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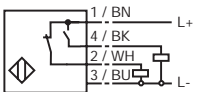
Output signals

Dimensions in mm

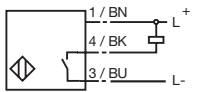
Output PO



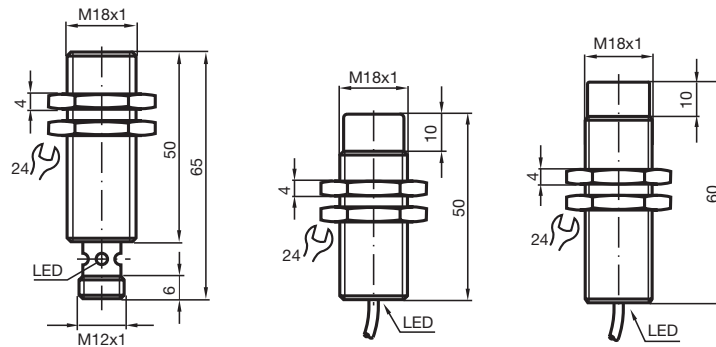
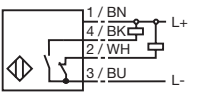
Output PK



Output NO



Output NK



Technical data, Approximate dimensions

Inductive sensors, M 18 x 1 thread



Inductive sensors, with thread M 18 x 1

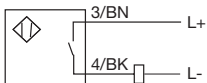
Operating distance S_n , mounting		8 mm non-flush	8 mm non-flush	8 mm non-flush	12 mm quasi flush
PNP	NO			SIN8-M18N-C1-PO	SIN12-M18N-V2-PO
	NC				
	Antivalent				
NPN	NO			SIN8-M18N-C1-NO	
	Antivalent				
DC 2-wire	NO	SIN8-M18N-V2-DO			
AC	NO		SIN8-M18N-V2-AO		
	NC		SIN8-M18N-V2-AC		
	Antivalent				
Switching distance	[mm]	0 ... 6.5	0 ... 6.5	0 ... 6.48	0 ... 9.72
Reduction factor	r_{V2A}	0.73	0.72	0.7	0.63
	r_{AL}	0.43	0.42	0.5	0.26
	r_{Cu}	0.42	0.4	0.4	0.2
Operating voltage	[V]	6 ... 60	20 ... 253	10 ... 30	10 ... 30
Operating current	[mA]		4 ... 100	200	200 200
Switching frequency	[Hz]		1000	20	500 500
Idle current / residual current	[mA]	- / 0.7	- / 1.7	18 / -	10 / -
Line voltage drop	[V]	6	8	3	2
Short circuit protection		no	no	clocking	no
Inverse polarity protection		yes	no	yes	yes
Indication	output signal	LED yellow	LED yellow	Multi-hole LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67	IP 67	IP 67
Connection type		2 m, PVC-cable	2 m, PVC-cable	Connector M12	2 m, PVC-cable
Conductor diameter		0.34 mm ²	0.34 mm ²	-	0.5 mm ²
Housing material		nickel-plated brass	nickel-plated brass	nickel-plated brass	chrome-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ080003	FZ080010	FZ080020	FZ120001

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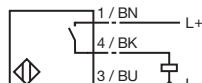
Output signals

Dimensions in mm

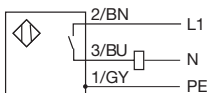
Output DO



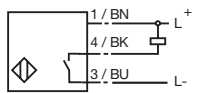
Output PO



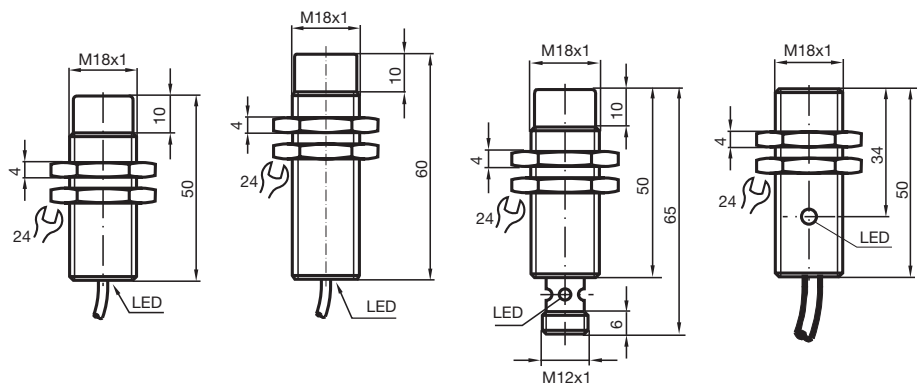
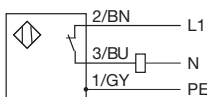
Output AO



Output NO



Output AC



Technical data, Approximate dimensions

Inductive sensors, M 18 x 1 thread

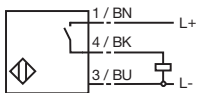
Inductive sensors, with thread M 18 x 1

Operating distance S_n , mounting		12 mm quasi flush
PNP	NO	SIN12-M18N-C1-PO
	NC	
	Antivalent	
NPN	NO	
	Antivalent	
DC 2-wire	NO	
AC	NO	
	NC	
	Antivalent	
Switching distance	[mm]	0 ... 9.72
Reduction factor	r_{VZA}	0.63
	r_{AL}	0.26
	r_{Cu}	0.2
Operating voltage	[V]	10 ... 30
Operating current	[mA]	200
Switching frequency	[Hz]	500
Idle current / residual current	[mA]	10 / -
Line voltage drop	[V]	2
Short circuit protection		no
Inverse polarity protection		yes
Indication	output signal	LED yellow
	voltage	-
Operating temperature range	[°C]	-25 ... 70
In compliance with		EN 60947-5-2
Protection class acc. to ICE 60529		IP 67
Connection type		Connector M12
Conductor diameter		-
Housing material		chrome-plated brass
Front face		PBT (Crastin)
Drawing No.		FZ120002

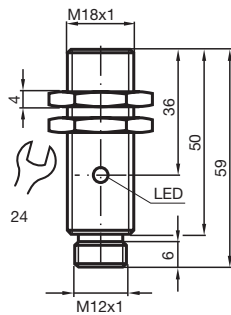
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Output signals

Output PO



Dimensions in mm



Technical data, Approximate dimensions

Inductive sensors, M 18 x 1 thread



Inductive sensors, with thread M 18 x 1

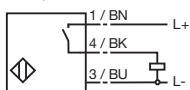
Operating distance S_n , mounting		5 mm flush	8 mm non-flush
PNP	NO	SIF5-M18E-C1-PO	SIN8-M18E-C1-PO
	NC		
	Antivalent		
NPN	NO	SIF5-M18E-C1-NO	
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		
	Antivalent		
Switching distance	[mm]	0 ... 4.05	0 ... 6.48
Reduction factor	r_{V2A}	0.62	0.72
	r_{AL}	0.2	0.42
	r_{Cu}	0.15	0.4
Operating voltage	[V]	10 ... 60	10 ... 60
Operating current	[mA]	200	200
Switching frequency	[Hz]	1500	1000
Idle current / residual current	[mA]	8.5	8.5
Line voltage drop	[V]	33	
Short circuit protection		clocking	clocking
Inverse polarity protection		yes	yes
Indication	output signal	LED yellow	LED yellow
	voltage	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67
Connection type		Connector M12	Connector M12
Conductor diameter		-	-
Housing material		stainless steel	stainless steel
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		EZ050013	SIN8-M18E-C1-PO

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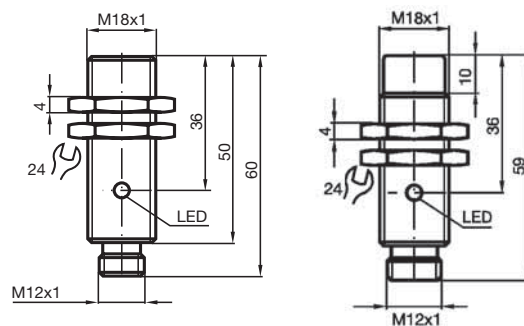
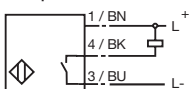
Output signals

Dimensions in mm

Output PO



Output NO



Technical data, Approximate dimensions

Inductive sensors, M 30 x 1.5 thread

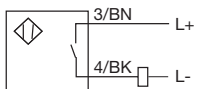
Inductive sensors, with thread M 30 x 1,5

Operating distance S_n , mounting		10 mm flush	10 mm flush	10 mm flush	10 mm flush
PNP	NO	SIF10-M30N-V2-PO			
	NC				
	Antivalent		SIF10-M30N-V2-PK		
NPN	NO	SIF10-M30N-V2-NO			
	Antivalent		SIF10-M30N-V2-NK		
DC 2-wire	NO			SIF10-M30N-V2-DO	
AC	NO				SIF10-M30N-V2-AO
	NC				SIF10-M30N-V2-AC
	Antivalent				
Switching distance	[mm]	0 ... 8.1	0 ... 8.1	0 ... 8.1	0 ... 8.1
Reduction factor	r_{V2A}	0.8	0.66	0.7	0.71
	r_{AL}	0.3	0.25	0.3	0.29
	r_{CU}	0.3	0.15	0.25	0.26
Operating voltage	[V]	10 ... 30	10 ... 30	6 ... 60	20 ... 253
Operating current	[mA]	200	2004 ...	1005 ...	200
Switching frequency	[Hz]	200	200	700	200
Idle current / residual current	[mA]	20 / -	20 / -	- / 0.7	- / 1.7
Line voltage drop	[V]	3	3	6	8
Short circuit protection		clocking	clocking	no	no
Inverse polarity protection		yes	yes	yes	no
Indication	output signal	LED yellow	LED yellow	LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67	IP 67	IP 67
Connection type		2 m, PVC-Kabel	2 m, PVC-Kabel	2 m, PVC-Kabel	2 m, PVC-Kabel
Conductor diameter		0.34 mm ²	0.34 mm ²	0.34 mm ²	0.34 mm ²
Housing material		nickel-plated brass	nickel-plated brass	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ100007	FZ100021	FZ100007	FZ100021

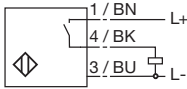
Output signals

Dimensions in mm

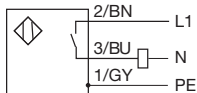
Output DO



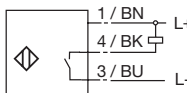
Output PO



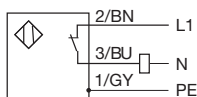
Output AO



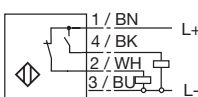
Output NO



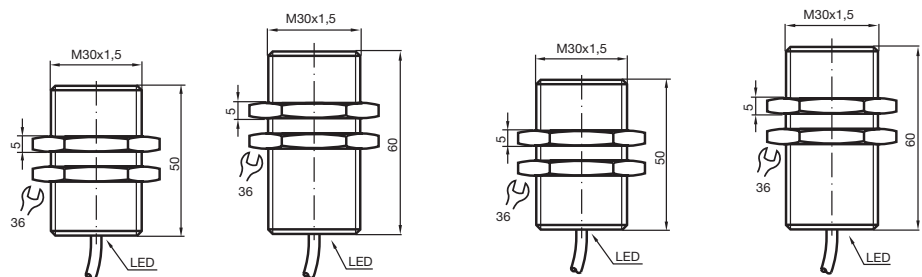
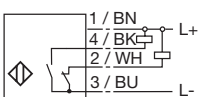
Output AC



Output PK



Output NK



Technical data, Approximate dimensions

Inductive sensors, M 30 x 1.5 thread



Inductive sensors, with thread M 30 x 1,5

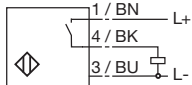
Operating distance S_n , mounting		10 mm flush	15 mm non-flush	15 mm non-flush
PNP	NO	SIF10-M30N-C1-PO	SIN15-M30N-V2-PO	
	NC			
	Antivalent			SIN15-M30N-V2-PK
NPN	NO	SIF10-M30N-C1-NO	SIN15-M30N-V2-NO	
	Antivalent			SIN15-M30N-V2-NK
DC 2-wire	NO			
AC	NO			
	NC			
	Antivalent			
Switching distance	[mm]	0 ... 8.1	0 ... 12.15	0 ... 12.15
Reduction factor	r_{V2A}	0.8	0.8	0.75
	r_{AL}	0.3	0.5	0.45
	r_{Cu}	0.3	0.4	0.4
Operating voltage	[V]	10 ... 30	10 ... 30	10 ... 30
Operating current	[mA]	200	200	200
Switching frequency	[Hz]	200	200	200
Idle current / residual current	[mA]	20 / -	15 / -	20 / -
Line voltage drop	[V]	3	3	3
Short circuit protection	clockingclockingclocking			
Inverse polarity protection	yesyesyes			
Indication	output signal	Multi hole LED yellow	LED yellow	LED yellow
	voltage	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67	IP 67
Connection type		Connector M12	2m, PVC-cable	2m, PVC-cable
Conductor diameter		-	0.34 mm ²	0.34 mm ²
Housing material		nickel-plated brass	nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ100035	FZ150003	FZ150014

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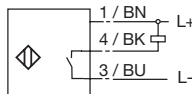
Output signals

Dimensions in mm

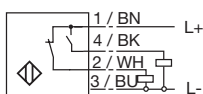
Output PO



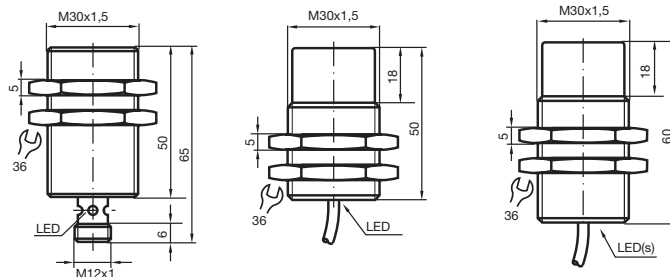
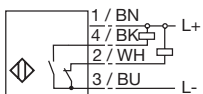
Output NO



Output PK



Output NK



Technical data, Approximate dimensions

Inductive sensors, M 30 x 1.5 thread

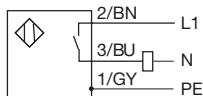
Inductive sensors, with thread M 30 x 1,5

Operating distance S_{pr} , mounting		15 mm non-flush	15 mm non-flush
PNP	NO		SIN15-M30N-C1-PO
	NC		
	Antivalent		
NPN	NO		SIN15-M30N-C1-NO
	Antivalent		
DC 2-wire	NO		
AC	NO	SIN15-M30N-V2-AO	
	NC	SIN15-M30N-V2-AC	
	Antivalent		
Switching distance	[mm]	0 ... 12.2	0 ... 12.15
Reduction factor	r_{V2A}	0.82	0.8
	r_{AL}	0.43	0.5
	r_{Cu}	0.41	0.4
Operating voltage	[V]	20 ... 253	10 ... 30
Operating current	[mA]	5 ... 200	200
Switching frequency	[Hz]	20	200
Idle current / residual current	[mA]	- / 1.7	20 / -
Line voltage drop	[V]	8	3
Short circuit protection		no	clocking
Inverse polarity protection		no	yes
Indication	output signal	LED yellow	Multi-hole LED yellow
	voltage	-	-
Operating temperature range	[°C]	25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67
Connection type		2 m, PVC-cable	Connector M12
Conductor diameter		0.34 mm ²	-
Housing material		nickel-plated brass	nickel-plated brass
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		FZ 150014	FZ 150027

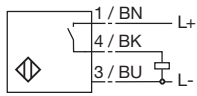
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Output signals

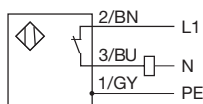
Output AO



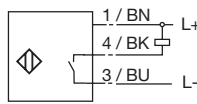
Output PO



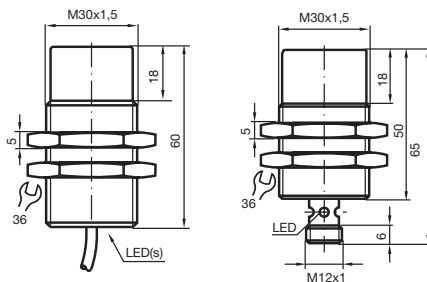
Output AC



Output NO



Dimensions in mm



Technical data, Approximate dimensions

Inductive sensors, M 30 x 1.5 thread



Inductive sensors, with thread M 30 x 1,5

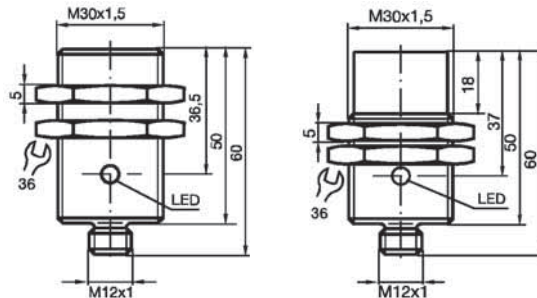
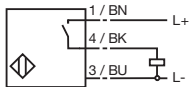
Operating distance S_n , mounting		15 mm flush	15 mm non-flush
PNP	NO	SIF10-M30E-C1-PO	SIN15-M30E-C1-PO
	NC		
	Antivalent		
NPN	NO		
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		
	Antivalent		
Switching distance	[mm]	0 ... 8.1	0 ... 12.15
Reduction factor	r_{V2A}	0.72	0.71
	r_{AL}	0.34	0.4
	r_{Cu}	0.32	0.38
Operating voltage	[V]	10 ... 60	10 ... 60
Operating current	[mA]	200	200
Switching frequency	[Hz]	650	500
Idle current / residual current	[mA]	9	12
Line voltage drop	[V]	2.8	2.8
Short circuit protection		clocking	clocking
Inverse polarity protection		yes	yes
Indication	output signal	LED yellow	LED yellow
	voltage	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67
Connection type		Connector M12	Connector M12
Conductor diameter		-	-
Housing material		stainless steel	stainless steel
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		SIF10-M30E-C1-PO	SIN15-M30E-C1-PO

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Output signals

Dimensions in mm

Output PO



Technical data, Approximate dimensions

Inductive sensors , block & square housings

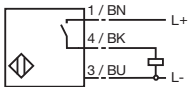
Inductive sensors, Block and square housings

Operating distance S_n , mounting		2 mm flush	6 mm flush
PNP	NO	SIF2-B28N-V0,1-PO	SIF6-B45N-U2-PO
	NC		
	Antivalent		
NPN	NO	SIF2-B28N-V0,1-NO	
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		
	Antivalent		
Switching distance	[mm]	0 ... 1.62	0 ... 4.8
Reduction factor	r_{V2A}	0.7	0.7
	r_{AL}	0.35	0.22
	r_{Cu}	0.2	0.2
Operating voltage	[V]	10 ... 30	10 ... 60
Operating current	[mA]	100	200
Switching frequency	[Hz]	1000	500
Idle current / residual current	[mA]	15 / -	20 / -
Line voltage drop	[V]	3	3
Short circuit protection		clocking	clocking
Inverse polarity protection		yes	yes
Indication	output signal	LED yellow	LED yellow
	voltage	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67
Connection type		0.1 m, PVC-cable	2 m, PUR-cable
Conductor diameter		0.14 mm ²	0.34 mm ²
Housing material		PBT (Crastin)	PBT (Crastin)
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		FQ030001	FF00001

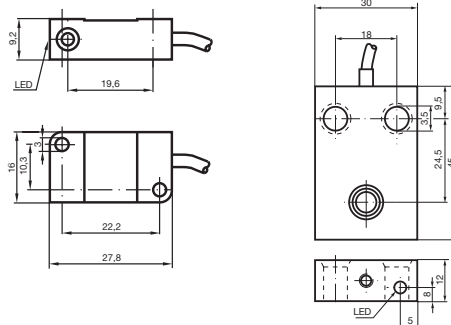
10

Output signals

Output PO



Dimensions in mm



Technical data, Approximate dimensions Inductive sensors , block & square housings



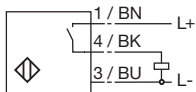
Inductive sensors, Block- and square housings

Operating distance S_n , mounting		15 mm flush	15 mm flush	20 mm flush	20 mm non-flush
PNP	NO	SIF15-Q40N-T-PO	SIF15-Q40N-C1-PO	SIF20-Q40N-T-PO	
	NC				
	Antivalent	SIF15-Q40N-T-PK			
NPN	NO	SIF15-Q40N-T-NO			
	Antivalent				
DC 2-wire	NO				
AC	NO				
	NC				
	Antivalent				SIN20-Q40N-T-AK
Switching distance	[mm]	0 ... 12.15	0 ... 12,15	0 ... 16,2	0 ... 16.2
Reduction factor	r_{VZA}	0.75	0.75	0.8	0.8
	r_{AL}	0.3	0.3	0.3	0.35
	r_{Cu}	0.25	0.25	0.3	0.35
Operating voltage	[V]	10 ... 60	20 ... 253	10 ... 60	20 ... 253
Operating current	[mA]	200	8 ... 500	200	8 ... 500
Switching frequency	[Hz]	150	20	150	20
Idle current / residual current	[mA]	10 / -- / 1.9510 / -- / 1.95			
Line voltage drop	[V]	2.8	12	2.8	12
Short circuit protection		clocking	no	clocking	no
Inverse polarity protection		yes	no	yes	no
Indication	output signal	LED yellow	LED yellow	LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 68	IP 68	IP 68	IP 68
Connection type		terminal connection	Connector M12	terminal connection	terminal connection
Conductor diameter		up to 2,5 mm ²	up to 2,5 mm ²	up to 2,5 mm ²	up to 2,5 mm ²
Housing material		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		CV150002	CV150002	CV150002	CV150002

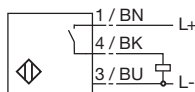
10

Output signals

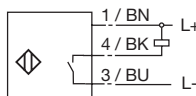
Output PO



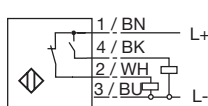
Output PO



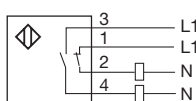
Output NO



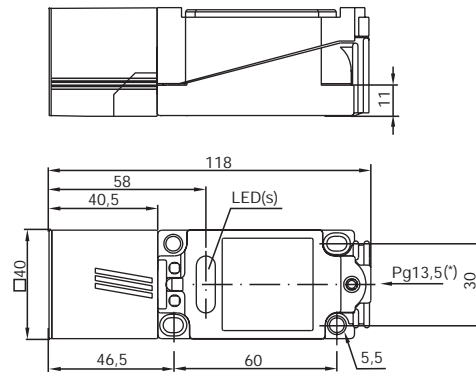
Output PK



Output AK



Dimensions in mm



(*) Cable inlet acc. to new standard henceforth in M20

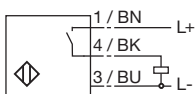
Inductive sensors, Block- and square housings

Operating distance S_n , mounting		30 mm non-flush	30 mm non-flush
PNP	NO	SIN30-Q40N-T-PO	
	NC		
	Antivalent	SIN30-Q40N-T-PK	
NPN	NO		
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		
	Antivalent		SIN30-Q40N-T-AK
Switching distance	[mm]	0 ... 24.3	0 ... 24.3
Reduction factor	r_{V2A}	0.8	0.8
	r_{AL}	0.45	0.45
	r_{Cu}	0.4	0.4
Operating voltage	[V]	10 ... 60	20 ... 253
Operating current	[mA]	200	8 ... 500
Switching frequency	[Hz]	100	20
Idle current / residual current	[mA]	10 / -	- / 1.95
Line voltage drop	[V]	2,8	12
Short circuit protection		clocking	no
Inverse polarity protection		yes	no
Indication	output signal	LED yellow	LED yellow
	voltage	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 68	IP 68
Connection type		terminal connection	terminal connection
Conductor diameter		up to 2.5 mm ²	up to 2.5 mm ²
Housing material		PBT (Crastin)	PBT (Crastin)
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		CV150002	CV150002

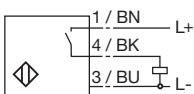
10

Output signals

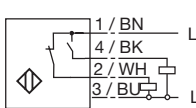
Output PO



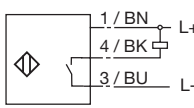
Output PO



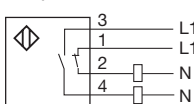
Output PK



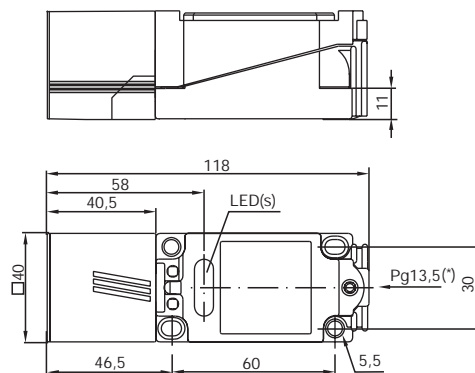
Output NO



Output AK



Dimensions in mm



(*) Cable inlet acc. to new standard henceforth in M20

Technical data, Approximate dimensions

Inductive sensors, block & square housings



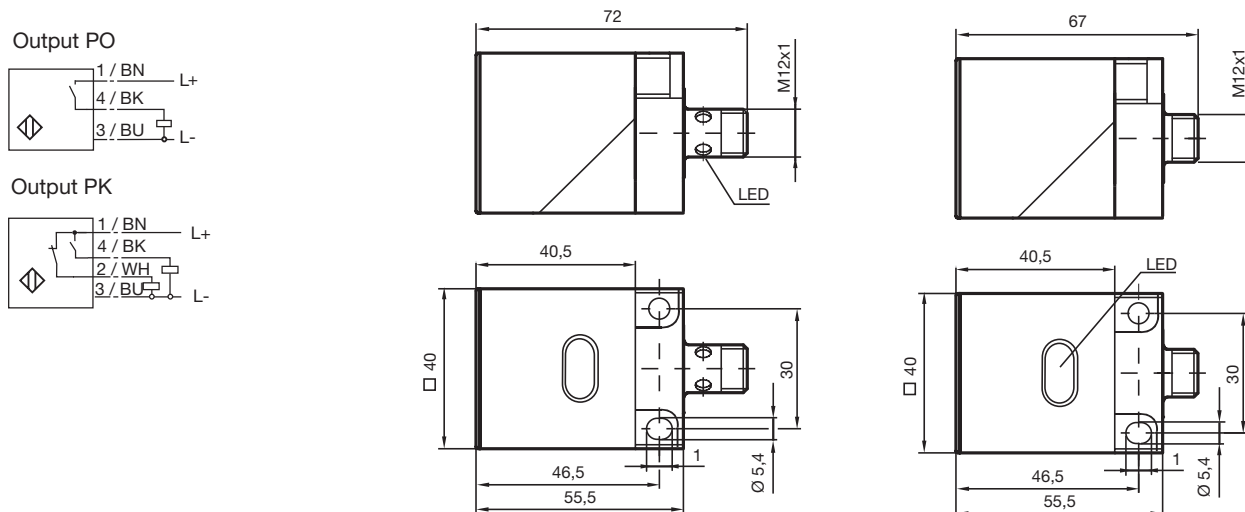
Inductive sensors, Block and square housings

Operating distance S_n , mounting		20 mm, flush	30 mm, non-flush	20 mm, flush	30 mm non-flush
PNP	NO	SIF20-Q40S-C1-PO	SIN30-Q40S-C1-PO	SIF20-Q40T-C1-PO	
	NC				
	Antivalent			SIF20-Q40T-C1-PK	SIN30-Q40T-C1-PK
NPN	NO				
	Antivalent				
DC 2-wire	NO				
AC	NO				
	NC				
	Antivalent				
Switching distance	[mm]	0 ... 16,2	0 ... 24,3	0 ... 16,2	0 ... 24,3
Reduction factor	r_{V2A}	0.85	0.85	0.85	0.85
	r_{AL}	0.4	0.5	0.4	0.5
	r_{Cu}	0.35	0.45	0.35	0.45
Operating voltage	[V]	10 ... 30	10 ... 30	10 ... 30	10 ... 30
Operating current	[mA]	200	200	200	200
Switching frequency	[Hz]	150	150	150	150
Idle current / residual current	[mA]	20 / -	20 / -	20 / -	20 / -
Line voltage drop	[V]	3	3	3	3
Short circuit protection		clocking	clocking	clocking	clocking
Inverse polarity protection		yes	yes	yes	yes
Indication	output signal	Multi-hole LED yellow	Multi-hole LED yellow	LED yellow	LED yellow
	voltage	-	-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67	IP 67	IP 67
Connection type		Connector M12	Connector M12	Connector M12	Connector M12
Conductor diameter		-	-	-	-
Housing material		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		CV150006	CV150006	CV150007	CV150007

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Output signals

Dimensions in mm



Technical data, Approximate dimensions

Inductive sensors, block & square housings

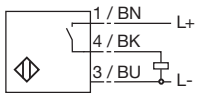
Inductive sensors, Block- and square housings

Operating distance S_n , mounting		40 mm flush	50 mm non-flush
PNP	NO		SIN50-Q80N-T-PO
	NC		
	Antivalent	SIF40-Q80N-T-PK	SIN50-Q80N-T-PK
NPN	NO		
	Antivalent		
DC 2-wire	NO		
AC	NO		
	NC		
	Antivalent		
Switching distance	[mm]	0 ... 32.4	0 ... 40.5
Reduction factor	r_{V2A}	0.83	0.85
	r_{AL}	0.38	0.4
	r_{Cu}	0.38	0.3
Operating voltage	[V]	10 ... 60	10 ... 60
Operating current	[mA]	200	200
Switching frequency	[Hz]	100	100
Idle current / residual current	[mA]	20 / -20 / -	
Line voltage drop	[V]	3	3
Short circuit protection		clocking	clocking
Inverse polarity protection		yes	yes
Indication	output signal	LED yellow	LED yellow
	voltage	LED green	LED green
Operating temperature range	[°C]	-25 ... 7	-25 ... 70
In compliance with		EN 60947-5-2	EN 60947-5-2
Protection class acc. to ICE 60529		IP 67	IP 67
Connection type		terminal connection	terminal connection
Conductor diameter		up to 2.5 mm ²	up to 2.5 mm ²
Housing material		PBT (Crastin)	PBT (Crastin)
Front face		PBT (Crastin)	PBT (Crastin)
Drawing No.		CFP40001	CFP40002

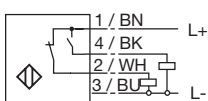
10

Output signals

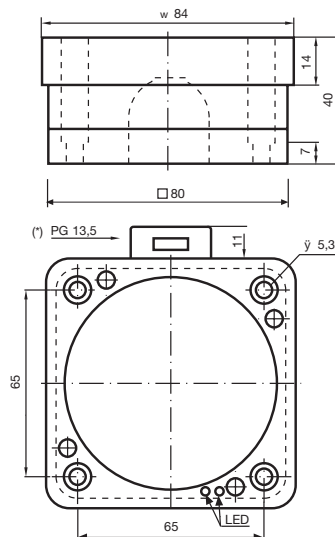
Output PO



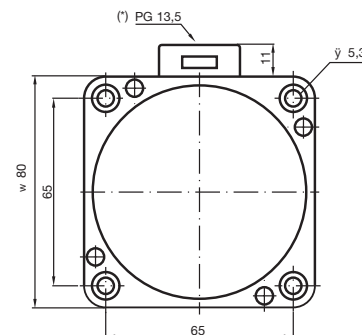
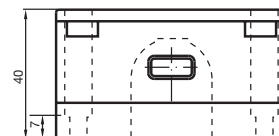
Output PK



Dimensions in mm



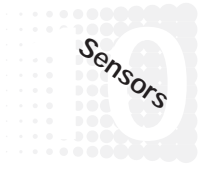
(*) Cable input according to new norm henceforth in M20



(*) Cable input according to new norm henceforth in M20

Technical data, Approximate dimensions

Inductive sensors, Analog sensor

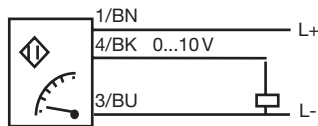


Inductive sensors: Analog sensor

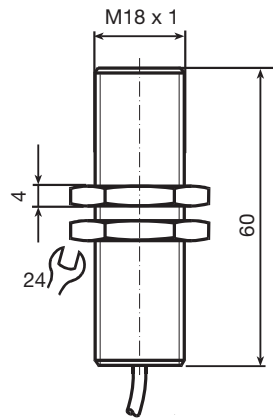
Metering range	2 mm... 5mm	
Type	SIF5-M18N-V2-M	
Operating voltage	V	15...30
Compensation tolerance zero-point	%	±2
Frequency limit (3 dB)	Hz	ca. 110
Reproducibility	µm	6
Output signal	mA	0...20
Load resistance	Ω	0... 500
Output ripple		ca. ± 0.15% of final value
Inverse polarity protection		yes
Temperature drift		ca. ± 0.1%K of final value
Idle current	mA	8
Operating temperature range	°C	-10... 70
In compliance with	EN 60947-5-2	
Protection class acc. to IEC 60529	IP 67	
Connection type	2 m PVC - cable	
Conductor diameter	0.5mm ²	
Housing material	nickel-plated brass	
Front face	PBT (Crastin)	
Drawing No.	WZ000004	

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Output signals



Approximate dimensions



Technical data, Approximate dimensions

Capacitive sensors, M 30 x 1.5 thread

Capacitive sensors, with thread M 30 x 1,5

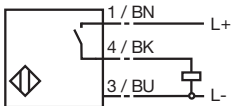
Operating distance S_n , mounting		10 mm flush	10 mm flush	10 mm flush
PNP	NO	SCF10-M30N-V2-PO	SCF10-M30N-C1-PO	
	NC			
NPN	NO	SCF10-M30N-V2-PK	SCF10-M30N-C1-PK	
	Antivalent			
DC 2-Draht	NO			SCF10-M30N-V2-AO
AC	NO			
	NC			
	Antivalent			
Switching distance	[mm]	1 ... 10	1 ... 10	1 ... 10
Reduction factor		r_{V2A} -	-	-
		r_{AL} -	-	-
		r_{Cu} -	-	-
Operating voltage	[V]	10 ... 60	10 ... 60	20 ... 253
Operating current	[mA]	200	200	200
Switching frequency	[Hz]	10	10	10
Idle current / residual current	[mA]	20 / 0.5	20 / 0.5	- / 1.5
Line voltage drop	[V]	2,8	2,8	8
Short circuit protection		clocking	clocking	no
Inverse polarity protection		yes	yes	yes
Indication	output signal voltage	LED yellow	LED yellow	LED yellow
		-	-	-
Operating temperature range	[°C]	-25 ... 70	-25 ... 70	-25 ... 70
In compliance with Protection class acc. to ICE 60529		EN 60947-5-2 IP 67	EN 60947-5-2 IP 67	EN 60947-5-2 IP 67
Connection type		2 m, PVC-cable	Connector	2 m, PVC-cable
Conductor diameter		0.75 mm ²	-	0.75 mm ²
Housing material		stainless steel	stainless steel	stainless steel
Front face		PBT (Crastin)	PBT (Crastin)	PBT (Crastin)
Drawing No.		LS100018	LS100019	LS100018

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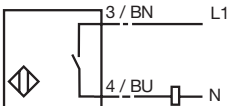
Output signals

Approximate dimensions

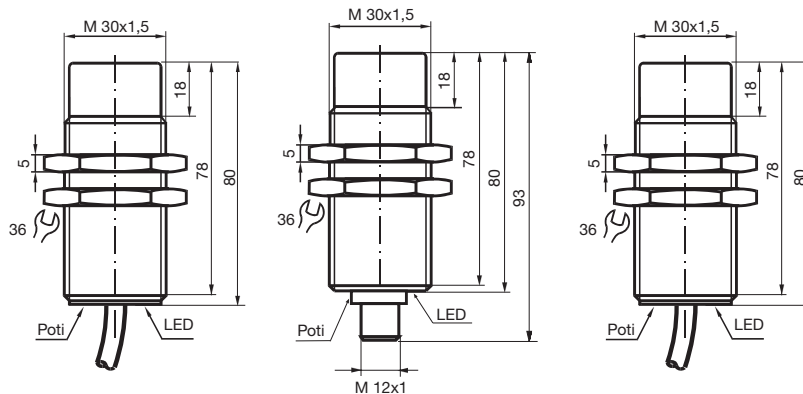
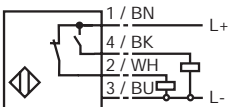
Output PO



Output AO



Output PK



Technical data, Approximate dimensions

Photoelectric sensors, Through beam

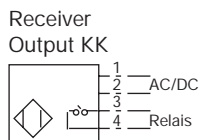


Photoelectric sensors: Through beam sensors

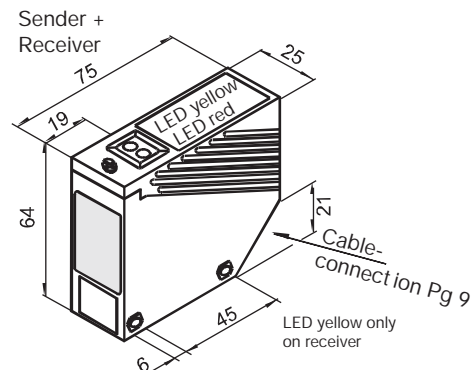
Device identification	STO20M-B75N-T-KK
Sensing range Output	20,000 mm DC, PNP
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object	No through beam photoelectric sensor with potentiometer 25 Hz / ≤ ms ≤ 50 - opaque
Operating mode LED yellow LED red Type of light External light limit (daylight / halogen light)	Light ON/dark ON, selectable only receiver: Output status rec.: stability control output, send.: net on IR-light 940 nm ≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range Storage temperature range	-25°C... +55°C -40°C... +55°C
Electrical data Operating voltage Idle current Output Rated operational current Line voltage drop Stability control output Rated operational current Short-circuit and overload protection Inverse polarity protection	12... 240 VDC ± 10% 24... 240 VAC ± 10%: 50...60 Hz — NC / NO relay: ≤ 240 VAC, ≤ 30 VDC, ≤ 3A — — — no no
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock and vibration resistance Connection type Weight In compliance with Drawing No.	IP 65 PMMA lenses, pole filter shock b ≤ 30 g, T ≤ 11ms; vibrations f ≤ 55 Hz, a ≤ 1 mm Terminal compartment, cable ø 10 mm emitter: 90 g; receiver: 100g EN 60 947-5-2 CO000008

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Output signals



Approximate dimensions



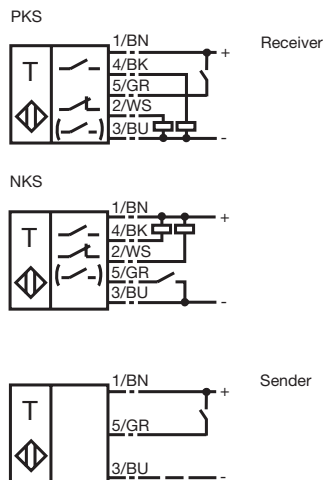
Technical data, Approximate dimensions

Photoelectric sensors, Through beam

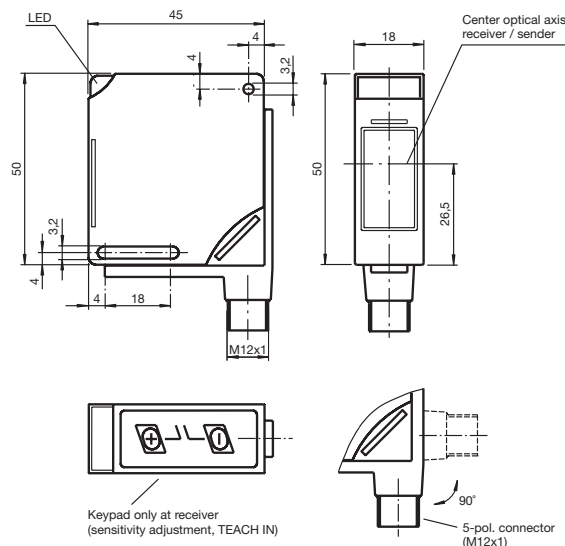
Photoelectric sensors: Through beam sensors

Device identification	SOT15M-B45N-C1-PKS	SOT15M-B45N-C1-NKS
Sensing range	2,000 mm ... 15,000 mm	2,000 mm ... 15,000 mm
Output	DC, PNP	DC, NPN
Operating data		
Polarized	no	no
Reference value	receiver	receiver
Range setting	with +/- keys	with +/- keys
Switching frequency (1:1) / response time	max. 1 kHz / ≤ 3 ms	max. 1 kHz / ≤ 3 ms
Readiness delay	< 400 ms, with switch-on standardisation	< 400 ms, with switch-on standardisation
Range hysteresis	-	-
Detectable object:	opaque, reflective	opaque, reflective
LED red	stability control output flashing 2 Hz, fault indication in teach-in mode 1,5 s	stability control output flashing 2 Hz, fault indication in teach-in mode 1,5 s
LED yellow	switching condition	switching condition
LED green	operating status, in teach-in mode flashing	operating status, in teach-in mode flashing
Type of light	visible red light 660 nm	visible red light 660 nm
External light limit (daylight / halogen light)	≤ 10,000 Lux / ≤ 7,500 Lux	≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range	-25 °C ... +55 °C	-25 °C ... +55 °C
Storage temperature range	-40 °C ... +55 °C	-40 °C ... +55 °C
Electrical data		
Operating voltage	10 VDC ... 30 VDC ±10%	10 VDC ... 30 VDC ±10%
Idle current	ca. 25 mA per device	ca. 25 mA per device
Rated operational current	200 mA per device	200 mA per device
Line voltage drop	≤ 2,5 V	≤ 2,5 V
Input voltage	for control / test: < 2 V off / > 7 V on	for control / test: < 2 V off / > 7 V on
Short-circuit and overload protection	yes	yes
Inverse polarity protection	yes	yes
Mechanical data		
Protection class acc. to EN 60529	> IP 67, materials approved for use in food production	> IP 67, materials approved for use in food production
Optical system	PMMA lenses	PMMA lenses
Permissible shock and vibration resistance	shock b ≤ 30 g, T ≤ 11 ms	shock b ≤ 30 g, T ≤ 11 ms
Connection type	vibrations f ≤ 55 Hz, a ≤ 1 mm	vibrations f ≤ 55 Hz, a ≤ 1 mm
	Connector M12 x 1, 5 - pole,	Connector M12 x 1, 5 - pole,
	90 ° pivoting	90 ° pivoting
Weight	60 g per device	60 g per device
In compliance with	EN 60 947-5-2	EN 60 947-5-2
Housing material	PBT (Crastin), plug and dovetail AISI	PBT (Crastin), plug and dovetail AISI

Output signals



Approximate dimensions



Technical data, Approximate dimensions

Photoelectric sensors, Retroflective



Photoelectric sensors: Retroreflective sensors

Device identification	SOR1500-M18N-C1-PO	SOR4000-M18N-C1-PO
Sensing range Output	1,500 mm DC, PNP	4,000 mm DC, PNP
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	yes Retroreflector 50mm x 50mm with potentiometer 300 Hz / ≤ 1,5 ms ≤ 50 ms - opaque, reflective	yes Retroreflector 50mm x 50mm with potentiometer ≤ 500 Hz ≤ 25 ms - opaque, reflective
Mode of operation LED yellow LED red Type of light External light limit (daylight / halogen light)	Light ON/dark ON, selectable by wiring switching condition - red light 660 nm ≤ 10,000 Lux / ≤ 3,000 Lux	Light ON/dark ON, selectable electronically switching condition - red light 660 nm ≤ 10,000 Lux / ≤ 3,000 Lux
Operating temperature range Storage temperature range	-25°C ... +55°C -40°C ... +70°C	-25°C ... +55°C -40°C ... +70°C
Electrical data Operating voltage Idle current Output Rated operational current Line voltage drop Stability control output Rated operational current Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{ss} ≤ 20 mA NC/NO 100 mA ≤ 2,5 V - - yes yes	10 VDC ... 30 VDC ≤ 25 mA NC/NO 100 mA ≤ 2,5 V - - yes yes
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection type Housing material Weight In compliance with Drawing No.	IP 67 PMMA lenses, pole filter shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1mm Connector M12 nickel-plated brass 45 g EN 60 947-5-2 CO00001A	IP 67 PMMA lenses, pole filter shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1mm Connector M12 nickel-plated brass 45 g EN 60 947-5-2 CO00001B

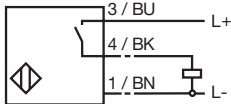
10

Output signals

Approximate dimensions

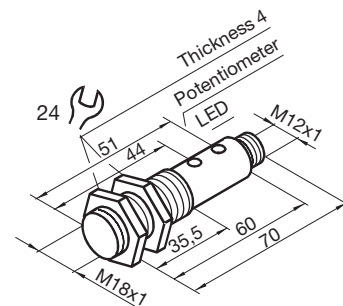
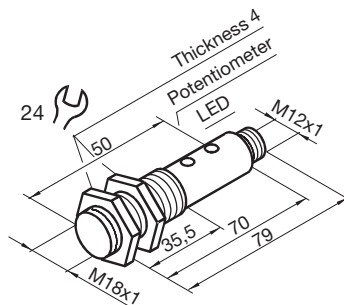
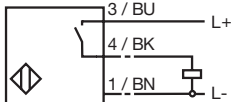
Output PO

Incidence of light → Output high



Output PO

Incidence of light → Output high



Technical data, Approximate dimensions

Photoelectric sensors, Retroflective

Photoelectric sensors: Retroreflective sensors

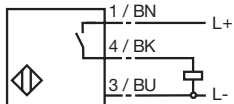
Device identification	SOR2000-B26N-U2-PO
Sensing range Output	2,000 mm DC, PNP
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	no Retroreflector 50mm x 50mm with potentiometer 500 Hz / ≤ 1 ms ≤ 30 ms - opaque
Operating mode LED yellow LED red Type of light External light limit (daylight / halogen light)	Light ON/dark ON, selectable switching condition stability control output IR-light 950 nm ≤ 20,000 Lux / ≤ 5,000 Lux
Operating temperature range Storage temperature range	-25°C ... +70°C -25°C ... +70°C
10 Electrical data Operating voltage Idle current Output Rated operational current Line voltage drop Stability control output Rated operational current Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{ss} ≤ 30 mA NC/NO 200 mA ≤ 2,5 V - - yes yes
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock and vibration resistance Connection type Housing material Weight In compliance with Drawing No.	IP67 PC lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1mm 2 m cable, 3 x 0.14mm ² , PUR black PBT (Crastin) 20 g EN 60 947-5-2 CO000003

Output signals

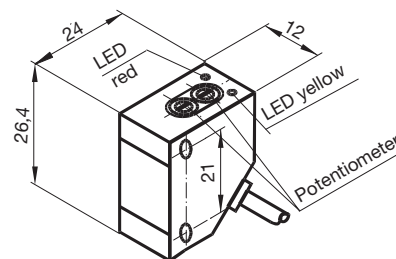
Output PO

Output low / high:

Selection with Potentiometer



Approximate dimensions



Technical data, Approximate dimensions

Photoelectric sensors, Retroflective



Photoelectric sensors: Retroreflective sensors

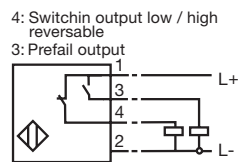
Device identification	SOR5000-B75N-T-POS	SOR5000-B75N-T-KK
Sensing range Output	5,000 mm DC, PNP	5,000 mm DC, PNP
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	yes Retroreflector 50mm x 50mm with potentiometer 300 Hz / ≤ 15 ms ≤ 50 ms - opaque, reflective	yes Retroreflector 50mm x 50mm with potentiometer 25 Hz / ≤ 20 ms ≤ 50 ms - opaque, reflective
Mode of operation LED yellow LED red Type of light External light limit (daylight / halogen light)	Light ON/dark ON, switchable switching condition stability control output red light 660 nm ≤ 10,000 Lux / ≤ 7,500 Lux	Light ON/dark ON, switchable switching condition stability control output red light 660 nm ≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range Storage temperature range	-25°C ... +55°C -40°C ... +55°C	-25°C ... +55°C -40°C ... +55°C
Electrical data Operating voltage Idle current Output Rated operational current Line voltage drop Stability control output Rated operational current Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{ss} ≤ 35 mA NC/NO 200 mA ≤ 3 V NO 200 mA short-circuit/overload proof yes yes	12 ... 240 VDC ±10% 24 ... 240 VAC ±10%, 50 ... 60 Hz - NC/NO relay: ≤ 240 VAC, 30 VDC, ≤ 3A - - no no
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection type Housing material Weight In compliance with Drawing No.	IP 66 PMMA lenses, polarisation filter shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Terminal compartment, cable ø 10 mm PBT (Crastin) 100 g EN 60 947-5-2 CO000006	IP 66 PMMA lenses, polarisation filter shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Terminal compartment, cable ø 10 mm PBT (Crastin) 110 g EN 60 947-5-2 CO000006

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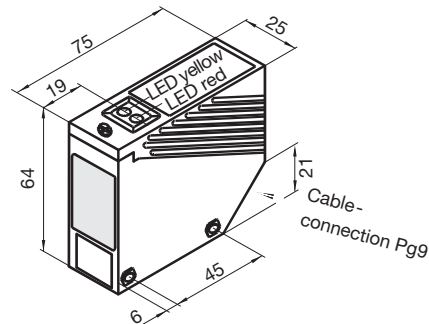
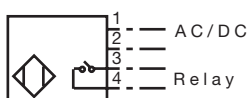
Output signals

Approximate dimensions

Output POS



Output KK



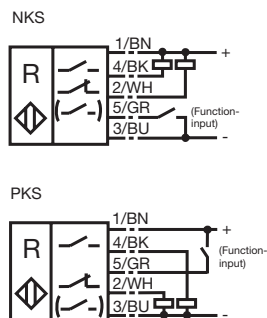
Technical data, Approximate dimensions

Photoelectric sensors, Retroreflective

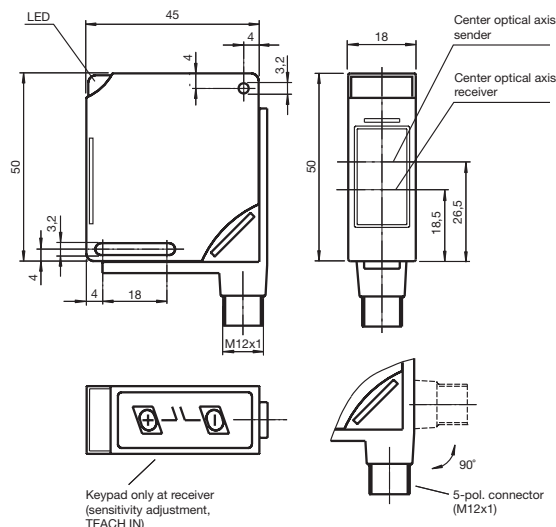
Photoelectric sensors: Retroreflective sensors

Device identification	SOR6000-B45N-C1-PKS	SOR6000-B45N-C1-NKS
Sensing range	0 mm ... 4,000 mm with 50 x 50 mm ² Reflector 0 mm ... 6,000 mm with 100 x 100 mm ² Reflector	0 mm ... 4,000 mm with 50 x 50 mm ² Reflector 0 mm ... 6,000 mm with 100 x 100 mm ² Reflector
Output	DC, PNP	DC, NPN
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	no included reflector 50 x 50 mm ² alternatively 100 x 100 mm ² reflector with +/- keys max. 1 kHz / ≤ 3 ms < 80 ms, with Einschaltnorm adjustable opaque, reflective	no included reflektor 50 x 50 mm ² alternatively 100 x 100 mm ² reflector with +/- keys max. 1 kHz / ≤ 3 ms < 80 ms, with Einschaltnorm adjustable opaque, reflective
LED red LED yellow LED green Type of light External light limit (daylight / halogen light)	Stability control output flashing 2 Hz, Fault indication in teach-in mode 1,5 s switching condition operating status, in teach-in mode flashing visible red light 660 mm ≤ 10,000 Lux / ≤ 7,500 Lux	Stability control output flashing 2 Hz, Fault indication in teach-in mode 1,5 s switching condition operating status, in teach-in mode flashing visible red light 660 mm ≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range Storage temperature range	-25 °C ... +55 °C -40 °C ... +55 °C	-25 °C ... +55 °C -40 °C ... +55 °C
Electrical data Operating voltage Idle current Rated operational current Line voltage drop Input voltage Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC ±10% ca. 25 mA 200 mA ≤ 2,5 V for control / test: < 2 V off / > 7 V on yes yes	10 VDC ... 30 VDC ±10% ca. 25 mA 200 mA ≤ 2,5 V for control / test: < 2 V off / > 7 V on yes yes
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection type Housing material Weight In compliance with	> IP 67, materials approved for use in food production PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Connector M12 x 1, 5 - pole, 90 ° pivoting PBT (Grastin), plug and dovetail AISi 60 g EN 60 947-5-2	> IP 67, materials approved for use in food production PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Connector M12 x 1,5-pole, 90 ° pivoting PBT (Grastin), plug and dovetail AISi 110 g EN 60 947-5-2

Output signals



Approximate dimensions



Technical data, Approximate dimensions

Photoelectric sensors, Retroflective

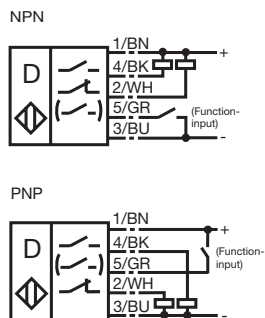


Photoelectric sensors: Retroreflective sensors for the detection of transparent objects

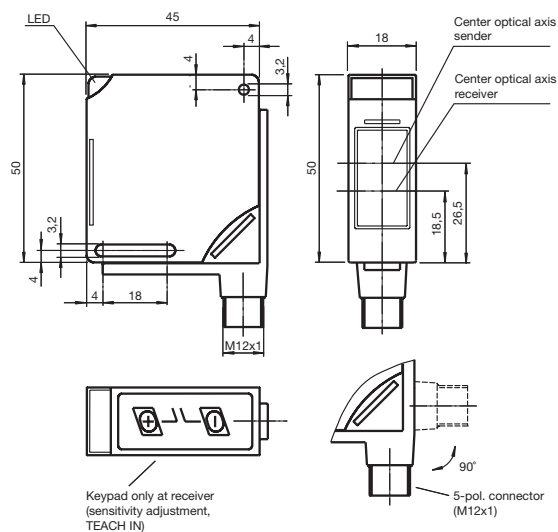
Device identification	SORG2000-B45N-C1-PKS	SORG2000-B45N-C1-NKS
Sensing range Output	0 mm ... 2,000 mm with 50 x 50 mm ² reflector DC, PNP	0 mm ... 2,000 mm with 50 x 50 mm ² reflector DC, NPN
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	yes Reflector 50 x 50 mm ² with +/- keys max. 1 kHz / ≤ 3 ms < 80 ms, with Einschaltnorm adjustable opaque, transparent (z.B. Klarglas, PET, Folien)	yes Reflektor 50 x 50 mm ² with +/- keys max. 1 kHz / ≤ 3 ms < 80 ms, with Einschaltnorm adjustable opaque, transparent (z.B. Klarglas, PET, Folien)
LED red LED yellow LED green Type of light External light limit (daylight / halogen light)	Stability control output flashing 2 Hz, Fault indication in teach-in mode 1,5 s switching condition operating status, in teach-in mode flashing visible red light 660 nm ≤ 10,000 Lux / ≤ 7,500 Lux	Stability control output flashing 2 Hz, Fault indication in teach-in mode 1,5 s switching condition operating status, in teach-in mode flashing visible red light 660 nm ≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range Storage temperature range	-25 °C ... +55 °C -40 °C ... +55 °C	-25 °C ... +55 °C -40 °C ... +55 °C
Electrical data Operating voltage Idle current Rated operational current Line voltage drop Input voltage Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC ±10% ca. 25 mA 200 mA ≤ 2,5 V for control / test: < 2 V off / > 7 V on yes yes	10 VDC ... 30 VDC ±10% ca. 25 mA 200 mA ≤ 2,5 V for control / test: < 2 V off / > 7 V on yes yes
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection type 90 ° schwenkbar Housing material Weight In compliance with	> IP 67, materials approved for use in food production PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1mm Connector M12 x 1, 5 - pole, 90 ° pivoting PBT (Grastin), plug and dovetail AISI 60 g EN 60 947-5-2	> IP 67, materials approved for use in food production PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1mm Connector M12 x 1, 5 - pole, PBT (Grastin), plug and dovetail AISI 60 g EN 60 947-5-2

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Output signals



Approximate dimensions



Technical data, Approximate dimensions

Photoelectric sensors, Diffuse Retroflective

Photoelectric sensors: Diffuse Reflective sensors

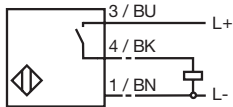
Device identification	SOD200-M18N-C1-PO	SOD400-B26N-U2-PO
Sensing range Output	200 mm DC, PNP	400 mm DC, PNP
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	no white 200mm x 200mm with potentiometer 300 Hz / ≤ 1,5 ms ≤ 50 ms ≤ 15 % opaque	no white 100mm x 100mm with potentiometer 500 Hz / ≤ 1 ms ≤ 30 ms ≤ 15 % opaque, transparent
Operating mode LED yellow LED red Type of light External light limit (daylight / halogen light)	Light ON/dark ON, selectable by wiring switching condition - IR-light 940 nm ≤ 10,000 Lux / ≤ 3,000 Lux	Light ON/dark ON, switchable switching condition stability control output IR-light 950 nm ≤ 20,000 Lux / ≤ 5,000 Lux
Operating temperature range Storage temperature range	-25°C ... +55°C -40°C ... +70°C	-25°C ... +70°C -25°C ... +70°C
Electrical data Operating voltage Idle current Output Rated operational current Line voltage drop Stability control output Rated operational current Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{ss} ≤ 20 mA NC / NO 100 mA ≤ 2,5 V - - yes yes	10 VDC ... 30 VDC, ripple 10% _{ss} ≤ 30 mA NC/NO 200 mA ≤ 2,5 V - - yes yes
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection type Housing material Weight In compliance with Drawing No.	IP 67 PC lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Connector M12 nickel-plated brass 45 g EN 60 947-5-2 CO000001	IP 67 PC lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm 2m cable PUR black, 3 x 0.14 mm ² PBT (Crastin) 20 g EN 60 947-5-2 CO000003

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Output signals

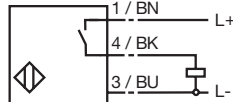
Output PO

Incidence of light → Output high



Output PO

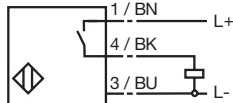
Incidence of light → Output low



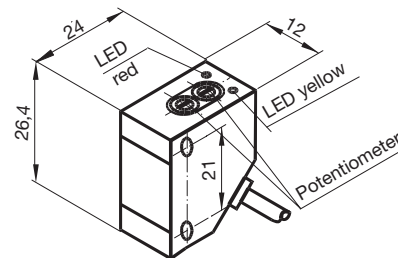
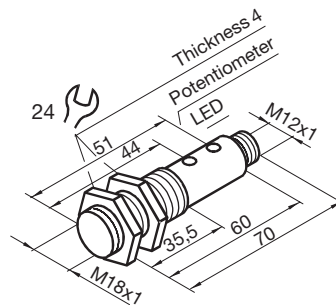
Output PO

Output low / high:

Selection with Potentiometer



Approximate dimensions



Technical data, Approximate dimensions

Photoelectric sensors, Diffuse Retroflective



Photoelectric sensors: Diffuse Reflective sensors

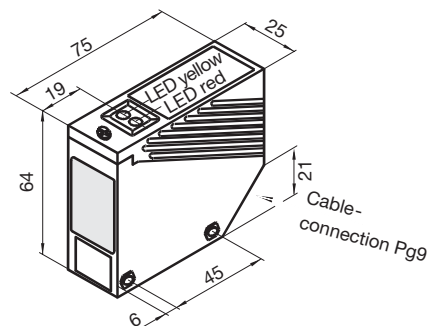
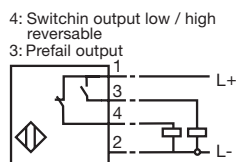
Device identification	SOD800-B75N-T-POS
Sensing range Output	800 mm DC, PNP
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	no white 100mm x 100mm with potentiometer 300 Hz / ≤ 15 ms ≤ 50 ms ≤ 15 % opaque, transparent
Operating mode LED yellow LED red Type of light External light limit (daylight / halogen light)	Light ON/dark ON, switchable switching condition stability control output IR-light 940 nm ≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range Storage temperature range	-25°C ... +70°C -40°C ... +80°C
Electrical data Operating voltage Idle current Output Rated operational current Line voltage drop Stability control output Rated operational current Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC, ripple 10% _{ss} ≤ 25 mA NC/NO 200 mA short circuit/overload proof ≤ 3 V NO 10 mA yes yes
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection type Housing material Weight In compliance with Drawing No.	IP 66 PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1mm Terminal compartment, cable ø 10 mm PBT (Crastin) 100 g EN 60 947-5-2 CO000006

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Output signals

Approximate dimensions

Output POS



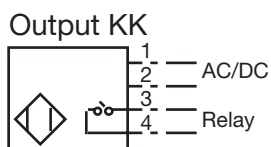
Technical data, Approximate dimensions

Photoelectric sensors, Diffuse Retroflective

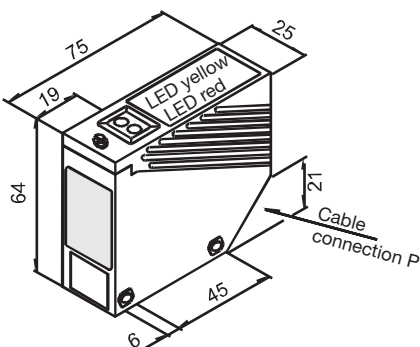
Photoelectric sensors: Diffuse Reflective sensors

Device identification	SOD2000-B75N-T-KK
Sensing range Output	2,000 mm DC, PNP
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object	no white 200mm x 200mm with potentiometer 300 Hz / ≤ 1,5 ms ≤ 50 ms ≤ 15 % opaque, transparent
Operating mode LED yellow LED red Type of light External light limit (daylight / halogen light)	Light ON/dark ON, switchable switching condition stability control output IR-light 940 mm ≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range Storage temperature range	-25°C ... +55°C -40°C ... +55°C
10 Electrical data Operating voltage Idle current Output Rated operational current Line voltage drop Stability control output Rated operational current Short-circuit and overload protection Inverse polarity protection	12 ... 240 VDC, ±10% 24 ... 240 VAC, ±10%; 50 ... 60 Hz - NC/NO relay: ≤ 240 VAC, ≤ 30 VDC, ≤ 3 A - - - no no
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection type Weight In compliance with Drawing No.	IP 66 PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Terminal compartment, cable ø 10 mm 110 g EN 60 947-5-2 CO000007

Output signals



Approximate dimensions



Technical data, Approximate dimensions

Photoelectric sensors, Diffuse Retroreflective

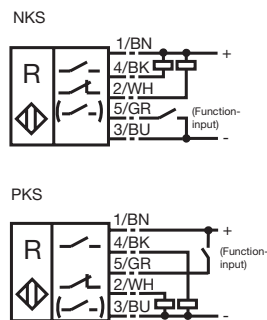


Photoelectric sensors: Diffuse Reflective sensors

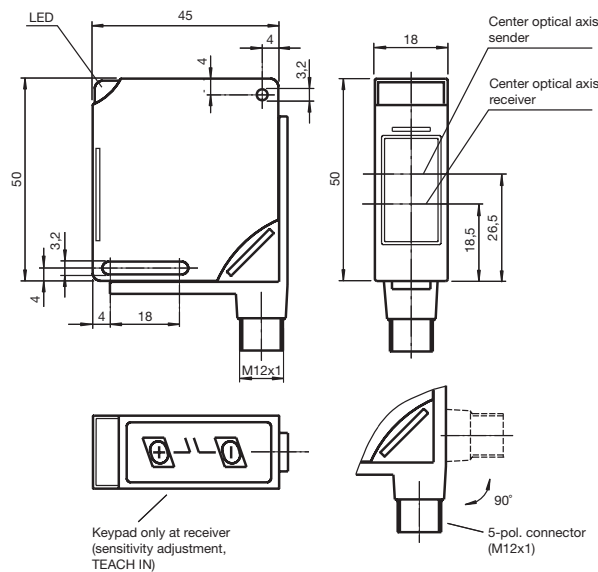
Device identification	SOD500-B45N-C1-PKS	SOD500-B45N-C1-NKS
Sensing range Output	DC, PNP	DC, NPN
Operating data Polarized Reference value Range setting Switching frequency (1:1) / response time Readiness delay Range hysteresis Detectable object:	no standard white 100 x 100 mm ² with +/- keys max. 1 kHz / ≤ 3 ms < 80 ms, with activation standard adjustable opaque	no standard white 100 x 100 mm ² with +/- keys max. 1 kHz / ≤ 3 ms < 80 ms, with activation standard adjustable opaque
LED red LED yellow LED green Type of light External light limit (daylight / halogen light)	stability control output flashing 2 Hz, Fault indication in learning mode 1,5 s switching condition Operation indication, flashing in teach-in mode visible red light 660 nm ≤ 10,000 Lux / ≤ 7,500 Lux	stability control output flashing 2 Hz, Fault indication in learning mode 1,5 s switching condition Operation indication, flashing in teach-in mode visible red light 660 nm ≤ 10,000 Lux / ≤ 7,500 Lux
Operating temperature range Storage temperature range	-25 °C ... +55 °C -40 °C ... +55 °C	-25 °C ... +55 °C -40 °C ... +55 °C
Electrical data Operating voltage Idle current Rated operational current Line voltage drop Input voltage Short-circuit and overload protection Inverse polarity protection	10 VDC ... 30 VDC ±10% ca. 25 mA 200 mA ≤ 2,5 V for control/ test: < 2 V off / > 7 V on yes yes	10 VDC ... 30 VDC ±10% ca. 25 mA 200 mA ≤ 2,5 V for control/ test: < 2 V off / > 7 V on yes yes
Mechanical data Protection class acc. to EN 60529 Optical system Permissible shock- and vibration resistance Connection Housing material Weight In compliance with	> IP 67, materials approved for use in food production PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Connector M12 x 1.5 - pole, 90 ° pivoting PBT (Grastin), plug and dovetail AISi 60 g EN 60 947-5-2	> IP 67, materials approved for use in food production PMMA lenses shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm Connector M12 x 1.5-pole, 90 ° pivoting PBT (Grastin), plug and dovetail AISi 60 g EN 60 947-5-2

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Output signals



Approximate dimensions



Technical data, Approximate dimensions

Fiber-optic photoelectric sensors, Diffuse reflective & thru beam

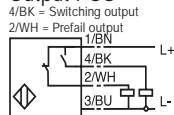
Fibre-optic photoelectric sensors: diffuse-reflective and thru-beam

Device identification	SOLX-B50N-C8-PKS	Programming via encoding switch																																																																																								
Output Sensing ranges with optical waveguides Diffuse-reflective SOLD50-B50N-PVM6: 50 mm SOLD15-B50N-PVM3: 15 mm Thru-beam SOLT150-B50N-PVM4: 150 mm SOLT150-B50N-PVM3: 150 mm	DC, PNP 50 mm 15 mm 150 mm 150 mm	Switch output: NO/ NC Pulse frequency: frequency 1 / frequency 2 Pulse prolongation: 0 ms / 20 ms ±20% only for diffuse-reflective op. Switching rate: 200 Hz / 1,5 kHz																																																																																								
Reference target Centered/ right angle Range setting Switching rate (mark:space1:1) no stability control at 1,5 kHz Response time at 200 Hz / 1.5 kHz Readiness delay Repeatability Detectable object Operating mode Pulse prolongation (als Lichttaster) Protection against mutual interaction LED yellow DUAL-LED green LED red, blinking at 2 Hz Type of light External light limits: daylight/ halogen light Operating temperature range Storage temperature range	white object 50mm x 50mm with potentiometer 200 Hz / 1.5 kHz switchable 2.5 ms / 0.3 ms 20 ms ≤ 0,5 % of sensing range depending on fibre-optic waveguide type Light ON/dark ON selectable 20 ms ± 20 %, switchable 2 pulse frequencies, selectable output status Power on Stability control indication (dynamic) red light 660 nm ≤ 40 000 Lux / ≤ 30 000 Lux -25°C.... +70°C -40°C.... +80°C	<table border="1"> <thead> <tr> <th>Encoding switch</th> <th>Switch output</th> <th>Pulse freq.</th> <th>Pulse prolong.1)</th> <th>Switching rate</th> </tr> </thead> <tbody> <tr><td>0</td><td>NO</td><td>1</td><td>0 ms</td><td>200 Hz</td></tr> <tr><td>1</td><td>NO</td><td>1</td><td>0 ms</td><td>1.5 kHz</td></tr> <tr><td>2</td><td>NO</td><td>1</td><td>20 ms</td><td>200 Hz</td></tr> <tr><td>3</td><td>NO</td><td>1</td><td>20 ms</td><td>1.5 kHz</td></tr> <tr><td>4</td><td>NO</td><td>2</td><td>0 ms</td><td>200 Hz</td></tr> <tr><td>5</td><td>NO</td><td>2</td><td>0 ms</td><td>1.5 kHz</td></tr> <tr><td>6</td><td>NO</td><td>2</td><td>20 ms</td><td>200 Hz</td></tr> <tr><td>7</td><td>NO</td><td>2</td><td>20 ms</td><td>1.5 kHz</td></tr> <tr><td>8</td><td>NC</td><td>1</td><td>0 ms</td><td>200 Hz</td></tr> <tr><td>9</td><td>NC</td><td>1</td><td>0 ms</td><td>1.5 kHz</td></tr> <tr><td>A</td><td>NC</td><td>1</td><td>20 ms</td><td>200 Hz</td></tr> <tr><td>B</td><td>NC</td><td>1</td><td>20 ms</td><td>1.5 kHz</td></tr> <tr><td>C</td><td>NC</td><td>2</td><td>0 ms</td><td>200 Hz</td></tr> <tr><td>D</td><td>NC</td><td>2</td><td>0 ms</td><td>1.5 kHz</td></tr> <tr><td>E</td><td>NC</td><td>2</td><td>20 ms</td><td>200 Hz</td></tr> <tr><td>F</td><td>NC</td><td>2</td><td>20 ms</td><td>1.5 kHz</td></tr> </tbody> </table>	Encoding switch	Switch output	Pulse freq.	Pulse prolong.1)	Switching rate	0	NO	1	0 ms	200 Hz	1	NO	1	0 ms	1.5 kHz	2	NO	1	20 ms	200 Hz	3	NO	1	20 ms	1.5 kHz	4	NO	2	0 ms	200 Hz	5	NO	2	0 ms	1.5 kHz	6	NO	2	20 ms	200 Hz	7	NO	2	20 ms	1.5 kHz	8	NC	1	0 ms	200 Hz	9	NC	1	0 ms	1.5 kHz	A	NC	1	20 ms	200 Hz	B	NC	1	20 ms	1.5 kHz	C	NC	2	0 ms	200 Hz	D	NC	2	0 ms	1.5 kHz	E	NC	2	20 ms	200 Hz	F	NC	2	20 ms	1.5 kHz			
Encoding switch	Switch output	Pulse freq.	Pulse prolong.1)	Switching rate																																																																																						
0	NO	1	0 ms	200 Hz																																																																																						
1	NO	1	0 ms	1.5 kHz																																																																																						
2	NO	1	20 ms	200 Hz																																																																																						
3	NO	1	20 ms	1.5 kHz																																																																																						
4	NO	2	0 ms	200 Hz																																																																																						
5	NO	2	0 ms	1.5 kHz																																																																																						
6	NO	2	20 ms	200 Hz																																																																																						
7	NO	2	20 ms	1.5 kHz																																																																																						
8	NC	1	0 ms	200 Hz																																																																																						
9	NC	1	0 ms	1.5 kHz																																																																																						
A	NC	1	20 ms	200 Hz																																																																																						
B	NC	1	20 ms	1.5 kHz																																																																																						
C	NC	2	0 ms	200 Hz																																																																																						
D	NC	2	0 ms	1.5 kHz																																																																																						
E	NC	2	20 ms	200 Hz																																																																																						
F	NC	2	20 ms	1.5 kHz																																																																																						
Elektrical data Operational voltage 10 VDC... 30 VDC, ripple 10% _{ss} Idle currents 30 mA Switch output NO/NC, switchable Rated operational current 200 mA Line voltage drop ≤ 2.5 V Stability control output NO (dynamical) Rated operational current 10 mA, short-circuit/overload proof Short-circuit and overload prediction yes Reverse polarity prediction	yes	1) only for diffuse-reflective operation Plastic fibre-optic waveguides for Type B50N: The length of the fibre-optic waveguides is 2 m. A cutting tool is also supplied. The minimum bending radius is 15 mm. The fibre-optic waveguide may not be bent in the area of 15 mm at the sensor and waveguide head. The fibre-optic waveguides must be pressed into the sensor's opening, whereby slight resistance will be felt. Fix the fibre-optic waveguide in positions with the screw. Fibre-optic waveguides for diffuse mode Reference target 50mm x 50mm white SOLD50-B50N-PVM6 Nominal range: 50 mm SOLD15-B50N-PVM3 Nominal range 15 mm Fibre-optic waveguides for thru-beam mode SOLT150-B50N-PVM4 (1 set = 2 pieces) Nominal range 150 mm SOLT150-B50N-PVM3 (1 set = 2 pieces) Nominal range 150 mm																																																																																								
Mechanical data Prediction class acc. to EN 60529 Permissible shock- and vibration loading Mounting Connection Housing material Weight In compliance with	IP 63 shock b ≤ 30 g, T ≤ 11 ms vibrations f ≤ 55 Hz, a ≤ 1 mm DIN rail C8-connection, 4 pin PBT (Crastin) 80 g EN 60 947-5-2																																																																																									

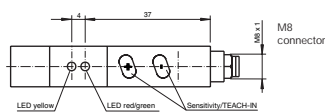
Output signals

Dimensions in mm

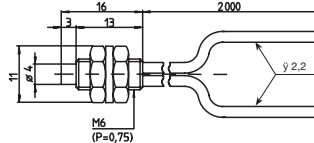
Output POS



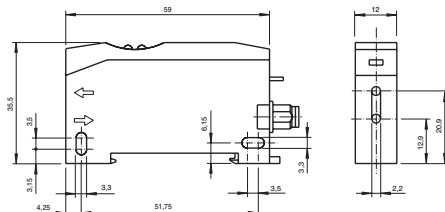
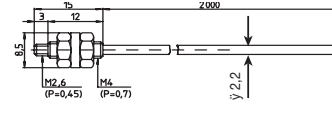
SOLX-B50N-C8-PKS



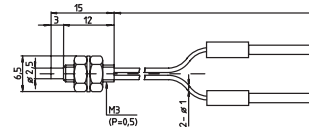
SOLD50-B50N-PVM6



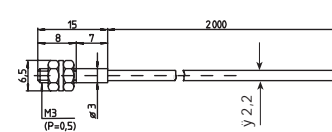
SOLT150-B50N-PVM4



SOLD15-B50N-PVM3



SOLT150-B50N-PVM3



Tuning on target object, Series B45 Photoelectric sensors



Dynamic TEACH-IN for moving objects



If necessary, press the "+"- and "-"- keys at the same time for 5 s (until the green LED flashes once). The sensor is now "unlocked".



Move the objects to be detected (one object should be enough) through the sensing range in the desired distance. The green LED will flash with a higher frequency (4 Hz) for a short period of time. The teach-in has been successful when an object is within the sensing range and the LED flashes with its original frequency again.

Note
It might happen that the change in frequency is not always noticeable.



Press the "+"- and "-"- keys at the same time (about 1 s) until the red LED is turned off. The sensor now is in the "teach in" mode and announces that through a flashing (2 Hz) green LED.



To conclude the TEACH-IN you now have to press either the "+"- or the "-"- key. This way the sensor returns to "normal mode".

10

Static TEACH-IN of objects with a set distance



If necessary, press the "+"- and "-"- keys at the same time for 5 s (until the green LED flashes once). The sensor is now "unlocked".



The green LED will flash with a higher frequency (4 Hz) for a short period of time. The teach-in has been successful when the LED flashes with its original frequency again.



Move the objects to be detected into the sensing range in the desired distance. Press the "+"- and "-"- keys at the same time (about 1 s) until the red LED is turned off. The sensor now is in the "teach in" mode and announces that through a flashing (2 Hz) green LED.

Note
The sensor is not yet unlocked if the red LED does not start flashing when pressing the keys.



To conclude the TEACH-IN you now have to press either the "+"- or the "-"- key. This way the sensor returns to "normal mode".

This program is a multi-lingual user interface for the read-in and editing the parameters of photoelectric sensors of series B45. It is a menu-driven program that contains numerous help- and support functions.

The sensors communicate with the PC using an photoelectric-serial interface.

The program shows, which sensor is connected. The program data used as well as the parameters obtained from the sensor can be saved on hard drive or disc, printed out and exported to a database for external use.

The software opens up a variety of setting options for sensors:

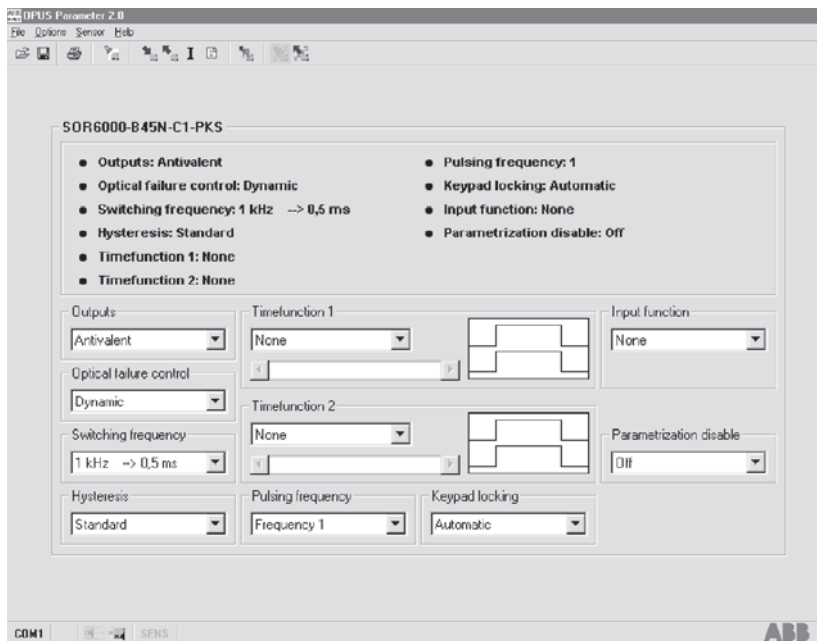
- Choosing the output function: NO/NC
- Type of stability control: dynamic/static
- Switching frequency: 1.5 kHz ... 20 Hz
- Hystereses: small/standard/large
- Readiness delay: none/ 0.1 s ... 25.5 s
- Falling delay/ impulse extension/wiper function
- 3 different pulse frequencies
- Key-lock: off/automatic/always
- Choice of kind of function input: test-/logical-input/div.
- Set-up lock: on/off
- Default read-in/reset

Requirements:

The OPUS parameterization software runs on every PC or Laptop using Windows 3.x, 95 or later that has a free interface for the connection to the sensors.

Included:

- 2 disks 3,5", 1.44 MB for the installation of the OPUS software
- One B45 combi clip
- Manual



Technical data, Approximate dimensions

Ultrasonic sensors (switch output)



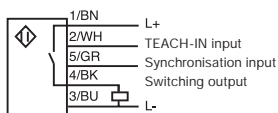
Ultrasonic sensors (switch output)

Device identification:	SUD500-M30N-C1-POS (...-NOS)	SUD2000-M30N-C1-POS (...-NOS)
Sensing range: Output signal:	60...500 mm (NOS), 30...500 mm (POS) PNP, NO (NPN, NO)	200...2000 mm (NOS), 80...2000 mm (POS) PNP, NO (NPN, NO)
Characteristics: Standard test target (min. flat surface) Beam divergence angle Transducer frequency Response time Hysteresis Repeatability Temperature drift	100 mm x 100 mm approx. 5 ° at -3 dB approx. 375 kHz approx. 38 ms ≤ 1 % of set operating distance ≤ 1 % 0,2 % / K	100 mm x 100 mm v. 5 ° at -3 dB approx. 175 kHz approx. 145 ms ≤ 1 % of set operating distance ≤ 1 % 0,2 % / K
Electrical data: Operating voltage U_B / ripple Reverse polarity protection Rated operational current Switch output (PNP-output) Teach-in input (2/WH): Synchronisation input (5/GR) for continuous measurement Synchronisation (used for 2 or more sensors) Measuring time/ switching rate approx. Change of output signals after: Synchronisation pulse / pause length Synchronisation input levels (5/GR) / impedance: Indicators: LED green LED red LED yellow	20 ... 30 VDC / +/- 10 % _{ss} yes ≤ 60 mA 200 mA, U_B -3V short-circuit/overload proof near switch point- U_B near switch point- U_B near switch point ≤ 1s low level or open input Start with falling edge 6,5 ms / ≤ 13Hz 5 impulses / ≥ 60 ms ≥ 100 μs / ≥ 100 μs Low P. 0...1 V, High P. 5V ...+ U_B ca. 27 kΩ Power on, Teach-in function, object detected Fault, object uncertain Output status indicator, Teach-in function, no object detected	20 ... 30 VDC / +/- 10 % _{ss} yes ≤ 60 mA 200 mA, U_B -3V short-circuit/overload proof far switch point+ U_B far switch point+ U_B far switch point ≥ 1s low level or open input Start with falling edge approx. 25 ms / ≤ 3,4 Hz 5 impulses / ≥ 150 ms 100 μs / ≥ 100 μs Low P. 0...1 V, High P. 5V ...+ U_B ca. 27 kΩ Power on, Teach-in function, object detected Fault, object uncertain Output status indicator, Teach-in function, no object detected
Mechanical data: Operating temperature range Storage temperature range Protection class acc. to DIN 40 050 Housing material Transducer material Cover and head Permissible shock- and vibration resistance Connection In compliance with Drawing No.	-25°C ... +70°C -40°C ... +85°C IP 65 nickel-plated brass Epoxy resin/hollow glass bead composite expanded PUR (Polyurethan) PBT (Crastin) b ≤ 30 g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1 mm Connector M12 EN 60974-5-2 CU000001	-25°C ... +70°C -40°C ... +85°C IP 65 nickel-plated brass Epoxy resin/hollow glass bead composite expanded PUR (Polyurethan) PBT (Crastin) b ≤ 30 g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1mm Connector M12 EN 60974-5-2 CU000001

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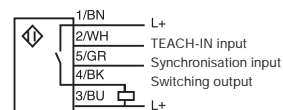
Output signals

Output POS

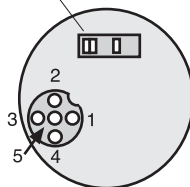


LS000013

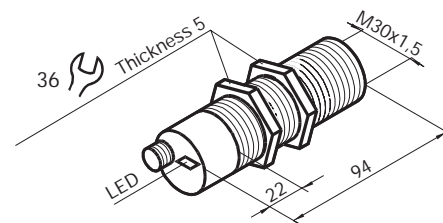
Output NOS



Connector side of sensor
LEDs: green / red / yellow



Dimensions in mm



Technical data, Approximate dimensions

Ultrasonic sensors (switch output)

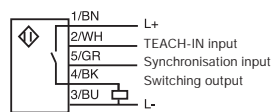
Ultrasonic sensors (switch output)

Device identification:	SUD4000-M30N-C1-POS (...-NOS)	SUD6000-M30N-C1-POS (...-NOS)
Sensing range: Output signal:	500...4000 mm (NOS), 200...4000 mm (POS) PNP, NO (NPN, NO)	800...6000 mm (NOS), 350...6000 mm (POS) PNP, NO (NPN, NO)
Characteristics: Standard test target (min. flat surface) Beam divergence angle Transducer frequency Response time Hysteresis Repeatability Temperature drift	100 mm x 100 mm approx. 5° at -3 dB approx. 85 kHz approx. 280 ms ≤ 1 % of set operating distance ≤ 1 % 0.2 % / K	100 mm x 100 mm approx. 5° at -3 dB approx. 65 kHz approx. 480 ms ≤ 1 % of set operating distance ≤ 1 % 0.2 % / K
Electrical data: Operating voltage U_B / ripple Reverse polarity protection Rated operational current Switch output (PNP-output) Synchronisation input (5/GR) for continuous measurement Synchronisation (used for s2 or more sensors) Measuring time/ switching rate c_a Change of output signals after: Synchronisation pulse / pause length Synchronisation input levels (5/GR) / impedance Indicators: LED green LED red LED yellow	20 ... 30 VDC / +/- 10 % _{ss} yes ≤ 60 mA 200 mA, U_B -3V short-circuit/overload proof ≥ 1s low level or open input Start with falling edge 48 ms / ≤ 1,7 Hzca. 5 impulses / ≥ 265 ms ≥ 100 μs / ≥ 100 μs Low P. 0...1 V, High P. 5V ...+ U_B approx. 27 kΩ Power on, Teach-in function, object detected Fault, object uncertain Output status indicator, Teach-in function, no object detectednt	20 ... 30 VDC / +/- 10 % _{ss} yes ≤ 60 mA 200 mA, U_B -3V short-circuit/overload proof ≤ 1s low level or open input Start with falling edge 66 ms / ≤ 1,2 Hz 5 impulses / ≥ 355 ms ≤ 100 μs / ≥ 100 μs Low P. 0...1 V, High P. 5V ...+ U_B approx. 27 kΩ Power on, Teach-in function, object detected Fault, object uncertain Output status indicator, Teach-in function, no object detected
Mechanical data: Operating temperature range Storage temperature range Protection class acc. to DIN 40 050 Housing material Transducer material Cover and head Permissible shock- and vibration resistance Connection In compliance with Drawing No.	-25°C ... +70°C -40°C ... +85°C IP 65 nickel-plated brass Epoxy resin/hollow glass bead composite expanded PUR (Polyurethan) PBT (Crastin) b ≤ 30g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1 mm Connector M12 EN 60974-5-2 CU000002	-25 °C ... +70 °C -40 °C ... +85 °C IP 65 nickel-plated brass Epoxy resin/hollow glass bead composite expanded PUR (Polyurethan) PBT (Crastin) b ≤ 30 g, T ≤ 11 ms f ≤ 55 Hz, a ≤ 1 mm Round Connector M12 EN 60974-5-2 CU000003

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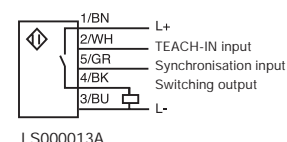
Output signals

Output POS



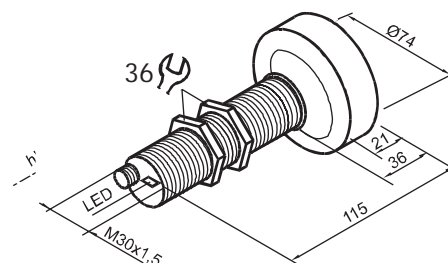
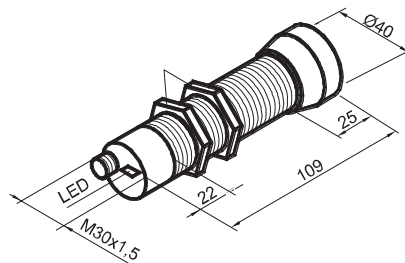
LS000013 Connector side of sensor
LEDs: green / red / yellow

Output NOS



LS000013A

Dimensions in mm



Technical Data

Ultrasonic sensors (switch output)



Ultrasonic sensors (switch output)

Setting the switching points:

The ultrasonic sensor is provided with a switch output with 2 teachable switch points. These are set by applying the supply voltage $-U_B$ or $+U_B$ at the teach-in input. The supply voltage should be applied to the teach-in input for at least 1 s. During the teach-in process, the LEDs indicate whether the sensor has detected the target. The switch points A1 and A2 are taught by voltage $-U_B$ and $+U_B$ respectively.

Five different modes can be set:

1. Window mode, NO function
2. Window mode, NC function
3. One switch point, NO function
4. One switch point, NC function
5. Detection of presence of an object

1. Teach-in Window mode, NO function

- Set object at near switch point
- Teach in switch point A1 with $-U_B$
- Set object at far switch point
- Teach in switch point A2 with $+U_B$

2. Teach-in Window mode, NC function

- Set object at near switch point
- Teach in switch point A2 with $+U_B$
- Set object at far switch point
- Teach in switch point A1 with $-U_B$

3. Teach-in one switch point, NO function

- Set object at near switch point
- Teach in switch point A2 with $+U_B$
- Cover sensor with the palm of your hand or remove all objects from the detection range of sensor
- Teach in switch point A1 with $-U_B$

4. Teach-in one switch point, NC function

- Set object at near switch point
- Teach in switch point A1 with $-U_B$
- Cover sensor with the palm of your hand or remove all objects from the detection range of sensor
- Teach in switch point A2 with $+U_B$

5. Teach-in detection of presence of object

- Cover sensor with the palm of your hand or remove all objects from the detection range of sensor
- Teach in switch point A1 with $-U_B$
- Teach in switch point A2 with $+U_B$

Presetting the switch points:

A1: near range
A2: nominal range

Synchronisation:

The sensor features a synchronisation input in order to suppress mutual interference. If the input is not connected, the sensor operates with an internally generated pulse rate. The sensor can be synchronised by applying a square-wave voltage. A synchronisation pulse at the synchronisation input enables one measuring cycle to be completed. The pulse width must be greater than 100 μ s. The measuring cycle commences with the falling edge. The state of the switch output changes after the switching threshold has been exceeded five times, as determined internally by five measurements. A low level 1 s or an open synchronisation input result in normal operation of the sensor. Synchronisation cannot be carried out during teach-in and vice versa.

Two operating modes are possible:

1. Multiple sensors are controlled with the same synchronising signal but the sensors operate on the same pulse
2. The synchronising pulses are fed cyclically to only one sensor at one time. The sensors operate in multiplex mode. A high level at the synchronisation input deactivates the sensor.

Accessory: Programming device SZP2>PROG

The programming device ZP2>PROG is available as accessory for the easy programming of ultrasonic sensors with switch output. The device is equipped with a 2 m cable, whose connector/socket can be placed between the connector of the ultrasonic sensor and its connection cable. The sensing range of the sensor can be memorized with two keys A1 and A2. Otherwise follow the teach-in process according to the description above.

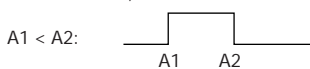
Technical data:

Dimensions:
H x W x D [mm]: 22 x 39 x 69
Electric connection:
2 m cable with device connector and socket M12

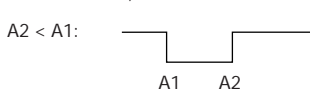
Indication as a function of operating condition	LED green	LED red	LED yellow
Teach-in switch point			
Object detected	flashing	off	off
No object detected	flashing	off	off
Object uncertain (teach-in invalid)	off	flashing	off
Normal operation	off	off	output status
Fault (e.g. compressed air)	off	flashing	last status

Mode of operation of the switch output depending on setting

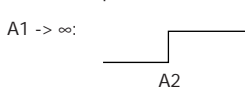
Window mode, NO function



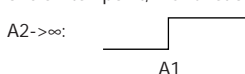
Window mode, NC function



one switch point, NO function



one switch point, NC function



A, $\rightarrow \infty$, A2 $\rightarrow \infty$: Detection for presence of object

Object detected: switch output closed / no object detected: switch output open

Technical data, Approximate dimensions

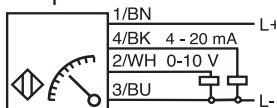
Ultrasonic sensors (analog output)

Ultrasonic sensors (Analog outputs)

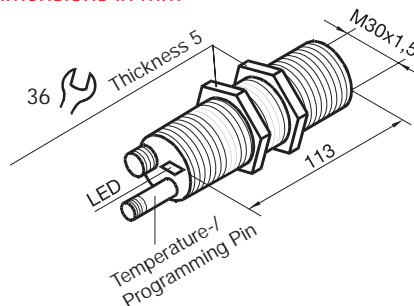
Device identification:	SUD500-M30N-C1-M	SUD2000-M30N-C1-M
General data		
Sensing range	30 ... 500 mm	80 ... 2000 mm
Operating range	50 ... 500 mm	120 ... 2000 mm
Blind zone	0 ... 30 mm	0 ... 80 mm
Standard test target	100 mm x 100 mm	
Transducer frequency	approx. 380 kHz	approx. 180 kHz
Response time	21 ms minimum 63 ms default	65 ms minimum 195 ms default
Indicator/Operating elements		
LED green	permanent: Power on flashing: standby or teach-in function: object detected	
LED yellow 1	permanent: object in operating range flashing: teach-in function	
LED yellow 2	permanent: object in sensing range flashing: teach-in function	
LED red	permanent: temperature-/program plug not plugged in flashing: fault or teach-in function object not detected	
Temperature-/program plugs	temperature compensation, teach-in of operating range, switching of output functions	
Electrical data		
Operating voltage	10 ... 30 V DC, ripple 10 %ss	
Power consumption P _o	≤ 900 mw	
In-/Output		
synchronisation	bidirectional 0-level: -U _B ...+1 V 1-level: +4 V...+U _B input impedancy: > 12 KΩ synchronisation impulse: ≥ 100 μs synchronisation impulse pause: ≥ 2 ms	
Synchronisation frequency		
Common mode	≤ 95 Hz	≤ 30 Hz
Multiplex mode	≤ 95/n Hz, n = number of sensors	≤ 30/n Hz, n = number of sensors
Output		
Output type	1 current output: 4 ... 20 mA 1 voltage output: 0 ... 10 V Evaluation limit [mm]/4000,	
Resolution	but ≤ 0.05 mm	but ≤ 0.35 mm
Characteristic deviation	≤ 0,2 % of final value	
Reproducibility	≤ 0,1 % of final value	
Load impedancy	current output: ≤ 500 Ohm voltage output: ≥ 1000 Ohm	
Temperature influence	≤ 2 % of final value (with temperature compensation) ≤ 0.2 %/K (without temperature compensation)	
Norms		
In compliance with	EN 60947-5-2	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 °C (233 ... 358 K)	
Mechanical Data		
Protection Class	IP65	
Connection	Connector VI 5 (M12 x 1), 5-pole	
Material		
Housing	stainless steel 1.4303 plastic parts PBT	
Transducer	Epoxy resin/hollow glass bead composite; expanded PUR (polyurethane)	

Output signals

Output M



Dimensions in mm



Technical data, Approximate dimensions

Ultrasonic sensors (analog output)



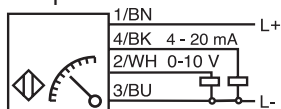
Ultrasonic sensors (Analog outputs)

Device identification:	SUD4000-M30N-C1-M	SUD6000-M30N-C1-M
General data		
Sensing range	200 ... 4000 mm	350 ... 6000 mm
Operating range	240 ... 4000 mm	400 ... 2000 mm
Blind zone	0 ... 200 mm	0 ... 350 mm
Standard test target	100 mm x 100 mm	
Transducer frequency	ca. 85 kHz	ca. 65 kHz
Response time	145 ms minimum 440 ms default	285 ms minimum 850 ms default
Indicator/Operating elements		
LED green	permanent: Power on flashing: standby or teach-in function: object detected	
LED yellow 1	permanent: object in operating range flashing: teach-in function	
LED yellow 2	permanent: object in sensing range flashing: teach-in function	
LED red	permanent: temperature-/program plug not plugged in flashing: fault or teach-in function object not detected	
Temperature-/program plug	temperature compensation, teach-in of operating range , switching of output functions	
Electrical data		
Operating voltage	10 ... 30 V DC , ripple 10 %ss	
Power consumption Po	≤ 900 mw	
In-/Output		
synchronisation	bidirectional 0-level: $-U_B \dots +1 V$ 1-level: $+4 V \dots +U_B$ Eingangsimpedanz: > 12 K Ω synchronisation impulse: $\geq 100 \mu s$ synchronisation impulse pause: $\geq 2 ms$	
Synchronisation frequency		
Common mode operation	≤ 13 Hz	≤ 7 Hz
Multiplex operation	≤ 13/n Hz, n = number of sensors	≤ 7/n Hz, n = number of sensors
Output		
Output type	1 current output: 4 ... 20 mA 1 voltage output: 0 ... 10 V	
Resolution	evaluation limit [mm]/4000, but $\leq 0,35 mm$	
Characteristic deviation	$\leq 0,2 \%$ of final value	
Reproducibility	$\leq 0,1 \%$ of final value	
Load impedancy	current output: $\leq 500 \Omega$ voltage output: $\geq 1000 \Omega$	
Temperature influence	$\leq 2 \%$ of final value (with temperature compensation) $\leq 0,2 \%/K$ (without temperatur compensation)	
Norms		
In compliance with	EN 60947-5-2	
Ambient conditions		
Ambient temperature	-25 ... 70 °C (248 ... 343 K)	
Storage temperature	-40 ... 85 -°C (233 ... 358 K)	
Mechanical Data		
Protection Class	IP65	
Connection	Connector VI 5 (M12 x 1), 5-pole	
Material	stainless steel 1.4303	
Housing	plastic parts PBT	
Transducer	Epoxy resin/hollow glass bead composite; expanded PUR (polyurethane)	

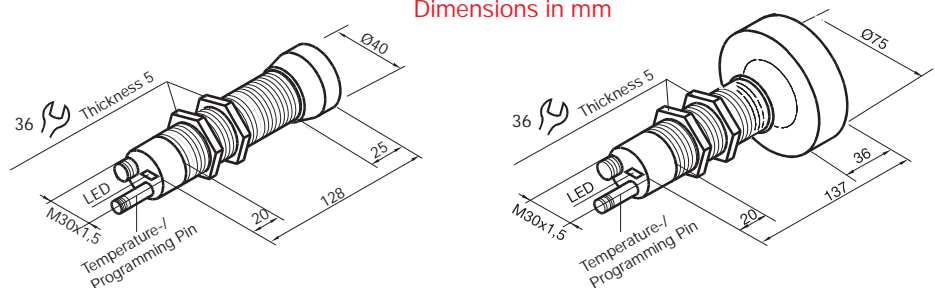
10

Output signals

Output M



Dimensions in mm



Technical data

Ultrasonic sensors (analog output)

Ultrasonic sensors (analog output)

Description of the sensor functions

This ultrasonic sensor is equipped with a four-pin temperature/teach-in plug, which can be inserted in four different positions. These positions have the significances shown in the table

Plug position	Significance
A1	Teach-in evaluation limit A1
A2	Teach-in evaluation limit A2
E2/E3	Rising/falling ramp Output characteristics of the voltage output go through the zero point
T	Temperature compensation

Description of the teach-in procedure

Teach-in of program evaluation limit 1 resp. 2

- 1) Disconnect the supply voltage
- 2) Disconnect the plug
- 3) Connect the supply voltage (reset)
- 4) Set target on desired switch position
- 5) Insert and then remove program plug into Position A1 resp. A2
- 6) This triggers the teach-in of the evaluation limits A1 resp. A2

Note

The values of the object position will be memorized with the removal of the temperature/teach-in plug.

You can supervise the teach-in process with the LEDs. The green LED flashes if the object has been detected, the red LED flashes, when no object has been detected.

Insert plug into position T to end the teach-in process and to save the taught-in distance. The sensor goes back to normal operation.

Teach-in of analog functions

Disconnect the supply voltage
Disconnect the plug
Connect the supply voltage (reset)
Insert teach-in plug in position E2/E3
Repeated plug-ins allow for the programming of 3 different operation modes in cyclical sequence:

- 1) rising ramp, LED A2 flashes
- 2) falling ramp, LED A1 flashes
- 3) zero point straight line

LED A1 and A2 flash

Insert plug into position T to end the teach-in process and to save the taught-in distance.

The sensor goes back to normal operation.

Note

If the temperature/teach-in plug is not inserted into the T-position the sensor will go back to normal operation (with the values saved last) without temperature compensation.

Synchronisation

The sensor is equipped with a synchronisation input for the suppression of inter-fereces. If this input is not on-line the sensor uses with an internally produced clock-speed. The sensor can be synchronised by impressing a square wave voltage.

A falling range will lead to the emission of a single ultrasonic impulse. A low level ≈ 1 s or an open synchronisation input will lead to the normal operation mode.

A high-level ≈ 1 s will lead to the stand-by operation mode of the sensor (green LED "ON"). The outputs remain in the status they where in before.

While teaching-in the sensors can not be synchronised and vice versa.

Different modes of operation are possible:

1. 2 (or up to 5) sensors can be synchronized by connecting their respective synchronisation inputs. This way the sensors emit ultrasonic impulses in turn.
2. Several sensors are controlled by the same synchronisation signal. The sensors operate in common mode
3. The synchronisations impulses are cyclically fed to one sensor at a time. The sensors operate in multiplex mode.
4. A high-level at the synchronisation input deactivates the sensor

The response time of a sensor increases in synchronised mode since the synchronisation also increases the measuring cycle time.

Note

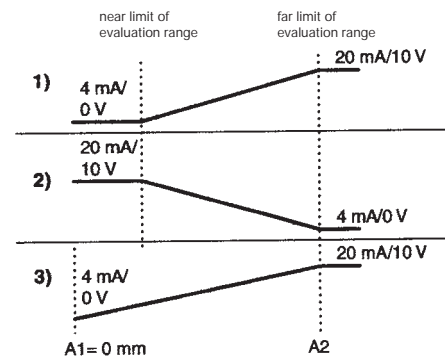
If you don't want to use the synchronisation make sure that either the synchronisation input is grounded or that the sensor is operated with a 4-pole connection cable.

Default

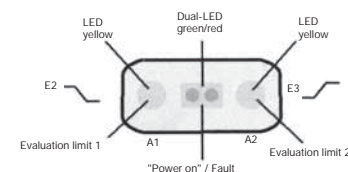
A1: Close-up range
A2: Nominal range
Direction of action: rising ramp

Programming of the analog output

Analog functions



LED-Window

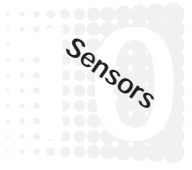


LED-indicator/Analog output

Indications depending on operating mode	Dual LED green	Dual LED red	LED yellow A1	LED yellow A2	Analog output
Teach-in evaluation limit 1					
Object detected	flashing	off	flashing	off	un-changed
Object not detected	off	flashing	flashing	off	
Teach-in evaluation limit 2					
Object detected	flashing	off	off	flashing	un-changed
Object not detected	off	flashing	off	flashing	
Teach-in operation mode (E2/E3)					
rising ramp	on	off	off	un-flashing	changed
falling ramp	on	off	flashing	off	
zero-point straight-line	on	off	flashing (common mode)	flashing (common mode)	
Normal operation					
temperature compensated	on	off	on, if object in evaluation range	on, if object in evaluation range	Analog value
Plug disconn./shorted	off	on			
Standby	flashing	off	last status	last status	unchanged
Fault (e.g. compressed air)	off	flashing	last status	last status	unchanged or fault value

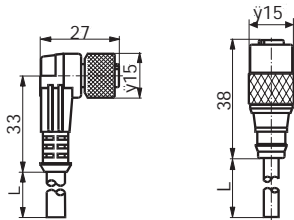
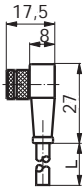
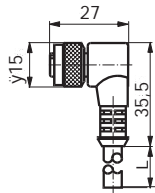
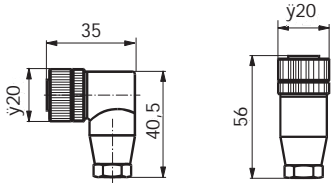
Approximate dimensions

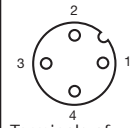
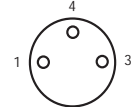
Ultrasonic sensors (analog output)



Accessories

Dimension in mm



SZC1>4POL-0	Socket M12 angled 4 pin	Terminals of plug on Sensor
SZC1/4POL-0	Socket M12 straight 4 pin	 (cannot be used on ultrasonic sensors)
SZC1>U5-3POL-LED0	Cable socket M12 angled Cable 5 m, PUR, 3 polig, LED 1 - 3 LED 4 - 3	Terminals of plug on sensor 1 - BN 3 - BU 4 - BK (not available: 2-WH and 5 - GR)
SZC8>U5-3POL-LED0	Cable socket M8 angled Cable 5 m, PUR, 3 pin, LED 1 - 3 LED 4 - 3	Terminals of plug on sensor 1 - BN 3 - BU 4 - BK 
SZC1>V5-4POL-0	Cable socket M12 angled Cable 5 m, PVC	Terminals 1 - BN 2 - WH
SZC1/V5-4POL-0	Cable socket M12 straight Cable 5 m, PVC	3 - BU 4 - BK

10

Accessories

Catalog numbering system



MB-5 KIT



ST-1



RFL-1



SZP2>PROG



OPUS-Software

Type	Catalog number	Pack. size/ pieces	Weight 1 piece kg
Accessories			
SZP2>PROG	1SAF 912 030 R 7000	1	0.020
SZC1>4POL-0	1SAF 912 020 R 4000	1	0.050
SZC1>4POL-0	1SAF 912 010 R 4000	1	0.050
SZC1>U5-3POL-LED0	1SAF 912 225 R 3100	1	0.200
SZC8>U5-3POL-LED0	1SAF 908 225 R 3100	1	0.200
SZC1>V5-4POL-0	1SAF 912 125 R 4000	1	0.200
SZC1>V5-4POL-0	1SAF 912 115 R 4000	1	0.200
MB5-Kit	1SAF 950 988 R 9403	1	0.100
ST-1	1SAF 950 988 R 9401	1	0.141
RFL-1	1SAF 950 988 R 9402	1	0.120
OPUS-Software	1SAF 950 988 R 9404	1	0.020
MH04-Mounting tool	1SAF 950 988 R 9405	1	0.282

Catalog numbering system

Inductive / Capacitive / Photoelectric and Ultrasonic Sensors

Type of Sensor

- SI** = Inductive
SC = Capacitive
SO = Photoelectric
SU = Ultrasonic
SOL = Light guide

Installation method

- F** = flush mounting (inductive and capacitive)
N = non-flush mounting (inductive and capacitive)
R = Retroreflective
D = Diffuse reflective (photoelectric and ultrasonic)
T = Through beam (photoelectric)

Housing

- Z** = cylindrical **4, 6** = diameter (mm) **N** = normal type length
M = Thread **8, 12, 18, 30** = diameter (mm) **S** = short type length
Q = block with square front **30, 40, 80** = diagonal (mm) **T** = short type length
B = block **26, 40, 45, 75** = corner distance (mm) **E** = stainless steel

Connections

- V2** = PVC, 2m cable
U2 = PUR, 2m Kable
C1 = M12 connector with 3-5 pins
C3 = M12 connector, AC
C8 = M8 connector with 3 pins
T = Terminal connection

Output signals

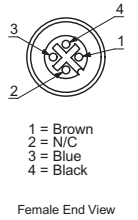
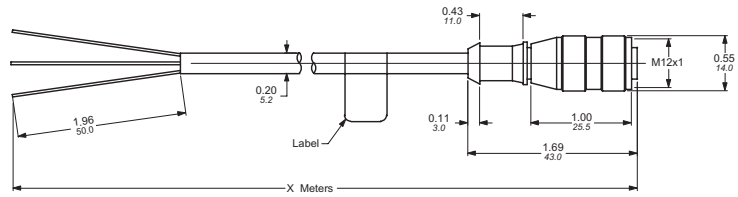
- PO** = 24 VDC, 3-wire PNP, NO
PC = 24 VDC, 3-wire PNP, NC
PK = 24 VDC, 4-wire PNP, NO/NC combination
NO = 24 VDC, 3-wire NPN, NO
NK = 24 VDC, 4-wire NPN, NO/NC combination
DO = 24 VDC, 2-wire, NO
AO = 230 VAC, 2-wire, NO
AC = 230 VAC, 2-wire, NC
AK = 230 VAC, 4-wire, NO/NC combination.
KK = 12 ... 240 VDC / 24 ... 240 VAC, 4-wire PNP, Relais output
M = analog signal

SI F2 M12N V2

PO



Connectors and cables

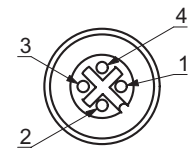


Connectors & cables

C1 Micro style

3 Wire straight

Wire type		3 Wire straight	3 Wire straight
Catalog number		C1-3WS-V2	C1-3WS-V4
List price		\$ 14.40	\$ 17.40
Cable length	meters	2	4
Number of conductors		3	3
Conductor colors		1 - Brown 2 - NC 3 - Blue 4 - Black	1 - Brown 2 - NC 3 - Blue 4 - Black
Wire size		20 AWG	20 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 250V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 250V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP68	IP68
LED output indication		—	—

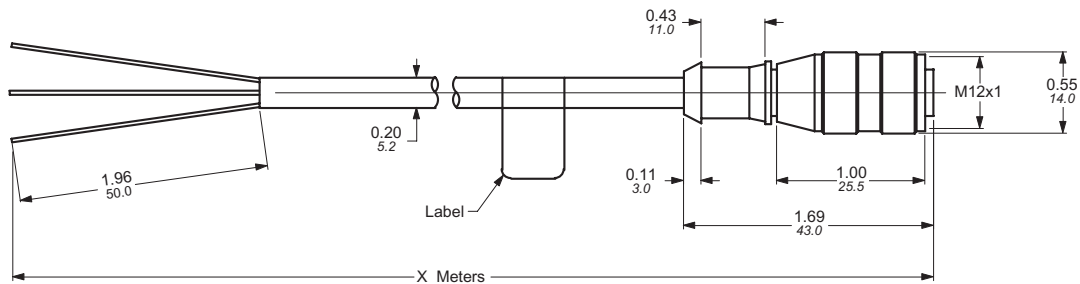


1 = Brown
2 = N/C
3 = Blue
4 = Black

Female End View

Approximate dimensions

C1-3WS-V2
C1-3WS-V4



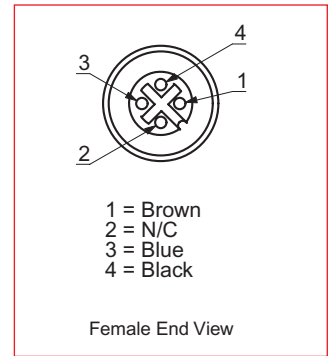
Connectors & cables

C1 Micro style

3 Wire 90°



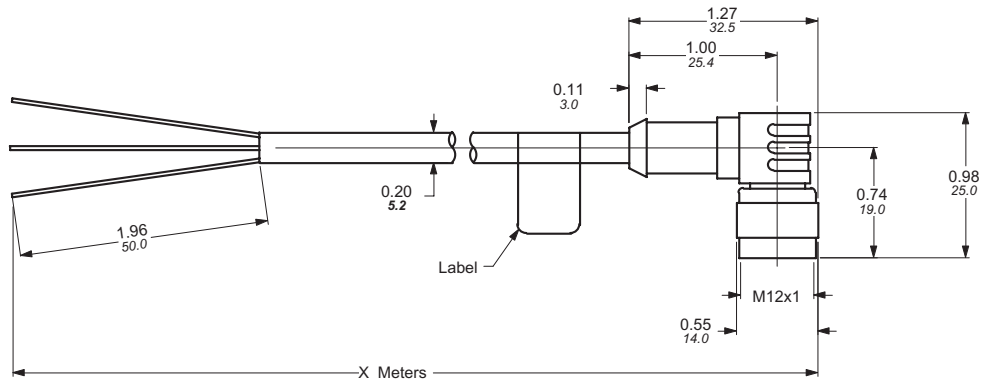
Wire type		3 Wire 90°	3 Wire 90°
Catalog number		C1-3W9-V2	C1-3W9-V4
List price		\$ 14.40	\$ 17.40
Cable length	meters	2	4
Number of conductors		3	3
Conductor colors		1 - Brown 2 - NC 3 - Blue 4 - Black	1 - Brown 2 - NC 3 - Blue 4 - Black
Wire size		20 AWG	20 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 250V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 250V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP68	IP68
LED output indication		—	—



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Approximate dimensions

C1-3W9-V2
C1-3W9-V4

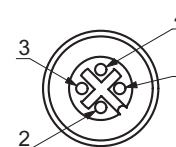


Connectors & cables

C1 Micro style

3 Wire 90° PNP, NPN

Wire type		3 Wire 90° PNP	3 Wire 90° NPN
Catalog number		C1-3W9LP-V2	C1-3W9LN-V2
List price		\$ 25.90	\$ 25.90
Cable length	meters	2	2
Number of conductors		3	3
Conductor colors		1 - Brown 2 - NC 3 - Blue 4 - Black	1 - Brown 2 - NC 3 - Blue 4 - Black
Wire size		22 AWG	22 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 90C	Oil resistant gray PVC jacket 300V, 90C
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP68	IP68
LED output indication		PNP	NPN

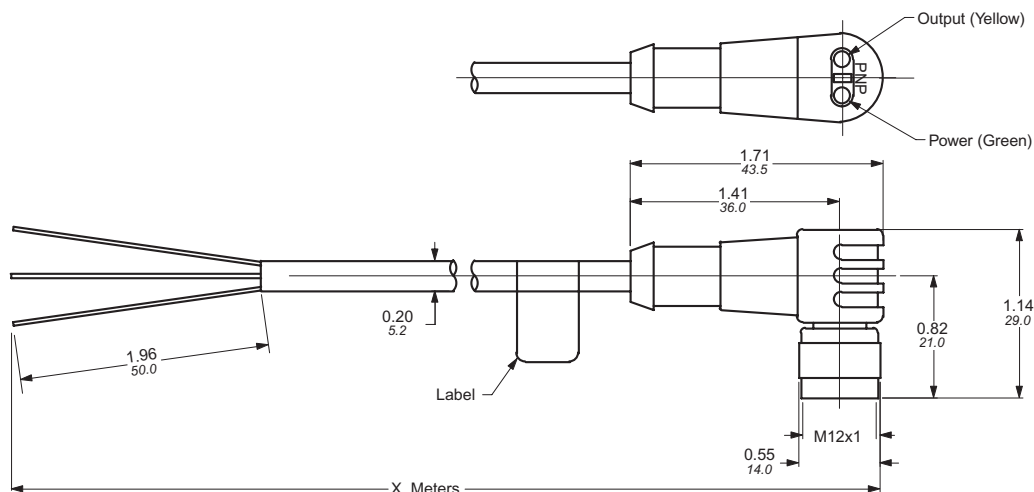


1 = Brown
2 = N/C
3 = Blue
4 = Black

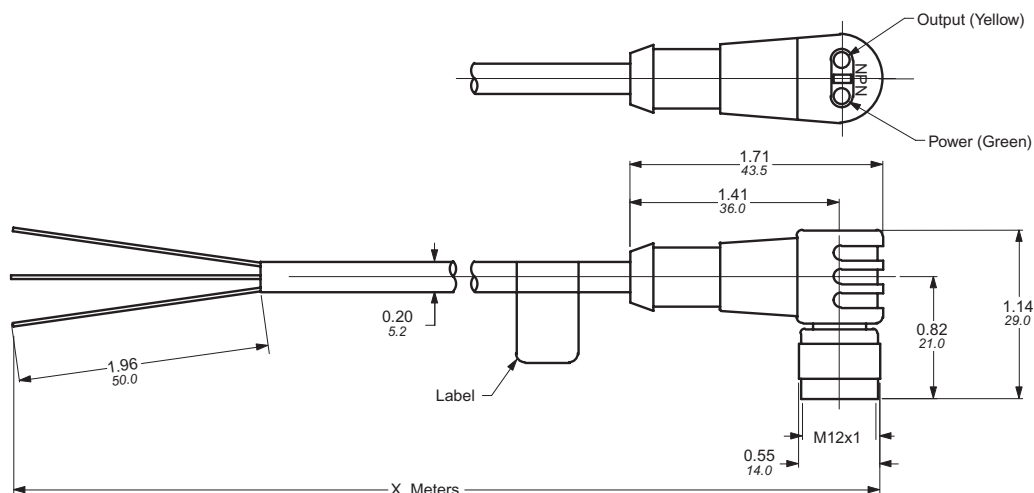
Female End View

Approximate dimensions

C1-3W9LP-V2



C1-3W9LN-V2



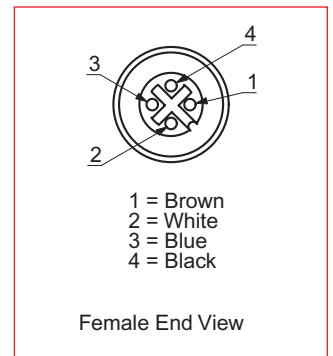
Connectors & cables

C1 Micro style

4 Wire straight

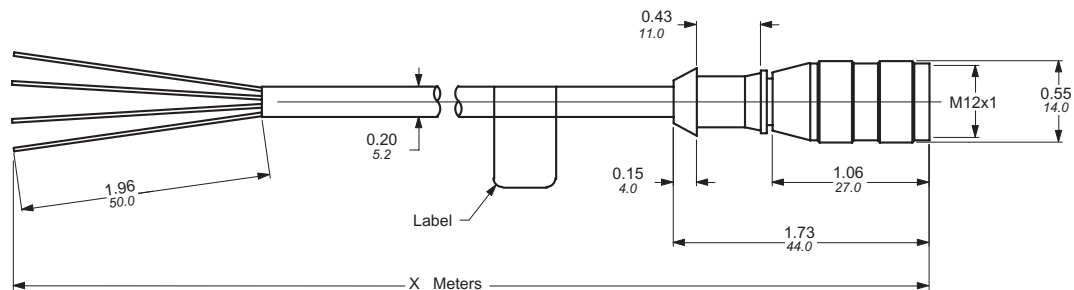


Wire type		4 Wire straight	4 Wire straight
Catalog number		C1-4WS-V2	C1-4WS-V4
List price		\$ 16.60	\$ 20.30
Cable length	meters	2	4
Number of conductors		4	4
Conductor colors		1 - Brown 2 - White 3 - Blue 4 - Black	1 - Brown 2 - White 3 - Blue 4 - Black
Wire size		22 AWG	22 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 300V, 90C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP68	IP68
LED output indication		—	—



Approximate dimensions

C1-4WS-V2
C1-4WS-V4

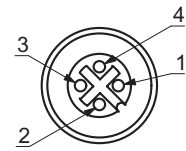


Connectors & cables

C1 Micro style

4 Wire 90°

Wire type		4 Wire 90°	4 Wire 90°
Catalog number		C1-4W9-V2	C1-4W9-V4
List price		\$ 16.60	\$ 20.30
Cable length	meters	2	4
Number of conductors		4	4
Conductor colors		1 - Brown 2 - White 3 - Blue 4 - Black	1 - Brown 2 - White 3 - Blue 4 - Black
Wire size		22 AWG	22 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP68	IP68
LED output indication		—	—

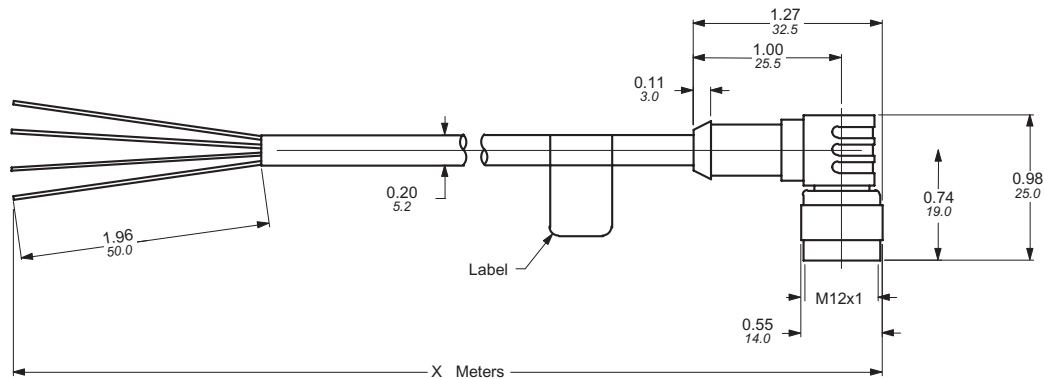


1 = Brown
2 = White
3 = Blue
4 = Black

Female End View

Approximate dimensions

C1-4W9-V2
C1-4W9-V4



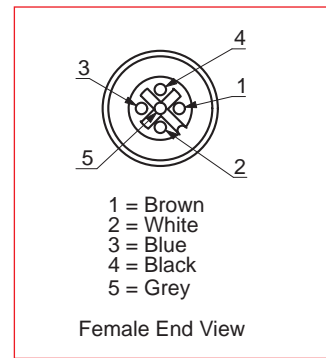
Connectors & cables

C1 Micro style

5 Wire straight



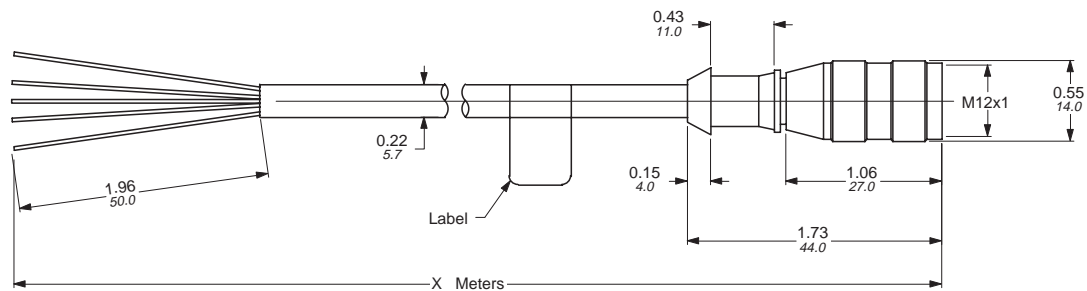
Wire type		5 Wire straight	5 Wire straight
Catalog number		C1-5WS-V2	C1-5WS-V4
List price		\$ 17.70	\$ 22.50
Cable length	meters	2	4
Number of conductors		5	5
Conductor colors		1 - Brown 2 - White 3 - Blue 4 - Black 5 - Grey	1 - Brown 2 - White 3 - Blue 4 - Black 5 - Grey
Wire size		22 AWG	22 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP68	IP68
LED output indication		—	—



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Approximate dimensions

C1-5WS-V2
C1-5WS-V4

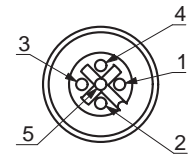


Connectors & cables

C1 Micro style

5 Wire 90°

Wire type		5 Wire 90°	5 Wire 90°
Catalog number		C1-5W9-V2	C1-5W9-V4
List price		\$ 17.70	\$ 22.50
Cable length	meters	2	4
Number of conductors		5	5
Conductor colors		1 - Brown 2 - White 3 - Blue 4 - Black 5 - Grey	1 - Brown 2 - White 3 - Blue 4 - Black 5 - Grey
Wire size		22 AWG	22 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 90C UL recognized CSA certified	Oil resistant gray PVC jacket 300V, 90C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP68	IP68
LED output indication		—	—

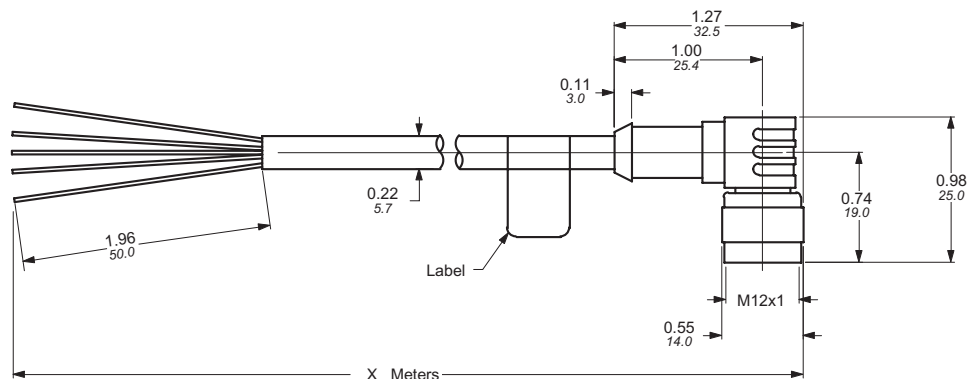


1 = Brown
2 = White
3 = Blue
4 = Black
5 = Grey

Female End View

Approximate dimensions

C1-5W9-V2
C1-5W9-V4



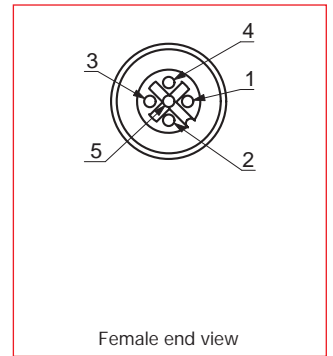
Connectors & cables

C1 Micro style

Custom wire straight

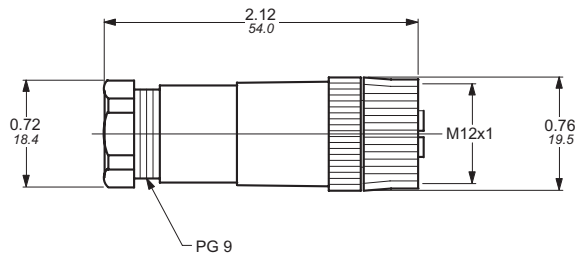


Wire type		Custom wire straight	Custom wire straight
Catalog number		C1-XWS	C1-XW9
List price		\$ 23.70	\$ 23.70
Cable length	meters	Customer supplies cable	Customer supplies cable
Number of conductors		Custom build from 1-5 wire cable	Custom build from 1-5 wire cable
Conductor colors		—	—
		—	—
		—	—
		—	—
Coupling nut		PBT	PBT
Contacts		Nickel-plated brass	Nickel-plated brass
Maximum wire size		18 AWG	18 AWG
Cable grip range	mm	4 - 8	4 - 8
Temperature	°F	-40 ... +185	-40 ... +185
Protection	IEC	IP67	IP67
LED output indication		—	—

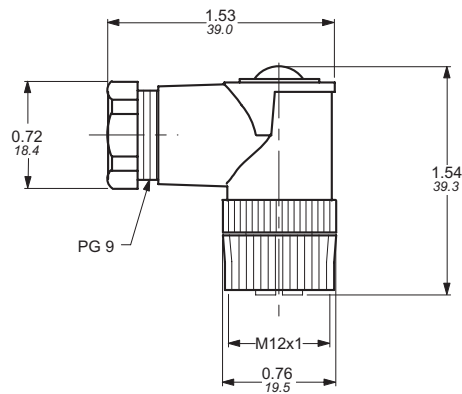


Approximate dimensions

C1-XWS



C1-XW9

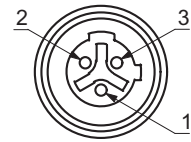


Connectors & cables

C2 Micro style

3 Wire straight

Wire type		3 Wire straight	3 Wire straight
Catalog number		C2-3WS-V2	C2-3WS-V6
List price		\$ 19.80	\$ 29.10
Cable length	meters	2	6
Number of conductors		3	3
Conductor colors		1 - Green 2 - Red/Black 3 - Red/White	1 - Green 2 - Red/Black 3 - Red/White
Wire size		22 AWG	22 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-13 ... +221	-13 ... +221
Protection	IEC	IP67	IP67
LED output indication		—	—

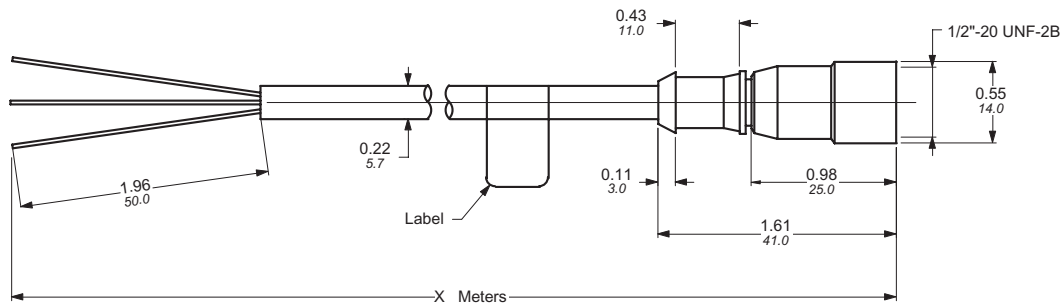


1 = Green
2 = Red/Black
3 = Red/White

Female End View

Approximate dimensions

C2-3WS-V2
C2-3WS-V6



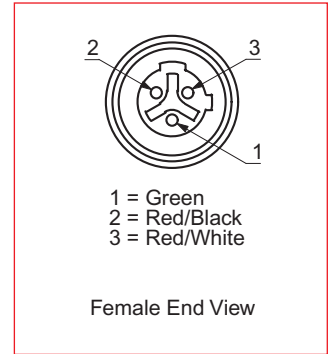
Connectors & cables

C2 Micro 1/2" – 20 style

3 Wire 90°



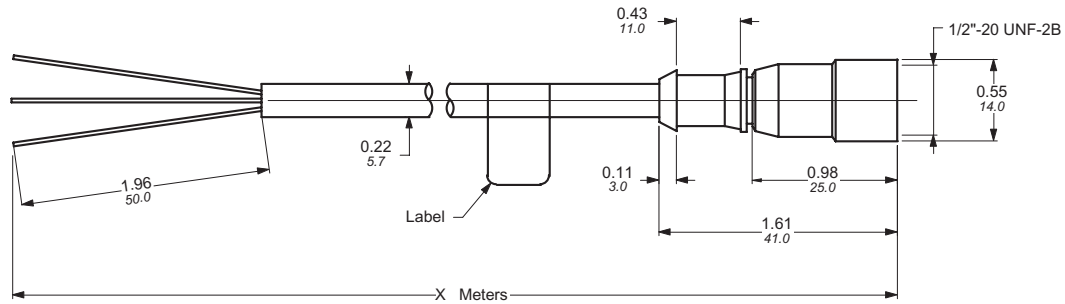
Wire type		3 Wire 90°	3 Wire 90°
Catalog number		C2-3W9-V2	C2-3W9-V6
List price		\$ 19.80	\$ 29.10
Cable length	meters	2	6
Number of conductors		3	3
Conductor colors		1 - Green 2 - Red/Black 3 - Red/White	1 - Green 2 - Red/Black 3 - Red/White
Wire size		22 AWG	22 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 300V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-13 ... +221	-13 ... +221
Protection	IEC	IP67	IP67
LED output indication		—	—



10

Approximate dimensions

C2-3W9-V2
C2-3W9-V6

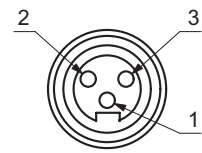


Connectors & cables

C7 Mini style

3 Wire straight

Wire type		3 Wire straight	3 Wire straight
Catalog number		C7-3WS-V2	C7-3WS-V6
List price		\$ 17.60	\$ 29.00
Cable length	meters	2	6
Number of conductors		3	3
Conductor colors		1 - Green 2 - Black 3 - White	1 - Green 2 - Black 3 - White
Wire size		16 AWG	16 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 600V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 600V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP67	IP67
LED output indication		—	—

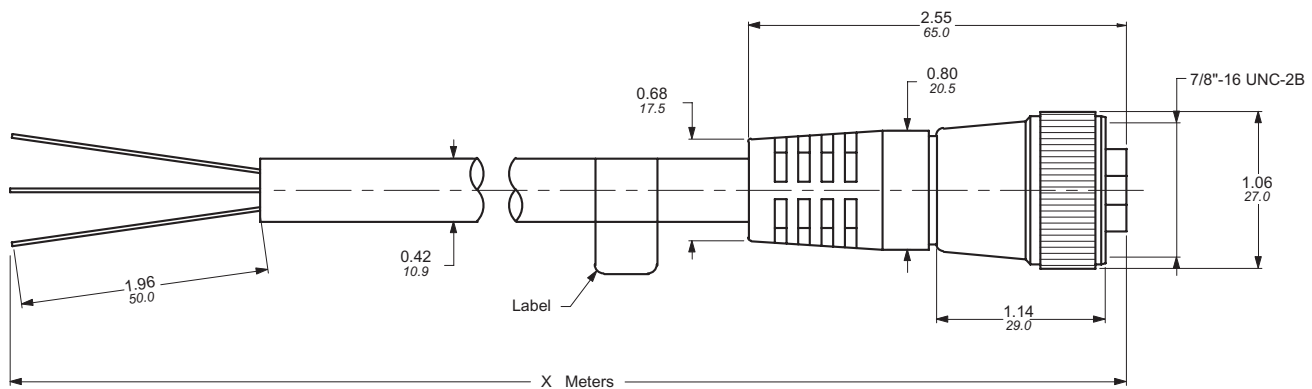


1 = Green
2 = Black
3 = White

Female End View

Approximate dimensions

C7-3WS-V2
C7-3WS-V6



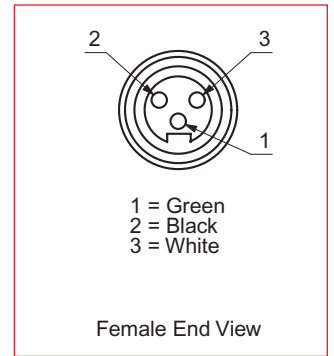
Connectors & cables

C7 Mini style

3 Wire 90°

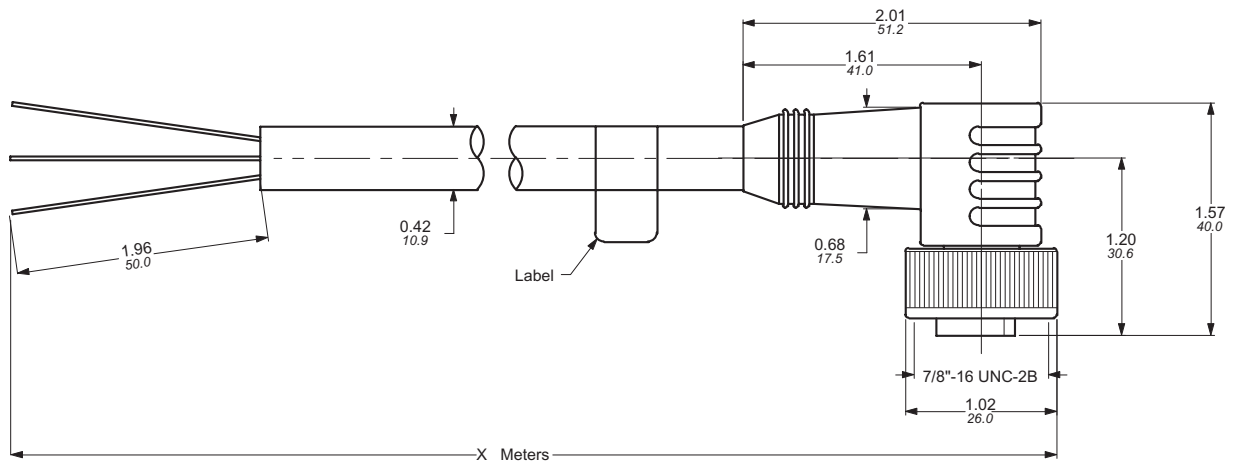


Wire type		3 Wire 90°	3 Wire 90°
Catalog number		C7-3W9-V2	C7-3W9-V6
List price		\$ 17.60	\$ 29.00
Cable length	meters	2	6
Number of conductors		3	3
Conductor colors		1 - Green 2 - Black 3 - White	1 - Green 2 - Black 3 - White
Wire size		16 AWG	16 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 600V, 105C UL recognized CSA certified	Oil resistant gray PVC jacket 600V, 105C UL recognized CSA certified
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +221	-40 ... +221
Protection	IEC	IP67	IP67
LED output indication		—	—



Approximate dimensions

C7-3W9-V2
C7-3W9-V6

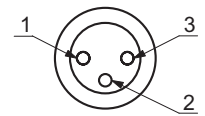


Connectors & cables

C8 Nano style

3 Wire straight

Wire type		3 Wire straight	3 Wire straight
Catalog number		C8-3WS-V2	C8-3WS-V6
List price		\$ 13.50	\$ 22.70
Cable length	meters	2	6
Number of conductors		3	3
Conductor colors		1 - Brown 2 - Black 3 - Blue	1 - Brown 2 - Black 3 - Blue
Wire size		24 AWG	24 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C	Oil resistant gray PVC jacket 300V, 105C
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +194	-40 ... +194
Protection	IEC	IP67	IP67
LED output indication		—	—



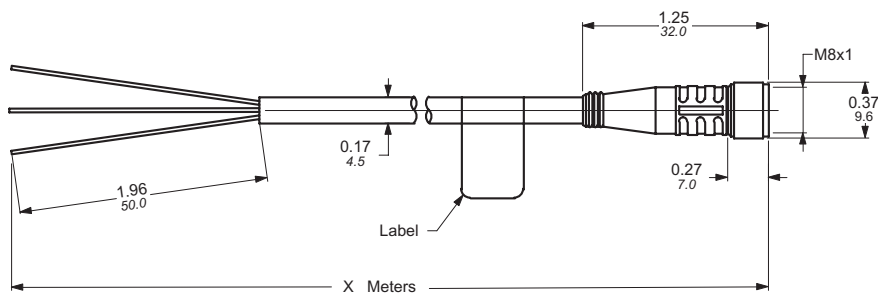
1 = Brown
2 = Black
3 = Blue

Female End View

10

Approximate dimensions

C8-3WS-V2
C8-3WS-V6



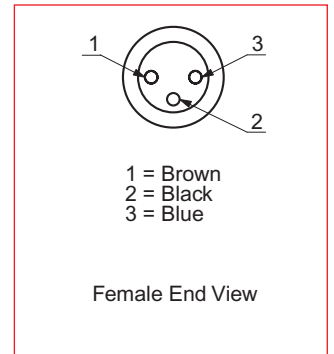
Connectors & cables

C8 Nano style

3 Wire 90°

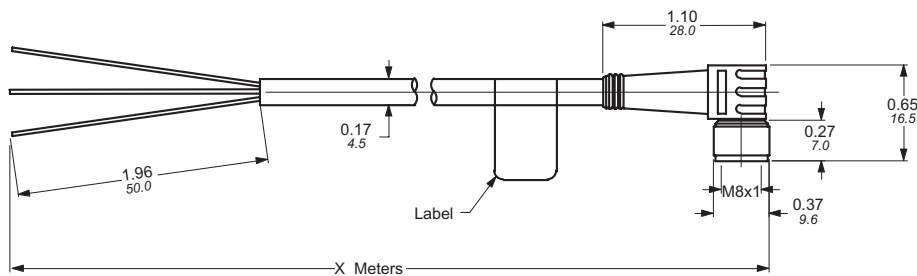


Wire type		3 Wire 90°	3 Wire 90°
Catalog number		C8-3W9-V2	C8-3W9-V6
List price		\$ 13.50	\$ 22.70
Cable length	meters	2	6
Number of conductors		3	3
Conductor colors		1 - Brown 2 - Black 3 - Blue	1 - Brown 2 - Black 3 - Blue
Wire size		24 AWG	24 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C	Oil resistant gray PVC jacket 300V, 105C
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +194	-40 ... +194
Protection	IEC	IP67	IP67
LED output indication		—	—



Approximate dimensions

C8-3W9-V2
C8-3W9-V6

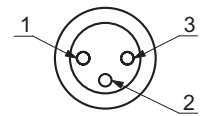


Connectors & cables

C8 Nano style

3 Wire 90° PNP, NPN

Wire type		3 Wire 90° PNP	3 Wire 90° NPN
Catalog number		C8-3W9LP-V2	C8-3W9LN-V2
List price		\$ 28.20	\$ 28.20
Cable length	meters	2	2
Number of conductors		3	3
Conductor colors		1 - Brown 2 - Black 3 - Blue	1 - Brown 2 - Black 3 - Blue
Wire size		24 AWG	24 AWG
Coupling nut		Nickel-plated brass	Nickel-plated brass
Connector		Thermoplastic PUR	Thermoplastic PUR
Contacts		Gold-plated brass	Gold-plated brass
Cable		Oil resistant gray PVC jacket 300V, 105C	Oil resistant gray PVC jacket 300V, 105C
Conductors		High flex stranding, PVC insulation	High flex stranding, PVC insulation
Temperature	°F	-40 ... +194	-40 ... +194
Protection	IEC	IP68	IP68
LED output indication		PNP	NPN



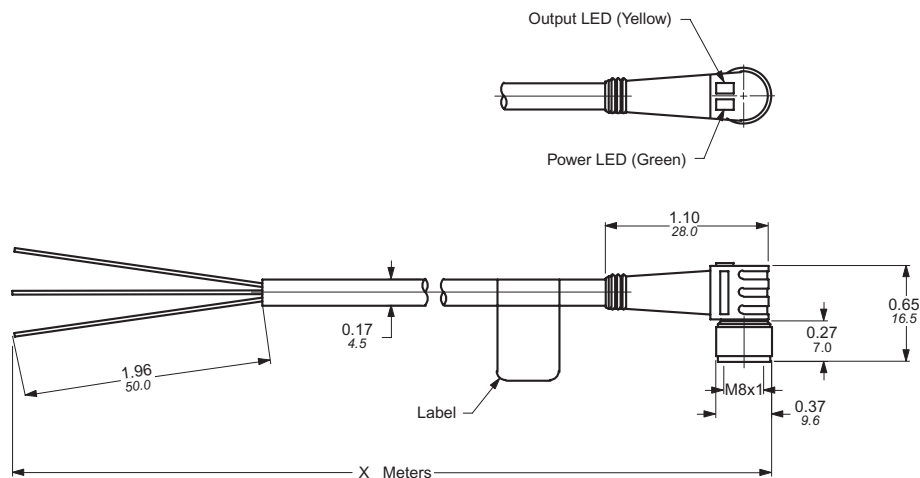
1 = Brown
2 = Black
3 = Blue

Female End View

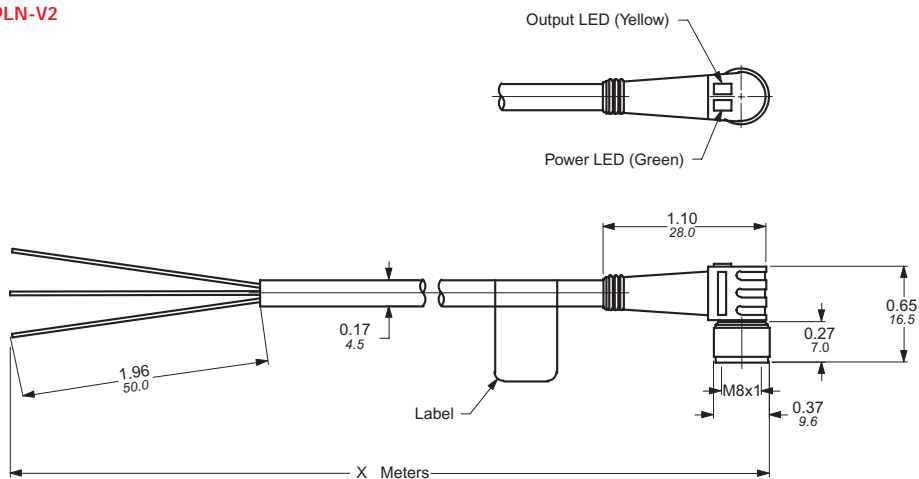
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Approximate dimensions

C8-3W9LP-V2



C8-3W9LN-V2



Wireless proximity switches



Wireless proximity switches



10

General information

Catalog numbering system

Description

Wireless proximity switches work according to the induction principle. In contrast to conventional proximity switches these do not require any cable connection between sensor and machine control system. An electromagnetic field that is produced by two power supplies with a pair of primary loops respectively supplies all proximity switches within a production line with the energy needed for their sensory functions as well as the radio communication. The proximity switches transmit their signals per radio communication to an input module which to this end is connected to a pair of antennas.

Design

Wireless proximity switches consist of the sensor head and the communication module, which receives its power from the electromagnetic field. Communication with the input module takes place according to the standard ETS300328 in the 2.4 GHz band. Up to 120 sensors can be allocated to one input module delivering their proximity changes within typically 20ms (REALTIME SUITED). The input module transmits the sensor signals to the machine control system via an ABB FieldBusPlug. A continuous function messaging of each wireless proximity switch ensures an immediate detection of failures.

Energy transfer

The electromagnetic field used for the power transfer is produced by two pairs of primary loops. The two pairs of primary loops supply a volume of 1m x 1m x 1m up to 3m x 3m x 3m which can be enlarged modularly. Up to 360 wireless proximity switches can be used within this space.

Advantages of the wireless proximity switches:

- high flexibility in use
- reduced engineering
- short commissioning times
- high reliability and availability of the production system

Catalog numbering system

Type of sensor

WSI = Wireless sensor inductive

Mounting type

F = flush-mounted

N = non flush-mounted

Nominal switching distance S_n

0.15 = 1.5 mm nominal switching distance

0.20 = 2.0 mm nominal switching distance

0.40 = 4.0 mm nominal switching distance

0.50 = 5.0 mm nominal switching distance

0.80 = 8.0 mm nominal switching distance

0.100 = 10.0 mm nominal switching distance

0.150 = 15.0 mm nominal switching distance

Housing

M = Metric

8, 12, 18, 30 = diameter in mm

N = Normal overall length

WSI

F

015

M8N



Wireless proximity switches



WSIN150-M30N



WSIX100-B50N



WDI100-120FBP



WAT100



WPC100-N

Type	Catalog number	Packing unit piece/meter	Weight 1 piece kg
Sensor heads			
WSIF015-M8N	1SAF108911R3000	1	0.025
WSIN020-M8N	1SAF108921R3000	1	0.025
WSIF020-M12N	1SAF112911R3000	1	0.030
WSIN040-M12N	1SAF112921R3000	1	0.025
WSIF050-M18N	1SAF118911R3000	1	0.060
WSIN080-M18N	1SAF118921R3000	1	0.055
WSIF100-M30N	1SAF130911R3000	1	0.140
WSIF150-M30N	1SAF130921R3000	1	0.120

Communication module one per sensor head			
WSIX100-B50N	1SAF900100R3000	1	0.125

Power supply			
WPU100-24	1SAF900200R0001	1	15.000

Input module			
WDI100-120FBP	1SAF900300R0001	1	0.410

Antennas for input module			
WAT100-R	1SAF900600R0001	1	0.100
WAT100-L	1SAF900600R0002	1	0.100

Antenna cable for input module			
WAC100-N03	1SAF900600R1030	3 m	0.370
WAC100-N05	1SAF900600R1050	5 m	0.600

Antenna fitting			
WAM100-N	1SAF900900R0001	1	0.095

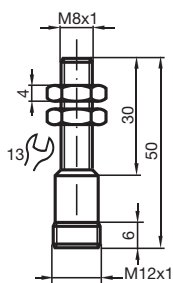
Primary loop			
WPC100-N10	1SAF900800R1100	10 m	1.280
WPC100-N11	1SAF900800R1110	11 m	1.410
WPC100-N12	1SAF900800R1120	12 m	1.535
WPC100-N13	1SAF900800R1130	13 m	1.665
WPC100-N14	1SAF900800R1140	14 m	1.790
WPC100-N15	1SAF900800R1150	15 m	1.920
WPC100-N16	1SAF900800R1160	16 m	2.050
WPC100-N17	1SAF900800R1170	17 m	2.175
WPC100-N18	1SAF900800R1180	18 m	2.305
WPC100-N19	1SAF900800R1190	19 m	2.430
WPC100-N20	1SAF900800R1200	20 m	2.550
WPC100-N21	1SAF900800R1210	21 m	2.690
WPC100-N22	1SAF900800R1220	22 m	2.815
WPC100-N23	1SAF900800R1230	23 m	2.945
WPC100-N24	1SAF900800R1240	24 m	3.070
WPC100-N12	1SAF900800R1250	25 m	3.200
WPC100-N26	1SAF900800R1260	26 m	3.330
WPC100-N27	1SAF900800R1270	27 m	3.455
WPC100-N28	1SAF900800R1280	28 m	3.585

Technical data

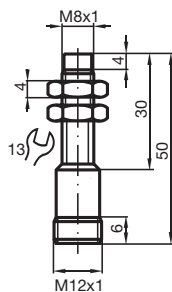
Sensor heads WSIF..., WSIN...

Sensor heads

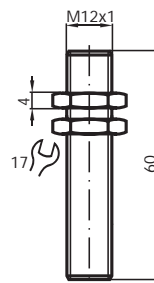
Switching distance S_r , mounting	1,5 mm flush-mounted	2 mm non flush-mounted	2 mm flush-mounted	4 mm non flush-mounted
Type	M8x1 flush-mounted	M8x1 non flush-mounted	M12x1 flush-mounted	M12x1 non flush-mounted
Identification	WSIF015-M8N	WSIN020-M8N	WSIF020-M12N	WSIN040-M12N
Switching distance [mm]	0 ... 1.21	0 ... 1.62	0 ... 1.62	0 ... 3.24
Reduction factor r_{ca} 0.750.750.750.8				
r_{ca} 0.40.40.30.45				
r_{ca} 0.40.40.250.4				
Nominal signal transfer rate	1/s	5 (signal changes per second, typically 20ms)		
Hysteresis H [%]	≤ 10	≤ 10	≤ 10	≤ 10
Reproducibility [%]	≤ 10	≤ 10	≤ 10	≤ 10
Temperature drift [%]	± 10	± 10	± 10	± 10
Short circuit protection	no, because usage only in connection with the communication module.			
Reverse polarity protection	no, because usage only in connection with the communication module.			
Indication	see communication module			
Operating temperature range [°C]	-25 ... +70			
Storage temperature range [°C]	-40 ... +70			
Permissible shock and vibration loading	shock $b \leq 30g$, $T \leq 11ms$			
Protection class acc. to IEC 60529	IP67			
In compliance with	EN 60 947-5-2			
Connection	M12 connector for one communication module			
Housing material	Nickel plated brass			
Sensing face	PBT (Crastin)			
Starting torque recommended/maximum [Nm]	3/5	3/5	10/15	10/15
Drawing number	120025	120026	117740	118943



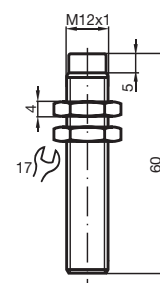
120025



120026



117740



118943

Technical data

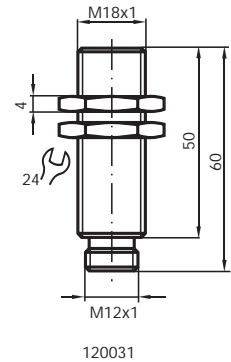
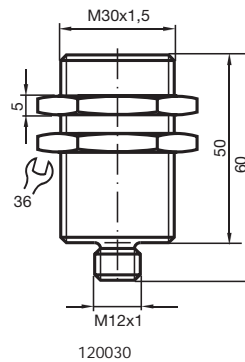
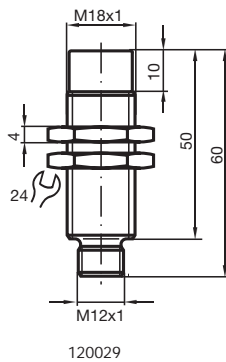
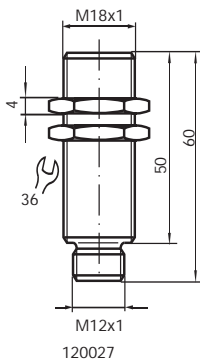
Sensor heads WSIF..., WSIN...

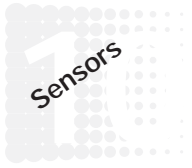


Sensor heads

Switching distance $S_{s,r}$ mounting	5 mm flush-mounted	8 mm non flush-mounted	10 mm flush-mounted	15 mm non flush-mounted
Type	M18x1 flush-mounted	M18x1 non flush-mounted	M30x1.5 flush-mounted	M30x1.5 non flush-mounted
Identification	WSIF050-M18N	WSIN080-M18N	WSIF100-M30N	WSIN150-M30N
Switching distance [mm]	0 ... 4.05	0 ... 6.5	0 ... 8.1	0 ... 12.15
Reduction factor				
r_{VDA}	0 .750	.750	.750	.7
r_{AL}	0 .350	.450	.450	.45
r_{Cu}	0 .30	.40	.250	.35
Nominal signal transfer rate 1/s5 (signal changes per second, typically 20ms)				
Hysteresis H [%]	≤ 10	≤ 10	≤ 10	≤ 10
Reproducibility [%]	≤ 10	≤ 10	≤ 10	≤ 10
Temperature drift [%]	± 10	± 10	± 10	± 10
Short circuit protection	no, because usage only in connection with the communication module.			
Reverse polarity protection	no, because usage only in connection with the communication module.			
Indication	see communication module			
Operating temperature range [°C]	-25 ... +70			
Storage temperature range [°C]	-40 ... +70			
Permissible shock and vibration loadingshock b	≤ 30g, T ≤ 11ms			
Protection class acc.	IEC 60529IP67			
In compliance with	EN 60 947-5-2			
Connection	M12 connector for one communication module			
Housing material	Nickel plated brass			
Sensing face	PBT (Crastin)			
Starting torque recommended/maximum [Nm]	30/50	30/50	30/100	30/100
Drawing number		120027	120029	120030 120031

10





Technical data

Communication module

Short description

The communication module is attached to one of the eight heads of an inductive sensor as if it were a conventional sensor plug. The communication module for all sensor head variations is identical.

The communication module receives its energy for the sensor functions and radio communication with the input module from an electromagnetic field.

Type	WSIX100-B50N
Nominal signal transfer rate 1/s	5 (signal changes per second)
Latency (99,9%)	20 ms (max. 34 ms) until the signal is available on the fieldbus
Switch status	LED, yellow
Operating status	LED, green
Operation	1 foil push-button
Operating temperatur range	-25 ... +55 °C
Storage temperatur range	-40 ... +70 °C
Permissible shock and vibration loading	shock $b \leq 30g$, $T \leq 11$ ms
Protection class in acc. with IEC 60529	IP67
In compliance with	EN 60 947-5-2
Connection	Connector M12 with connecting nut for sensor heads for wireless proximity switches
Housing material	Bergamit A700 (PA6.6 not fortified)
Power consumption	≤ 6 mW
Frequency of the power transfer	120 kHz
Frequency band	2,4 GHz ISM band in accordance with ETSI standard ETS 300 328
Maximum number of communication modules in one machine cell (3x3x3 m ³)	360
Maximum transfer rate	10 m/s
Error rate	10^{-9}
Range for communication	5 m
Frequency change	Frequency hopping method
Address storage	Adresses cannot be lost



Technical data

Input module



Short description

One input module transmits the information of up to 120 wireless position sensors to the machine control. The sensor signals reach the input module via two antennas and are then transferred to the machine control system via a FieldBusPlug.

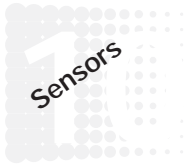
Communication takes place in the 2.4 GHz band according to the standard ETS 300 328. A frequency hopping process with varying frequency sequences is used for reliable data transfer.

Every 500 ms the input module expects a status report of all its assigned sensors. This way the input module monitors the correct functioning of the sensors. Additionally, the input module is equipped with functions for the configuration and diagnosis of wireless position sensors.

Type	WDI100-120FBP
Number of inputs	120 digital inputs for wireless position sensors 120 valid-status signals for wireless position sensors
Frequency band (communication)	2.4 GHz ISM band in acc. with ETSI standard ETS 300 328
Frequency-/antenna change	Frequency hopping method with varying frequency sequences Alternation between emitting- and receiving antenna
Error rate (per input)	10 ⁻⁹
Latency (99,9 %)	20 ms (max. 34 ms) until the signal is available on the fieldbus
Range (of antenna)	5 m
Maximum number of input modules per machine cell	3
Operating display	- LCD-Display, double-spaced with 16 characters each - 4 foil push-buttons
Electrical connection	- 2 coaxial connectors: antenna cable - 1 connector: interface to ABB-FieldBusPlug - 1 set of screw terminals: 24 VDC supply
Protection class in acc. with IEC 60529	IP20
Supply voltage	24 V DC (+20%, -15%)
Operating temperature range	0 ... +50°C
Storage temperature range	-25 ... +70°C
Permissible humidity for operation	+50 ... +95 %, without bedewing
Dimensions (h x w x d)	140 mm x 120 mm x 85 mm
Mounting	- DIN-rail in acc. with DIN EN 50022 - Mounting holes for screws up to 4 mm diameter

10





Technical data

Power supply

Short description

The power supply WPU100 provides the energy for the generation of an electromagnetic field of 120 kHz with the help of the connected primary loops. This again supplies the wireless position sensors. The installation in pairs generates a two-dimensional, rotating, electromagnetic field.

Type	WPU100-24
Output frequency	120 kHz
Output voltage	up to 700 V at the connected primary loops
Output current	4 ... 24 A adjustable in 16 stages
Permissible inductivity at output	0,011 ... 0,058 mH (primary loops including feed line)
Control elements	1 green LED, System ready 2 red LEDs for signalling of errors 16-stage rotary switch for the selection of output current 1 DIL-switch for phase selection (0°/90°) 1 DIL-switch for the selection of operating mode (Master/Slave)
Electrical connection	2 terminals for the electrical connection of primary loops 1 terminal: synchronisation input 1 terminal: synchronisation output 1 terminal: supply voltage
10 Synchronisation	Automatic synchronisation with a second power supply for the generation of a two-dimensional, rotating electromagnetic field
Supply voltage	120 ... 230 V AC (+10%, -15%), (50 ... 60 Hz (±5%))
Power consumption	100 ... 700 W
Operating temperature range	0 ... +45°C
Storage temperature range	-25 ... +70°C
Protection class in acc. with IEC 60529	IP67
Mounting	4 mounting holes for screw mounting
Dimensions (h x w x d)	400 mm x 310 mm x 150 mm
Weight	15 kg
Suitable synchronized wires	screened twisted-pair-cable, screen applied one-sided
Suitable primary loops	Solely the prepacked primary loops that are offered within this product range



Technical data

Antenna

Primary loops



Short description

The antennas WAT100 transmit and receive the signals between an input module and the wireless proximity switches. Two antennas with varying polarisation are connected to each input module.

Type	WAT100-R, WAT100-L
Frequency range	2.4 ... 2.5 GHz
Polarisation	Right- resp. leftcircular polarized (-R, -L)
Impedancy	50 Ω
Dimensions (h x w x d)	101 mm x 95 mm x 32 mm
Antenna cable	Prepacked coaxial cable (length: 3 m and 5 m)
Accessories	Antenna mounting kit



10

Short description

The primary loops WPC100 emit an electromagnetic field of 120kHz with the help of the connected power supply for wireless position sensors. The installation in pairs generates a two-dimensional, rotating electromagnetic field.

Type	WPC100-N
Rated voltages	1000 V AC, suitable for installation in acc. with VDE100-520
Total diameter	9.4 ± 0.5 mm
Total cross section	6.6 mm ²
Properties	Halogene-free, bio-diesel resistant, UV-resistant
Conductor insulation	Silicone (Si/Y); wall thickness 1.3 mm; colour: red
Exterior insulation	TPE/U (thermoplastic polyurethan); wall thickness 1.3 mm; colour: light grey
Availabe types	prepacked cable (cable shoes on both ends) for the connection to the power supply for wireless position sensors Lengths between 10 m and 28 m, graduation 1 m





Notes



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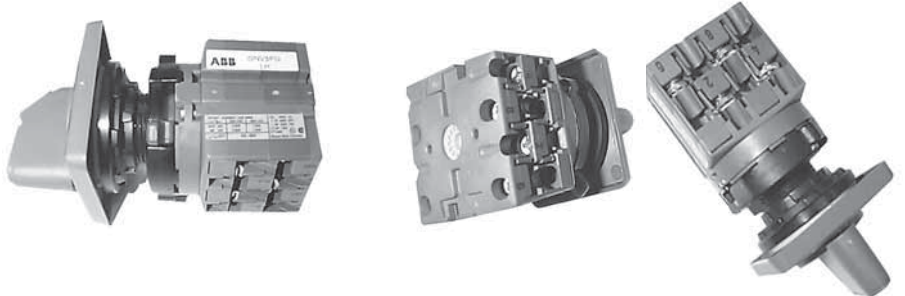
Notes

Type OM, ON, & OL Cam switches

ABB Cam switches

Cam switches OM, ON & OL (10A, 25A, 40A, 80A, 125A, 160A & 200A)

Complete range of standard and special cam switches for door and base mounting



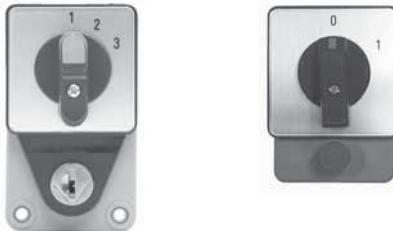
Complete delivery includes handle and frontplate. Snap-on mounting of contact block with interlocking

Protected terminals and interconnections. Selflifting plus-minus screws for fast assembly.

Handle, color black or grey. Padlockable handle, color black or red-yellow.



Keylock and cylinder lock solutions



Enclosed cam switches. Water and dustproof IP 65. NEMA4 X for outdoor use.



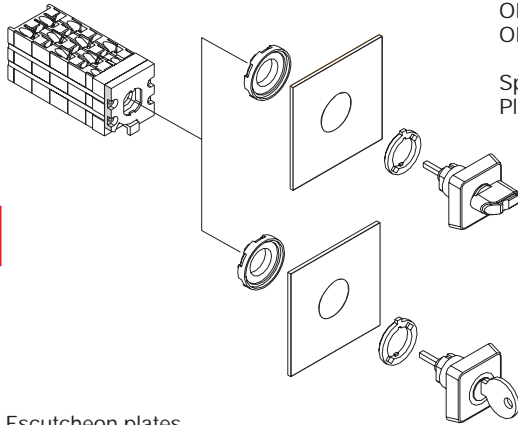
Door mounting cam switches

- IP 65
- NEMA 4X outdoor (ON, OL40)
- Key operated switch, IP54
- OM, Miniature
- ON, Normal
- OL, Large

Door drilling

OM: Ø 16.5mm / Ø 22.5mm
 ON: Ø 22.5mm / Ø 30.5mm
 OL40: Ø 22.5mm / Ø 30.5mm

Maximum panel thickness 5.5 mm.
 The black handle with square escutcheon plate marked with switch type is supplied with the switch body. Optional adaptor ring available for 30.5 mm hole.



Escutcheon plates	
OM	30x30
ON	48x48
OL40	48x68

DIN-rail mounting

- P 44
- ON, Modular



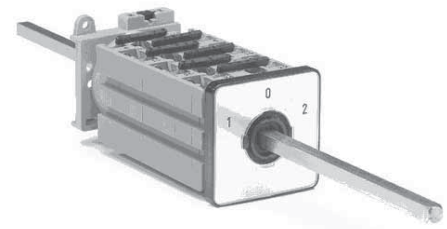
Number of contacts

OM:	16 contacts
ON:	20 contacts
ON_M:	6 contacts
OL40:	20 contacts
OL80, 125, 160, 200:	24 contacts

Special switches up to 60 contacts
 Please consult with us.

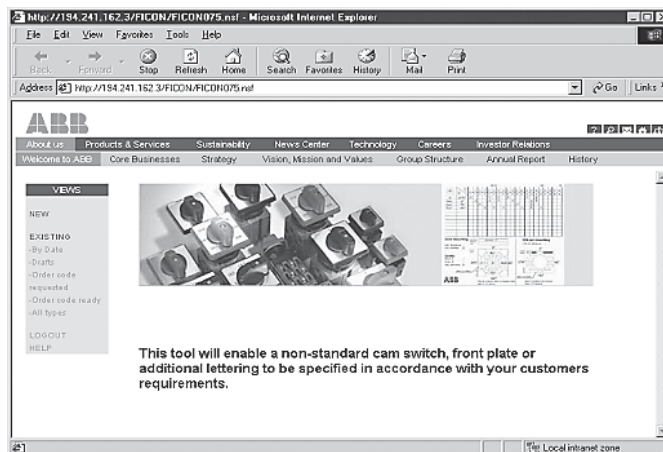
Features:

- Complete delivery for easy purchasing and assembly
 - Standard delivery with black handle, alt. grey or red yellow handle
 - Small panel size: front space in side to side mounting 30 mm or 50 mm up to 25 A
 - Finger protected terminals and interconnections (IP20, VBG4)
 - Self lifting screws, terminal screws for fast cabling
 - Double break silver contacts with 0,35 µm gold grid ensure a high breaking capacity and reliable connection.
- Also available with solid golden contacts for extremely difficult circumstances. Have to be ordered separately, please add G to the type, e.g: OMA 1 PBG.
- Fast special engraving service available
 - Metallic shaft as special version
 - Fast-on terminals available as special version



11

User guiding CamWeb Configurator for special cam switches



The user guiding CamWeb Configurator generates automatically the new cam switch type and sends order code for non-standard cam switches and front plates.

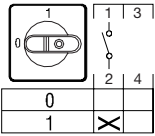
The global order code enables fast and failure free EDI-orders as standard switch from the first time.

The path to the configurator through ABB home pages:
www.abb.com or inside.abb.com
 Product&Services
 Low Voltage Products
 Switches&Fusegear
 Switches
 Cam Switches – CamLine
 Special Cam Switches

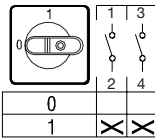
You may also use the direct internet URL:
<http://194.241.162.3/FICON/FICON075.nsf>

ON-OFF Switches ①

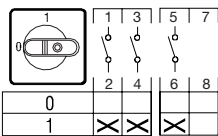
Cam switches



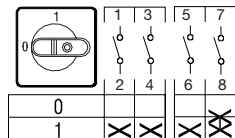
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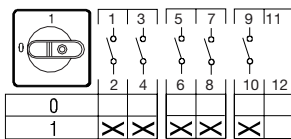
O_A2_



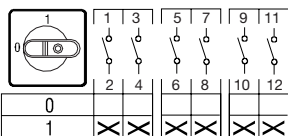
O_A3_



O_A4_



O_A5_



O_A6_

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece. Special engraved front-plates to be ordered as separate items.

Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
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Rotating angle 90°, O-position: 9 o'clock

Miniature, door mounted

0 - 1	1	10	0.04	OMA1PB	\$ 51
	2	10	0.04	OMA2PB	59
	3	10	0.05	OMA3PB	90
0 - 1	4	10	0.05	OMA4PB	124
	5	10	0.06	OMA5PB	135
	6	10	0.06	OMA6PB	210

Normal, door mounted

0 - 1	1	25	0.08	ONA1PB	53
	2	25	0.09	ONA2PB	66
	3	25	0.10	ONA3PB	102
0 - 1	4	25	0.11	ONA4PB	135
	5	25	0.12	ONA5PB	142
	6	25	0.12	ONA6PB	237

Large, door mounted

0 - 1	1	40	0.13	OL40A1PB	100
	2	40	0.17	OL40A2PB	119
	3	40	0.21	OL40A3PB	136
0 - 1	4	40	0.25	OL40A4PB	150
	5	40	0.29	OL40A5PB	172
	6	40	0.33	OL40A6PB	191

Modular, DIN-rail mounted

0 - 1	1	25	0.09	ONA1M	50
	2	25	0.10	ONA2M	66
	3	25	0.11	ONA3M	102
	6	25	0.12	ONA6M	237

Key operated, withdrawable in both positions, rotating angle 90°, O-position: 9 o'clock ②

Miniature, door mounted

0 - 1	1	10	0.06	OMA1KB	66
	3	10	0.07	OMA3KB	123

Normal, door mounted 90°

0 - 1	1	25	0.11	ONA1KB	78
	3	25	0.13	ONA3KB	130

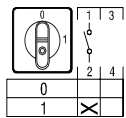
Packing sizes: OM 130 x 100 x 120 [mm]
ON, OL 250 x 100 x 110 [mm]

① 80, 125, 160 & 200A sizes will be available 1st Qtr, 2006. Consult factory for availability.

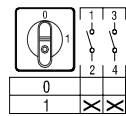
② Different withdrawability of key is also possible to be ordered as special switch.

Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

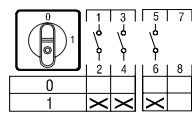
ON - OFF switches ① Change-over switches ①



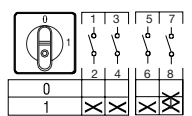
O_A01_



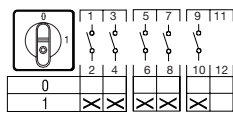
O_A02_



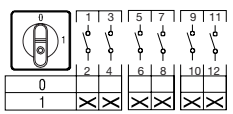
O_A03_



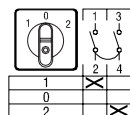
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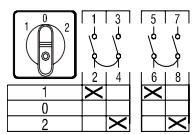
O_A05_



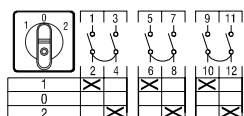
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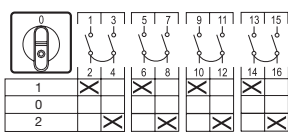
O_U1_



O_U2_



O_U3_



O_U4_

ON - OFF switches

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.

Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
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Rotating angle 90°, O-position: 12 o'clock

Miniature, door mounted

0 - 1	1	10	0.04	OMA01PB	\$ 51
	2	10	0.04	OMA02PB	59
	3	10	0.05	OMA03PB	90
0 - 1	4	10	0.05	OMA04PB	124
	5	10	0.06	OMA05PB	135
	6	10	0.06	OMA06PB	215

Normal, door mounted

0 - 1	1	25	0.08	ONA01PB	53
	2	25	0.09	ONA02PB	66
	3	25	0.10	ONA03PB	102
0 - 1	4	25	0.11	ONA04PB	135
	5	25	0.12	ONA05PB	142
	6	25	0.12	ONA06PB	237

Modular, DIN-rail mounted

0 - 1	1	25	0.09	ONA01M	50
	2	25	0.10	ONA02M	66
	3	25	0.11	ONA03M	102
	6	25	0.12	ONA06M	237

Key operated, withdrawable in both positions, rotating angle 90°, O-position: 12 o'clock

Miniature, door mounted

0 - 1	1	10	0.06	OMA01KB	116
	3	10	0.07	OMA03KB	123

Normal, door mounted

0 - 1	1	25	0.11	ONA01KB	140
	3	25	0.13	ONA03KB	130

Change-over switches

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.

Rotating angle 60° - 0 - 60°

Miniature, door mounted

1 - 0 - 2	1	10	0.05	OMU1PB	56
	2	10	0.06	OMU2PB	85
	3	10	0.06	OMU3PB	124
	4	10	0.07	OMU4PB	143

Normal, door mounted

1 - 0 - 2	1	25	0.09	ONU1PB	65
	2	25	0.11	ONU2PB	88
	3	25	0.13	ONU3PB	135
	4	25	0.14	ONU4PB	150

Large, door mounted

1 - 0 - 2	1	40	0.17	OL40U1PB	114
	2	40	0.25	OL40U2PB	139
	3	40	0.33	OL40U3PB	189
	4	40	0.41	OL40U4PB	244

Modular, DIN-rail mounted

1 - 0 - 2	1	25	0.09	ONU1M	65
	2	25	0.11	ONU2M	88
	3	25	0.13	ONU3M	135
	4	25	0.14	ONU4M	150

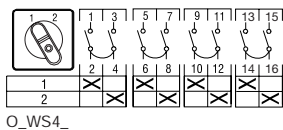
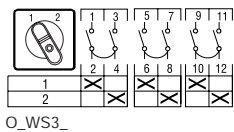
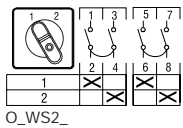
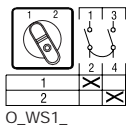
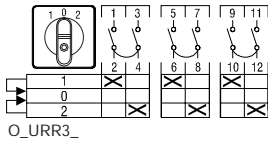
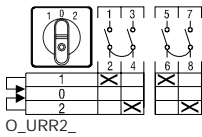
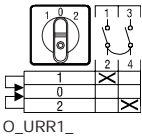
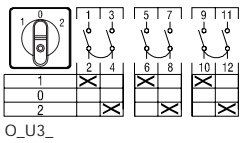
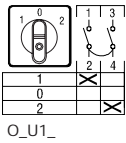
Packing sizes: OM 130 x 100 x 120 [mm]
ON, OL 250 x 100 x 110 [mm]

① 80, 125, 160 & 200A sizes will be available 1st Qtr, 2006. Consult factory for availability.

Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

Change-over switches ①

Cam switches



Black handle and frontplate with standard text are included. The type and the ordering number are for one piece. Special engraved frontplates to be ordered as separate items.

Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
Key operated, with 0-position, withdrawable in all positions					
Miniature, door mounted					
1 - 0 - 2	1 3	10 10	0.07 0.08	OMU1KB OMU3KB	\$ 107 159
Normal, door mounted					
1 - 0 - 2	1 3	25 25	0.12 0.13	ONU1KB ONU3KB	131 179
1_R - 0 - 2_R, with two sided spring return					
Miniature, door mounted					
1 _R - 0 - 2 _R	1 3	10 10	0.05 0.06	OMURR1PB OMURR3PB	63 130
Normal, door mounted					
1 _R - 0 - 2 _R	1 2 3	25 25 25	0.09 0.11 0.12	ONURR1PB ONURR2PB ONURR3PB	79 153 142
Large, door mounted					
1 _R - 0 - 2 _R	1 2 3	45 45 45	0.17 0.25 0.33	OL40URR1PB OL40URR2PB OL40URR3PB	133 144 189
Modular, DIN-rail mounted					
1 _R - 0 - 2 _R	1	25	0.09	ONURR1M	89
Without 0-position					
Miniature, door mounted					
1 - 2	1 2 3 4	10 10 10 10	0.09 0.11 0.13 0.14	OMWS1PB OMWS2PB OMWS3PB OMWS4PB	58 79 103 119
Normal, door mounted					
1 - 2	1 2 3 4	25 25 25 25	0.09 0.11 0.13 0.14	ONWS1PB ONWS2PB ONWS3PB ONWS4PB	66 90 124 144
Large, door mounted					
1 - 2	1 2 3 4	40 40 40 40	0.17 0.25 0.33 0.41	OL40WS1PB OL40WS2PB OL40WS3PB OL40WS4PB	122 150 200 244
Modular, DIN-rail mounted					
1 - 2	1 2 3 4	25 25 25 25	0.09 0.11 0.13 0.14	ONWS1M ONWS2M ONWS3M ONWS4M	66 90 124 166

Packing sizes: OM 130 x 100 x 120 [mm]
ON, OL 250 x 100 x 110 [mm]

① 80, 125, 160 & 200A sizes will be available 1st Qtr. 2006. Consult factory for availability.

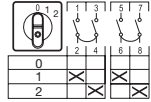
Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

Multi-step switches ①

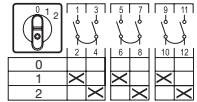
Black handle and frontplate with standard text are included. The type and the ordering number are for one piece. Special engraved frontplates to be ordered as separate items.



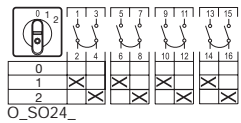
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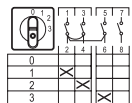
O_SO22_



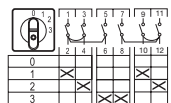
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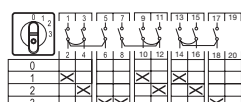
O_SO24_



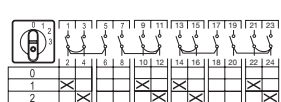
O_SO31_



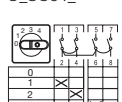
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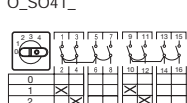
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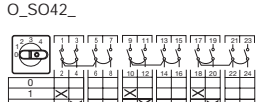
O_SO34_



O_SO41_



O_SO42_



O_SO43_

Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
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2- step, with O-position

Miniature, door mounted					
0 - 1 - 2	1	10	0.04	OMSO21PB	\$ 58
	2	10	0.05	OMSO22PB	79
	3	10	0.06	OMSO23PB	98
	4	10	0.07	OMSO24PB	113

Normal, door mounted

0 - 1 - 2	1	25	0.10	ONSO21PB	68
	2	25	0.12	ONSO22PB	82
	3	25	0.13	ONSO23PB	111
	4	25	0.14	ONSO24PB	135

Modular, DIN-Rail mounted

0 - 1 - 2	1	25	0.10	ONSO21M	68
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3- step, with O-position

Miniature, door mounted					
0 - 1 - 2 - 3	1	10	0.05	OMSO31PB	68
	2	10	0.06	OMSO32PB	96
	3	10	0.07	OMSO33PB	107
	4	10	0.08	OMSO34PB	160

Normal, door mounted

0 - 1 - 2 - 3	1	25	0.10	ONSO31PB	83
	2	25	0.12	ONSO32PB	101
	3	25	0.13	ONSO33PB	113
	4	25	0.14	ONSO34PB	159

Large, door mounted

0 - 1 - 2 - 3	1	45	0.41	OL40SO31PB	133
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Modular, DIN-rail mounted

0 - 1 - 2 - 3	1	25	0.11	ONSO31M	83
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3- step, without O-position

Miniature, door mounted					
1 - 2 - 3	1	10	0.05	OMST31PB	74
	2	10	0.06	OMST32PB	98
	3	10	0.07	OMST33PB	133
	4	10	0.08	OMST34PB	170

Normal, door mounted

1 - 2 - 3	1	25	0.10	ONST31PB	78
	2	25	0.12	ONST32PB	111
	3	25	0.13	ONST33PB	154
	4	25	0.14	ONST34PB	192

Modular, DIN-rail mounted

1 - 2 - 3	1	25	0.10	ONST31M	78
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4- step, with O-position

Miniature, door mounted					
0 - 1 - 2 - 3 - 4	1	10	0.05	OMSO41PB	79
	2	10	0.06	OMSO42PB	98
	3	10	0.07	OMSO43PB	126

Normal, door mounted

0 - 1 - 2 - 3 - 4	1	25	0.11	ONSO41PB	85
	2	25	0.12	ONSO42PB	119
	3	25	0.13	ONSO43PB	132

4- step, without O-position

Miniature, door mounted					
1 - 2 - 3 - 4	1	10	0.05	OMST41PB	85
	2	10	0.06	OMST42PB	124
	3	10	0.07	OMST43PB	198

Normal, door mounted

1 - 2 - 3 - 4	1	25	0.11	ONST41PB	90
	2	25	0.12	ONST42PB	136
	3	25	0.13	ONST43PB	215

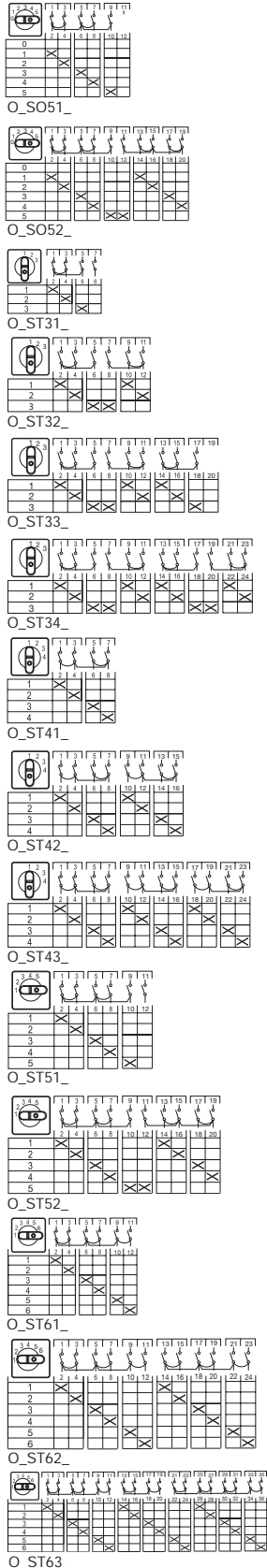
Packing sizes: OM 130 x 100 x 120 [mm]
ON, OL 250 x 100 x 110 [mm]

① 80, 125, 160 & 200A sizes will be available 1st Qtr, 2006. Consult factory for availability.

Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

Multi-step switches ①

Cam switches



Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.

Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
5- step, with O-position Miniature, door mounted					
0 - 1 - 2 - 3 - 4 - 5	1	10	0.06	OMSO51PB	\$ 102
	2	10	0.08	OMSO52PB	147
Normal, door mounted					
0 - 1 - 2 - 3 - 4 - 5	1	25	0.12	ONSO51PB	119
	2	25	0.14	ONSO52PB	166
5- step, without O-position Miniature, door mounted					
1 - 2 - 3 - 4 - 5	1	10	0.06	OMST51PB	117
	2	10	0.08	OMST52PB	155
Normal, door mounted					
1 - 2 - 3 - 4 - 5	1	25	0.12	ONST51PB	135
	2	25	0.14	ONST52PB	165
6-step with 0-position Normal, door mounted					
1-2-3-4-5-6	1	25	0.115	ONSO61PB	145
	2	25	0.19	ONSO62PB	234
	3	25	0.265	ONSO63PB	323
Large, door mounted					
1-2-3-4-5-6	1	40	0.185	OL40SO61PB	267
	2	40	0.305	OL40SO62PB	424
	3	40	0.425	OL40SO63PB	658
6-step without 0-position Normal, door mounted					
1-2-3-4-5-6	1	25	0.115	ONST61PB	167
	2	25	0.19	ONST62PB	267
	3	25	0.265	ONST63PB	357
Large, door mounted					
1-2-3-4-5-6	1	40	0.185	OL40ST61PB	267
	2	40	0.305	OL40ST62PB	412
	3	40	0.425	OL40ST63PB	613

Packing sizes: OM 130 x 100 x 120 [mm]
ON, OL 250 x 100 x 110 [mm]

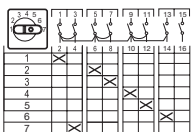
11

① 80, 125, 160 & 200A sizes will be available 1st Qtr, 2006. Consult factory for availability.

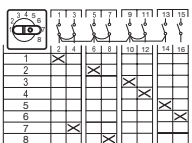
Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

Multi-step switches ①

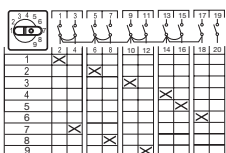
Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.



O_ST71_



O_ST81_



O_ST91_

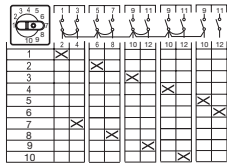
Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
7-step with 0-position					
Normal, door mounted					
1-2-3-4-5-6-7	1	25	0.14	ONSO71PB	\$ 199
Large, door mounted					
1-2-3-4-5-6-7	1	40	0.3	OL40SO71PB	289
7-step without 0-position					
Normal, door mounted					
1-2-3-4-5-6-7	1	25	0.14	ONST71PB	167
Large, door mounted					
1-2-3-4-5-6-7	1	40	0.3	OL40ST71PB	290
8-step with 0-position					
Normal, door mounted					
1-2-3-4-5-6-7-8	1	25	0.145	ONSO81PB	233
Large, door mounted					
1-2-3-4-5-6-7-8	1	40	0.148	OL40SO81PB	311
8-step without 0-position					
Normal, door mounted					
1-2-3-4-5-6-7-8	1	25	0.145	ONST81PB	233
Large, door mounted					
1-2-3-4-5-6-7-8	1	40	0.148	OL40ST81PB	311
9-step with 0-position					
Normal, door mounted					
1-2-3-4-5-6-7-8-9	1	25	0.165	ONSO91PB	278
Large, door mounted					
1-2-3-4-5-6-7-8-9	1	40	0.265	OL40SO91PB	334
9-step without 0-position					
Normal, door mounted					
1-2-3-4-5-6-7-8-9	1	25	0.165	ONST91PB	200
Large, door mounted					
1-2-3-4-5-6-7-8-9	1	40	0.265	OL40ST91PB	345

① 80, 125, 160 & 200A sizes will be available 1st Qtr, 2006. Consult factory for availability.

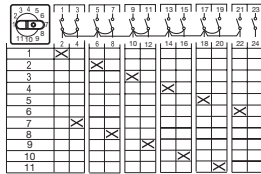
Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

Multi-step switches ①

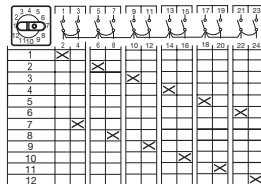
Cam switches



O_ST101_



O_ST111_



O_ST121_

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.

Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
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10-step with 0-position

Normal, door mounted

1-2-3-4-5-6-7-8-9-10	1	25	0.17	ONSO101PB	\$ 212
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Large, door mounted

1-2-3-4-5-6-7-8-9-10	1	40	0.27	OL40SO101PB	357
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10-step without 0-position

Normal, door mounted

1-2-3-4-5-6-7-8-9-10	1	25	0.17	ONST101PB	223
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Large, door mounted

1-2-3-4-5-6-7-8-9-10	1	40	0.27	OL40ST101PB	357
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11-step with 0-position

Normal, door mounted

1-2-3-4-5-6-7-8-9-10-11	1	25	0.19	ONSO111PB	245
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Large, door mounted

1-2-3-4-5-6-7-8-9-10-11	1	40	0.305	OL40SO111PB	390
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11-step without 0-position

Normal, door mounted

1-2-3-4-5-6-7-8-9-10-11	1	25	0.19	ONST111PB	245
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Large, door mounted

1-2-3-4-5-6-7-8-9-10-11	1	40	0.305	OL40ST111PB	401
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12-step without 0-position

Normal, door mounted

1-2-3-4-5-6-7-8-9-10-11-12	1	25	0.195	ONST121PB	267
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Large, door mounted

1-2-3-4-5-6-7-8-9-10-11-12	1	40	0.31	OL40ST121PB	379
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Packing sizes: OM 130 x 100 x 120 [mm]
ON, OL 250 x 100 x 110 [mm]

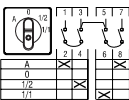
11

① 80, 125, 160 & 200A sizes will be available 1st Qtr, 2006. Consult factory for availability.

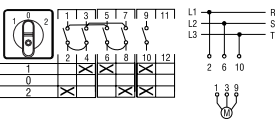
Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.



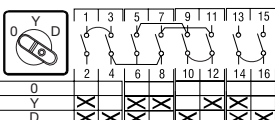
O_SE158_



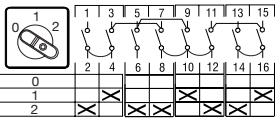
O_ST301_



O_W3_



O_SD_



O_P12_

Pumpstart switches

Miniature, door mounted

Function	Number of poles	Rated thermal current [A]	Weight [kg]	Catalog number	List price
0 - 1	1	10	0.04	OMSE158PB	\$ 78

Normal, door mounted

0 - 1	1	25	0.09	ONSE158PB	79
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Modular, DIN-rail mounted

0 - 1	1	25	0.09	ONSE158M	100
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Ventilation switches

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.

Function	Number of poles	Rated thermal current [A]	Motor rating [kW/400V]	Weight [kg]	Catalog number	List price
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Miniature, door mounted

A - 0 - 1/2 - 1/1	2	10	7.5	0.06	OMST301PB	\$ 74
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Normal, door mounted

A - 0 - 1/2 - 1/1	2	25	7.5	0.11	ONST301PB	78
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Modular, DIN-rail mounted

A - 0 - 1/2 - 1/1	2	25	7.5	0.11	ONST301M	78
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Large, door mounted

A - 0 - 1/2 - 1/1	2	40	15	0.21	OL40ST301PB	139
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Reversing switches

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs.. Special engraved frontplates to be ordered as separate items.

Normal, door mounted

1 - 0 - 2	3	25	7.5	0.10	ONW3PB	130
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Large, door mounted

1 - 0 - 2	3	40	15	0.21	OL40W3PB	233
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Star-delta switches

Normal, door mounted

0 - Y - ΔΔ	3	25	7.5	0.12	ONSDEPB	222
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Large, door mounted

0 - Y - Δ	3	40	15	0.21	OL40SDEPB	368
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Pole-change switches (Dahlander)

Winding for 2 speeds, one direction, 0 - A - AYY

Normal, door mounted

0 - 1 - 2	3	25	7.5	0.12	ONP12PB	234
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Large, door mounted

0 - 1 - 2	3	40	15	0.25	OL40P12PB	312
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Packing sizes: OM 130 x 100 x 120 [mm]
ON, OL 250 x 100 x 110 [mm]

Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

Voltmeter switches

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.

Function	Number of stages	Rated thermal current [A]	Weight kg	Catalog number	List price
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4 Positions, 3 phase -3 wire, with 0-position

Miniature, door mounted

0, L1-L2,L2-L3,L3-L1	2	10	0.06	OMV3PB	\$ 79
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Normal, door mounted

0, L1-L2,L2-L3,L3-L1	2	25	0.11	ONV3PB	86
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Modular, DIN-rail mounted

0, L1-L2,L2-L3,L3-L1	2	25	0.11	ONV3M	86
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3 Positions, 3 phase -3 wire, without 0-position

Miniature, door mounted

L1-L2,L2-L3,L3-L1	2	10	0.06	OMVN3PB	79
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Normal, door mounted

L1-L2,L2-L3,L3-L1	2	25	0.11	ONVN3PB	113
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Modular, DIN-rail mounted

L1-L2,L2-L3,L3-L1	2	25	0.11	ONVN3M	113
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7 Positions, 3 phase to phase 3 phase to neutral, without 0-position

Miniature, door mounted

L1-L3,L2-L3,L1-L2 L1-N,L2-N,L3-N	3	10	0.08	OMVN30PB	128
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Normal, door mounted

L1-L3,L2-L3,L1-L2 L1-N,L2-N,L3-N	3	25	0.12	ONVN30PB	113
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Modular, DIN-rail mounted

L1-L3,L2-L3,L1-L2 L1-N,L2-N,L3-N	M	25	0.12	ONVN30M	113
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7 Positions, 3 phase to phase 3 phase to neutral, with 0-position

Miniature, door mounted

L1-L3,L2-L3,L1-L2,0 L1-N,L2-N,L3-N	3	10	0.12	OMV30PB	102
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Normal, door mounted

L1-L3,L2-L3,L1-L2,0 L1-N,L2-N,L3-N	3	25	0.12	ONV30PB	113
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Modular, DIN-rail mounted

L1-L3,L2-L3,L1-L2,0 L1-N,L2-N,L3-N	3	25	0.12	ONV30M	113
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7 Positions, 3 phase to phase voltages for 2 circuits, with 0 position

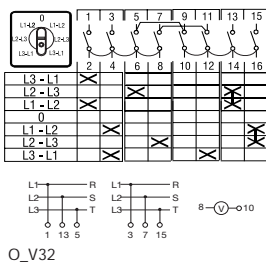
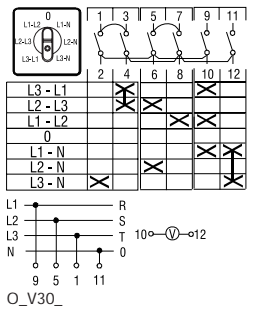
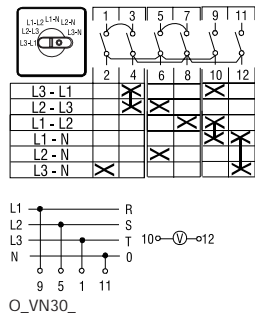
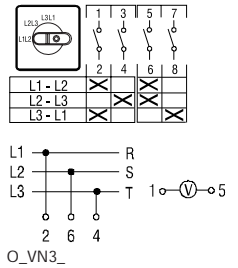
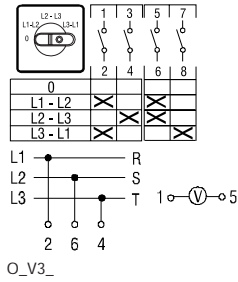
Miniature, door mounted

L1-L3,L2-L3,L1-L2,0 L1-L3,L2-L3,L1-L2	4	10	0.14	OMV32PB	159
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Normal, door mounted

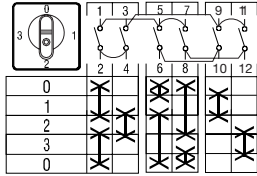
L1-L3,L2-L3,L1-L2,0 L1-L3,L2-L3,L1-L2	4	25	0.14	ONV32PB	192
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Packing sizes: OM 130 x 100 x 120 [mm]
ON 250 x 100 x 110 [mm]

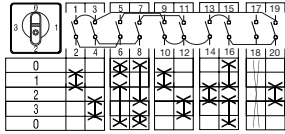


Ammeter switches

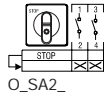
Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.



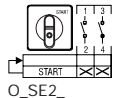
O_AU31



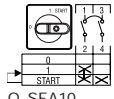
O_AU32



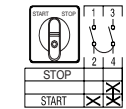
O_SA2_



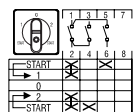
O_SE2_



O_SEA10_



ONSEA1PB



O_UR139_

Function	Number of stages	Rated thermal current [A]	Weight kg	Catalog number	List price
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For 3 current transformer circuits, with 0-position

Miniature, door mounted

Single pole	3	10	0.12	OMAU31PB	\$ 102
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Normal, door mounted

Single pole	3	25	0.12	ONAU31PB	113
2 pole or direct measurement in 3 phases	5	25	0.15	ONAU32PB	

Modular, DIN-rail mounted

Single pole	4	25	0.12	ONAU31M	244
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Stop switches

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items.

Miniature, door mounted, with spring return, contacts N.C.

O _R -Stop	2	10	0.04	OMSA2PB	56
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Normal, door mounted, with spring return, contacts N.C.

O _R -Stop	2	25	0.09	ONSA2PB	66
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Start switches

Black handle and frontplate with standard text are included. The type and the ordering number are for one piece, package quantity is 10 pcs. Special engraved frontplates to be ordered as separate items. With spring return.

Miniature, door mounted, with spring return.

O _R -Start	1	10	0.04	OMSE2PB	56
0-1 _R -Start	1	10	0.05	OMSEA10PB	

Normal, door mounted, with spring return.

Stop-Start	1	25	0.04	ONSEA1PB	83
O _R -Start	1	25	0.04	ONSE2PB	83
0-1 _R -Start	1	25	0.09	ONSEA10PB	66
Start-1 _R -0-2 _R -Start	1	25	0.09	ONUR139PB	159

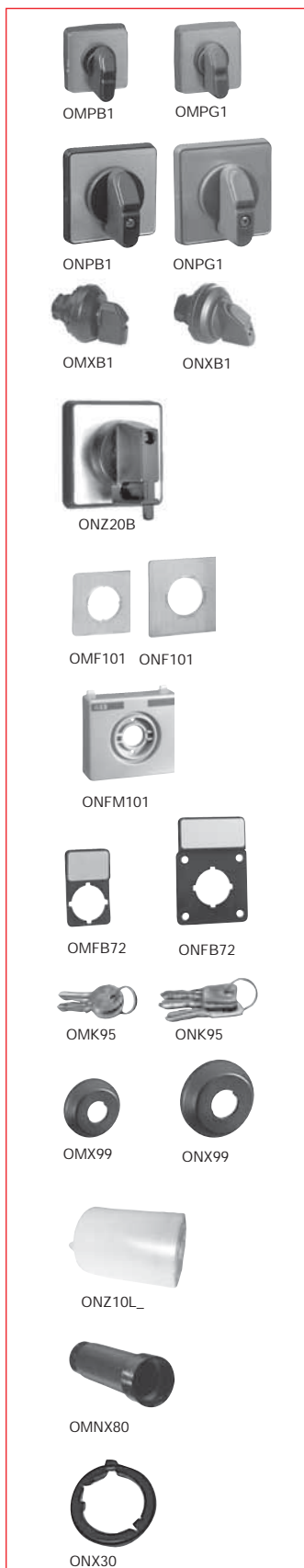
Modular, DIN-rail mounted, with spring return

0-1 _R -Start	1	25	0.09	ONSEA10M	89
Start-1 _R -0-2 _R -Start	1	25	0.09	ONUR139M	159

Packing sizes: OM 130 x 100 x 120 [mm]
ON 250 x 100 x 110 [mm]

Standard delivery with black handle. Available also as an optional extra with grey handle, please change in type designation B to G, eg. OMA1PB would be OMA1PG with grey handle.

Accessories



The type and the ordering number are for one piece.

Color	For cam switches type	Packing quantities	Weight kg	Catalog number	List price
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Handle with blank front plate without engraving

Black	OM_, Mini	5	0.05	OMPB1	\$ 51
Grey	OM_, Mini		0.05	OMPG1	
Black	ON_Normal, OL40	5	0.08	ONPB1	60
Grey	ON_Normal, OL40		0.08	ONPG1	

Handle with round escutcheon plate

Black	OM_, Mini	5	0.02	OMXB1	66
Black, nose-type	OM_, Mini		0.02	OMXNB1	66
Black	ON_Normal, OL40		0.02	ONXB1	72

Padlockable handle

For max 2 padlocks with 6 mm ball diameter or for max 3 padlocks with 4 mm ball diameter, 90 degrees.

Black	ON_Normal, OL40	5	0.06	ONZ20B	41
Red yellow	ON_Normal, OL40		0.06	ONZ20RY	28

Front ring only

Black	OM_, Mini	10	0.01	OMX99	13
Black	ON_, Normal		0.01	ONX99	

Front plate, blank without engraving ①

Silver	OM_, Mini	10	0.003	OMF101	7
Silver	ON_, Normal		0.003	ONF 101	8
Yellow	ON_ Normal, OL40		0.003	ONFY 101	17
Grey	ON_, Modular		0.003	ONFM 101	17

Additional lettering plate, without engraving, black engraving from front side ②

Black frame	OM_, Mini	5	0.01	OMFB72	12
Black frame	ON_, Normal, OL40		0.01	ONFB72	12
Grey frame	OM_, Mini		0.01	OMFG72	12
Grey frame	ON_, Normal		0.01	ONFG72	13

Spare key

2 pcs	OM_, Mini	2	0.01	OMK95	56
3 pcs	ON_, Normal, OL40		0.01	ONK95	68

Protective rear cover

Transparent, IP 42 protection

Number of chambers	Contacts	For cam switches type	Packing quantities	Weight kg	Catalog number	List price
1-2	2-4	ON_, Normal	1	0.02	ONZ10L2	\$ 39
3-4	6-8	ON_, Normal		0.04	ONZ10L4	52
5-6	10-12	ON_, Normal		0.06	ONZ10L6	69

Nut spanner for mounting the handle to the door

Black	OM_, Mini ON_, Normal	1	0.02	OMNX80	30
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Adaptor ring for 30 mm door drilling

Black	ON_, Normal	10	0.01	ONX30	10
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① Special front plate for standard switches: order as separate position. Attach specification in electronic format or paper. Eg. ONF 101/TEXT
 ② Additional lettering plate with engraving: order as separate position. Attach specification in electronic format or paper. The text can also be typed as comment. Eg. ONFB 72/TEXT Pumping station

Accessories

Available for special cam switches



ONZ74_



O_Z31_



O_Z21_

The type and the ordering number are for one piece.
Special cam switches to be specified by CAMWEB configurator.

Base mounting switches

Base mounting kit includes base for DIN-rail mounting, shaft adaptor and 200 mm shaft for cutting up to 250 mm panel depth. Can be supplied also as optional extra.

Depth[mm]	For cam switches	Catalog number	List Price
250	ON_Normal	ONZ74	\$ 38

Cylinder interlock

To lock all pre-determined positions with a safety key (2 pcs)
Available for special cam switches only. Special configuration with CAMWEB.

	OL_Large	OLZ31	368
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Pushbutton interlock

To release all pre-determined positions while pushed. Special configuration with CAMWEB.

	OL_Large	OLZ21	167
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Technical data ^①

According to IEC / 60947-3-4-5

Cam switches

IEC ratings				OM_	ON_	OL40
Resistive and inductive load						
AC ratings						
Impulse withstand voltage	U_{imp}		kV	-	-	6
Rated operating voltage U_e	IEC		V	500	690	690
Isolation conditions acc. to VDE			V	250	400	690
Rated thermal current I_{th}	IEC		A	10	25	45
Rated short circuit current (prospective)			kA	1	10	10
Max back up fuse link			A	10	25	40
Short time current carrying capacity		3s	A	-	100	360
		10s	A	-	60	200
		30s	A	-	32	120
		60s	A	-	30	80
Rated operational current I_e			A	10	25	45
Non- or slightly inductive load	AC1	380 V	A	10	25	45
Switching of resistive loads	AC21	400 V	A	10	25	45
Switching of magnetic drives relays, valves, traction magnets	AC11	220-240 V	A	2.5	5.5	14
		380-440	A	-	3.5	6
		500 V	A	-	4.5	7
Mixed resistive and inductive load, pf. 0,7	AC22	220-500 V	A	10	20	40
		660-690 V	A	-	20	40
DC ratings						
Switching capacity DC rated voltage with resistive circuits (T ≤ 1ms)	DC1	24 V	A	10	10	45
		40 V	A	6	10	20
		60 V	A	2.5	3	5
		110 V	A	0.7	0.8	1
		220 V	A	0.3	0.32	0.3
		440 V	A	-	0.22	0.25
Switching capacity DC rated voltage with inductive circuits (T < 50 ms)	DC1	24 V	A	6	10	45
		30 V	A	3	4.5	11
		40 V	A	1	1.7	4
		60 V	A	0.7	0.7	1.5
		110 V	A	0.3	0.3	0.4
Motor ratings						
AC ratings						
Rated operational power	AC2	220-240 V	kW	2.5	3.5	11
3-phase		380-440 V	kW	-	6	18.5
Starting of slip-ring, switching off		500 V	kW	-	6	18.5
		660-690 V	kW	-	6	18.5
Rated operational power	AC3	220-240 V	kW	1.8	2.2	7.5
3-phase, 3-pole		380-440 V	kW	2.2	5.5	11
Direct starting of squirrel cage motors, switching off running motors		500 V	kW	-	4	11
		660-690 V	kW	-	4	11
1-phase		110 V	kW	0.3	0.4	2.5
		220-240 V	kW	0.55	0.75	4
		400 V	kW	0.75	1.3	5.5
Rated operational power	AC23	220-240 V	kW	1.8	2.6	7.5
3-phase, 3-pole		380-440 V	kW	3.0	7.5	15
Occasional switching of motors or other highly-inductive devices load		500 V	kW	-	4.8	15
		660-690 V	kW	-	4.8	17
1-phase		110 V	kW	0.37	0.5	2.5
		220-240 V	kW	0.75	0.9	4
		380-440 V	kW	1.1	1.5	7.5

① 80, 125, 160 & 200A sizes will be available 1st Qtr, 2006. Consult factory for availability.

UL and CSA ratings

UL 508 Manual Motor Controller file number E 63822

			OM_	ON_	OL_40	OL80	OL125	OL160	OL200
Maximum operating voltage	VAC		300	600	600	600	600	600	600
Ampere rating	Pilot duty	CSA/UL category	A300	A600	A600	A600	A600	A600	A600
	General use	CSA/UL	10	25	40	80	125	160	200
Rated power (HP)	120V	HP	1	1	5	10	15	15	32
3-phase	240V	HP	1	1	10	30	40	40	64
	480V	HP	-	2	20	40	50	50	120
	600V	HP	-	5	23	40	50	50	120
1-phase	120V	HP	0.33	.05	2	7.5	10	10	—
	240V	HP	0.75	1	3	15	20	20	—
	480V	HP	-	2	10	—	—	—	—
	600V	HP	-	3	10	—	—	—	—
Short circuit ratings									
Maximum prospective fault current	kA		1	10	10	10	10	10	10
Maximum fuse size	A		16	35(RK5)	50(RK3)	100(RK5)	150(RK5)	200(RK5)	—
Switching frequency	cycles/h		150	150	150	150	150	150	—
Connecting screws	M		2.5	3.5	5	5	5	5	10
Max. cable cross section	mm ²		1.5	4	6	70	70	70	150
	AGW		14	14-12	14-8(Cu75)	12-2/0	12-2/0	12-2/0	300 kcmil

Approvals:

UL-Approval, file number EG 63822
 CSA-Approval
 Lloyds Register of Shipping
 Det Norske Veritas (DNV)
 Germanischer Lloyd (GL)
 Ghost R



ON_, Normal



ON_M, Modular



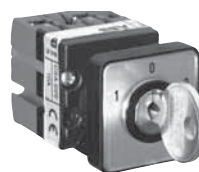
OM_, Miniature

Standards:

IEC 60947-3
 EN 60947-3
 UL 508
 CSA C22.2 No14



OL_, Large

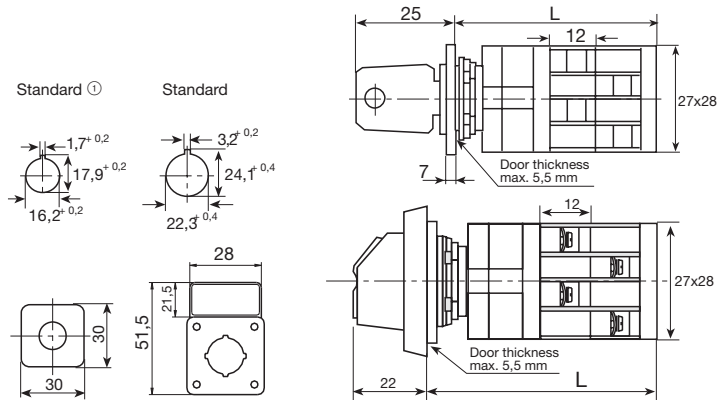


OM_, Key operated

Approximate dimensions OM, ON and OL switches

Dimensions in mm.
Remark: Terminal screws on top and bottom side.

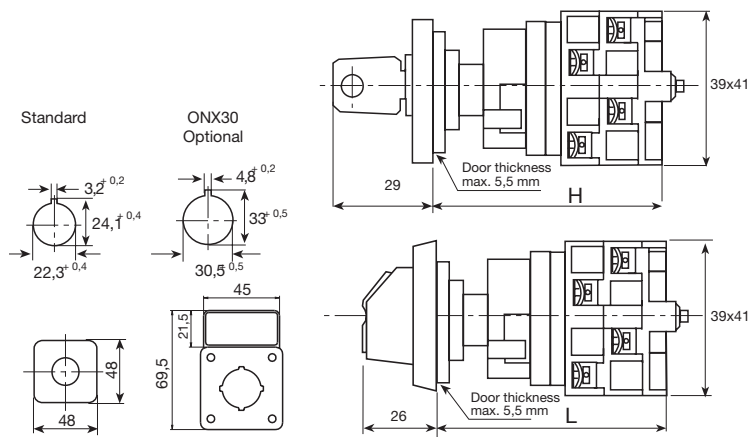
OM, Miniature



L number of contact chambers

	1	2	3	4	5	6	7	8
	45	57	69	81	90	105	111	138

ON, Normal



L number of contact chambers

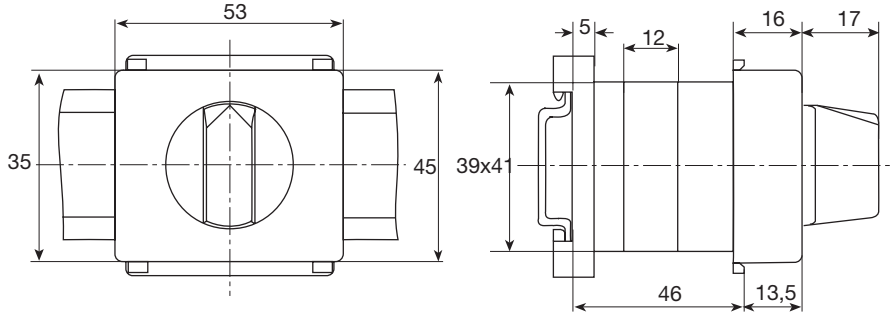
	1	2	3	4	5	6	7	8	9	10
L	54	66	78	90	102	114	126	138	150	162
H	62	76	86	98	110	122	134	146	159	171

① 22mm adaptor ring can be removed and become 16mm.

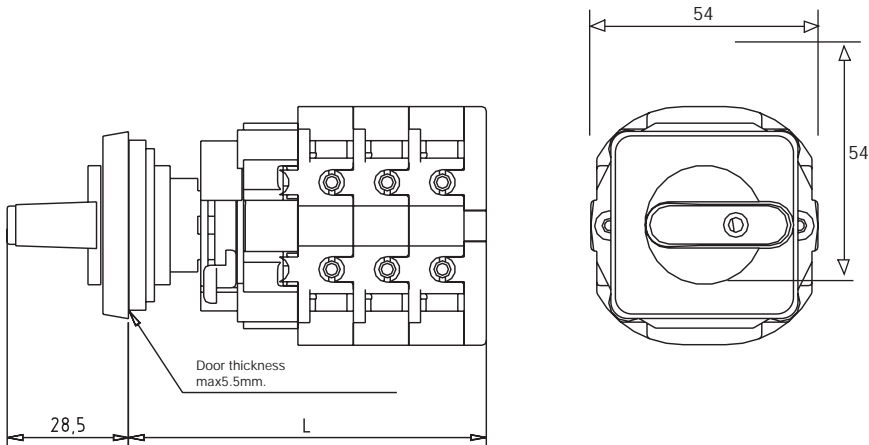
Approximate dimensions ON and OL cam switches

Dimensions in mm.

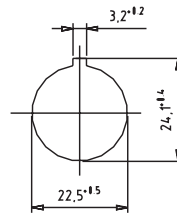
ON, Modular



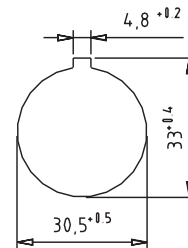
11 OL, Large



Standard



ONX30 (Optional)



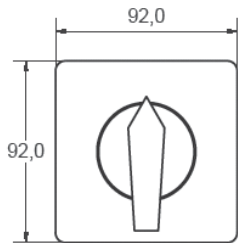
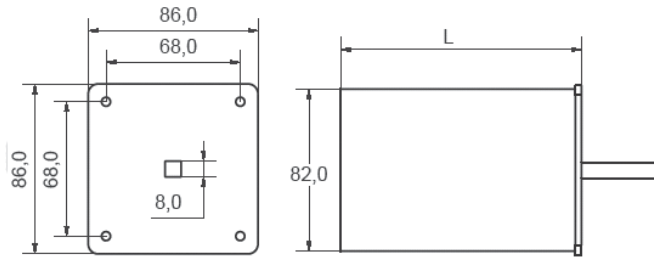
L number of contact chambers

1	2	3	4	5	6	7	8	9	10
59	72	85	98	111	124	137	150	163	176

Approximate dimensions OL Cam switches

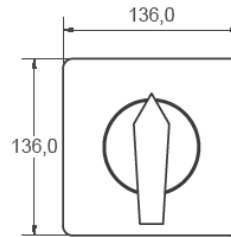
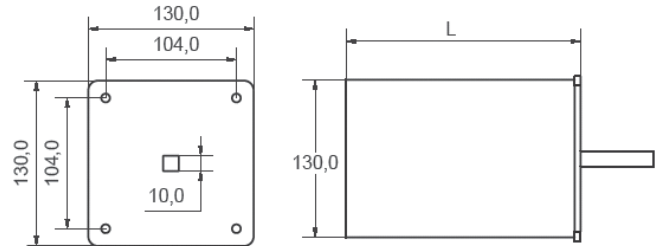


OL 80, OL125, & OL150



No. of Contacts	Length L
1 - 2	66
3 - 4	94
5 - 6	122
7 - 8	150
9 - 10	178
11 - 12	206
13 - 14	234
15 - 16	262

OL 200



No. of Contacts	Length L
1 - 2	120
3 - 4	181
5 - 6	242
7 - 8	303
9 - 10	364
11 - 12	425
13 - 14	486
15 - 16	547



Special cam switches, contact plan

Company _____

Type _____

Phone/Fax nr. _____

Project number _____

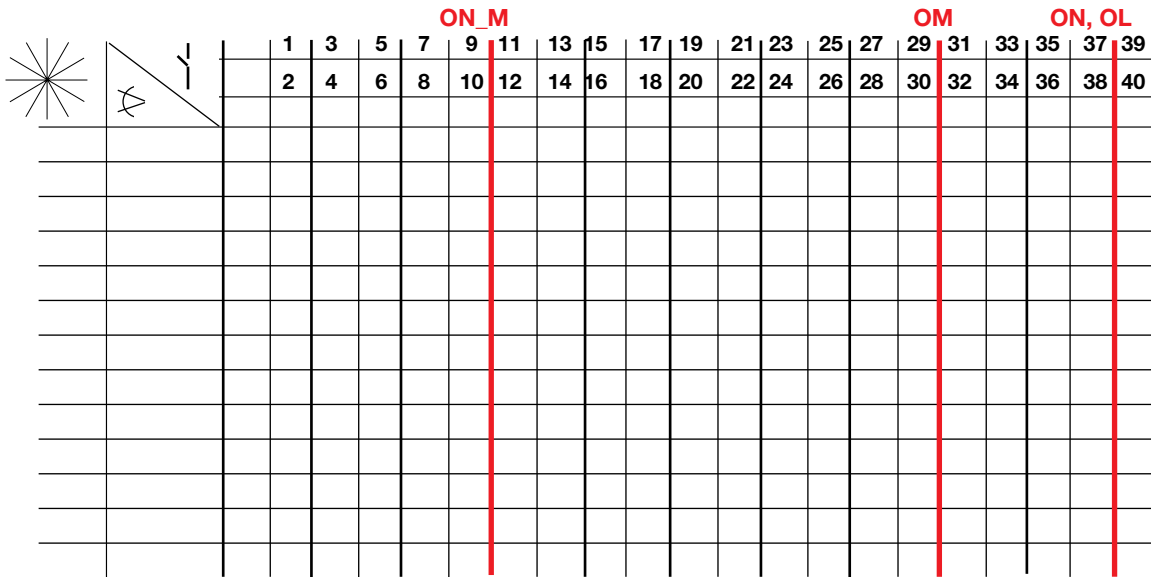
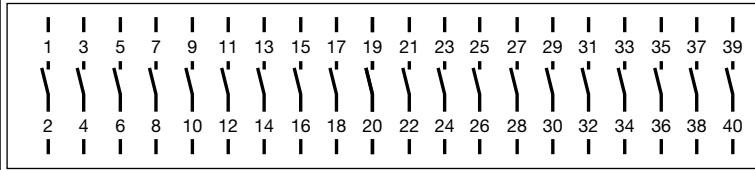
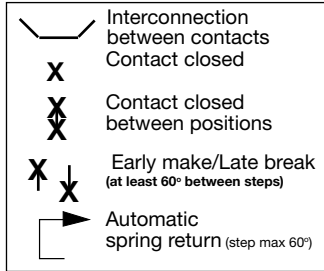
Name _____

Customer's number _____

Quantity: _____ pcs

Handled by: _____

Date: _____

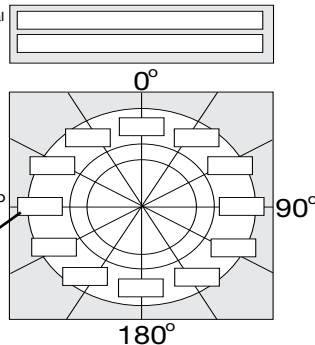


	Normal	Padlockable_X20	Key operated_K	Enclosed_E_6 IP65	Cylinder locking	Pusbutton locking
Black_B						
Grey_G						
Red-yellow_RY						

Door mounting

- OM, 10A
- ON, 25A
- OL, 40A
- OL, 80A
- OL, 125A
- OL, 160A
- OL, 200A

Additional lettering plate
 Front plate
 Max 6 (7) Letters



DIN-rail mounting

ON_M, Modular

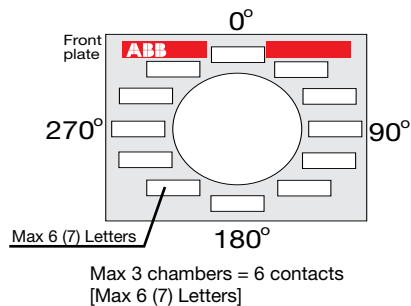


ABB Inc.

ABB Enclosed rotary cam switches



Enclosed cam switches



ONA_EPB



ONA3EKP



ONA_EZB



OTU16B3M6



OTC2_M25



OTC3_M25



OTC4_M25



OTC36LM25

The type and the ordering number are for one piece, the package quantity is four pieces.

Neutral and earth terminal, 6mm² included

Number of poles	Function	Size of ① enclosure	Weight [kg]	Catalog number	List price
ON-OFF switches, IP65					
2	0 - 1	96x96x70	0.3	ONA2EPB	\$ 227
3	0 - 1	96x96x70	0.3	ONA3EPB	247
4	0 - 1	96x96x70	0.3	ONA4EPB	245
5	0 - 1	96x96x85	0.3	ONA5EPB	279
6	0 - 1	96x96x85	0.3	ONA6EPB	301
8	0 - 1	96x96x108	0.3	ONA8EPB	379
9	0 - 1	96x96x138	0.3	ONA9EPB	400

ON - OFF switches, padlockable handle, IP65					
2	0 - 1	96x96x70	0.3	ONA2EZB	279
3	0 - 1	96x96x70	0.3	ONA3EZB	312
4	0 - 1	96x96x70	0.3	ONA4EZB	334
5	0 - 1	96x96x85	0.3	ONA5EZB	357
6	0 - 1	96x96x85	0.3	ONA6EZB	379
8	0 - 1	96x96x108	0.3	ONA8EZB	401
9	0 - 1	96x96x138	0.3	ONA9EPB	446

ON - OFF switches, key type, IP54					
3	0 - 1	96x96x100	0.3	ONA3EKB	379

Change-over switches					
1	1 - 0 - 2	96x96x100	0.3	ONU1EPB	222

Reversing switches					
3	1 - 0 - 2	96x96x100	0.3	ONW3EPB	311

Star delta switches					
25	0 - Y - ΔΔ	305x215x185	0.3	ONSDEPB	222
40	0 - Y - ΔΔ	305x215x185	0.4	OL40SDEPB	

Enclosures

Anonymous enclosures

The enclosures can accommodate cam switches for door mounting and OT-switches for door and base mounting, see following pages. Includes fastening rings.

Neutral and earth terminal, 6mm² included

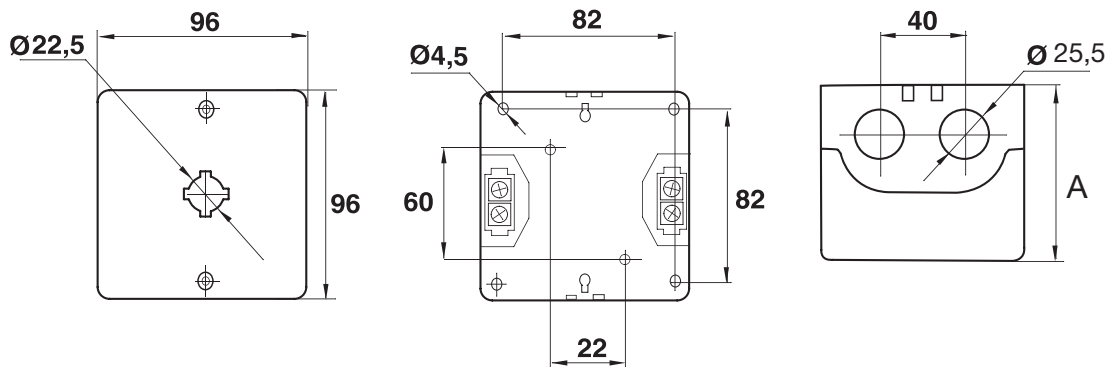
Number of contacts	Protection- Class	Size of enclosure	Weight [kg]	Catalog number	List price
ON-OM: 4 contacts, 2 stages, OL: 2 contacts, 1 stage					
	IP 54	96x96x70	0.2	OTC25M25	\$ 45
	IP 65	96x96x70	0.2	OTC26M25	49
ON-OM: 6 contacts, 3 stages, OL: 4 contacts, 2 stages					
	IP54	96x96x84.5	0.2	OTC35M25	53
	IP65	96x96x84.5	0.2	OTC36M25	56
ON-OM: 10 contacts, 5 stages, OL: 6 contacts, 3 stages					
	IP 54	96x96x108	0.2	OTC45M25	65
	IP 65	96x96x108	0.2	OTC46M25	69
ON-OM: 6 contacts, 3 stages, wide, OL: 4 contacts, 2 stages					
	IP 65	161x100x80	0.2	OTC36LM25	67
	NEMA 4x	161x100x80	0.2	OTC36NPT3/4	67

① The height without handle.

Special enclosed cam switches configured by CAMWEB tool.

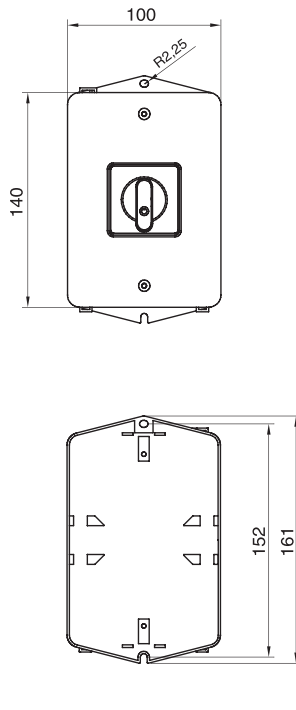
Approximate dimensions Enclosed cam switches

OTC_



Catalog number	A/mm outside	A/mm inside
OTC2_M25	70	61
OTC3_M25	84.5	75.5
OTC4_M25	108	99

OTC36LM25





Notes

ABB Transformers Index

General information	12.1 - 12.4
Technical data	12.10 - 12.11
Transformers.....	12.3 - 12.6
Transformers with CE Mark.....	12.7 - 12.9



Notes

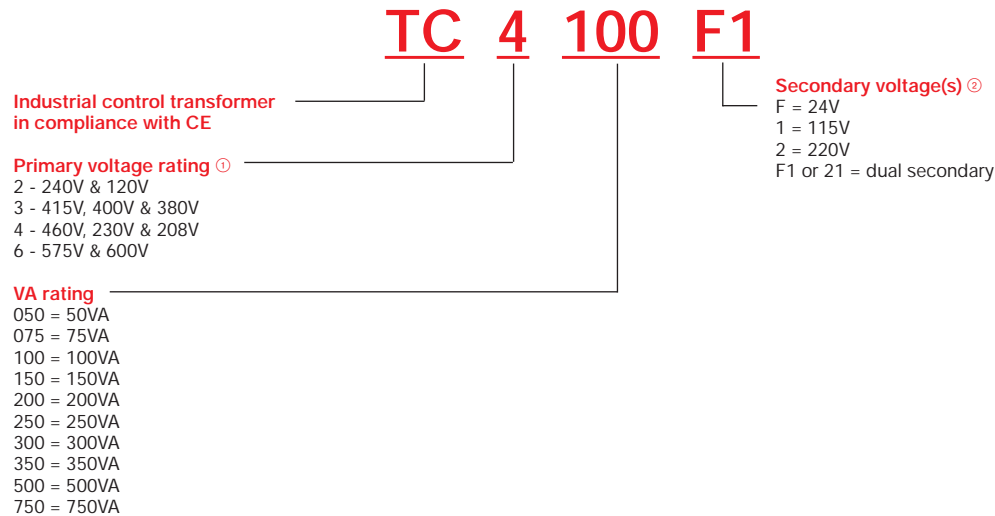
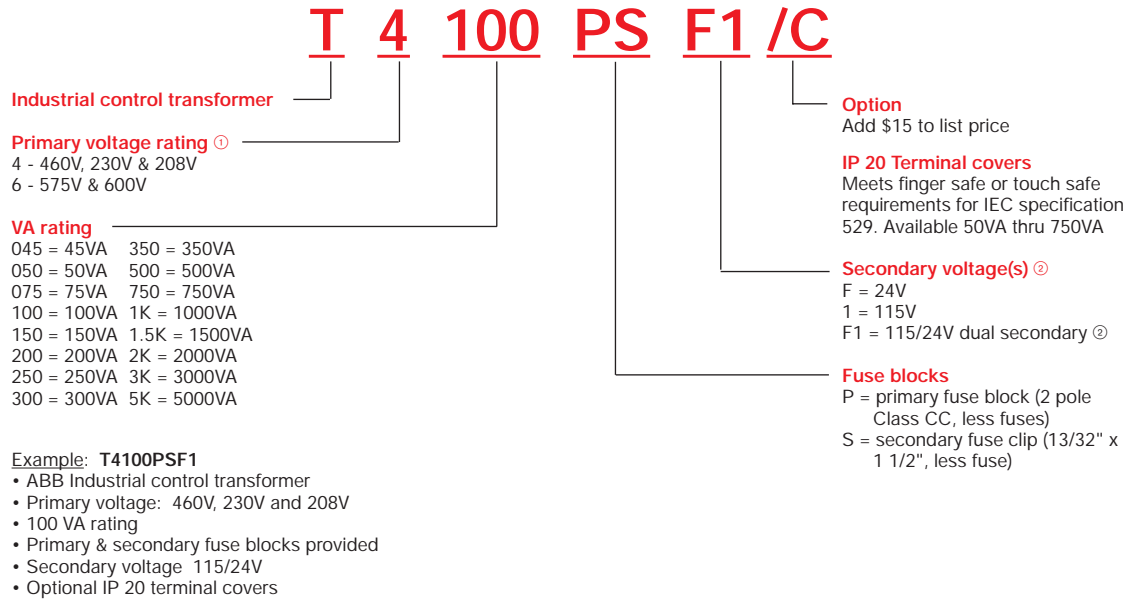
Transformers



Description

- Epoxy encapsulated coils up through 750VA
- Epoxy resin impregnated coils 1 kVA to 5 kVA
- Provides stepped down voltages for machine tool control devices and industrial control panels
- Laminations of high quality silicon steel
- Minimum core loss
- Optimized performance
- Copper magnet wire providing the highest quality and efficient operation
- Molded-in terminals
- 55° C rise, Class 10 insulation system
- 50/60 Hz
- UL File # E175311
- CSA File #LR27533
- IP 20 Touch safe covers available as an option
- Transformers with CE Mark available

General information Catalog number explanation



① Consult factory for applications with different voltages.

② Whenever both secondary voltages are to be used at the same time, remove the secondary fuse clip and use a separate mounted 2 pole fuse block.

Regulation

Selecting a transformer for industrial control circuit applications requires knowledge of the following terms:

INRUSH VA is the product of load voltage (V) multiplied by the current (A) that is required during circuit start-up. It is calculated by adding the inrush VA requirements of all devices (contactors, timers, relays, pilot lights, solenoids, etc.), which will be energized together. Inrush VA requirements are best obtained from the component manufacturer.

SEALED VA is the product of load voltage (V) multiplied by the current (A) that is required to operate the circuit after initial start-up or under normal operating conditions. It is calculated by adding the sealed VA requirements of all electrical components of the circuit that will be energized at any given time. Sealed VA requirements are best obtained from the component manufacturer. Sealed VA is also referred to as steady state VA.

PRIMARY VOLTAGE is the voltage available from the electrical distribution system and its operational frequency, which is connected to the transformer supply voltage terminals.

SECONDARY VOLTAGE is the voltage required for load operation which is connected to the transformer load voltage terminals.

Once the circuit variables have been determined, transformer selection is a simple 5-step process as follows:

1. Determine the application inrush VA by using the following industry accepted formula:

$$\text{Application inrush VA} = \sqrt{(\text{INRUSH VA})^2 + (\text{SEALED VA})^2}$$

2. Refer to the Regulation Data chart. If the primary voltage is basically stable and does not vary by more than 5% from nominal, the 90% secondary voltage column should be used. If the primary voltage varies between 5 and 10% of nominal, the 95% secondary voltage column should be used.
3. After determining the proper secondary voltage column, read down until a value equal to or greater than the application inrush VA is found. In no case should a figure less than the Application Inrush VA be used.
4. Read left to the Transformer VA rating column to determine the proper transformer for this application. As a final check, make sure that the Transformer VA rating is equal to or greater than the total sealed requirements. If not, select a transformer with a VA rating equal to or greater than the total sealed VA.
5. Refer to transformer selection pages to determine the proper catalog number based on the transformer VA, and primary and secondary voltage requirements.

Inrush

Industrial control circuits and motor control loads typically require more current when they are initially energized than under normal operating conditions. This period of high current demand, referred to as inrush, may be as great as ten times the current required under steady state (normal) operation conditions and can last up to 40 milliseconds.

A transformer in a circuit subject to inrush will typically attempt to provide the load with the required current during the inrush period. However, it will be at the expense of the secondary voltage stability by allowing the voltage to the load to decrease as the current increases. This period of secondary voltage instability, resulting from increased current, can be of such a magnitude that the transformer is unable to supply sufficient voltage to energize the load.

This transformer must therefore be designed and constructed to accommodate the high inrush current, while maintaining secondary voltage stability. According to NEMA standards, the secondary voltage should typically be at 85% of the rated voltage.

Industrial Control Circuit Transformers by ABB Control Inc. are specifically designed and built to provide adequate voltage to the load while accommodating the high current levels present at inrush. These transformers deliver excellent secondary voltage regulation and meet or exceed the standards established by NEMA, ANSI, UL and CSA. Their hearty construction and excellent electrical characteristics assure reliable operation of electromagnetic devices and trouble-free performance.

① For units with class 105°C insulation systems.
 ② For units with class 180°C insulation systems.

Regulation Data Chart

Transformer VA rating	Inrush VA at 20% power factor		
	95% secondary voltage	90% secondary voltage	85% secondary voltage
25	100	130	150
50	170	200	240
75	310	410	540
100	370	540	730
150	780	930	1150
200	810	1150	1450
250	1400	1900	2300
300	1900	2700	3850
350	3100	3650	4800
500	4000	5300	7000
750	8300	11000	14000
1000 ①	15000	21000	27000
1000 ②	9000	13000	18500
1500	10500	15000	205000
2000	17000	25500	34000
3000	24000	36000	47500
5000	55000	92500	115000

To comply with NEMA standards, which require all magnetic devices to operate successfully at 85% of rated voltage, the 90% secondary voltage column is most often used in selecting a transformer.

NOTE
 For UL overcurrent protection, see page 12.11

IEC-742

The requirements for industrial control circuit transformers to be used in the European Common Market are identified by the International Electrotechnical Commission (IEC) and specified under IEC-742, Non-Short Circuit Proof Isolating Transformers, under the Low Voltage Directive 73/23/EEC. Manufacturers of control transformers indicate compliance with these requirements by placing a CE mark on the product.

In addition to being able to handle the inrush requirements of industrial control circuits and motor loads, transformers built to the requirements of IEC-742 will exhibit several major construction differences from those manufactured in accordance with UL506. These construction differences will typically increase not only the physical size of the transformer when compared to those built only to UL requirements, but the inrush capability as well.

- The winding insulation thickness requirements, depending upon electrical currents, are comparable layer to layer for IEC-742 versus UL506. Winding to winding insulation requirements, however, may be twice that for IEC-742 compared to UL506.
- The electrical clearances between current carrying parts are one-third greater to comply with IEC-742 requirements for units up to 250VA with voltages up to 440 volts ac.
- The dielectric strength (hipot) test voltages are twice as long in duration to comply with IEC-742 compared to UL506 for all units and up to one-and-a-half times greater in magnitude on smaller VA sizes.
- Transformers manufactured to IEC-742 requirements will have a minimum of 10% higher overload capacity than those manufactured only to UL506 requirements.

IEC-742 requires that transformers in a failure mode under excessive current (10 times the unit rating) must not exhibit flame or molten material. There is no comparable requirement under UL506.

While no requirement exists in IEC-742 for the electrical connections to be either finger safe or touch proof, the specification does state that IF a transformer is supplied with a cover to prevent incidental contact with current carrying parts, that cover must utilize two separate methods or places of securing it to the component, with neither being dependent upon the other. Additionally, one of these methods MUST require a tool to remove it.

IEC-529

The requirements for finger-safe or touch-proof electrical connections are identified by the International Electrotechnical Commission (IEC) under specification 529, Classification of Degrees of Protection Provided by Enclosures. These various degrees of protection are identified and differentiated by IP ratings.

A variety of IP ratings are defined in IEC-529 ranging from IP00, which provides no protection from contact, to IP68, which identifies dust-proof and water-proof protection. Optionally, IP ratings may contain additional and supplementary designators. The IP specification which most closely approximates protection to a human finger is IP20. This IP rating would be the most common degree of touch-proof connection for electrical components such as transformers.

IEC-529 protection requirements would most commonly apply to products which fall under the requirements of the Machinery Directive 89/392/EEC, as opposed to the Low Voltage Directive 73/23/EEC, which covers components such as control transformers. Over time, however, users subject to the requirements of the Machinery Directive and/or IEC-529 have expanded their interpretation of finger-safe or touch-proof electrical connections to include the components of the equipment, such as transformers.

CB Scheme

A CE mark indicates compliance to the applicable requirements of a particular product as outlined by the International Electrotechnical Commission (IEC) and by mutual agreement is recognized throughout the European Union. By itself, however, the CE mark may not necessarily be accepted as evidence of product compliance in countries outside of the European Union. Additionally, even countries within the European Union may require their own country's approval mark in addition to the CE mark. To that end, a system of mutual recognition and reciprocal acceptance has been developed which would allow product acceptance outside of the European Union and the ability to obtain the approval mark of countries within it.

The official title for this mutual acceptance agreement is The Scheme of the IECEE for Recognition of Results of Testing to Standards for Safety of Electrical Equipment (CB Scheme for short). The basis of the CB Scheme is a CB Test Certificate providing evidence that representative samples of a particular product have been tested to a particular IEC standard and successfully passed the required tests.

Each country participating in the CB Scheme, currently over 50, including East and West Europe, the Middle and Far East, and the Pacific Rim, has a representative agency, referred to as a National Certification Body, in the IECEE. Each participant has agreed that they will accept the test results of other members if such results are based on a reasonably harmonized IEC standard. Thus, by utilizing the CB Scheme, a manufacturer of product carrying a CE mark may be able to have that product accepted throughout the world, or obtain additional listing marks, with no further product testing being required.

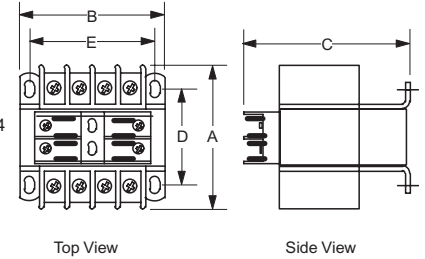
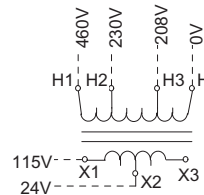
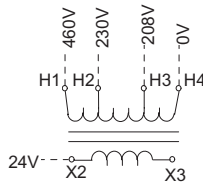
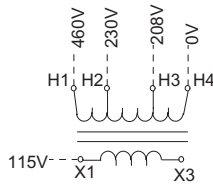
To utilize the CB Scheme, a manufacturer must present the appropriate test reports, along with a CB Test Certificate prepared by the National Certification Body responsible for the original product listing, to the National Certification Body of the country to which the product is being supplied. At such time as the reports are accepted, the product manufacturer may place the certification mark of the country on the product without the need for additional testing.

Transformers



T4050PSF1

Primary voltage — 460/230/208V, 480/240V, 440/220/200V
Secondary voltage — 115/24V Ⓣ, 120/25V, 110/23V



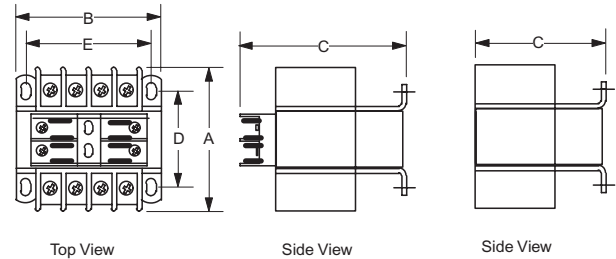
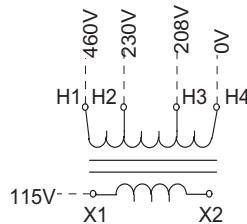
VA rating	Catalog number	List price	Output amps 24/115	Dimensions (inches • mm)					mounting slots	Approx. wt. Lbs • kg
				A	B	C	D	E		
45	T4045SF1	\$ 39.00	1.90 / 0.39	3 1/4 • 83	3 • 76	2 9/16 • 65	2 1/4 • 57	2 1/2 • 64	13/64 x 3/8 • 5 x 10	3.4 • 1.6
50	T4050PSF1	45.00	2.08 / 0.44	3 1/4 • 83	3 • 76	3 15/16 • 100	2 1/4 • 57	2 1/2 • 64	13/64 x 3/8 • 5 x 10	3.4 • 1.6
75	T4075PSF1	50.00	3.13 / 0.65	3 1/2 • 89	3 3/8 • 86	3 15/16 • 100	2 1/2 • 64	2 13/16 • 71	13/64 x 3/8 • 5 x 10	4.8 • 2.2
100	T4100PSF1	55.00	4.17 / 0.87	3 5/8 • 92	3 3/4 • 95	4 1/4 • 108	2 1/2 • 64	3 1/8 • 79	13/64 x 3/8 • 5 x 10	5.9 • 2.7
150	T4150PSF1	59.00	6.25 / 1.30	4 3/8 • 111	3 3/4 • 95	4 9/16 • 116	3 1/4 • 83	3 1/8 • 79	13/64 x 3/8 • 5 x 10	7.9 • 3.6
200	T4200PSF1	70.00	8.33 / 1.74	4 1/2 • 114	4 1/2 • 114	5 3/16 • 132	3 • 76	3 3/4 • 95	13/64 x 3/8 • 5 x 10	10.6 • 4.8
250	T4250PSF1	78.00	10.42 / 2.17	5 1/4 • 133	4 1/2 • 114	5 3/16 • 132	3 3/4 • 95	3 3/4 • 95	13/64 x 3/8 • 5 x 10	13.9 • 6.3
300	T4300PSF1	85.00	12.50 / 2.61	5 1/8 • 130	5 1/4 • 133	6 1/8 • 156	3 7/8 • 98	4 3/8 • 111	5/16 x 11/16 • 8 x 17	15.5 • 7.1
350	T4350PSF1	92.00	14.58 / 3.04	5 3/8 • 137	5 1/4 • 133	6 1/8 • 156	4 1/8 • 105	4 3/8 • 111	5/16 x 11/16 • 8 x 17	16.8 • 7.6
500	T4500PSF1	123.00	20.84 / 4.35	6 7/8 • 175	5 1/4 • 133	6 1/8 • 156	5 1/4 • 133	4 3/8 • 111	5/16 x 11/16 • 8 x 17	23.4 • 10.6

NOTE: Primary & secondary fuse block provided as standard (except for the 45VA unit where only the secondary fuse clip is provided).



T4750PS1

Primary voltage — 460/230/208V, 480/240V, 440/220/200V
Secondary voltage — 115V, 120V, 110V



VA rating	Catalog number	List price	Output amps	Dimensions (inches • mm)					mounting slots	Approx. wt. Lbs • kg
				A	B	C	D	E		
750 Ⓣ	T4750PS1	\$ 145.00	6.52	7 3/8 • 187	5 1/4 • 133	6 1/8 • 156	5 3/4 • 146	4 3/8 • 111	5/16 x 11/16 • 8 x 17	30.0 • 13.6
1000	T41K1	160.00	8.70	7 1/8 • 181	6 3/8 • 162	5 3/8 • 137	4 1/2 • 114	5 5/16 • 135	5/16 x 11/16 • 8 x 17	29.2 • 13.3
1500	T41.5K1	230.00	13.04	7 1/2 • 191	6 3/4 • 171	5 11/16 • 144	4 7/16 • 113	6 1/16 • 154	9/32 x 9/16 • 7 x 14	33.5 • 15.2
2000	T42K1	280.00	17.39	8 1/4 • 210	6 3/4 • 171	5 11/16 • 144	5 1/4 • 133	6 1/16 • 154	9/32 x 9/16 • 7 x 14	42.5 • 19.3
3000	T43K1	395.00	26.09	8 9/16 • 217	9 • 229	7 1/2 • 191	5 3/4 • 147	7 1/2 • 191	7/16 x 3/4 • 11 x 19	77.0 • 35.0
5000	T45K1	660.00	43.48	10 1/2 • 267	9 • 229	10 3/16 • 259	6 1/2 • 165	6 1/2 • 165	7/16 x 3/4 • 11 x 19	102 • 46.4

Ⓣ Primary & secondary fuse block provided as standard (750VA unit, only).

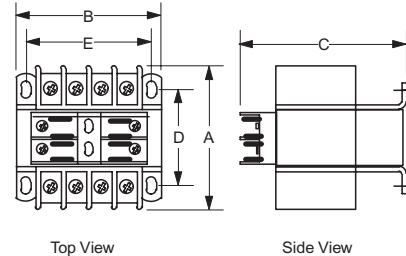
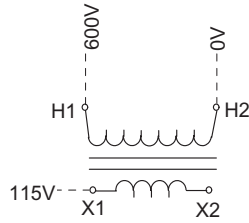
Ⓣ Whenever both secondary voltages are to be used at the same time, remove the secondary fuse clip and use a separate mounted 2 pole fuse block.

Transformers



T6045S1

Primary voltage — 600/575/550V
Secondary voltage — 120/115/110V



Top View

Side View

VA rating	Catalog number	List price	Output amps	A	Dimensions (inches • mm)				E	mounting slots	Approx. wt. Lbs • kg
					B	C	D				
45	T6045S1	\$ 41.00	0.43	3 • 76	3 • 76	29/16 • 65	2 • 51	2 1/2 • 64	13/64 x 3/8 • 5 X 10	2.7 • 1.2	
50	T6050PS1	47.00	0.43	3 • 76	3 • 76	315/16 • 100	2 • 51	2 1/2 • 64	13/64 x 3/8 • 5 X 10	2.7 • 1.2	
75	T6075PS1	52.00	0.65	3 1/2 • 89	3 • 76	315/16 • 100	2 1/2 • 64	2 1/2 • 64	13/64 x 3/8 • 5 X 10	3.6 • 1.6	
100	T6100PS1	58.00	0.87	3 3/8 • 86	3 3/8 • 86	4 1/4 • 108	2 3/8 • 60	2 13/16 • 71	13/64 x 3/8 • 5 X 10	4.2 • 1.9	
150	T6150PS1	73.00	1.30	4 • 102	3 3/4 • 95	4 9/16 • 116	2 7/8 • 73	3 1/8 • 79	13/64 x 3/8 • 5 X 10	6.8 • 3.1	
200	T6200PS1	87.00	1.74	4 • 102	4 1/2 • 114	5 3/16 • 132	2 1/2 • 64	3 3/4 • 95	13/64 x 3/8 • 5 X 10	8.4 • 3.8	
250	T6250PS1	92.00	2.17	4 3/8 • 111	4 1/2 • 114	5 3/16 • 132	2 7/8 • 73	3 3/4 • 95	13/64 x 3/8 • 5 X 10	10.0 • 4.6	
300	T6300PS1	102.00	2.61	4 3/4 • 121	4 1/2 • 114	5 3/16 • 132	3 1/4 • 83	3 3/4 • 95	13/64 x 3/8 • 5 X 10	11.3 • 5.1	
350	T6350PS1	106.00	3.04	5 1/4 • 133	4 1/2 • 114	5 3/16 • 132	3 3/4 • 95	3 3/4 • 95	13/64 x 3/8 • 5 X 10	13.6 • 6.2	
500	T6500PS1	132.00	4.35	5 3/8 • 137	5 1/4 • 133	6 1/8 • 156	4 1/8 • 105	4 3/8 • 111	5/16 x 11/16 • 8 X 17	16.8 • 7.6	
750	T6750PS1	175.00	6.52	7 • 178	5 1/4 • 133	6 1/8 • 156	5 3/4 • 146	4 3/8 • 111	5/16 x 11/16 • 8 X 17	25.7 • 11.7	

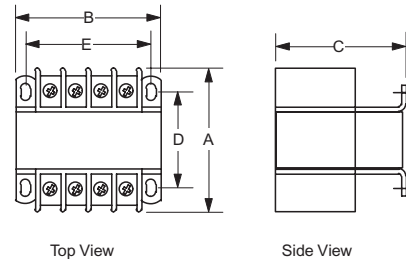
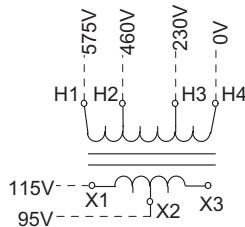
NOTE: Primary & secondary fuse block provided as standard (except for the 45VA unit where only the secondary fuse clip is provided).

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T61K1

Primary voltage — 575/460/230V
Secondary voltage — 115 - 95V



Top View

Side View

VA rating	Catalog number	List price	Output amps	A	Dimensions (inches • mm)				E	mounting slots	Approx. wt. Lbs • kg
					B	C	D				
1000	T61K1	\$ 220.00	8.70	7 1/8 • 184	6 3/8 • 162	5 3/8 • 137	4 1/2 • 114	5 5/16 • 135	5/16 x 11/16 • 8 X 17	29.2 • 13.3	
1500	T61.5K1	258.00	13.04	8 1/4 • 210	6 3/4 • 171	5 11/16 • 144	5 1/4 • 133	6 1/16 • 154	9/32 x 9/16 • 7 X 14	33.5 • 15.2	
2000	T62K1	319.00	17.39	7 9/16 • 192	9 • 229	7 9/16 • 192	4 3/16 • 106	6 1/2 • 165	7/16 x 3/4 • 11 X 19	42.5 • 19.3	
3000	T63K1	622.00	26.09	8 5/8 • 219	9 • 229	7 9/16 • 192	5 1/4 • 133	6 1/2 • 165	7/16 x 3/4 • 11 X 19	63.7 • 29.0	
5000	T65K1	1222.00	43.48	13 1/2 • 343	9 • 229	10 3/16 • 259	8 1/4 • 210	6 1/2 • 165	7/16 x 3/4 • 11 X 19	102 • 46.4	

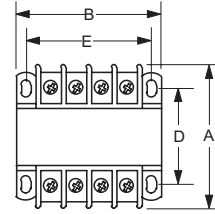
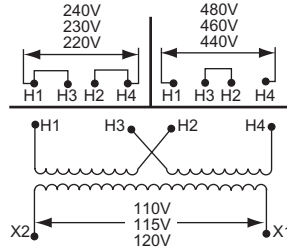
NOTE: No integral fusing capability.

Transformers with CE Mark

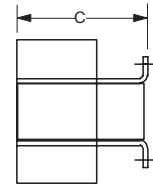


TC40501

Primary voltage - 240/480V, 230/460V, 220/440V
Secondary voltage - 120V, 115V, 110V



Top View



Side View

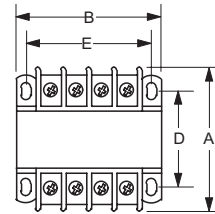
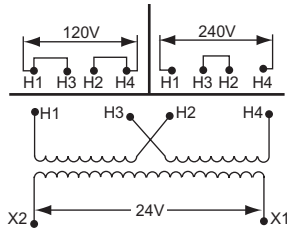
VA rating	Catalog number	List price	Output amps	Dimensions (inches • mm)					Mounting slots	Approx. wt. Lbs • kg
				A	B	C	D	E		
50	TC40501	\$ 55	0.43	3 • 86	3 • 76	3 • 76	2 1/2 • 64	2 1/2 • 64	203 X 460 • 5.1x11.7	3.5 • 1.6
75	TC40751	62	0.65	3 3/8 • 89	3 3/8 • 86	3 1/4 • 83	2 1/2 • 64	2 13/16 • 71	203 X 460 • 5.1x11.7	4.8 • 2.2
100	TC41001	72	0.87	3 1/2 • 92	3 3/4 • 95	3 1/2 • 89	2 1/2 • 64	3 1/8 • 79	203 X 460 • 5.1x11.7	5.9 • 2.7
150	TC41501	88	1.30	4 • 102	4 1/2 • 114	4 • 102	2 1/2 • 64	3 3/4 • 95	203 X 460 • 5.1x11.7	8.5 • 3.9
200	TC42001	101	1.74	4 1/2 • 114	4 1/2 • 114	4 • 102	3 1/2 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	10.6 • 4.8
250	TC42501	120	2.17	4 3/4 • 121	4 1/2 • 114	4 • 102	3 3/16 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	11.3 • 5.1
300	TC43001	130	2.61	5 1/4 • 133	4 1/2 • 114	4 • 102	3 3/4 • 95	3 3/4 • 95	203 X 460 • 5.1x11.7	13.2 • 6.0
350	TC43501	154	3.04	5 • 127	5 1/4 • 133	4 1/2 • 114	3 3/4 • 95	4 • 111	312 X 687 • 8x17.5	14.9 • 6.8
500	TC45001	168	4.35	6 • 152	5 1/4 • 133	4 1/2 • 114	4 • 102	4 3/8 • 111	312 X 687 • 8x17.5	21.0 • 9.5
750	TC47501	242	6.52	7 3/8 • 187	5 1/4 • 133	4 1/2 • 114	5 3/4 • 146	4 3/8 • 111	312 X 687 • 8x17.5	29.8 • 13.6

Note: No integral fusing capability. Supplied with touch-safe terminal covers installed.

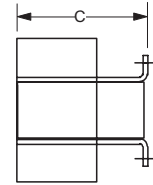


TC2050F

Primary voltage - 120/240V
Secondary voltage - 24V



Top View



Side View

VA rating	Catalog number	List price	Output amps	Dimensions (inches • mm)					Mounting slots	Approx. wt. Lbs • kg
				A	B	C	D	E		
50	TC2050F	\$ 57	2.08	3 1/4 • 83	3 • 76	3 • 76	2 1/4 • 57	2 1/2 • 64	203 X 460 • 5.1x11.7	3.4 • 1.6
75	TC2075F	64	3.13	3 1/4 • 83	3 3/8 • 86	3 1/4 • 83	2 1/4 • 57	2 13/16 • 71	203 X 460 • 5.1x11.7	4.2 • 1.9
100	TC2100F	76	4.17	3 • 92	3 3/4 • 95	3 1/2 • 89	2 1/2 • 64	3 • 79	203 X 460 • 5.1x11.7	5.9 • 2.7
150	TC2150F	101	6.25	4 5/8 • 102	4 3/4 • 114	4 1/2 • 102	2 1/2 • 64	3 3/8 • 95	203 X 460 • 5.1x11.7	8.5 • 3.9
200	TC2200F	114	8.33	4 3/8 • 111	4 1/2 • 114	4 • 102	2 13/16 • 71	3 3/4 • 95	203 X 460 • 5.1x11.7	10.0 • 4.6
250	TC2250F	125	10.42	4 3/4 • 121	4 1/2 • 114	4 • 102	3 3/16 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	11.3 • 5.1
300	TC2300F	139	12.50	5 1/8 • 130	4 1/2 • 114	4 • 102	3 3/16 • 95	3 3/4 • 95	203 X 460 • 5.1x11.7	13.2 • 6.0
350	TC2350F	161	14.58	5 • 127	5 1/4 • 133	4 1/2 • 114	3 3/4 • 95	4 • 111	312 X 687 • 8x17.5	14.9 • 6.8
500	TC2500F	179	20.83	5 1/2 • 140	5 1/4 • 133	4 1/2 • 114	4 3/4 • 108	4 3/8 • 111	312 X 687 • 8x17.5	19.2 • 8.7
750	TC2750F	267	31.25	7 1/2 • 187	5 1/4 • 133	4 1/2 • 114	5 1/4 • 146	4 3/8 • 111	312 X 687 • 8x17.5	29.8 • 13.6

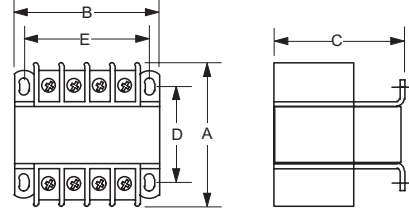
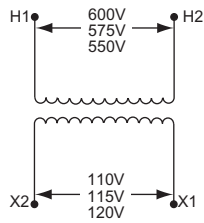
Note: No integral fusing capability. Supplied with touch-safe terminal covers installed.

Transformers with CE Mark



TC60501

Primary voltage - 550/575/ 600V
Secondary voltage - 110/115/120V



Top View

Side View

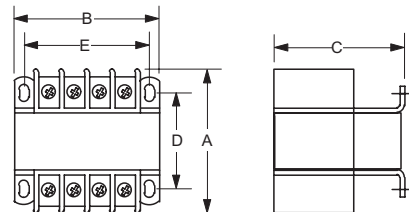
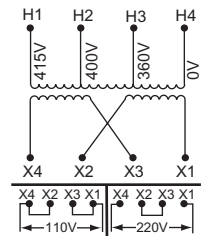
VA rating	Catalog number	List price	Output amps	Dimensions (inches • mm)					Mounting slots	Approx. wt. Lbs • kg
				A	B	C	D	E		
50	TC60501	\$ 56	0.43	3 3/8 • 86	3 • 76	3 • 76	2 1/2 • 64	2 1/2 • 64	203 X 460 • 5.1x11.7	3.5 • 1.6
75	TC60751	63	0.65	3 1/2 • 89	3 3/8 • 86	3 3/4 • 83	2 1/2 • 64	2 13/16 • 71	203 X 460 • 5.1x11.7	4.8 • 2.2
100	TC61001	76	0.87	3 5/8 • 92	3 3/4 • 95	3 1/2 • 89	2 1/2 • 64	3 1/8 • 79	203 X 460 • 5.1x11.7	5.9 • 2.7
150	TC61501	100	1.30	4 • 102	4 1/2 • 114	4 • 102	2 1/2 • 64	3 3/4 • 95	203 X 460 • 5.1x11.7	8.5 • 3.9
200	TC62001	113	1.74	4 1/2 • 114	4 1/2 • 114	4 • 102	3 3/16 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	10.6 • 4.8
250	TC62501	124	2.17	4 1/2 • 121	4 1/2 • 114	4 • 102	3 3/16 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	11.3 • 5.1
300	TC63001	137	2.61	5 3/4 • 133	4 1/2 • 114	4 • 102	3 3/4 • 95	3 3/4 • 95	203 X 460 • 5.1x11.7	13.2 • 6.0
350	TC63501	160	3.04	5 • 127	5 1/2 • 133	4 1/2 • 114	3 3/4 • 95	4 • 111	203 X 460 • 5.1x11.7	14.9 • 6.8
500	TC65001	178	4.35	6 • 152	5 1/4 • 133	4 1/2 • 114	4 3/4 • 121	4 3/8 • 111	.312 X .687 • 8x17.5	21.0 • 9.5
750	TC67501	264	6.52	7 3/8 • 187	5 1/4 • 133	4 1/2 • 114	5 3/4 • 146	4 3/8 • 111	.312 X .687 • 8x17.5	29.8 • 13.6

Note: No integral fusing capability. Supplied with touch-safe terminal covers installed.



TC305021

Primary voltage - 380/400/415V
Secondary voltage - 110/220V



Top View

Side View

VA rating	Catalog number	List price	Output amps	Dimensions (inches • mm)					Mounting slots	Approx. wt. Lbs • kg
				A	B	C	D	E		
50	TC305021	\$ 81	.46/.23	3 1/2 • 89	3 • 76	3 • 76	2 1/2 • 64	2 1/2 • 64	203 X 460 • 5.1x11.7	3.5 • 1.6
75	TC307521	83	.68/.34	3 1/2 • 89	3 3/8 • 86	3 1/4 • 83	2 1/2 • 64	2 13/16 • 71	203 X 460 • 5.1x11.7	4.8 • 2.2
100	TC310021	94	.91/.46	3 5/8 • 92	3 3/4 • 95	3 1/2 • 89	2 • 64	3 1/8 • 79	203 X 460 • 5.1x11.7	5.9 • 2.7
150	TC315021	120	1.37/.69	4 • 102	4 1/2 • 114	4 • 102	2 1/2 • 64	3 3/4 • 95	203 X 460 • 5.1x11.7	8.5 • 3.9
200	TC320021	133	1.82/.91	4 1/2 • 114	4 1/2 • 114	4 • 102	3 3/16 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	10.6 • 4.8
250	TC325021	154	2.28/1.14	4 3/4 • 121	4 1/2 • 114	4 • 102	3 3/16 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	11.3 • 5.1
300	TC330021	178	2.72/1.36	5 1/4 • 133	4 1/2 • 114	4 • 102	3 3/4 • 95	3 3/4 • 95	203 X 460 • 5.1x11.7	13.2 • 6.0
350	TC335021	193	3.18/1.59	5 1/2 • 140	4 1/2 • 114	4 • 102	4 1/16 • 103	3 3/4 • 95	203 X 460 • 5.1x11.7	15.2 • 6.9
500	TC350021	210	4.55/2.27	6 • 152	5 1/4 • 133	4 1/2 • 114	4 3/4 • 121	4 3/8 • 111	203 X 460 • 5.1x11.7	21.0 • 9.5
750	TC375021	260	6.82/3.41	7 3/8 • 187	5 1/4 • 133	4 1/2 • 114	5 3/4 • 146	4 3/8 • 111	.312 X .687 • 8x17.5	29.8 • 13.6

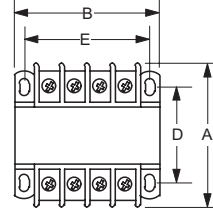
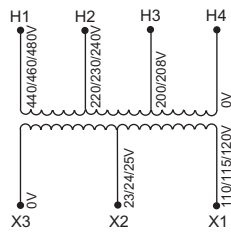
Note: No integral fusing capability. Supplied with touch-safe terminal covers installed.

Transformers with CE Mark

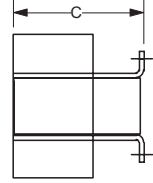


TC4050F1

Primary voltage - 200/220/440V, 208/230/460V, 240/480V
Secondary voltage - 23/110V, 24/115V, 25/120V



Top View



Side View

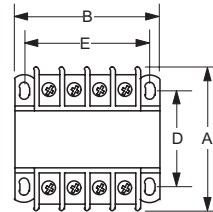
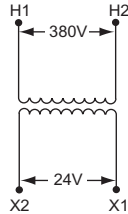
VA rating	Catalog number	List price	Output amps	Dimensions (inches • mm)					E	Mounting slots	Approx. wt. Lbs • kg
				A	B	C	D				
50	TC4050F1	\$ 62	2.08/4.44	3 1/4 • 83	3 3/8 • 86	3 1/4 • 83	2 1/4 • 57	2 13/16 • 71	203 X 460 • 5.1x11.7	4.2 • 1.6	
75	TC4075F1	70	3.13/6.65	3 5/8 • 92	3 3/4 • 95	3 1/2 • 89	2 1/2 • 64	3 3/8 • 79	203 X 460 • 5.1x11.7	5.9 • 2.7	
100	TC4100F1	91	4.17/8.87	4 1/8 • 111	3 3/4 • 95	3 1/2 • 89	3 3/16 • 81	3 3/8 • 79	203 X 460 • 5.1x11.7	7.9 • 3.6	
150	TC4150F1	109	6.25/1.3	4 3/8 • 111	4 1/2 • 114	4 • 102	2 13/16 • 71	3 3/4 • 95	203 X 460 • 5.1x11.7	10.0 • 4.6	
200	TC4200F1	127	8.33/1.74	5 • 127	4 1/2 • 114	4 • 102	3 7/16 • 87	3 3/4 • 95	203 X 460 • 5.1x11.7	12.8 • 5.8	
250	TC4250F1	146	10.42/2.17	5 1/2 • 140	4 1/2 • 114	4 • 102	4 1/16 • 103	3 3/4 • 95	203 X 460 • 5.1x11.7	15.2 • 6.9	
300	TC4300F1	172	12.5/2.61	5 3/8 • 137	5 1/4 • 133	4 1/2 • 114	4 3/8 • 105	4 3/8 • 111	312 X 687 • 8x17.5	16.8 • 7.6	
350	TC4350F1	178	14.58/3.04	5 1/2 • 140	5 1/4 • 133	4 1/2 • 114	4 3/4 • 108	4 3/8 • 111	312 X 687 • 8x17.5	19.2 • 8.7	
500	TC4500F1	204	20.84/4.35	7 1/4 • 184	5 1/4 • 133	4 1/2 • 114	6 • 153	4 3/8 • 111	312 X 687 • 8x17.5	27.0 • 12.3	

Note: No integral fusing capability. Supplied with touch-safe terminal covers installed.

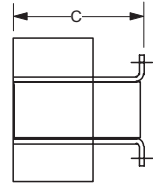
Primary voltage - 380V
Secondary voltage - 24V



TC3050F



Top View



Side View

VA rating	Catalog number	List price	Output amps	Dimensions (inches • mm)					E	Mounting slots	Approx. wt. Lbs • kg
				A	B	C	D				
50	TC3050F	\$ 57	2.08	3 1/4 • 83	3 • 76	3 • 76	2 1/4 • 57	2 1/2 • 64	203 X 460 • 5.1x11.7	3.5 • 1.6	
75	TC3075F	64	3.13	3 1/4 • 83	3 3/8 • 86	3 1/4 • 83	2 1/4 • 57	2 13/16 • 71	203 X 460 • 5.1x11.7	4.2 • 1.9	
100	TC3100F	76	4.17	3 1/4 • 92	3 3/8 • 95	3 1/2 • 89	2 1/2 • 64	3 1/8 • 79	203 X 460 • 5.1x11.7	5.9 • 2.7	
150	TC3150F	101	6.25	4 1/8 • 105	3 3/4 • 95	3 1/2 • 89	3 • 76	3 3/8 • 79	203 X 460 • 5.1x11.7	7.3 • 3.3	
200	TC3200F	114	8.33	4 1/8 • 108	4 1/2 • 114	4 • 102	2 13/16 • 71	3 3/8 • 95	203 X 460 • 5.1x11.7	9.6 • 4.4	
250	TC3250F	125	10.42	4 1/4 • 121	4 1/2 • 114	4 • 102	3 3/16 • 81	3 3/4 • 95	203 X 460 • 5.1x11.7	11.3 • 5.1	
300	TC3300F	139	12.50	5 3/4 • 130	4 1/2 • 114	4 • 102	3 3/4 • 95	3 3/4 • 95	203 X 460 • 5.1x11.7	13.2 • 6.0	
350	TC3350F	161	14.58	5 • 127	5 1/2 • 133	4 1/2 • 114	3 3/4 • 95	4 3/8 • 111	312 X 687 • 8x17.5	14.9 • 6.8	
500	TC3500F	179	20.83	5 1/2 • 140	5 1/4 • 133	4 1/2 • 114	4 3/4 • 108	4 3/8 • 111	312 X 687 • 8x17.5	19.2 • 8.7	
750	TC3750F	267	31.25	7 3/8 • 187	5 1/4 • 133	4 1/2 • 114	5 3/4 • 146	4 3/8 • 111	312 X 687 • 8x17.5	29.8 • 13.6	

Note: No integral fusing capability. Supplied with touch-safe terminal covers installed.

What is a transformer?

A transformer is a passive electrical device which is designed to change one voltage to another by magnetic induction.

What is an isolation transformer?

An isolation transformer, also referred to as an insulating transformer, is one where the primary and secondary windings are separate, as opposed to an autotransformer where the primary and secondary share a common winding.

What is a control transformer?

A control transformer is an isolation transformer designed to provide a high degree of secondary voltage stability (regulation) during a short period overload condition typically referred to as inrush. Control transformers are also referred to as Industrial Control Transformers, Machine Tool Transformers or Control Power Transformers (CPTs).

Can a control transformer be reversed connected?

A control transformer can be reverse connected. However, the output voltage will be less than nameplate due to the compensation factor of the windings.

Can a single phase transformer be used with a three phase source?

A single phase transformer can be used with a three phase source by connecting the primary leads to any two wires of the three phase system. The transformer output will be single phase.

Can a transformer be used at higher frequencies?

A transformer designed for 50/60HZ operation can be utilized at frequencies up to 400 HZ. However, at 400 HZ, the inrush capability will be reduced.

What is regulation?

12 Regulation is the change in output voltage when the load is reduced from rated value (full load) to zero (no load) with input voltage remaining constant.

Can transformers be used at ambients other than 40°C?

Transformers may be used at ambients less than 40°C at full nameplate capacity. For ambients above 40°C, they must be derated as follows:

Max. ambient temperature	Max. percent of load	
	180°C Units	105°C Units
40°C	100%	100%
50°C	90%	78%
60°C	79%	50%

What is the effect of altitude on a transformer?

A transformer may be used at full nameplate capacity up to 3300 feet (1000 meters). Above that altitude, the capacity of the transformer should be derated by 0.3% for each 300 feet of elevation above 3300 feet.

What is the effect of load on a control transformer?

A control transformer is designed to provide rated output voltage at full VA. As the load decreases, the output voltage will go up. Conversely, increases in load will result in lower output voltages. Typically, the smaller the VA size of the unit, the greater difference there is between no-load and full-load voltage.

What is temperature class?

Temperature class is the rating of the transformer insulation system. It is determined by adding the ambient temperature, temperature rise and hottest spot temperature. The standard insulation system classification per UL506, are as follows:

Ambient temperature	Average winding temperature rise*	Hot spot temperature	Temperature class
40°C	55°C	10°C	105°C
40°C	80°C	10°C	130°C
40°C	100°C	15°C	155°C
40°C	120°C	20°C	180°C

*Measured by change-in-resistance method

What is temperature rise?

Temperature rise is the difference between the average temperature of the transformer windings and the ambient temperature.

What is hot spot?

The hot spot is an allowance selected to approximate the difference between the highest temperature inside the transformer coil and the average temperature of the transformer coil.

Is one insulation system better than another?

One insulation system is not necessarily better than another. Each will typically provide a comparable life expectancy. The choice of an insulation system depends upon application, performance and cost considerations.

Why is a control transformer needed?

A control transformer is required to supply voltage to a load which requires significantly more current when initially energized than under normal steady state operating conditions. A control transformer is designed to provide secondary voltage stability under a short period of specific overload referred to as inrush.

Are control transformers current limiting?

A control transformer is not current limiting and will allow as much current to pass through as is demanded by the load. As such, a secondary overcurrent device should be utilized.

Will a control transformer regulate output voltage?

Control transformers are not voltage regulating. Because voltage changes are a function of the transformer's turns ratio, variations in input voltage will be proportionally reflected to the output.

What is duty cycle?

Duty cycle is the period and duration when a transformer will be loaded. The transformer is designed to run continuously at full load without exceeding the temperature limits. Transformers may also be operated for short time duty. Depending upon the time and cycle of the maximum load, the transformer VA size may be smaller than for continuous duty.

What is the value of encapsulation in control transformers?

Encapsulating the coils of a control transformer will help to protect the unit from moisture, dust, dirt and industrial contaminants. Encapsulation helps provide maximum protection in hostile environments while allowing the unit to run cooler than a non-encapsulated unit.

What effect does a control transformer have on electrical disturbances found on the line?

Because a control transformer has isolated primary and secondary windings, it will provide some degree of "clean-up" with regard to electrical noise, spikes, surges and transients. It will not, however, provide the same degree of power conditioning found in products designed for that purpose.

Technical data

UL Overcurrent protection

Primary & secondary



Overcurrent protection on both the primary and secondary sides of transformers are specified in UL508 and the National Electrical Code. The maximum acceptable ratings are shown below. Due to the high inrush currents present when a transformer is initially energized, it is recommended that the primary fuse be time delay, to prevent nuisance trips during startup.

Maximum acceptable rating of primary overcurrent protection

Primary voltage	VA Rating										
	25	50	75	100	150	200	250	300	350	500	750
115	6/10 (1)	1-1/4 (2)	1-8/10 (3-2/10)	2-1/2 (4)	3-1/2 (6-1/4)	5 (8)	5	6-1/4	7-1/2	10	15
120	6/10 (1)	1-1/4 (2)	1-8/10 (3)	2-1/4 (4)	3-1/2 (6-1/4)	5 (8)	5	6-1/4	7	10	15
200	3/10 (6/10)	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	2-1/4 (3-1/2)	3 (5)	3-1/2 (6-1/4)	4-1/2 (7-1/2)	5 (8)	6-1/4	9
208	3/10 (6/10)	6/10 (1-1/8)	1 (1-8/10)	1-4/10 (2-1/4)	2 (3-1/2)	2-8/10 (4-1/2)	3-1/2 (6)	4 (7)	5 (8)	6	9
220	3/10 (1/2)	6/10 (1-1/8)	1 (1-6/10)	1-1/4 (2-1/4)	2 (3-2/10)	2-1/2 (4-1/2)	3-2/10 (5-6/10)	4 (6-1/4)	4-1/2 (7-1/2)	5-6/10	8
230	3/10 (1/2)	6/10 (1)	8/10 (1-6/10)	1-1/4 (2)	1-8/10 (3-2/10)	2-1/2 (4)	3-2/10 (5)	3-1/2 (6-1/4)	4-1/2 (7-1/2)	5	8
240	3/10 (1/2)	6/10 (1)	8/10 (1-1/2)	1-1/4 (2)	1-8/10 (3)	2-1/4 (4)	3 (5)	3-1/2 (6-1/4)	4 (7)	5	7-1/2
277	1/4 (4/10)	1/2 (8/10)	8/10 (1-1/4)	1 (1-8/10)	1-6/10 (2-1/2)	2 (3-1/2)	2-1/2 (4-1/2)	3-2/10 (5)	3-1/2 (6-1/4)	5 (9)	6-1/4
380	3/16 (3/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	1-8/10 (3-2/10)	2-1/4 (3-1/2)	2-1/2 (4-1/2)	3-1/2 (6-1/4)	5-6/10 (9)
400	3/16 (3/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	1-8/10 (3)	2-1/4 (3-1/2)	2-1/2 (4)	3-1/2 (6-1/4)	5-6/10 (9)
415	15/100 (3/10)	3/10 (6/10)	1/2 (8/10)	6/10 (1-1/8)	1 (1-8/10)	1-4/10 (2-1/4)	1-8/10 (3)	2 (3-1/2)	2-1/2 (4)	3-1/2 (6)	5 (9)
440	15/100 (1/4)	3/10 (1/2)	1/2 (8/10)	6/10 (1-1/8)	1 (1-6/10)	1-1/4 (2-1/4)	1-6/10 (2-8/10)	2 (3-2/10)	2-1/4 (3-1/2)	3-2/10 (5-6/10)	5 (8)
460	15/100 (1/4)	3/10 (1/2)	4/10 (8/10)	6/10 (1)	8/10 (1-6/10)	1-1/4 (2)	1-6/10 (2-1/2)	1-8/10 (3-2/10)	2-1/4 (3-1/2)	3-2/10 (5)	4-1/2 (8)
480	15/100 (1/4)	3/10 (1/2)	4/10 (3/4)	6/10 (1)	8/10 (1-1/2)	1-1/4 (2)	1-1/2 (2-1/2)	1-8/10 (3)	2 (3-1/2)	3 (5)	4-1/2 (7-1/2)
550	1/8 (2/10)	1/4 (4/10)	4/10 (6/10)	1/2 (8/10)	8/10 (1-1/4)	1 (1-8/10)	1-1/4 (2-1/4)	1-6/10 (2-1/2)	1-8/10 (3)	2-1/2 (4-1/2)	4 (6-1/4)
575	1/8 (2/10)	1/4 (4/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1 (1-6/10)	1-1/4 (2)	1-1/2 (2-1/2)	1-8/10 (3)	2-1/2 (4)	3-1/2 (6-1/4)
600	1/8 (2/10)	2/10 (4/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	8/10 (1-6/10)	1-1/4 (2)	1-1/2 (2-1/2)	1-6/10 (2-8/10)	2-1/4 (4)	3-1/2 (6-1/4)

12

If the rated primary current is less than 2 amps, the maximum rating of the overcurrent device is 300% for power circuits, shown above, or 500% for control circuits, shown above in (brackets). If the rated primary current is 2 amps or more, the maximum rating of the overcurrent device is 250%.

All figures assume secondary overcurrent protection per UL/NEC.

Reference: NEC 430 - 72(c) exception #2, 450-3(b) 1 & 2, UL508 32.7, UL845 11.16 & 11.17.

Maximum acceptable rating of secondary overcurrent protection

Secondary voltage	VA Rating										
	25	50	75	100	150	200	250	300	350	500	750
23	1-8/10	3-1/2	5	7	10	12	15	20	20	30	45
24	1-6/10	3-2/10	5	6-1/4	10	12	15	20	20	30	40
25	1-6/10	3-2/10	5	6-1/4	10	12	15	15	20	25	40
90	4/10	8/10	1-1/4	1-8/10	2-1/2	3-1/2	4-1/2	5	6-1/4	9	12
95	4/10	8/10	1-1/4	1-6/10	2-1/2	3-1/2	4	5	6	8	12
100	4/10	8/10	1-1/4	1-6/10	2-1/2	3-2/10	4	5	5-6/10	8	12
110	3/10	3/4	1-1/8	1-1/2	2-1/4	3	3-1/2	4-1/2	5	7-1/2	10
115	3/10	6/10	1	1-4/10	2	2-8/10	3-1/2	4	5	7	10
120	3/10	6/10	1	1-1/4	2	2-1/2	3-2/10	4	4-1/2	6-1/4	10
220	15/100	3/10	1/2	3/4	1-1/8	1-1/2	1-8/10	2-1/4	2-1/2	3-1/2	5-6/10
230	15/100	3/10	1/2	6/10	1	1-4/10	1-8/10	2	2-1/2	3-1/2	5
240	15/100	3/10	1/2	6/10	1	1-1/4	1-6/10	2	2-1/4	3-2/10	5

If the rated secondary current is less than 9 amps, the maximum rating of the overcurrent device is 167%; 9 amps or more, the maximum rating of the overcurrent device is 125%. If 125% does not correspond to a standard fuse rating, the next highest standard rating may be used.

Reference: NEC 430 - 72(c) exception #2, 450-3(b) 1 & 2, UL508 32.7, UL845 11.16 & 11.17.



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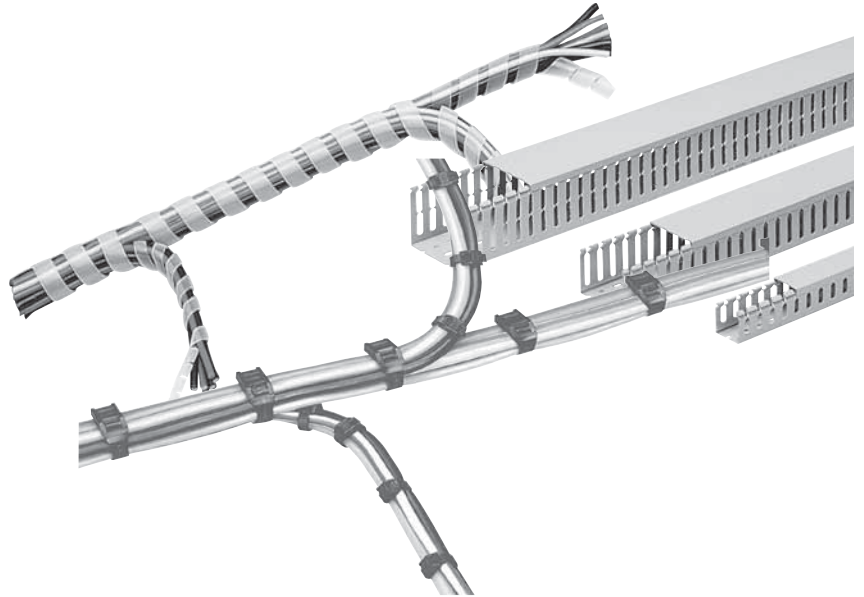
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Cable management systems



Cable management systems

- Wire duct
- Cable ties
- Spiral wrap

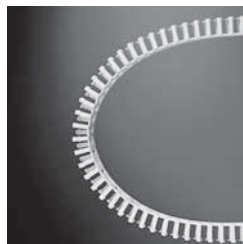


General information

Those requiring considerable space for cables will find their needs met by ABB cable management systems, now also available in the 100 mm height and in a choice of six different base sizes (25, 40, 60, 80, 100 and 150 mm). New wiring ducts join the established designs (with heights between 17 and 80 mm), bringing to 28 the total size combinations offered, all available with 8 – 12 mm and 4 – 6 mm slots.



Less complicated work brings installers and panel builders faster solutions thanks to the new top profile of the ribs.



The new flexible thermoplastic wiring ducts solve every electrical switchboard and distribution switchboard wiring problem.

The best solution for hinged panels and doors are our new flexible thermoplastic cable management systems (available in seven sizes), which are ideal for every situation in which wiring is subject to flexion or torsion.

A new design of cable management systems with circular knockouts in the sides to facilitate branch connections using rigid and corrugated conduits has also been introduced for environments in which cables require greater protection against external agents (elevator rooms are a typical example).



New wiring ducts with circular knockouts in the sides are available for any specific kind of branch connections.

The updated range is completed by installation accessories and tools: plastic rivets, wire stops, label tags, new wiring ducts bases, a new rivet gun and shears.

The top profile of the ribs of these wiring ducts has been redesigned to make it easier to open and close the cover and to ensure even more secure engagement.

All in one movement: thanks to the controlled splaying of the sides, gentle pressure is all it takes to fix the cover on the duct, forming a perfect seal in all conditions, even in environments that reach high temperatures.

To release it, simply press the ribs inwards with one hand.

continued next page

General information

Wire duct, cable ties, spiral wrap

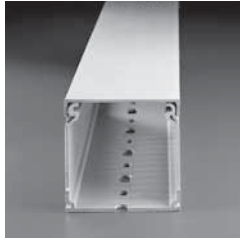
The cover can't slide in vertical sections, nor is the bottom rib affected by the weight of the cables in horizontal sections.

The exceptional care with which ABB wiring ducts are manufactured also ensures a clean internal finish. Because there aren't any plastic burrs you can work hour after hour without your hands suffering the consequences.

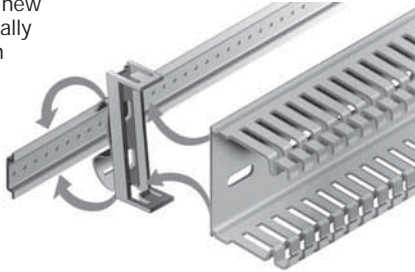
The dimensions and resilience of the ribs on ABB cable management systems ensure they can be moved apart many times during the wiring phase. But when you need to remove the rib to create openings for letting cables in or out, the special knockouts allow you to make an instant clean break. The base of the wall also features knockouts that make it possible to cut the edge when you want to make level branch connections.

The 80 and 100 mm high versions feature cable holder moldings in the middle of the straight sections of the ribs.

The new ABB cable management systems are in a class of their own when it comes to ease of installation. In fact they have been made for snap-on installation to a new accessory that's been specially designed for fast fitting both to DIN rails and base plates. The new bottom profile of the wiring ducts has been changed and no longer needs drilling or rivets. Thanks to this new accessory, mounting and removal both take no more than a click.



All the space cables need with the new wiring ducts available in the 100 mm height and six different base sizes.



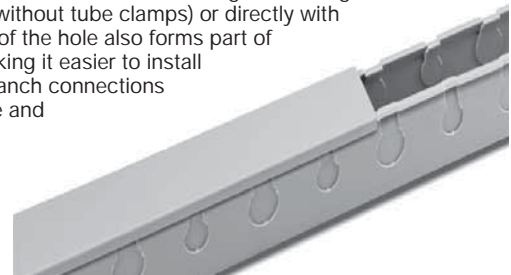
How do you connect the switchgears installed on switchboard doors? Our new flexible cable management systems can be bent or twisted without breaking and allow you to solve all manner of connection problems where hinged moving parts are concerned.

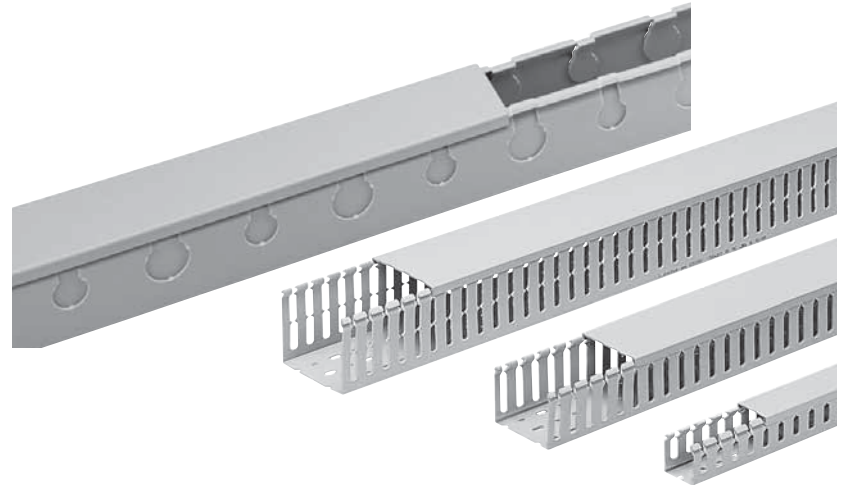
They are quick and easy to use: the offset position of the ribs and the way they are angled slightly downwards makes it easier to insert and extract the cables.

These new ducts save time and energy compared to traditional coiled designs. When you need to add new cables, change and inspect them or carry out maintenance, the operations

required are simple and take next to no time at all. Simply pull out the cables or feed in new ones without having to unwind or rewind the coils. The flexible wiring ducts are supplied as standard with ready-fitted double-sided adhesive tape offering high adhesion on steel. And you can, of course, naturally fit them using screws and rivets as well. They engage in special slots on the bottom that are orientated in two axes to enable the position of the ducts to be adjusted.

In those cases in which it's advantageous to protect cables from dust (IP 40) while retaining maximum installation flexibility, we designed these new cable management systems with circular knockouts in the sides for branch connections with rigid or corrugated conduits (with or without tube clamps) or directly with cables. The neck of the hole also forms part of the knockout, making it easier to install the cables and branch connections in any work phase and conditions.





Description

ABB wiring ducts are now also available in the 100 mm height and in a choice of six different base sizes (25, 40, 60, 80, 100 and 150 mm). These new wiring ducts join the established designs (with heights between 17 and 80 mm), bringing to 28 the total size combinations offered, all available with 8 – 12 mm and 4 – 6 mm slots.

Flexible thermoplastic wiring ducts (available in seven sizes) are ideal for every situation in which wiring is subject to flexion or torsion.

A new design of wiring ducts with circular knockouts in the sides to facilitate branch

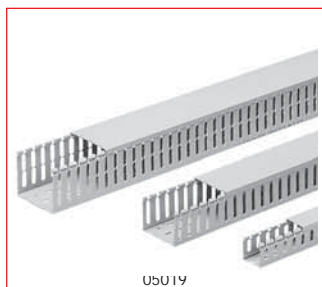
connections using rigid and corrugated conduits has also been introduced for environments in which cables require greater protection against external agents (elevator rooms are a typical example).

The updated range is completed by installation accessories and tools: plastic rivets, wire stops, label tags, new wiring ducts bases, a new rivet gun and shears.

The 80 and 100 mm high versions feature cable holder moldings in the middle of the straight sections of the ribs.

Wiring duct, gray

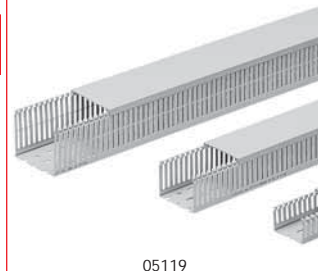
Standard; 8 – 12 mm slot
High density; 4 – 6 mm slot



Standard; 8 – 12 mm slot, gray

Dimensions W x H (mm)	Dimensions W x H (in)	Meters per package	Feet per package	Pieces per package ^①	Catalog number ^{①②}	List price per package	List price per 2M piece	List price per foot
15 x 17	1/2 x 5/8	46	151	23	05019	\$ 345.00	\$ 15.00	\$ 2.29
25 x 30	1 x 1 1/4	58	190.5	29	05033	565.50	19.50	2.97
40 x 30	1 1/2 x 1 3/4	40	131.5	20	05035	500.00	25.00	3.81
60 x 30	2 1/4 x 1 1/4	52	171	26	05037	734.50	28.25	4.31
25 x 40	1 x 1 1/2	48	157.5	24	05043	570.00	23.75	3.62
40 x 40	1 1/2 x 1 1/2	30	98.5	15	05045	397.50	26.50	4.04
60 x 40	2 1/4 x 1 1/2	40	131	20	05047	590.00	29.50	4.50
80 x 40	3 x 1 1/2	32	105	16	05049	604.00	37.75	5.75
100 x 40	4 x 1 1/2	24	79	12	05051	474.00	39.50	6.02
120 x 40	4 3/4 x 1 1/2	20	66	10	05053	432.50	43.25	6.59
25 x 60	1 x 2 1/4	34	111.5	17	05063	442.00	26.00	3.96
40 x 60	1 1/2 x 2 1/4	22	72	11	05065	319.00	29.00	4.42
60 x 60	2 1/4 x 2 1/4	32	105	16	05067	488.00	30.50	4.65
80 x 60	3 x 2 1/4	24	79	12	05069	468.00	39.00	5.94
100 x 60	4 x 2 1/4	20	66	10	05071	430.00	43.00	6.55
120 x 60	4 3/4 x 2 1/4	14	46	7	05073	343.00	49.00	7.47
25 x 80	1 x 3	28	92	14	05083	451.50	32.25	4.91
40 x 80	1 1/2 x 3	36	118	18	05085	634.50	35.25	5.37
60 x 80	2 1/4 x 3	24	79	12	05087	456.00	38.00	5.79
80 x 80	3 x 3	16	52	8	05089	364.00	45.50	6.93
100 x 80	4 x 3	16	52	8	05091	394.00	49.25	7.51
120 x 80	4 3/4 x 3	12	39	6	05093	336.00	56.00	8.53
25 x 100	1 x 4	20	65.5	10	05094	377.50	37.75	5.75
40 x 100	1 1/2 x 4	28	92	14	05095	567.00	40.50	6.17
60 x 100	2 1/4 x 4	20	66	10	05096	432.50	43.25	6.59
80 x 100	3 x 4	14	46	7	05097	371.00	53.00	8.08
100x 100	4 x 4	8	26	4	05098	236.00	59.00	8.99
150 x 100	6 x 4	8	26	4	05099	372.00	93.00	14.17

NOTE: Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
Example: For 05019, 23 pieces must be ordered to get package quantity.



High density; 4 – 6 mm slot, gray

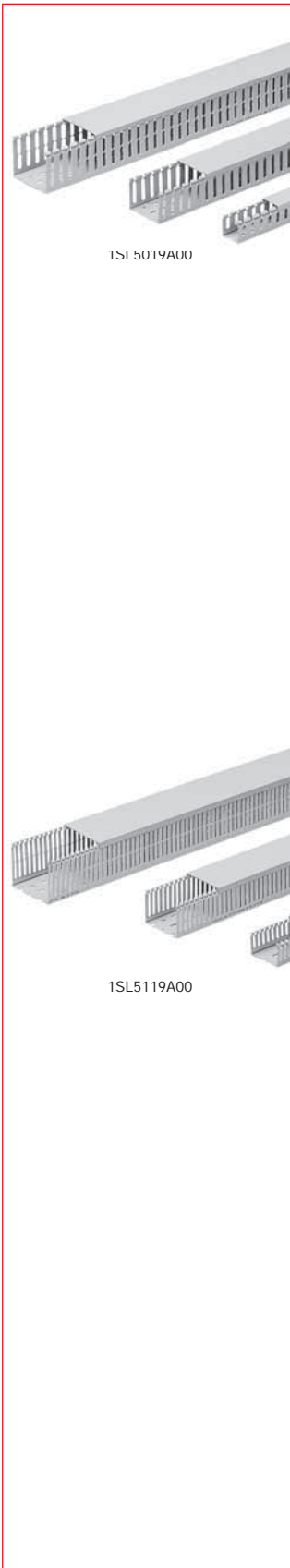
Dimensions W x H (mm)	Dimensions W x H (in)	Meters per package	Feet per package	Pieces per package ^①	Catalog number ^{①②}	List price per package	List price per 2M piece	List price per foot
15 x 17	1/2 x 5/8	46	151	23	05119	\$ 345.00	\$ 15.00	\$ 2.29
25 x 30	1 x 1 1/4	58	190.5	29	05133	565.50	19.50	2.97
40 x 30	1 1/2 x 1 3/4	40	131.5	20	05135	500.00	25.00	3.81
60 x 30	2 1/4 x 1 1/4	52	171	26	05137	734.50	28.25	4.31
25 x 40	1 x 1 1/2	48	157.5	24	05143	570.00	23.75	3.62
40 x 40	1 1/2 x 1 1/2	30	98.5	15	05145	397.50	26.50	4.04
60 x 40	2 1/4 x 1 1/2	40	131	20	05147	590.00	29.50	4.50
80 x 40	3 x 1 1/2	32	105	16	05149	604.00	37.75	5.75
100 x 40	4 x 1 1/2	24	79	12	05151	474.00	39.50	6.02
120 x 40	4 3/4 x 1 1/2	20	66	10	05153	432.50	43.25	6.59
25 x 60	1 x 2 1/4	34	111.5	17	05163	442.00	26.00	3.96
40 x 60	1 1/2 x 2 1/4	22	72	11	05165	319.00	29.00	4.42
60 x 60	2 1/4 x 2 1/4	32	105	16	05167	488.00	30.50	4.65
80 x 60	3 x 2 1/4	24	79	12	05169	468.00	39.00	5.94
100 x 60	4 x 2 1/4	20	66	10	05171	430.00	43.00	6.55
120 x 60	4 3/4 x 2 1/4	14	46	7	05173	343.00	49.00	7.47
25 x 80	1 x 3	28	92	14	05183	451.50	32.25	4.91
40 x 80	1 1/2 x 3	36	118	18	05185	634.50	35.25	5.37
60 x 80	2 1/4 x 3	24	79	12	05187	456.00	38.00	5.79
80 x 80	3 x 3	16	52	8	05189	364.00	45.50	6.93
100 x 80	4 x 3	16	52	8	05191	394.00	49.25	7.51
120 x 80	4 3/4 x 3	12	39	6	05193	336.00	56.00	8.53
25 x 100	1 x 4	20	65.5	10	05194	377.50	37.75	5.75
40 x 100	1 1/2 x 4	28	92	14	05195	567.00	40.50	6.17
60 x 100	2 1/4 x 4	20	66	10	05196	432.50	43.25	6.59
80 x 100	3 x 4	14	46	7	05197	371.00	53.00	8.08
100x 100	4 x 4	8	26	4	05198	236.00	59.00	8.99
150 x 100	6 x 4	8	26	4	05199	372.00	93.00	14.17

NOTE: Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
Example: For 05119, 23 pieces must be ordered to get package quantity.

① Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
② Wire duct cover included.

Wiring duct, white

Standard; 8 – 12mm slot
High density; 4 – 6mm slot



Standard; 8 – 12 mm slot

Dimensions W x H (mm)	Dimensions W x H (in)	Meters per package	Feet per package	Pieces per package ^①	Catalog number ^{①②}	List price per package	List price per 2M piece	List price per foot
15 x 17	1/2 x 5/8	46	151	23	1SL5019A00	\$ 345.00	\$ 15.00	\$ 2.29
25 x 30	1 x 1 1/4	58	190.5	29	1SL5033A00	565.50	19.50	2.97
40 x 30	1 1/2 x 1 3/4	40	131.5	20	1SL5035A00	500.00	25.00	3.81
60 x 30	2 1/4 x 1 1/4	52	171	26	1SL5037A00	734.50	28.25	4.31
25 x 40	1 x 1 1/2	48	157.5	24	1SL5043A00	570.00	23.75	3.62
40 x 40	1 1/2 x 1 1/2	30	98.5	15	1SL5045A00	397.50	26.50	4.04
60 x 40	2 1/4 x 1 1/2	40	131	20	1SL5047A00	590.00	29.50	4.50
80 x 40	3 x 1 1/2	32	105	16	1SL5049A00	604.00	37.75	5.75
100 x 40	4 x 1 1/2	24	79	12	1SL5051A00	474.00	39.50	6.02
120 x 40	4 3/4 x 1 1/2	20	66	10	1SL5053A00	432.50	43.25	6.59
25 x 60	1 x 2 1/4	34	111.5	17	1SL5063A00	442.00	26.00	3.96
40 x 60	1 1/2 x 2 1/4	22	72	11	1SL5065A00	319.00	29.00	4.42
60 x 60	2 1/4 x 2 1/4	32	105	16	1SL5067A00	488.00	30.50	4.65
80 x 60	3 x 2 1/4	24	79	12	1SL5069A00	468.00	39.00	5.94
100 x 60	4 x 2 1/4	20	66	10	1SL5071A00	430.00	43.00	6.55
120 x 60	4 3/4 x 2 1/4	14	46	7	1SL5073A00	343.00	49.00	7.47
25 x 80	1 x 3	28	92	14	1SL5083A00	451.50	32.25	4.91
40 x 80	1 1/2 x 3	36	118	18	1SL5085A00	634.50	35.25	5.37
60 x 80	2 1/4 x 3	24	79	12	1SL5087A00	456.00	38.00	5.79
80 x 80	3 x 3	16	52	8	1SL5089A00	364.00	45.50	6.93
100 x 80	4 x 3	16	52	8	1SL5091A00	394.00	49.25	7.51
120 x 80	4 3/4 x 3	12	39	6	1SL5093A00	336.00	56.00	8.53
25 x 100	1 x 4	20	65.5	10	1SL5094A00	377.50	37.75	5.75
40 x 100	1 1/2 x 4	28	92	14	1SL5095A00	567.00	40.50	6.17
60 x 100	2 1/4 x 4	20	66	10	1SL5096A00	432.50	43.25	6.59
80 x 100	3 x 4	14	46	7	1SL5097A00	371.00	53.00	8.08
100 x 100	4 x 4	8	26	4	1SL5098A00	236.00	59.00	8.99
150 x 100	6 x 4	8	26	4	1SL5099A00	372.00	93.00	14.17

NOTE: Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
Example: For 1SL5019A00, 23 pieces must be ordered to get package quantity.

High density; 4 – 6 mm slot

Dimensions W x H (mm)	Dimensions W x H (in)	Meters per package	Feet per package	Pieces per package ^①	Catalog number ^{①②}	List price per package	List price per 2M piece	List price per foot
15 x 17	1/2 x 5/8	46	151	23	1SL5119A00	\$ 345.00	\$ 15.00	\$ 2.29
25 x 30	1 x 1 1/4	58	190.5	29	1SL5133A00	565.50	19.50	2.97
40 x 30	1 1/2 x 1 3/4	40	131.5	20	1SL5135A00	500.00	25.00	3.81
60 x 30	2 1/4 x 1 1/4	52	171	26	1SL5137A00	734.50	28.25	4.31
25 x 40	1 x 1 1/2	48	157.5	24	1SL5143A00	570.00	23.75	3.62
40 x 40	1 1/2 x 1 1/2	30	98.5	15	1SL5145A00	397.50	26.50	4.04
60 x 40	2 1/4 x 1 1/2	40	131	20	1SL5147A00	590.00	29.50	4.50
80 x 40	3 x 1 1/2	32	105	16	1SL5149A00	604.00	37.75	5.75
100 x 40	4 x 1 1/2	24	79	12	1SL5151A00	474.00	39.50	6.02
120 x 40	4 3/4 x 1 1/2	20	66	10	1SL5153A00	432.50	43.25	6.59
25 x 60	1 x 2 1/4	34	111.5	17	1SL5163A00	442.00	26.00	3.96
40 x 60	1 1/2 x 2 1/4	22	72	11	1SL5165A00	319.00	29.00	4.42
60 x 60	2 1/4 x 2 1/4	32	105	16	1SL5167A00	488.00	30.50	4.65
80 x 60	3 x 2 1/4	24	79	12	1SL5169A00	468.00	39.00	5.94
100 x 60	4 x 2 1/4	20	66	10	1SL5171A00	430.00	43.00	6.55
120 x 60	4 3/4 x 2 1/4	14	46	7	1SL5173A00	343.00	49.00	7.47
25 x 80	1 x 3	28	82	14	1SL5183A00	451.50	32.25	4.91
40 x 80	1 1/2 x 3	36	118	18	1SL5185A00	634.50	35.25	5.37
60 x 80	2 1/4 x 3	24	79	12	1SL5187A00	456.00	38.00	5.79
80 x 80	3 x 3	16	52	8	1SL5189A00	364.00	45.50	6.93
100 x 80	4 x 3	16	52	8	1SL5191A00	394.00	49.25	7.51
120 x 80	4 3/4 x 3	12	39	6	1SL5193A00	336.00	56.00	8.53
25 x 100	1 x 4	20	65.5	10	1SL5194A00	377.50	37.75	5.75
40 x 100	1 1/2 x 4	28	92	14	1SL5195A00	567.00	40.50	6.17
60 x 100	2 1/4 x 4	20	66	10	1SL5196A00	432.50	43.25	6.59
80 x 100	3 x 4	14	46	7	1SL5197A00	371.00	53.00	8.08
100x 100	4 x 4	8	26	4	1SL5198A00	236.00	59.00	8.99
150 x 100	6 x 4	8	26	4	1SL5199A00	372.00	93.00	14.17

NOTE: Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
Example: For 1SL5119A00, 23 pieces must be ordered to get package quantity.

① Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
② Wire duct cover included.

Wiring duct Specialty products

Wiring duct with knockouts

Wiring duct with 18mm 1/2" and 23mm 3/4" knockouts, gray

Dimensions W x H (mm)	Dimensions W x H (in)	Meters per package	Feet per package	Pieces per package ①	Catalog number ①②	List price per package ①	List price per 2M piece	List price per foot
50 x 50	2 x 2	36	118	18	05330	\$ 738.00	\$ 41.00	\$ 6.25
100 x 60	4 x 1 1/2	18	59	9	05331	450.00	45.00	7.50

NOTE: Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
Example: For 05330, 18 pieces must be ordered to get package quantity.

Flexible wiring duct

Flexible wiring duct – (500mm), White

Dimensions W x H (mm)	Dimensions W x H (in)	Meters per package	Feet per package	Pieces per ①	Catalog number ①	List price per package	List price per piece	List price per foot
12.5 x 12.5	1/2 x 1/2	56	184	112	05400	\$ 1344.00	\$ 12.00	\$ 7.32
16 x 16	5/8 x 5/8	42	138	84	05402	1134.00	13.50	8.23
20 x 20	3/4 x 3/4	56	184	112	05405	1820.00	16.25	9.91
25 x 25	1 x 1	35	115	70	05410	1260.00	18.00	10.97
30 x 30	1 3/4 x 1 3/4	25	82	50	05415	1075.00	21.50	13.11
40 x 40	1 1/2 x 1 1/2	25	82	50	05420	1375.00	27.50	16.76
50 x 50	2 x 2	16	52	32	05425	1064.00	33.25	20.27

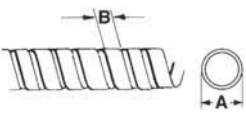
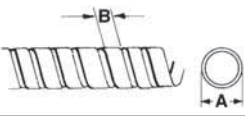
NOTE: Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
Example: For 05400, 112 pieces must be ordered to get package quantity.

Flexible wiring duct – UL Recognized (19.5"), Gray

Dimensions Inside dia. (mm)	Dimensions Inside dia. (in.)	Meters per package	Feet per package	Pieces per package	Catalog number	List price per package	List price per piece	List price per foot
10	.39	350	1148	700	T-10 ③	\$ 7700.00	\$ 11.00	\$ 6.77
20	.79	175	574	350	T-20 ③	4112.50	11.75	7.23
30	1.18	100	328	200	T-30 ③	2550.00	12.75	7.85
40	1.58	50	164	100	T-40 ③	1450.00	14.50	8.92

Spiral wrap

Spiral wrap

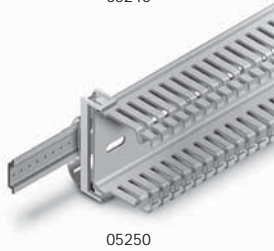
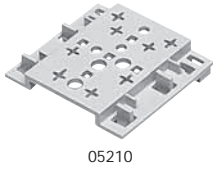
Height Dim A in [mm]	Width Dim B in [mm]	Diameter (mm)		Length per roll (meters)	Length per roll (feet)	Catalog number	List price	
		Min. in [mm]	Max. in [mm]					
Translucent polyethylene								
.12 [3]	.2 [5]	.08 [2]	.47 [12]		50	164	18370	\$ 60.00
.24 [6]	.31 [8]	.2 [5]	2.20 [56]		25	82	18372	40.75
.39 [10]	.43 [11]	.47 [12]	3.94 [100]		25	82	18374	56.50
.47 [12]	.51 [13]	.55 [14]	5.12 [130]		25	82	18376	92.00
Self-extinguishing polyethylene								
.12 [3]	.2 [5]	.08 [2]	.47 [12]		50	164	18380	70.00
.24 [6]	.31 [8]	.2 [5]	2.20 [56]		25	82	18382	52.50
.39 [10]	.43 [11]	.47 [12]	3.94 [100]		25	82	18384	84.00
.47 [12]	.51 [13]	.55 [14]	5.12 [130]		25	82	18386	117.25

① Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.

② Wire duct cover included.

③ T10 has a square body; T20 - T40 has a round body.

Wiring duct Tools and Accessories



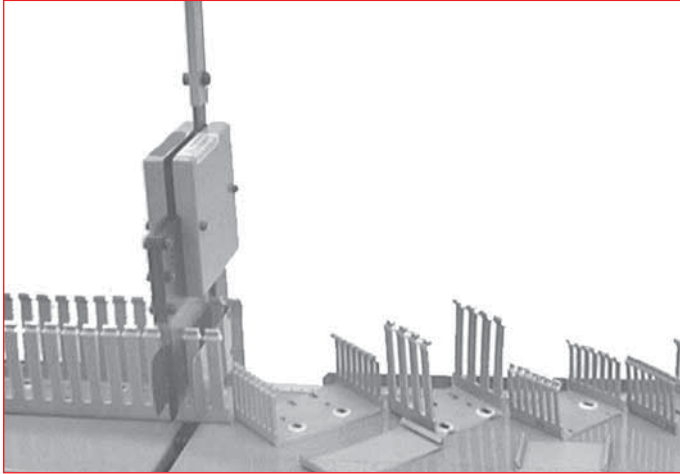
Item	Pieces per package	Catalog number	List price per package
Plastic rivet, 4 mm (to be used with plastic ducting base)	100	05214	\$ 30
Plastic rivet, 6 mm, (to be used with plastic ducting base)	100	05216	36
Plastic ducting base	100	05210	150
Plastic wire stops for 8 - 12 mm slot 40 mm bases	100	05224	100
Plastic wire stops for 8 - 12 mm slot 60 mm bases	100	05226	125
Plastic wire stops for 8 - 12 mm slot 80 mm bases	100	05228	150
Plastic wire stops for 8 - 12 mm slot 100 mm bases	100	05230	200
Plastic label for 8 - 12 mm slot	100	05240	240
Rapid clip for DIN rail for 25 mm base	20	05250	100
Rapid clip for DIN rail for 40 mm base	20	05252	80
Rapid clip for DIN rail for 60 mm base	20	05254	90
Rapid clip for DIN rail for 80 mm base	20	05256	100
Rapid clip for DIN rail for 100 mm base	20	05258	105
Rapid clip for DIN rail for 120 mm base	20	05260	110
Rapid clip for DIN rail for 150 mm base	20	05262	115
Wire duct hand cutting tool	1	05265	150
Rivet gun	1	05266	200
Adhesive tape, 6 mm wide x 50 m long	1	05930	65
Adhesive tape, 9 mm wide x 50 m long	1	05932	95

Wiring duct covers

Dimensions Width mm	Color	Meters per package	Feet per package	Pieces per package	Catalog number	List price per package	List price per 2M piece	List price per foot
15	Gray	200	656	100	05300	\$ 400.00	\$ 4.00	\$ 0.61
25	Gray	60	197	30	05302	144.00	4.80	0.73
40	Gray	40	131	20	05304	170.00	8.50	1.30
60	Gray	24	79	12	05306	159.00	13.25	2.02
80	Gray	16	52	8	05308	164.00	20.50	3.12
100	Gray	48	157	24	05310	576.00	24.00	3.66
120	Gray	36	118	18	05312	621.00	34.50	5.26
150	Gray	28	92	14	05314	637.00	45.50	6.93
15	White	200	656	100	1SL5300A00	400.00	4.00	0.61
25	White	60	197	30	1SL5302A00	144.00	4.80	0.73
40	White	40	131	20	1SL5304A00	170.00	8.50	1.30
60	White	24	79	12	1SL5306A00	159.00	13.25	2.02
80	White	16	52	8	1SL5308A00	164.00	20.50	3.12
100	White	48	157	24	1SL5310A00	576.00	24.00	3.66
120	White	36	118	18	1SL5312A00	621.00	34.50	5.26
150	White	28	92	14	1SL5314A00	637.00	45.50	6.93

NOTE: Sold in package quantity only. Order quantity must equal quantity shown in "pieces per package" column.
Example: For 05300, 100 pieces must be ordered to get package quantity.

Wiring duct Tools Wiring duct cutter – Industrial grade

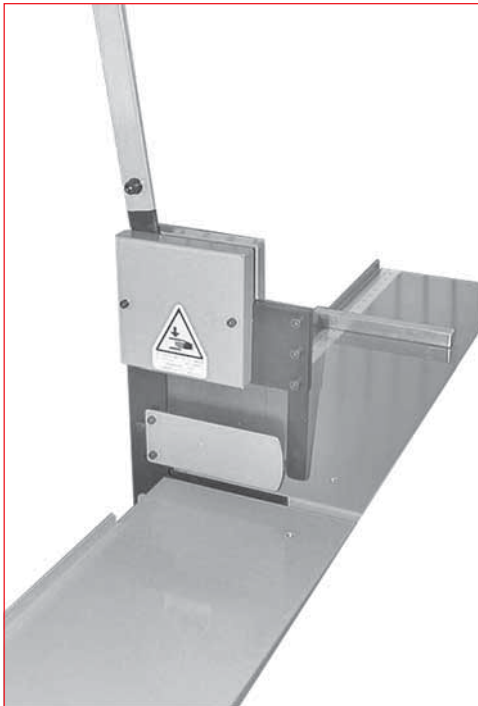


Description

Description	Catalog number	List price
Wire duct cutting machine - Industrial grade	XUS001628	\$ 800
Replacement blade	XUS001629	300

Technical Features

- Length: 1450 mm
- Height: 950 mm
- Depth: 260 mm
- Blade length: 130 mm (maximum wire duct cutting width is 120 mm (5.0 in))
- Blade life: 250,000 cuts
- Blade life is based on usage of traditional PVC wiring duct. Use of halogen-free wiring or any other wiring duct containing abrasive material dramatically reduces the blade life
- Bench mounting material not included.



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Wiring duct

Tools

Wiring duct cutter – Production grade



Description

Description	Catalog number	List price
Wire duct cutting machine - Production grade	XUS002518	\$ 1200
Replacement blade	XUS002519	495

Technical Features

- Length: 1290 mm
- Height: 785 mm
- Depth: 285 mm
- Blade length: 136 mm (maximum wire duct cutting width is 120 mm (5.0 in))
- Blade life: 400,000 cuts
- Blade life is based on usage of traditional PVC wiring duct. Use of halogen-free wiring or any other wiring duct containing abrasive material dramatically reduces the blade life
- Calibrated scale
- Bench mounting material not included.

Wiring duct
Technical data
Wire capacity, 18 - 750 AWG

18 - 1 AWG

Gray 4/6 slot	Gray 8/12 slot	ABB wiring duct code		Nominal duct size (mm)	Nominal duct size (inches)	Usable areas (mm ²)	Maximum number of wires according to AGW and cable section (mm ²)													
		White 4/6 slot	White 8/12 slot				18 0.82	16 1.3	14 2.1	12 3.3	10 5.3	8 8.4	6 13.3	4 21.2	3 26.7	2 33.6	1 42.4			
05119	05019	1SL5119A00	1SL5019A00	15x17	1/2x5/8	110	67	42	26	16	10	6	4	2	2	1	1			
05133	05033	1SL5133A00	1SL5033A00	25x30	1x1 1/4	490	298	188	116	74	46	29	18	11	9	7	5			
05135	05035	1SL5135A00	1SL5035A00	40X30	1 1/2X1 1/4	890	542	342	211	134	83	52	33	20	16	13	10			
05137	05037	1SL5137A00	1SL5037A00	60x30	2 1/4X1 1/4	1430	871	550	340	216	134	85	53	33	26	21	16			
05143	05043	1SL5143A00	1SL5043A00	25X40	1X1 1/2	710	432	273	169	107	66	42	26	16	13	10	8			
05145	05045	1SL5145A00	1SL5045A00	40x40	1 1/2x1 1/2	1260	768	484	300	190	118	75	47	29	23	18	14			
05147	05047	1SL5147A00	1SL5047A00	60x40	2 1/4x1 1/2	2000	1219	769	476	303	188	119	75	47	37	29	23			
05149	05049	1SL5149A00	1SL5049A00	80X40	3X1 1/2	2710	1652	1042	645	410	255	161	101	63	50	40	31			
05151	05051	1SL5151A00	1SL5051A00	100X40	4X1 1/2	3460	2109	1330	823	524	326	205	130	81	64	51	40			
05153	05053	1SL5153A00	1SL5053A00	120X40	4 3/4X1 1/2	4200	2560	1615	1000	636	396	250	157	99	78	62	49			
05163	05063	1SL5163A00	1SL5063A00	25X60	1 X 2 1/4	1120	682	430	266	169	105	66	42	26	20	16	13			
05165	05065	1SL5165A00	1SL5065A00	40X60	1 1/2X2 1/4	1970	1201	757	469	298	185	117	74	46	36	29	23			
05167	05067	1SL5167A00	1SL5067A00	60X60	2 1/4X2 1/4	3060	1865	1176	728	463	288	182	115	72	57	45	36			
05169	05069	1SL5169A00	1SL5069A00	80X60	3X2 1/4	4190	2554	1611	997	634	395	249	157	98	78	62	49			
05171	05071	1SL5171A00	1SL5071A00	100X60	4X2 1/4	5320	3243	2046	1266	806	501	316	200	125	99	79	62			
05173	05073	1SL5173A00	1SL5073A00	120X60	4 3/4X2 1/4	6330	3859	2434	1507	959	597	376	237	149	118	94	74			
05183	05083	1SL5183A00	1SL5083A00	25X80	1X3	1540	939	592	366	233	145	91	57	36	28	22	18			
05185	05085	1SL5185A00	1SL5085A00	40X80	1 1/2X3	2670	1628	1026	635	404	251	158	100	62	50	39	31			
05187	05087	1SL5187A00	1SL5087A00	60X80	2 1/4X3	4140	2524	1592	985	627	390	246	155	97	77	61	48			
05189	05089	1SL5189A00	1SL5089A00	80X80	3X3	5650	3445	2173	1345	856	533	336	212	133	105	84	66			
05191	05091	1SL5191A00	1SL5091A00	100X80	4X3	7170	4371	2757	1707	1086	676	426	269	169	134	106	84			
05193	05093	1SL5193A00	1SL5093A00	120X80	4 3/4X3	8570	5225	3296	2040	1298	808	510	322	202	160	127	101			
05194	05094	1SL5194A00	1SL5094A00	25X100	1X4	1970	1201	757	469	298	185	117	74	46	36	29	23			
05195	05095	1SL5195A00	1SL5095A00	40X100	1 1/2X4	3410	2079	1311	811	516	321	202	128	80	63	50	40			
05196	05096	1SL5196A00	1SL5096A00	60X100	2 1/4X4	5300	3231	2038	1261	803	500	315	199	125	99	78	62			
05197	05097	1SL5197A00	1SL5097A00	80X100	3X4	7190	4384	2765	1711	1089	678	427	270	169	134	106	84			
05198	05098	1SL5198A00	1SL5098A00	100X100	4X4	9110	5554	3503	2169	1380	859	542	342	214	170	135	107			
05199	05099	1SL5199A00	1SL5099A00	150X100	6X4	13,740	8378	5284	3271	2081	1296	817	516	324	257	204	162			

1/0 - 750 AWG

13

Gray 4/6 slot	Gray 8/12 slot	ABB wiring duct code		Nominal duct size (mm)	Nominal duct size (inches)	Usable areas (mm ²)	Maximum number of wires according to AGW and cable section (mm ²)													
		White 4/6 slot	White 8/12 slot				1/0 53.5	2/0 67.4	3/0 85	4/0 107.2	250 127	300 152	350 177	400 203	500 253	600 304	750 380			
05119	05019	1SL5119A00	1SL5019A00	15x17	1/2x5/8	110	1	0	0	0	0	0	0	0	0	0	0			
05133	05033	1SL5133A00	1SL5033A00	25x30	1x1 1/4	490	4	3	2	2	1	1	1	1	0	0	0			
05135	05035	1SL5135A00	1SL5035A00	40X30	1 1/2X1 1/4	890	8	6	5	4	3	2	2	2	1	1	1			
05137	05037	1SL5137A00	1SL5037A00	60x30	2 1/4X1 1/4	1430	13	10	8	6	5	4	4	3	2	2	1			
05143	05043	1SL5143A00	1SL5043A00	25X40	1X1 1/2	710	6	5	4	3	2	2	2	1	1	1	0			
05145	05045	1SL5145A00	1SL5045A00	40x40	1 1/2x1 1/2	1260	11	9	7	5	4	4	3	3	2	2	1			
05147	05047	1SL5147A00	1SL5047A00	60x40	2 1/4x1 1/2	2000	18	14	11	9	7	6	5	4	3	3	2			
05149	05049	1SL5149A00	1SL5049A00	80X40	3X1 1/2	2710	25	20	15	12	10	8	7	6	5	4	3			
05151	05051	1SL5151A00	1SL5051A00	100X40	4X1 1/2	3460	32	25	20	16	13	11	9	8	6	5	4			
05153	05053	1SL5153A00	1SL5053A00	120X40	4 3/4X1 1/2	4200	39	31	24	19	16	13	11	10	8	6	5			
05163	05063	1SL5163A00	1SL5063A00	25X60	1 X 2 1/4	1120	10	8	6	5	4	3	3	2	2	1	1			
05165	05065	1SL5165A00	1SL5065A00	40X60	1 1/2X2 1/4	1970	18	14	11	9	7	6	5	4	3	3	2			
05167	05067	1SL5167A00	1SL5067A00	60X60	2 1/4X2 1/4	3060	28	22	18	14	12	10	8	7	6	5	4			
05169	05069	1SL5169A00	1SL5069A00	80X60	3X2 1/4	4190	39	31	24	19	16	13	11	10	8	6	5			
05171	05071	1SL5171A00	1SL5071A00	100X60	4X2 1/4	5320	49	39	31	24	20	17	15	13	10	8	7			
05173	05073	1SL5173A00	1SL5073A00	120X60	4 3/4X2 1/4	6330	59	46	37	29	24	20	17	15	12	10	8			
05183	05083	1SL5183A00	1SL5083A00	25X80	1X3	1540	14	11	9	7	6	5	4	3	3	2	2			
05185	05085	1SL5185A00	1SL5085A00	40X80	1 1/2X3	2670	24	19	15	12	10	8	7	6	5	4	3			
05187	05087	1SL5187A00	1SL5087A00	60X80	2 1/4X3	4140	38	30	24	19	16	13	11	10	8	6	5			
05189	05089	1SL5189A00	1SL5089A00	80X80	3X3	5650	52	41	33	26	22	18	15	13	11	9	7			
05191	05091	1SL5191A00	1SL5091A00	100X80	4X3	7170	67	53	42	33	28	23	20	17	14	11	9			
05193	05093	1SL5193A00	1SL5093A00	120X80	4 3/4X3	8570	80	63	50	39	33	28	24	21	16	14	11			
05194	05094	1SL5194A00	1SL5094A00	25X100	1X4	1970	18	14	11	9	7	6	5	4	3	3	2			
05195	05095	1SL5195A00	1SL5095A00	40X100	1 1/2X4	3410	31	25	20	15	13	11	9	8	6	5	4			
05196	05096	1SL5196A00	1SL5096A00	60X100	2 1/4X4	5300	49	39	31	24	20	17	14	13	10	8	6			
05197	05097	1SL5197A00	1SL5097A00	80X100	3X4	7190	67	53	42	33	28	23	20	17	14	11	9			
05198	05098	1SL5198A00	1SL5098A00	100X100	4X4	9110	85	67	53	42	35	29	25	22	18	14	11			
05199	05099	1SL5199A00	1SL5099A00	150X100	6X4	13,740	128	101	80	64	54	45	38	33	27	22	18			

Wiring duct

Technical data

Wire capacity, 800 - 1000 AWG

800 - 1000 AWG

Gray 4/6 slot	Gray 8/12 slot	ABB wiring duct code		Nominal duct size (mm)	Nominal duct size (inches)	Usable areas (mm ²)	Maximum number of wires according to AGW and cable section (mm ²)	
		White 4/6 slot	White 8/12 slot				800 405	1000 508
05119	05019	1SL5119A00	1SL5019A00	15x17	1/2x5/8	110	0	0
05133	05033	1SL5133A00	1SL5033A00	25x30	1x1 1/4	490	0	0
05135	05035	1SL5135A00	1SL5035A00	40X30	1 1/2X1 1/4	890	1	0
05137	05037	1SL5137A00	1SL5037A00	60x30	2 1/4x1 1/4	1430	1	1
05143	05043	1SL5143A00	1SL5043A00	25X40	1X1 1/2	710	0	0
05145	05045	1SL5145A00	1SL5045A00	40x40	1 1/2x1 1/2	1260	1	1
05147	05047	1SL5147A00	1SL5047A00	60x40	2 1/4x1 1/2	2000	2	1
05149	05049	1SL5149A00	1SL5049A00	80X40	3X1 1/2	2710	3	2
05151	05051	1SL5151A00	1SL5051A00	100X40	4X1 1/2	3460	4	3
05153	05053	1SL5153A00	1SL5053A00	120X40	4 3/4X1 1/2	4200	5	4
05163	05063	1SL5163A00	1SL5063A00	25X60	1 X 2 1/4	1120	1	1
05165	05065	1SL5165A00	1SL5065A00	40X60	1 1/2X2 1/4	1970	2	1
05167	05067	1SL5167A00	1SL5067A00	60X60	2 1/4X2 1/4	3060	3	3
05169	05069	1SL5169A00	1SL5069A00	80X60	3X2 1/4	4190	5	4
05171	05071	1SL5171A00	1SL5071A00	100X60	4X2 1/4	5320	6	5
05173	05073	1SL5173A00	1SL5073A00	120X60	4 3/4X2 1/4	6330	7	6
05183	05083	1SL5183A00	1SL5083A00	25X80	1X3	1540	1	1
05185	05085	1SL5185A00	1SL5085A00	40X80	1 1/2X3	2670	3	2
05187	05087	1SL5187A00	1SL5087A00	60X80	2 1/4X3	4140	5	4
05189	05089	1SL5189A00	1SL5089A00	80X80	3X3	5650	6	5
05191	05091	1SL5191A00	1SL5091A00	100X80	4X3	7170	8	7
05193	05093	1SL5193A00	1SL5093A00	120X80	4 3/4X3	8570	10	8
05194	05094	1SL5194A00	1SL5094A00	25X100	1X4	1970	2	1
05195	05095	1SL5195A00	1SL5095A00	40X100	1 1/2X4	3410	4	3
05196	05096	1SL5196A00	1SL5096A00	60X100	2 1/4X4	5300	6	5
05197	05097	1SL5197A00	1SL5097A00	80X100	3X4	7190	8	7
05198	05098	1SL5198A00	1SL5098A00	100X100	4X4	9110	11	8
05199	05099	1SL5199A00	1SL5099A00	150X100	6X4	13,740	16	13

Wiring duct Technical data

- Gray color — RAL 7030
- White color — RAL 9016
- Plastic insulating, shock-proof, self-extinguishing material in compliance with UL 94 VO Standard and resistant to abnormal heat and fire up to 960° (glow wire test) in compliance with IEC 695-2-1 Standard. UL File # E125800
- Minimum storage/transport temperature -5°C
- Minimum installation and usage temperature -15°C
- Maximum usage temperature +60°C.
- Resistance to acids, oils and greases
- No burr, rounded-off inner edges
- New rib profile makes it easy to open and close the cover and guarantees that it clips on more safely
- Designed to snap onto the Fix-O-rapid special accessory, suitable to be fastened both to DIN rail and base plate
- The ribs are cut using a special pressing process (rounding of the edges) producing wiring ducts completely free of burr and rough edges
- The dimensions and resilience of the ribs ensure repeated splaying during cabling
- Controlled splaying of sides to ensure a perfect seal of the cover in the vertical sections and at high temperatures
- Double trimming line, one at the base of the ribs so that they can be removed by bending them outwards, and one at the base of the lateral sides so that the edge can be cut when two wiring ducts are branched
- Cable holder moldings half-way up the straight section of the ribs in 80 and 100 mm high wiring ducts
- Cover can be opened without having to use a special tool
- Can be mounted on horizontal or vertical surfaces even when the cover is on the bottom
- Standard 2 meter length
- Industrial application

Wiring duct

Technical data

Resistance to chemical agents

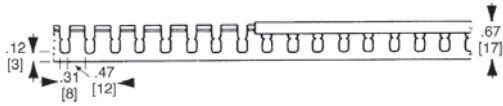
Chemical	Concentration	Temp. °C	Resistance	Chemical	Concentration	Temp. °C	Resistance
Acetic acid, hydrous	10%	50	①	Formic acid	100%	20	①
Acetic acid'	60%	50	①	Freon 12	—	20	①
Acetone	Traces	20	②	Gasoline	—	50	①
Acetone	100%	20	②	Glycerine, hydrous	—	50	①
Acqua regia	—	20	①	Hydrochloric acid	saturated	50	①
Ammonia concentrate	88%	50	①	Hydrogen	—	50	①
Ammonia, dry gas	100%	50	①	Linseed oil	—	50	①
Ammonia, liquid	100%	20	③	Lubricating oils	—	50	①
Aniline, pure	100%	20	②	Mineral oil	—	50	①
Arsenic acid, hydrous	concentrated	20	①	Molasses	—	20	④
Barium hydroxide, hydr.	—	50	①	Oils and fats	commercial	50	①
Beer	commercial	20	①	Oil of turpentine	commercial	20	①
Benzene	—	20	②	Ozone	—	20	①
Benzoic acid	—	20	③	Paraffin wax	—	50	①
Borax, hydrous	thinned	50	①	Photographic developer	commercial	50	①
Boric acid, hydrous	thinned	50	①	Photographic emulsions	—	50	①
Brandy	commercial	20	①	Potassium permanganate	6%	20	①
Bromide liquid	—	20	②	Propane, liquid	—	20	①
Butane gaseous	—	20	①	Salicylic acid	—	50	①
Butadiene	50%	50	①	Sea water	—	50	①
Butanol	—	20	①	Soda, hydrous	saturated	50	①
Butyric acid, hydrous	20%	20	①	Sodium chloride	thinned	50	①
Calcium chloride	—	50	①	Spirits, all types	—	20	①
Camphor oil	—	20	①	Sulphur	—	50	①
Carbon tetrachloride	—	20	③	Sulphuric acid, hydrous	40%	50	①
Chlorine gaseous, dry	100%	20	①	Tannic acid	—	50	①
Chlorine gaseous, moist	20%	20	③	Tetrahydrofuran	—	20	②
Chlorine water	saturated	20	③	Toluene	—	20	②
Chromic acid, hydrous	—	50	①	Urea, hydrous	—	50	①
Citric acid, hydrous	—	50	①	Urine	—	50	①
Copper sulphate, hydrous	thinned	50	①	Vinegar	commercial	50	①
Diesel oil	—	20	①	Water	—	50	①
Ethyl-alcohol	100% (in water)	20	①	Wines, red & white	commercial	20	①
Formaldehyde, hydrous	40%	50	①	Zinc sulphate, hydrous	thinned	50	①

① Resistant
 ② Not sufficiently resistant
 ③ Resistant in certain conditions
 ④ Resistance to this product has been determined from the resistance to chemical products of similar composition

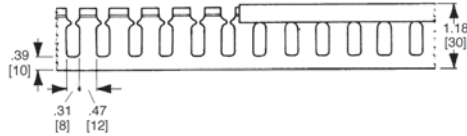
Wiring duct Approximate dimensions

00.00 — Inches
00.00 — [Millimeters]

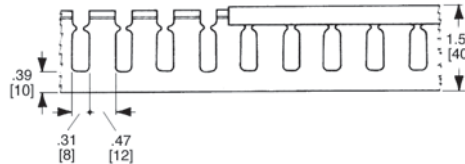
.31 – .47" [8-12 mm] slot
.87" [17 mm] height



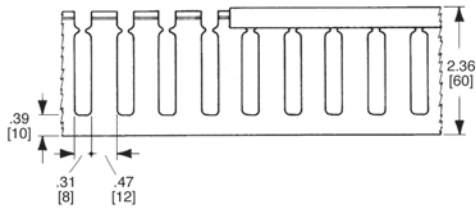
1.18" [30 mm] height



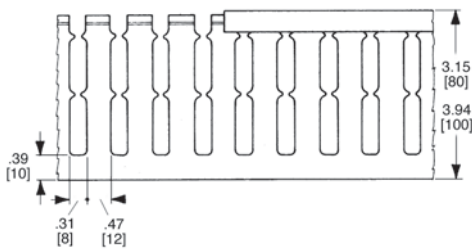
1.57" [40 mm] height



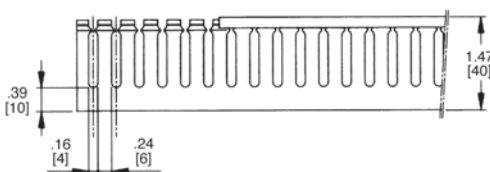
2.36" [60 mm] height



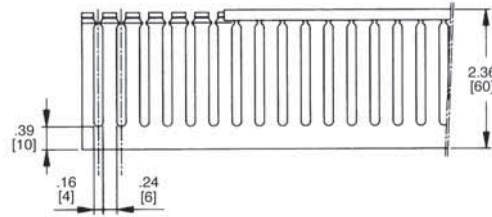
3.15", 3.94" [80 mm, 100 mm] height



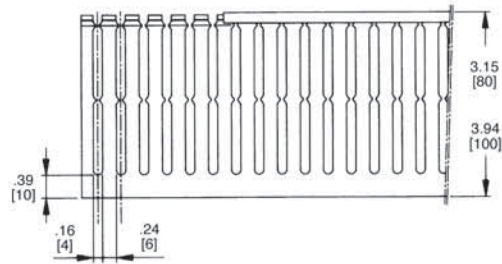
.16 – .24" [4 – 6 mm] slot
1.47" [40 mm] height



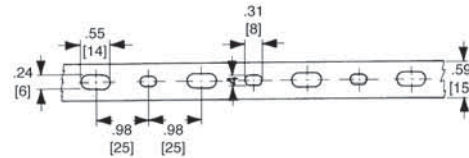
2.36" [60 mm] height



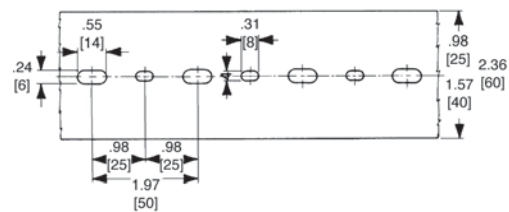
3.15", 3.94" [80 mm, 100 mm] height



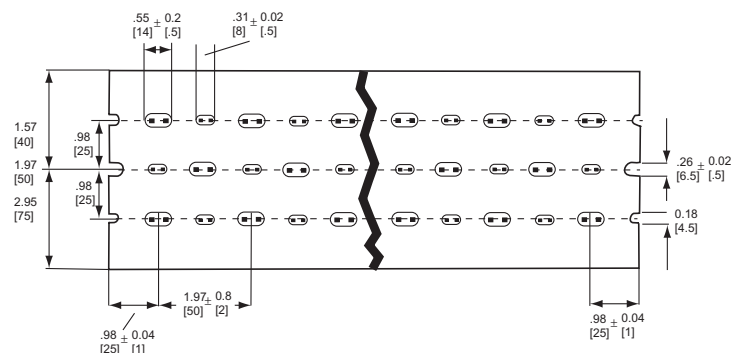
.16 – .24" [4 – 6 mm] & .31 – .47" [8 – 12 mm] spacing
.59" [15 mm] width

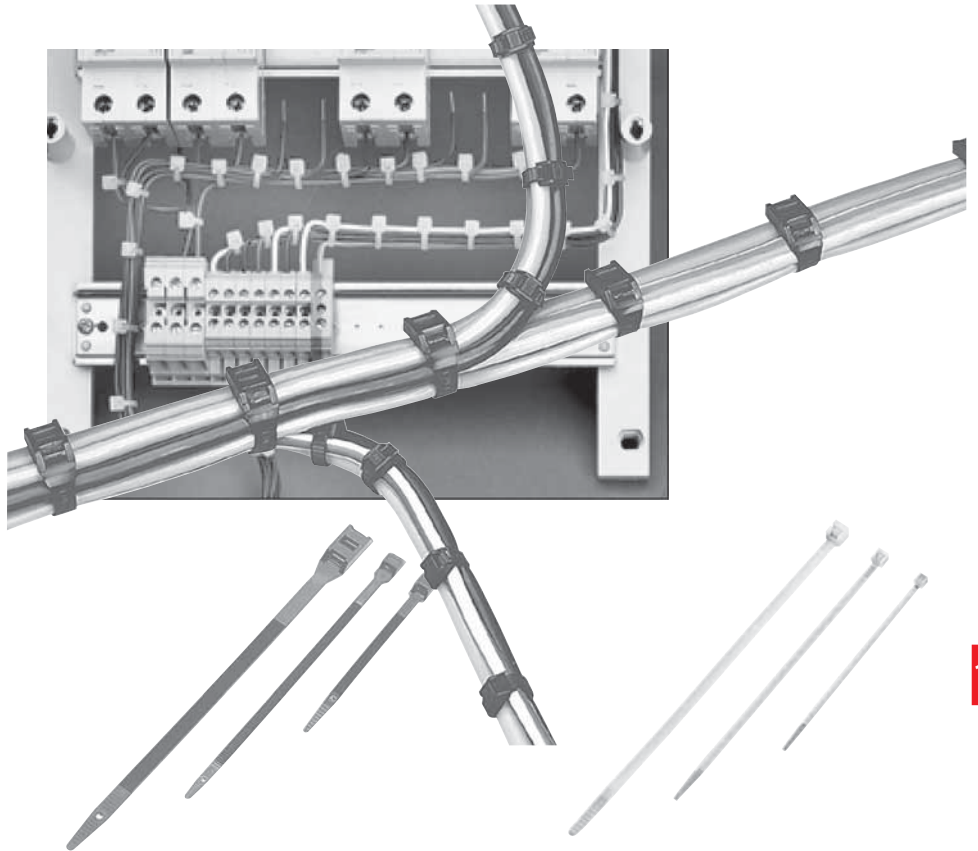


.98", 1.57", 2.36" [25, 40, 60 mm] width



1.57", 1.97", 2.95" [80, 100, 150 mm] width





Features

- Easy to install and remove.
- Provides protection to the wire bundle.
- Available in white and black

Applications

- Fast and economical grouping of wire bundles.
- Joining groups of wires and/or tubing.
- Flexible connections between door and panel

Cable ties



Sample cable tie installations



White 6/6 polyamide cable ties



Black 6/6 polyamide cable ties



Black 12 polyamide cable ties

Cable ties

Item L x W ②	Minimum tensile strength (lbs.)	Pieces per ① package	Catalog number ①	List price per package	
White (6/6 polyamide)					
3.94" (100 mm) x .10" (2.5 mm)	24	100	18010	\$ 6.50	
5.31" (135 mm) x .10" (2.5 mm)	24		18011	7.00	
6.30" (160 mm) x .10" (2.5 mm)	24		18013	8.00	
5.51" (140 mm) x .14" (3.5 mm)	44		18012	8.00	
7.87" (200 mm) x .14" (3.5 mm)	44		18014	9.00	
11.02" (280 mm) x .14" (3.5 mm)	44		18017	12.00	
7.09" (180 mm) x .17" (4.5 mm)	61		18015	10.25	
11.02" (280 mm) x .17" (4.5 mm)	61		18018	19.00	
14.17" (360 mm) x .17" (4.5 mm)	61		18020	23.00	
7.87" (200 mm) x .30" (7.5 mm)	143		18024	22.00	
11.02" (280 mm) x .30" (7.5 mm)	143		18026	28.00	
14.17" (360 mm) x .30" (7.5 mm)	143		18028	34.00	
16.92" (430 mm) x .35" (9 mm)	176		18034	46.00	
21.65" (550 mm) x .35" (9 mm)	176		18036	55.00	
30.71" (780 mm) x .35" (9 mm)	176		18038	75.00	
White (6/6 bulk)					
3.94" (100 mm) x .10" (2.5 mm)	24		1000	18060	55.00
5.31" (135 mm) x .10" (2.5 mm)	24			18061	60.00
6.30" (160 mm) x .10" (2.5 mm)	24	18063		70.00	
5.51" (140 mm) x .14" (3.5 mm)	44	18062		70.00	
7.87" (200 mm) x .14" (3.5 mm)	44	18064		80.00	
Black (6/6 polyamide)					
3.94" (100 mm) x .10" (2.5 mm)	24	100	18110	6.75	
5.31" (135 mm) x .10" (2.5 mm)	24		18111	7.25	
6.30" (160 mm) x .10" (2.5 mm)	24		18113	8.50	
5.51" (140 mm) x .14" (3.5 mm)	44		18112	8.25	
7.87" (200 mm) x .14" (3.5 mm)	44		18114	9.50	
11.02" (280 mm) x .14" (3.5 mm)	44		18117	13.00	
7.09" (180 mm) x .17" (4.5 mm)	61		18115	10.75	
11.02" (280 mm) x .17" (4.5 mm)	61		18118	20.50	
14.17" (360 mm) x .17" (4.5 mm)	61		18120	25.00	
7.87" (200 mm) x .30" (7.5 mm)	143		18124	24.00	
11.02" (280 mm) x .30" (7.5 mm)	143		18126	31.00	
14.17" (360 mm) x .30" (7.5 mm)	143		18128	37.00	
16.92" (430 mm) x .35" (9 mm)	176		18134	48.00	
21.65" (550 mm) x .35" (9 mm)	176		18136	57.00	
30.71" (780 mm) x .35" (9 mm)	176		18138	77.00	
Black (6/6 bulk)					
3.94" (100 mm) x .10" (2.5 mm)	24		1000	18160	57.00
5.31" (135 mm) x .10" (2.5 mm)	24			18161	63.00
6.30" (160 mm) x .10" (2.5 mm)	24	18163		77.00	
5.51" (140 mm) x .14" (3.5 mm)	44	18162		77.00	
7.87" (200 mm) x .14" (3.5 mm)	44	18164		85.00	
Black (12 polyamide)					
4.53" (115 mm) x .24" (6 mm)	55	100	18210	21.00	
6.89" (175 mm) x .24" (6 mm)	55		18212	24.00	
4.53" (115 mm) x .35" (9 mm)	88		18218	32.00	
7.09" (180 mm) x .35" (9 mm)	110		18220	36.00	
10.43" (265 mm) x .35" (9 mm)	110		18222	42.00	
14.17" (360 mm) x .35" (9 mm)	110		18224	55.00	

① Sold in package quantity only.

② 25.4mm = 1 inch

Cable ties Accessories

Cable tie accessories



18250



18252



18270



18280



18282



18290

Item	Pieces per package ①	Catalog number ①	List price per package
Self-adhesive base for cable ties (clear)	50	18250	\$ 18.00
Self-adhesive base for cable ties (black)	50	18251	18.00
Screw mounted base for cable ties (clear)	100	18252	14.00
Screw mounted base for cable ties (black)	100	18253	14.00
Cable tie cutter	1	18270	150.00
Screw mounted base for cable ties	25	18280	13.00
Push-in base for cable ties	25	18282	20.00
Outer cable tie cutter	1	18290	80.00

① Sold in package quantity only.

Cable ties

Technical data & approximate dimensions

General features

- Manufactured in 6/6 nylon: Colorless for general uses
- Better stored at mild temperatures, away from heat and excessively dry conditions
- Black cable ties are UV resistant; excellent for outdoor applications

Thermal properties

- Suitable for use at temperatures from -40° to +110°C
- Softening point VICAT VST/B/50-DIN 53460 over 200°C

Electrical characteristics






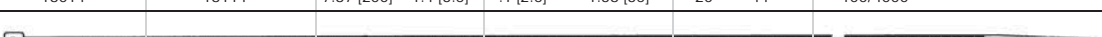
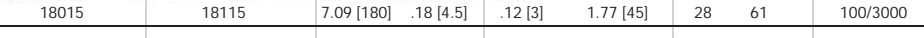
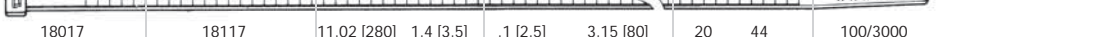

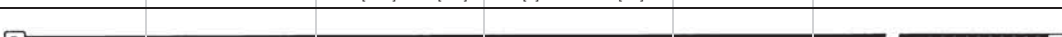
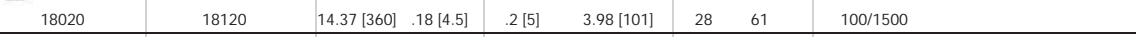

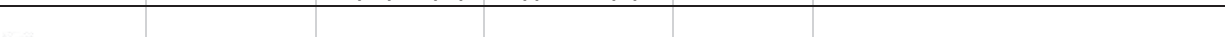
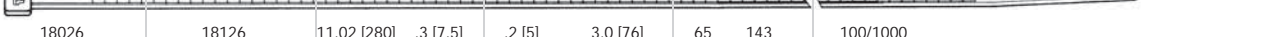

- Dielectric endurance 50,000 V/mm

Chemical characteristics

- Good resistance to bases, oil, grease, hydrocarbons, acetone, chlorales
- Limited concentrated acid resistance
- Dissolved by phenol and formic acid

Mechanical characteristics

- Bending point DIN 53452 110 M Pa
- Load point DIN 53457 2800 M Pa
- Resilience DIN 53453 6-8 KJ/m²
- Yield point DIN 53456 80 M Pa
- Stretch point DIN 53455 35%
- Hardness DIN 53456 125 N/mm²

White polyamide Catalog number	Black polyamide Catalog number	Size		Tightening diameter		Minimum tightness		Pcs Unit/pack
		L in [mm]	D in [mm]	Minimum in [mm]	Maximum in [mm]	(N)	(lbs.)	
 18010	18110	3.94 [100]	.1 [2.5]	.08 [2]	.94 [24]	11	24	100/8000
 18013	18113	6.29 [160]	.1 [2.5]	.08 [2]	1.65 [42]	11	24	100/5000
 18012	18112	5.51 [140]	.14 [3.5]	.1 [2.5]	1.42 [36]	20	44	100/5000
 18011	18111	5.31 [135]	.1 [2.5]	.08 [2]	1.38 [35]	11	24	100/6000
 18014	18114	7.87 [200]	1.4 [3.5]	.1 [2.5]	1.38 [35]	20	44	100/4000
 18015	18115	7.09 [180]	.18 [4.5]	.12 [3]	1.77 [45]	28	61	100/3000
 18017	18117	11.02 [280]	1.4 [3.5]	.1 [2.5]	3.15 [80]	20	44	100/3000
 18018	18118	11.02 [280]	.18 [4.5]	.2 [5]	3.0 [76]	28	61	100/2500
 18020	18120	14.37 [360]	.18 [4.5]	.2 [5]	3.98 [101]	28	61	100/1500
 18024	18124	7.87 [200]	.3 [7.5]	.2 [5]	2 [51]	65	143	100/2000
 18026	18126	11.02 [280]	.3 [7.5]	.2 [5]	3.0 [76]	65	143	100/1000
 18034	18134	16.93 [430]	.35 [9.0]	.2 [5.0]	4.33 [110]	80	176	100/2000
 18036	18136	21.65 [550]	.35 [9.0]	.2 [5.0]	5.51 [140]	80	176	100/2000
 18038	18138	30.71 [780]	.35 [9.0]	.2 [5.0]	7.48 [190]	80	176	100/800
 18028	18128	14.17 [360]	.3 [7.5]	.2 [5.0]	4.02 [102]	65	143	100/2000

Cable ties

Technical data & approximate dimensions

General features

- Manufactured in 12 nylon
- Moisture absorption less than 1%
- Black cable ties are UV resistant; excellent for outdoor applications

Thermal properties

- Suitable for use at temperatures from -30° to +80°C
- Softening point VICAT VST/B/50-DIN 53460 over 160°C

Electrical characteristics

- Dielectric endurance 28,000 V/mm

Chemical characteristics

- Good resistance to bases, oil, grease, hydrocarbons, acetone, chlorales
- Limited resistance to nitric and chromic acid

Mechanical characteristics

- Bending point DIN 53452 20 M Pa
- Load point DIN 53457 420 M Pa
- Breaking load point DIN 53455 61 M Pa
- Resilience 20°C DIN 53453 KJ/m not broken
- Yield point DIN 53456 24 M Pa
- Stretch point DIN 53455 37%
- Hardness G2 Shore D

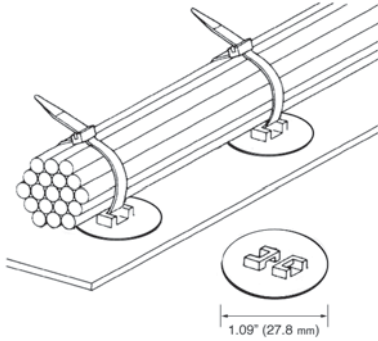
Black polyamide Catalog number	Size		Tightening diameter		Minimum tightness		Pcs Unit/pack
	L In [mm]	D in [mm]	Minimum in [mm]	Maximum in [mm]	(N)	(lbs.)	
18210	4.53 [115]	.24 [6]	.2 [5]	.79 [20]	25	55	100/3000
18212	6.89 [175]	.24 [6]	.39 [10]	1.57 [40]	25	55	100/2000
18218	4.53 [115]	.35 [9]	.2 [5]	.79 [20]	40	88	100/2000
18220	7.09 [180]	.35 [9]	.39 [10]	1.77 [45]	50	110	100/2000
18222	10.43 [265]	.35 [9]	.59 [15]	2.75 [70]	50	110	100/1000
18224	14.17 [360]	.35 [9]	.98 [25]	3.94 [100]	50	110	100/800

Cable ties

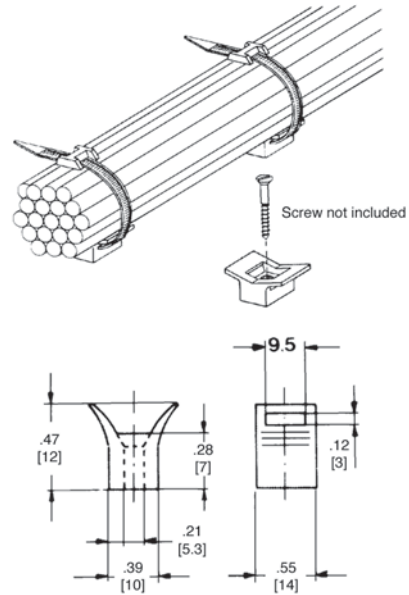
Approximate dimensions

00.00 Inches
00.00 [Millimeters]

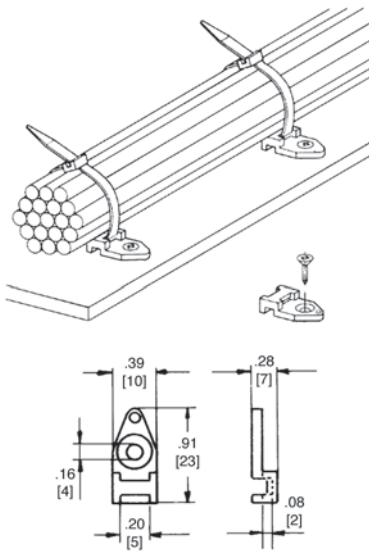
18250 & 18251
Self-adhesive base for cable ties



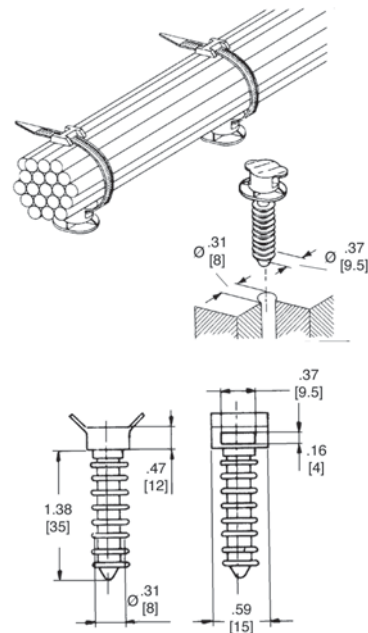
18280
Screw-mounted base for cable ties



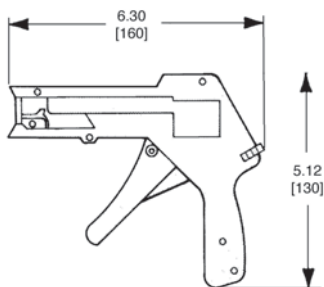
18252 & 18253
Screw-mounted base for cable ties



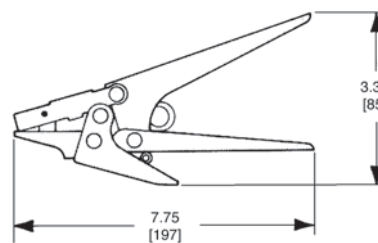
18282
Push-in base for cable ties



18270
Cable tie cutter



18270
Cable tie cutter





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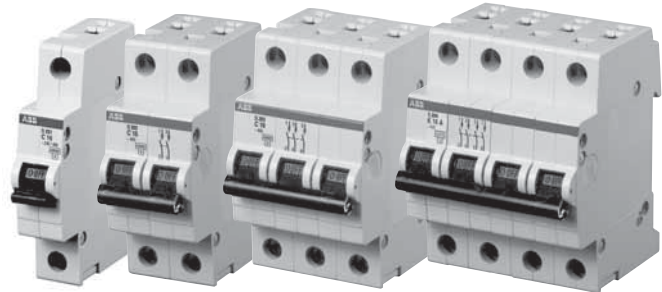
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S200 Miniature circuit breakers



**System pro M compact
Miniature circuit breakers
S200, S200P, S200U, S200UP**



Description

The S2 Series of miniature circuit breakers offer a compact solution to protection requirements. The S2 devices are current limiting, DIN rail mounted and can offer a good equivalent to fused systems.

The S2 is available with application-specific trip characteristics to provide maximum circuit protection. The breakers offer thermal-magnetic trip protection according to B, C, D, K and Z characteristics.

For the worldwide market, the breakers carry UL, CSA, IEC, CE and many other agency approvals and certifications.

Features

- Current limiting
- Fast breaking time (2.5 – 3.5 msec)
- Unique bus connection system
- Wide range of accessories
- Available with variable depth handle mechanism
- Optional Z curve for SCR protection
- CE certified and marked
- DIN rail or front panel mounting
- Finger safe terminals
- Multi-function terminals
- Suitable for reverse feed
- 480Y/277VAC and 500VDC versions
- **UL489 Listed - branch circuit protective device. UL file # E212323**
- **UL1077 Recognized - supplemental protective device. UL file # E76126**

**UL Approved Miniature Molded
Case Circuit Breakers and
Supplemental Protectors**

General information

Miniature circuit breakers (MCBs) are used throughout the world in all types of electrical installations. ABB MCBs are approved for use by Underwriters Laboratories in systems rated up to 600VAC/VDC. Devices are also certified per CSA.

MCBs are approved per IEC-898 and VDE 0641, and certified under IEC-947 and VDE 0660 standards for use in systems rated up to 690VAC.

MCBs can be applied to 16 2/3Hz – 400Hz and DC power systems.

Special direct current version MCBs include a permanent magnet for DC fault current interruption. These "UC" versions are rated 250/500VDC under UL1077/CSA 22.2 No. 235.

Continuous current ratings are as low as 0.2 amperes and up to 125 amperes maximum.

MCBs are of compact size and can be quickly mounted on standard 35mm DIN rail or can be front mounted by use of a front mounting kit.

MCBs include line and load side terminals for conductors from 18 through 4AWG (0.75 – 25mm²) for 63 amperes.

MCBs can also be connected via busbar conductors which can be either upper or lower mounted for top feed or bottom feed. Dual function terminals allow busbars to be connected with main incoming line conductors without separate lugs.

Accessories

Auxiliary devices can be added to the, S200 series MCBs:

- Shunt trips
- Auxiliary contacts
- Bell alarm contacts
- Aux/bell alarm contacts
- Undervoltage release

Accessory device modules can be field mounted to all above listed ABB MCBs. Auxiliary contacts are also available for the S500 series MCB.

Applications

MCBs can be used for equipment protection, in commercial appliances, protection of control circuits against overcurrent faults, computer equipment and other computer peripheral devices.

UL 489

S200U and S200UP MCBs are listed as molded case circuit breakers for use as branch circuit protective devices. Miniature MCCBs and accessories are listed under UL file E212323.

UL 1077

S200 and S200P MCBs are recognized as supplementary protectors and are intended for use as overcurrent protection within an appliance or other electrical equipment where branch circuit overcurrent protection is already provided or not required. MCBs and accessories are recognized under UL File E76126.

CSA C22.2

MCBs and accessories are certified under CSA C22.2 No. 235 per File LR98793.

Tripping characteristics

Time-current curves

ABB miniature circuit breakers are available with different trip characteristics, allowing for maximum system protection.

B Characteristic

Available with the S200 and S500 series has rated currents of 6 through 63 amperes in 10 steps. The "B" time-current curve is designed primarily for use in cable protection applications. Instantaneous tripping occurs between approximately 3 to 5 times rated current in 50/60Hz systems. This quick trip curve maximizes protection of control circuits under low short circuit fault levels that could damage control wiring.

C Characteristic

Available in the S200 and S500 series with rated currents up through 63 amperes and the S290 series with rated currents of 80, 100 and 125 amperes. The "C" time-current curve is designed for medium magnetic start-up currents. Instantaneous tripping occurs between 5 and 10 times rated current in 50/60 Hz systems.

D Characteristic

The new magnetic trip action has an instantaneous trip between 10 and 20 times the breaker rating. Thus, the S200 and S500-D can be a good protective solution for applications involving high in-rush transformers, motors and other high inductive systems. It is also suitable for any application where a high instantaneous trip point is desired.

K Characteristic

The "K" time-current characteristic considers high magnetic start-up currents from motors, transformers and other equipment. Instantaneous tripping occurs between 8 and 12 times rated current in 50/60Hz systems. The "K" characteristic is available up through 63 amperes.

The "K" curve offers the best protection for the broadest range of electrical systems. The higher magnetic trip settings maximizes protection while allowing for higher in-rush currents during system start-up. Available in S200P, S200U, S200UP and S500.

Z Characteristic

Also available up through 63 amperes, the "Z" characteristic offers instantaneous tripping between 2 and 3 times rated current in 50/60Hz systems. This trip characteristic is available in the S200P, S200U and S200UP series with both the 480Y/277VAC and 250/500VDC ratings.

Many applications require a very low short circuit trip setting in order to protect semiconductor or other sensitive devices and the "Z" trip characteristic may provide maximum protection and service in these applications.

General information

Interruption ratings

Trip characteristics overview

System pro M
S200 Series

Interruption ratings

Voltage	Rated interrupting capacity	Rated current	MCB type	Comment	
120 VAC	10kA	0.5 - 63A	S200-B,C,D		
		0.5 - 63A	S200-K		
		0.2 - 63A	S200P-K, Z		
	18kA	30kA	0.2 - 63A	S200U-K, Z	
			0.2 - 25A	S200UP-K, Z	
			32 - 63A	S500-B,C,D	
			26 - 45A	S500-K	
			6 - 25A	S500-B,C,D	
			0.15 - 25A	S500-K	
240 VAC	6kA	0.5 - 63A	S200-B,C,D	Single pole	
		0.5 - 63A	S200-K	Single pole	
		0.5 - 63A	S200-K	Multi pole	
	10kA	0.5 - 63A	S200-B,C,D	Multi pole	
		0.5 - 63A	S200-K	Multi pole	
		0.2 - 63A	S200P-K,Z	Single pole	
		0.2 - 63A	S200P-K,Z	Multi pole	
		0.2 - 63A	S200U-K,Z	Single pole	
		0.2 - 63A	S200U-K,Z	Multi pole	
	18kA	30kA	0.2 - 25A	S200UP-K,Z	Single pole
			0.2 - 25A	S200UP-K,Z	Multi pole
			32 - 63A	S500-B,C,D	
			26 - 45A	S500-K	
			6 - 25A	S500-B,C,D	
			0.15 - 25A	S500-K	
277 VAC	6kA	0.5 - 63A	S200-B,C,D		
		0.5 - 63A	S200-K		
	10kA	0.2 - 63A	S200P-K,Z		
		0.2 - 25A	S200UP-K,Z		
480Y/277 VAC	6kA	0.5 - 63A	S200-B,C,D		
		0.5 - 63A	S200-K		
	10kA	0.2 - 63A	S200P-K,Z		
		0.2 - 25A	S200UP-K,Z		
60 VDC	10kA	0.5 - 63A	S200-B,C,D	Single pole	
		0.5 - 63A	S200-K	Single pole	
125 VDC	10kA	0.5 - 63A	S200-B,C,D	Multi pole	
		0.5 - 63A	S200-K	Multi pole	
		0.2 - 63A	S280UC-K,Z	Single pole	
250 VDC	4.5kA	0.2 - 63A	S280UC-K,Z	Single pole	
500 VDC	4.5kA	0.2 - 63A	S280UC-K,Z	Multi pole	

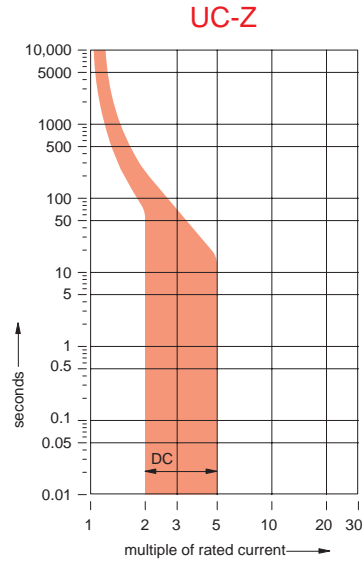
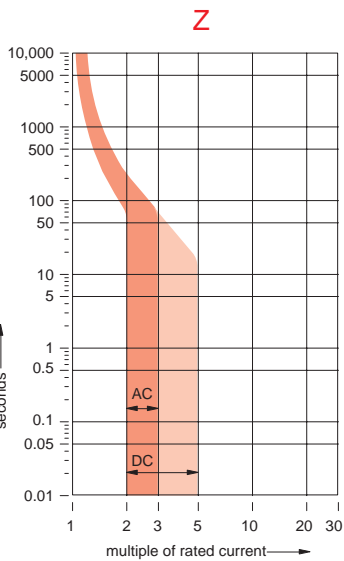
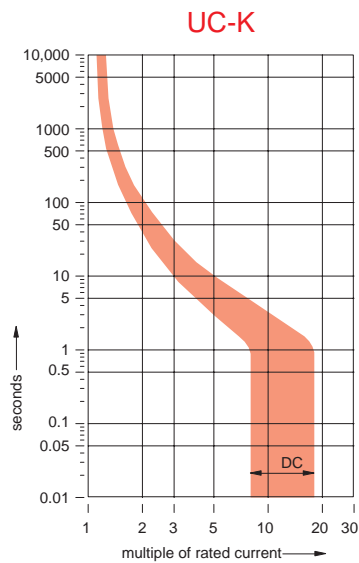
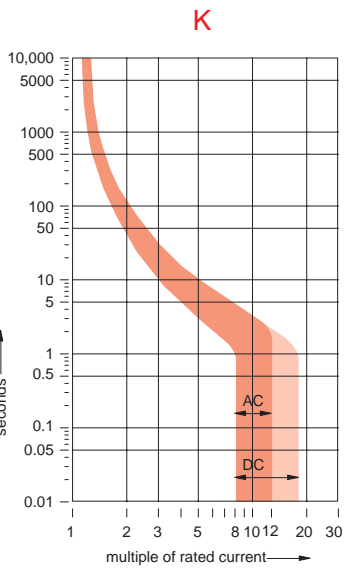
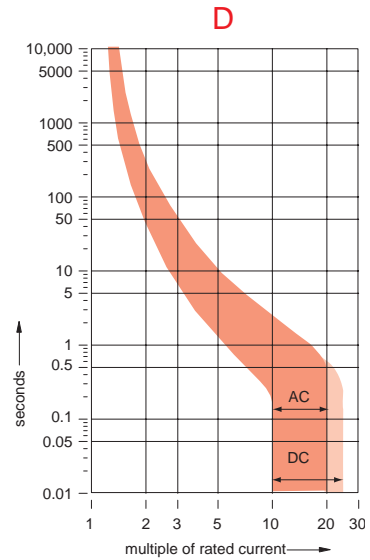
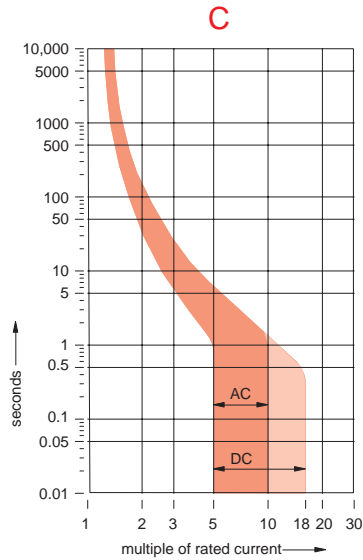
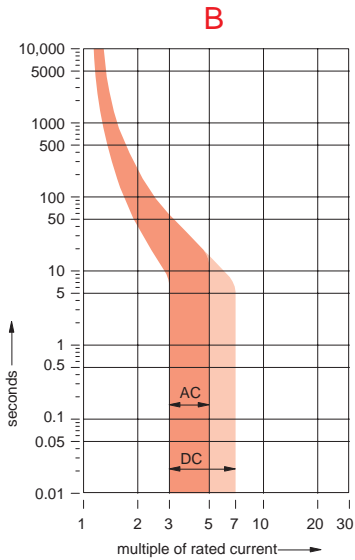
Trip characteristics overview

Curve	Magnetic characteristic ①	Thermal characteristic	Series
B	3 - 5X	1.13 1.45X	S200, S500
C	5 - 10X	1.13 1.45X	S200, S290, S500
D	10 - 20X	1.13 1.45X	S200, S500
K	8 - 12X	1.05 1.20X	S200, S500
Z	2 - 3X	1.05 1.20X	S200

① All values are relative to MCB's ampere rating.

General information

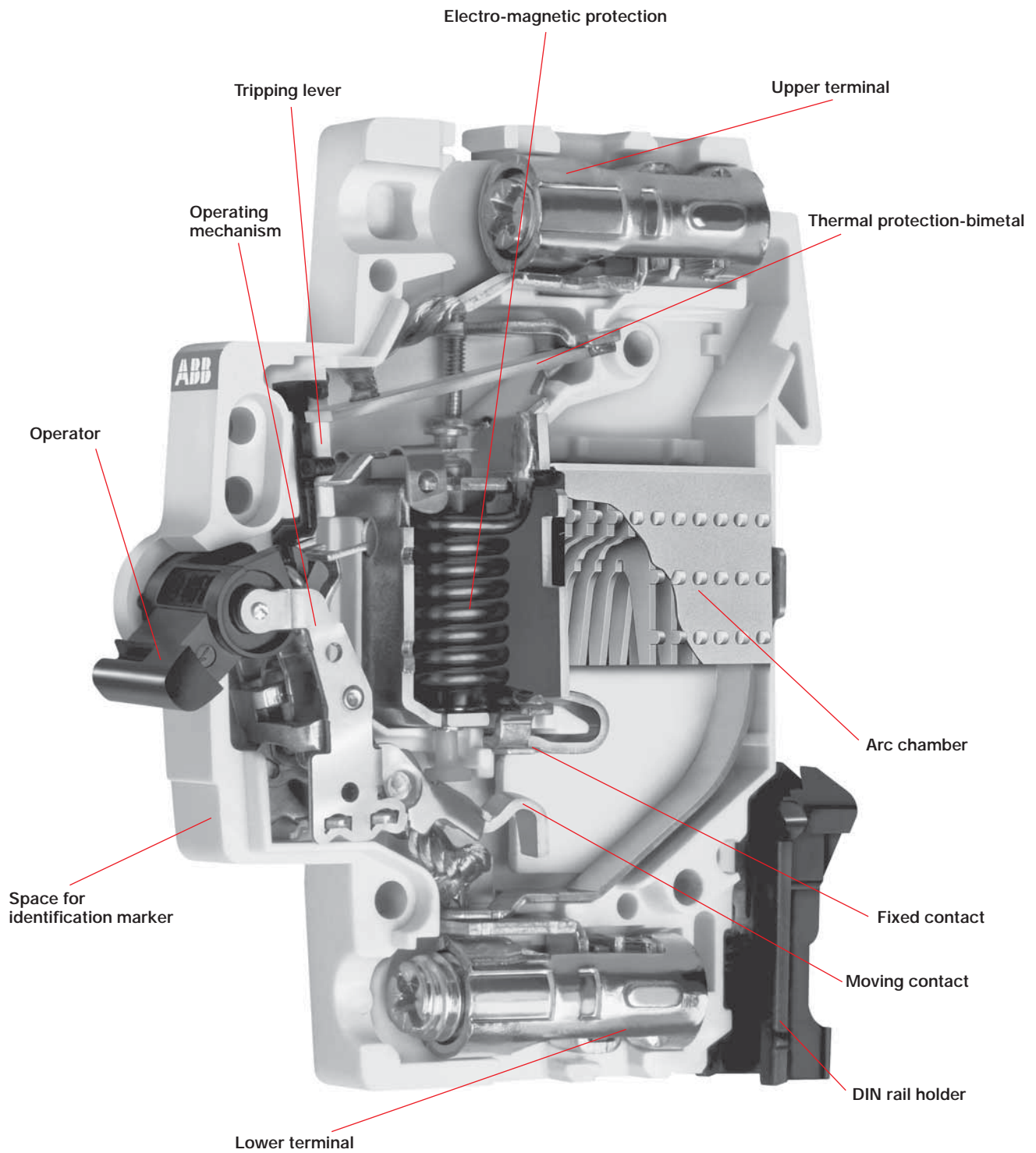
Tripping curves



General information

Construction details

System pro M
S200 Series



S200

480Y/277 VAC

Supplemental protectors

B UL 1077 CSA C22.2 No. 235
VDE 0641 IEC-898
Cable protection



S201-B, 1 pole



S202-B, 2 pole
S201-BNA, 1 P+N

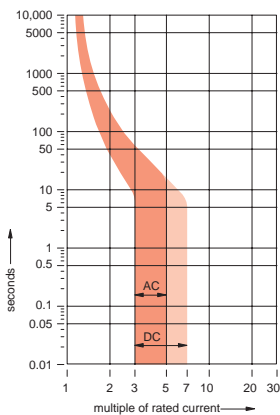


S203-B, 3 pole



S204-B, 4 pole
S203-BNA, 3P+N

B



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
6	S201-B6	\$ 36	A	10	4.5
10	S201-B10	36			
13	S201-B13	36			
16	S201-B16	36			
20	S201-B20	38			
25	S201-B25	38			
32	S201-B32	40			
40	S201-B40	42			
50	S201-B50	48			
63	S201-B63	56			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole + neutral					
6	S201-B6NA	62	B	5	9.0
10	S201-B10NA	62			
13	S201-B13NA	62			
16	S201-B16NA	62			
20	S201-B20NA	68			
25	S201-B25NA	72			
32	S201-B32NA	74			
40	S201-B40NA	76			
50	S201-B50NA	90			
63	S201-B63NA	102			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
6	S202-B6	78	A	5	9.0
10	S202-B10	78			
13	S202-B13	78			
16	S202-B16	78			
20	S202-B20	86			
25	S202-B25	88			
32	S202-B32	94			
40	S202-B40	98			
50	S202-B50	112			
63	S202-B63	128			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
6	S203-B6	\$ 118	A	1	13.5
10	S203-B10	118			
13	S203-B13	118			
16	S203-B16	118			
20	S203-B20	130			
25	S203-B25	132			
32	S203-B32	142			
40	S203-B40	148			
50	S203-B50	170			
63	S203-B63	194			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole + neutral					
6	S203-B6NA	142	B	1	18.0
10	S203-B10NA	142			
13	S203-B13NA	142			
16	S203-B16NA	142			
20	S203-B20NA	162			
25	S203-B25NA	168			
32	S203-B32NA	176			
40	S203-B40NA	184			
50	S203-B50NA	212			
63	S203-B63NA	240			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
6	S204-B6	156	B	1	18.0
10	S204-B10	156			
13	S204-B13	156			
16	S204-B16	156			
20	S204-B20	172			
25	S204-B25	176			
32	S204-B32	188			
40	S204-B40	196			
50	S204-B50	224			
63	S204-B63	256			

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

S200

480Y/277 VAC

Supplemental protectors

System pro M
S200 Series

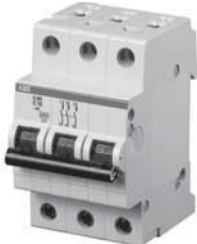
C UL 1077 CSA C22.2 - NO. 235
VDE 0641 IEC-898
Cable & equipment protection



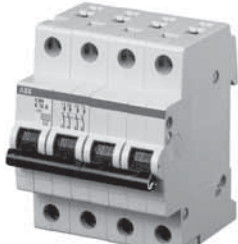
S201-C, 1 pole



S202-C, 2 pole
S201-CNA, 1P+N

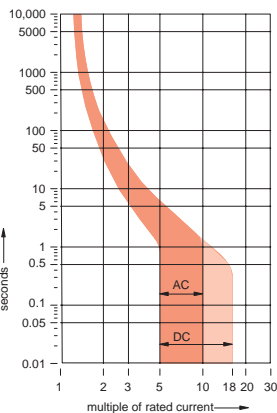


S203-C, 3 pole



S204-C, 4 pole
S203-CNA, 3P+N

C



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.5	S201-C0.5	\$ 42			
1	S201-C1	42			
1.6	S201-C1.6	42			
2	S201-C2	42			
3	S201-C3	42			
4	S201-C4	42			
6	S201-C6	42			
8	S201-C8	42			
10	S201-C10	42	A	10	4.5
13	S201-C13	42			
16	S201-C16	42			
20	S201-C20	42			
25	S201-C25	46			
32	S201-C32	48			
40	S201-C40	52			
50	S201-C50	60			
63	S201-C63	68			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole + neutral					
0.5	S201-C0.5NA	84			
1	S201-C1NA	84			
1.6	S201-C1.6NA	84			
2	S201-C2NA	84			
3	S201-C3NA	84			
4	S201-C4NA	84			
6	S201-C6NA	84			
8	S201-C8NA	84			
10	S201-C10NA	84	B	5	9.0
13	S201-C13NA	84			
16	S201-C16NA	84			
20	S201-C20NA	84			
25	S201-C25NA	88			
32	S201-C32NA	90			
40	S201-C40NA	96			
50	S201-C50NA	112			
63	S201-C63NA	130			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.5	S202-C0.5	96			
1	S202-C1	96			
1.6	S202-C1.6	96			
2	S202-C2	96			
3	S202-C3	96			
4	S202-C4	96			
6	S202-C6	96			
8	S202-C8	96			
10	S202-C10	96	A	5	9.0
13	S202-C13	96			
16	S202-C16	96			
20	S202-C20	96			
25	S202-C25	106			
32	S202-C32	106			
40	S202-C40	116			
50	S202-C50	136			
63	S202-C63	152			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.5	S203-C0.5	\$ 138			
1	S203-C1	138			
1.6	S203-C1.6	138			
2	S203-C2	138			
3	S203-C3	138			
4	S203-C4	138			
6	S203-C6	138			
8	S203-C8	138			
10	S203-C10	138	A	1	13.5
13	S203-C13	138			
16	S203-C16	138			
20	S203-C20	138			
25	S203-C25	156			
32	S203-C32	158			
40	S203-C40	174			
50	S203-C50	200			
63	S203-C63	228			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole + neutral					
0.5	S203-C0.5NA	200			
1	S203-C1NA	200			
1.6	S203-C1.6NA	200			
2	S203-C2NA	200			
3	S203-C3NA	200			
4	S203-C4NA	200			
6	S203-C6NA	200			
8	S203-C8NA	200			
10	S203-C10NA	200	B	1	18.0
13	S203-C13NA	200			
16	S203-C16NA	200			
20	S203-C20NA	200			
25	S203-C25NA	206			
32	S203-C32NA	212			
40	S203-C40NA	224			
50	S203-C50NA	204			
63	S203-C63NA	304			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.5	S204-C0.5	218			
1	S204-C1	218			
1.6	S204-C1.6	218			
2	S204-C2	218			
3	S204-C3	218			
4	S204-C4	218			
6	S204-C6	218			
8	S204-C8	218			
10	S204-C10	218	B	1	18.0
13	S204-C13	218			
16	S204-C16	218			
20	S204-C20	218			
25	S204-C25	234			
32	S204-C32	238			
40	S204-C40	260			
50	S204-C50	300			
63	S204-C63	338			

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

S200

480Y/277 VAC

Supplemental protectors

D UL 1077 CSA C22.2
VDE 0641 IEC-898
Cable & equipment protection



S201-D, 1 pole



S202-D, 2 pole



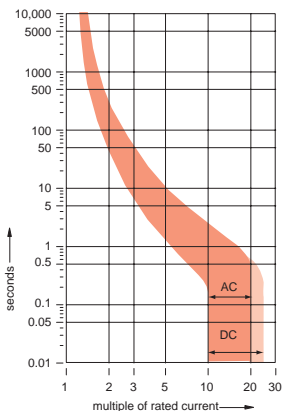
S203-D, 3 pole

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.5	S201-D0.5	\$ 42			
1	S201-D1	42			
1.6	S201-D1.6	42			
2	S201-D2	42			
3	S201-D3	42			
4	S201-D4	42			
6	S201-D6	42			
8	S201-D8	42			
10	S201-D10	42	A	10	4.5
13	S201-D13	42			
16	S201-D16	42			
20	S201-D20	42			
25	S201-D25	46			
32	S201-D32	48			
40	S201-D40	52			
50	S201-D50	60			
63	S201-D63	68			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.5	S203-D0.5	\$ 138			
1	S203-D1	138			
1.6	S203-D1.6	138			
2	S203-D2	138			
3	S203-D3	138			
4	S203-D4	138			
6	S203-D6	138			
8	S203-D8	138	A	1	13.5
10	S203-D10	138			
13	S203-D13	138			
16	S203-D16	138			
20	S203-D20	138			
25	S203-D25	156			
32	S203-D32	158			
40	S203-D40	174			
50	S203-D50	200			
63	S203-D63	228			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.5	S202-D0.5	96			
1	S202-D1	96			
1.6	S202-D1.6	96			
2	S202-D2	96			
3	S202-D3	96			
4	S202-D4	96			
6	S202-D6	96			
8	S202-D8	96	A	5	9.0
10	S202-D10	96			
13	S202-D13	96			
16	S202-D16	96			
20	S202-D20	96			
25	S202-D25	106			
32	S202-D32	106			
40	S202-D40	116			
50	S202-D50	136			
63	S202-D63	152			

D



S200

480Y/277 VAC

Supplemental protectors

System pro M
S200 Series

K UL 1077 CSA C22.2 - NO. 235
VDE 0641 IEC-898
Cable & equipment protection



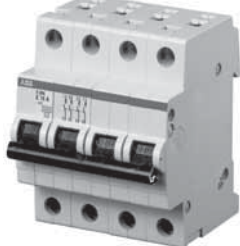
S201-K, 1 pole



S202-K, 2 pole
S201-KNA, 1P+N

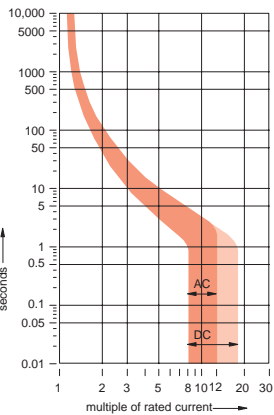


S203-K, 3 pole



S204-K, 4 pole
S203-KNA, 3P+N

K



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.5	S201-K0.5	\$ 42			
1	S201-K1	42			
1.6	S201-K1.6	42			
2	S201-K2	42			
3	S201-K3	42			
4	S201-K4	42			
5	S201-K5	42			
6	S201-K6	42			
8	S201-K8	42			
10	S201-K10	42			
13	S201-K13	42	A	10	4.5
15	S201-K15	42			
16	S201-K16	42			
20	S201-K20	42			
25	S201-K25	46			
30	S201-K30	48			
32	S201-K32	48			
40	S201-K40	52			
50	S201-K50	60			
60	S201-K60	68			
63	S201-K63	68			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole + neutral					
0.5	S201-K0.5NA	84			
1	S201-K1NA	84			
1.6	S201-K1.6NA	84			
2	S201-K2NA	84			
3	S201-K3NA	84			
4	S201-K4NA	84			
6	S201-K6NA	84			
8	S201-K8NA	84			
10	S201-K10NA	84	B	5	9.0
13	S201-K13NA	84			
16	S201-K16NA	84			
20	S201-K20NA	84			
25	S201-K25NA	88			
32	S201-K32NA	90			
40	S201-K40NA	96			
50	S201-K50NA	112			
63	S201-K63NA	130			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.5	S202-K0.5	96			
1	S202-K1	96			
1.6	S202-K1.6	96			
2	S202-K2	96			
3	S202-K3	96			
4	S202-K4	96			
5	S202-K5	96			
6	S202-K6	96			
8	S202-K8	96			
10	S202-K10	96	A	5	9.0
13	S202-K13	96			
15	S202-K15	96			
16	S202-K16	96			
20	S202-K20	96			
25	S202-K25	106			
30	S202-K30	106			
32	S202-K32	106			
40	S202-K40	116			
50	S202-K50	136			
60	S202-K60	152			
63	S202-K63	152			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.5	S203-K0.5	\$ 138			
1	S203-K1	138			
1.6	S203-K1.6	138			
2	S203-K2	138			
3	S203-K3	138			
4	S203-K4	138			
5	S203-K5	138			
6	S203-K6	138			
8	S203-K8	138			
10	S203-K10	138			
13	S203-K13	138	A	1	13.5
15	S203-K15	138			
16	S203-K16	138			
20	S203-K20	138			
25	S203-K25	156			
30	S203-K30	158			
32	S203-K32	158			
40	S203-K40	174			
50	S203-K50	200			
60	S203-K60	228			
63	S203-K63	228			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole + neutral					
0.5	S203-K0.5NA	200			
1	S203-K1NA	200			
1.6	S203-K1.6NA	200			
2	S203-K2NA	200			
3	S203-K3NA	200			
4	S203-K4NA	200			
6	S203-K6NA	200			
8	S203-K8NA	200			
10	S203-K10NA	200	B	1	18.0
13	S203-K13NA	200			
16	S203-K16NA	200			
20	S203-K20NA	200			
25	S203-K25NA	206			
32	S203-K32NA	212			
40	S203-K40NA	224			
50	S203-K50NA	264			
63	S203-K63NA	304			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.5	S204-K0.5	218			
1	S204-K1	218			
1.6	S204-K1.6	218			
2	S204-K2	218			
3	S204-K3	218			
4	S204-K4	218			
6	S204-K6	218			
8	S204-K8	218			
10	S204-K10	218	B	1	18.0
13	S204-K13	218			
16	S204-K16	218			
20	S204-K20	218			
25	S204-K25	234			
32	S204-K32	238			
40	S204-K40	260			
50	S204-K50	300			
63	S204-K63	338			

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

S200P

480Y/277 VAC

Supplemental protectors

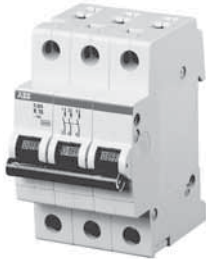
K UL 1077 CSA C22.2 - NO. 235
VDE 0660
Cable & equipment protection



S201P-K, 1 pole



S202P-K, 2 pole



S203P-K, 3 pole

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.2	S201P-K0.2	\$ 54			
0.3	S201P-K0.3	54			
0.5	S201P-K0.5	54			
0.75	S201P-K0.75	54			
1	S201P-K1	54			
1.6	S201P-K1.6	54			
2	S201P-K2	54			
3	S201P-K3	54			
4	S201P-K4	54			
6	S201P-K6	54			
8	S201P-K8	54	A	10	4.6
10	S201P-K10	54			
13	S201P-K13	54			
16	S201P-K16	54			
20	S201P-K20	54			
25	S201P-K25	56			
32	S201P-K32	58			
40	S201P-K40	64			
50	S201P-K50	70			
63	S201P-K63	80			

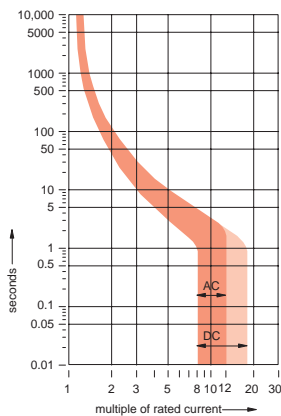
Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.2	S203P-K0.2	\$ 194			
0.3	S203P-K0.3	194			
0.5	S203P-K0.5	194			
0.75	S203P-K0.75	194			
1	S203P-K1	194			
1.6	S203P-K1.6	194			
2	S203P-K2	194			
3	S203P-K3	194			
4	S203P-K4	194			
6	S203P-K6	194	A	1	13.9
8	S203P-K8	194			
10	S203P-K10	194			
13	S203P-K13	194			
16	S203P-K16	194			
20	S203P-K20	194			
25	S203P-K25	196			
32	S203P-K32	200			
40	S203P-K40	214			
50	S203P-K50	246			
63	S203P-K63	280			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.2	S202P-K0.2	128			
0.3	S202P-K0.3	128			
0.5	S202P-K0.5	128			
0.75	S202P-K0.75	128			
1	S202P-K1	128			
1.6	S202P-K1.6	128			
2	S202P-K2	128			
3	S202P-K3	128			
4	S202P-K4	128			
6	S202P-K6	128	A	5	9.2
8	S202P-K8	128			
10	S202P-K10	128			
13	S202P-K13	128			
16	S202P-K16	128			
20	S202P-K20	128			
25	S202P-K25	130			
32	S202P-K32	134			
40	S202P-K40	134			
50	S202P-K50	162			
63	S202P-K63	182			

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

K

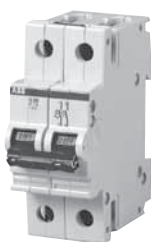


S280 (W) 480Y/277 VAC Supplemental protectors

K UL 1077 CSA C22.2 - NO. 235
VDE 0660
Cable & equipment protection



S281-KW, 1 pole



S282-KW, 2 pole



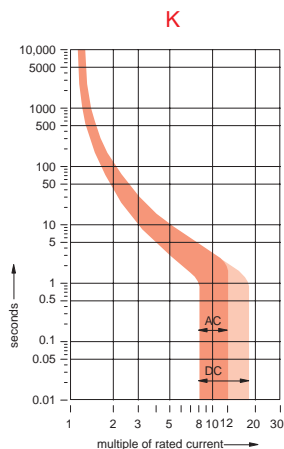
S283-KW, 3 pole

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.2	S281-K0.2W	\$ 54			
0.3	S281-K0.3W	54			
0.5	S281-K0.5W	54			
0.75	S281-K0.75W	54			
1	S281-K1W	54			
1.6	S281-K1.6W	54			
2	S281-K2W	54			
3	S281-K3W	54			
4	S281-K4W	54			
6	S281-K6W	54			
8	S281-K8W	54	B	10	4.6
10	S281-K10W	54			
13	S281-K13W	54			
16	S281-K16W	54			
20	S281-K20W	54			
25	S281-K25W	56			
32	S281-K32W	58			
40	S281-K40W	64			
50	S281-K50W	70			
63	S281-K63W	80			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.2	S283-K0.2W	\$ 194			
0.3	S283-K0.3W	194			
0.5	S283-K0.5W	194			
0.75	S283-K0.75W	194			
1	S283-K1W	194			
1.6	S283-K1.6W	194			
2	S283-K2W	194			
3	S283-K3W	194			
4	S283-K4W	194			
6	S283-K6W	194	B	3	13.9
8	S283-K8W	194			
10	S283-K10W	194			
13	S283-K13W	194			
16	S283-K16W	194			
20	S283-K20W	194			
25	S283-K25W	196			
32	S283-K32W	200			
40	S283-K40W	214			
50	S283-K50W	246			
63	S283-K63W	280			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.2	S282-K0.2W	128			
0.3	S282-K0.3W	128			
0.5	S282-K0.5W	128			
0.75	S282-K0.75W	128			
1	S282-K1W	128			
1.6	S282-K1.6W	128			
2	S282-K2W	128			
3	S282-K3W	128			
4	S282-K4W	128			
6	S282-K6W	128	B	5	9.2
8	S282-K8W	128			
10	S282-K10W	128			
13	S282-K13W	128			
16	S282-K16W	128			
20	S282-K20W	128			
25	S282-K25W	130			
32	S282-K32W	134			
40	S282-K40W	134			
50	S282-K50W	162			
63	S282-K63W	182			

Delivery Class
A - Standard item, stock to 2 weeks lead time
B - Stock to 4 weeks lead time
C - 6 to 8 week lead time



For use with ring tongue terminal connectors

S280UC

500 VDC

Supplemental protectors

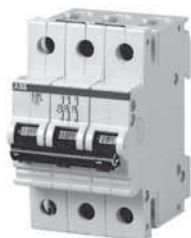
K UL 1077 VDE 0660
CSA 22.2 No. 235
Cable and Equipment Protection



S281UC-K, 1 pole



S282UC-K, 2 pole



S283UC-K, 3 pole

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.2	S281UC-K0.2	\$ 104			
0.3	S281UC-K0.3	104			
0.5	S281UC-K0.5	104			
0.75	S281UC-K0.75	104			
1	S281UC-K1	104			
1.6	S281UC-K1.6	104			
2	S281UC-K2	104			
3	S281UC-K3	104			
4	S281UC-K4	104			
6	S281UC-K6	104	B	10	4.6
8	S281UC-K8	104			
10	S281UC-K10	104			
16	S281UC-K16	104			
20	S281UC-K20	104			
25	S281UC-K25	108			
32	S281UC-K32	110			
40	S281UC-K40	116			
50	S281UC-K50	136			
63	S281UC-K63	152			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.2	S282UC-K0.2	242			
0.3	S282UC-K0.3	242			
0.5	S282UC-K0.5	242			
0.75	S282UC-K0.75	242			
1	S282UC-K1	242			
1.6	S282UC-K1.6	242			
2	S282UC-K2	242			
3	S282UC-K3	242			
4	S282UC-K4	242	B	5	9.2
6	S282UC-K6	242			
8	S282UC-K8	242			
10	S282UC-K10	242			
16	S282UC-K16	242			
20	S282UC-K20	242			
25	S282UC-K25	248			
32	S282UC-K32	256			
40	S282UC-K40	266			
50	S282UC-K50	312			
63	S282UC-K63	348			

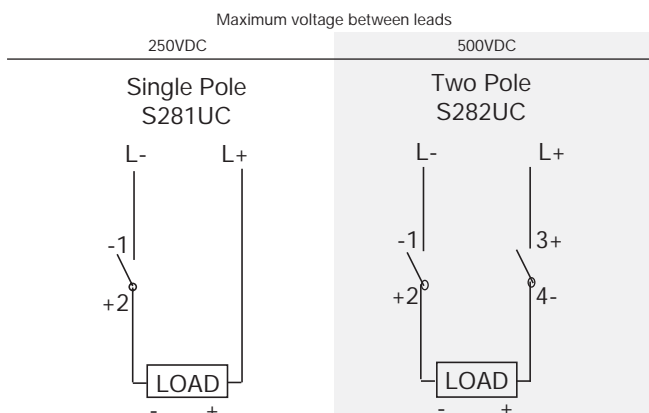
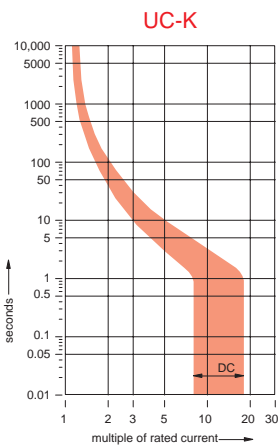
Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.2	S283UC-K0.2	\$ 370			
0.3	S283UC-K0.3	370			
0.5	S283UC-K0.5	370			
0.75	S283UC-K0.75	370			
1	S283UC-K1	370			
1.6	S283UC-K1.6	370			
2	S283UC-K2	370			
3	S283UC-K3	370			
4	S283UC-K4	370	B	3	13.9
6	S283UC-K6	370			
8	S283UC-K8	370			
10	S283UC-K10	370			
16	S283UC-K16	370			
20	S283UC-K20	370			
25	S283UC-K25	382			
32	S283UC-K32	408			
40	S283UC-K40	448			
50	S283UC-K50	472			
63	S283UC-K63	534			

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

Direct current applications

The S280UC differs from standard miniature circuit breakers in that the UC versions include a permanent magnet which aids in the extinguishing of the arc during medium and high level faults. It is necessary to observe the correct polarity and current direction when connecting the UC breakers. Two examples of correct connection are shown below.



Termination points are marked on all UC type MCBs, points one (1) and four (4) are negative and points two (2) and three (3) are positive. Four pole breakers are also available for voltage reversal applications.

S200P & S280UC 480Y/277 VAC & 500 VDC Supplemental protectors

System pro M
S200 Series

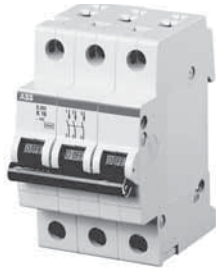
Z UL 1077 VDE 0660
CSA 22.2 No. 235
Fast trip characteristic



S201P-Z, 1 pole



S202P-Z, 2 pole



S203P-Z, 3 pole

480Y/277 VAC

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.5	S201P-Z0.5	\$ 70			
1	S201P-Z1	70			
1.6	S201P-Z1.6	70			
2	S201P-Z2	70			
3	S201P-Z3	70			
4	S201P-Z4	70			
6	S201P-Z6	70			
8	S201P-Z8	70	B	10	4.5
10	S201P-Z10	70			
16	S201P-Z16	70			
20	S201P-Z20	70			
25	S201P-Z25	70			
32	S201P-Z32	74			
40	S201P-Z40	78			
50	S201P-Z50	88			
63	S201P-Z63	100			

2 pole					
0.5	S202P-Z0.5	162			
1	S202P-Z1	162			
1.6	S202P-Z1.6	162			
2	S202P-Z2	162			
3	S202P-Z3	162			
4	S202P-Z4	162			
6	S202P-Z6	162			
8	S202P-Z8	162	B	5	9.2
10	S202P-Z10	162			
16	S202P-Z16	162			
20	S202P-Z20	162			
25	S202P-Z25	170			
32	S202P-Z32	170			
40	S202P-Z40	176			
50	S202P-Z50	206			
63	S202P-Z63	232			

3 pole					
0.5	S203P-Z0.5	244			
1	S203P-Z1	244			
1.6	S203P-Z1.6	244			
2	S203P-Z2	244			
3	S203P-Z3	244			
4	S203P-Z4	244			
6	S203P-Z6	244			
8	S203P-Z8	244	B	1	13.9
10	S203P-Z10	244			
16	S203P-Z16	244			
20	S203P-Z20	244			
25	S203P-Z25	248			
32	S203P-Z32	254			
40	S203P-Z40	266			
50	S203P-Z50	306			
63	S203P-Z63	344			

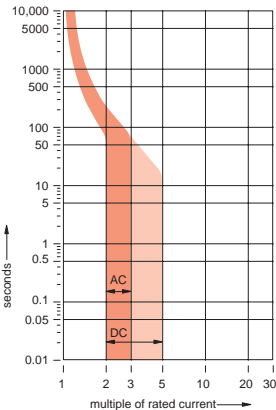
500 VDC

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.5	S281UC-Z0.5	\$ 168			
1	S281UC-Z1	168			
1.6	S281UC-Z1.6	168			
2	S281UC-Z2	168			
3	S281UC-Z3	168			
4	S281UC-Z4	168			
6	S281UC-Z6	168			
8	S281UC-Z8	168			
10	S281UC-Z10	168	B	10	4.6
16	S281UC-Z16	168			
20	S281UC-Z20	168			
25	S281UC-Z25	170			
32	S281UC-Z32	176			
40	S281UC-Z40	188			
50	S281UC-Z50	216			
63	S281UC-Z63	242			

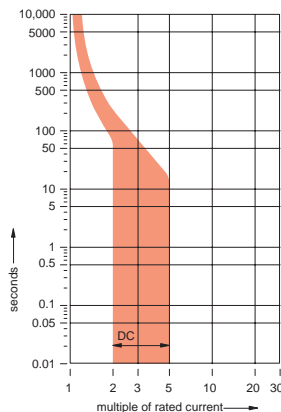
2 pole					
0.5	S282UC-Z0.5	390			
1	S282UC-Z1	390			
1.6	S282UC-Z1.6	390			
2	S282UC-Z2	390			
3	S282UC-Z3	390			
4	S282UC-Z4	390			
6	S282UC-Z6	390			
8	S282UC-Z8	390	B	5	9.2
10	S282UC-Z10	390			
16	S282UC-Z16	390			
20	S282UC-Z20	390			
25	S282UC-Z25	398			
32	S282UC-Z32	410			
40	S282UC-Z40	426			
50	S282UC-Z50	498			
63	S282UC-Z63	558			

3 pole					
0.5	S283UC-Z0.5	594			
1	S283UC-Z1	594			
1.6	S283UC-Z1.6	594			
2	S283UC-Z2	594			
3	S283UC-Z3	594			
4	S283UC-Z4	594			
6	S283UC-Z6	594			
8	S283UC-Z8	594	B	3	13.9
10	S283UC-Z10	594			
16	S283UC-Z16	594			
20	S283UC-Z20	594			
25	S283UC-Z25	603			
32	S283UC-Z32	612			
40	S283UC-Z40	657			
50	S283UC-Z50	756			
63	S283UC-Z63	855			

Z



UC-Z



Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

S200U

240 VAC

Miniature MCCBs

K UL 489 CSA C22.2 - NO. 5
VDE 0660
Cable & equipment protection



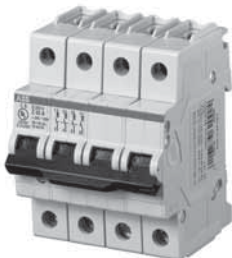
S201U-K, 1 pole



S202U-K, 2 pole

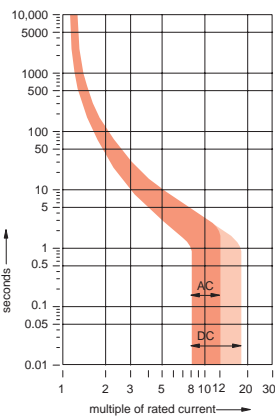


S203U-K, 3 pole



S204U-K, 4 pole

K



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.2	S201U-K0.2	\$ 54			
0.3	S201U-K0.3	54			
0.5	S201U-K0.5	54			
0.75	S201U-K0.75	54			
1	S201U-K1	54			
1.6	S201U-K1.6	54			
2	S201U-K2	54			
3	S201U-K3	54			
4	S201U-K4	54			
5	S201U-K5	54			
6	S201U-K6	54			
8	S201U-K8	54			
10	S201U-K10	54	A	10	4.6
13	S201U-K13	54			
15	S201U-K15	54			
16	S201U-K16	54			
20	S201U-K20	54			
25	S201U-K25	56			
30	S201U-K30	58			
32	S201U-K32	58			
40	S201U-K40	64			
50	S201U-K50	70			
60	S201U-K60	80			
63	S201U-K63	80			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.2	S202U-K0.2	128			
0.3	S202U-K0.3	128			
0.5	S202U-K0.5	128			
0.75	S202U-K0.75	128			
1	S202U-K1	128			
1.6	S202U-K1.6	128			
2	S202U-K2	128			
3	S202U-K3	128			
4	S202U-K4	128			
5	S202U-K5	128			
6	S202U-K6	128			
8	S202U-K8	128			
10	S202U-K10	128	A	5	9.2
13	S202U-K13	128			
15	S202U-K15	128			
16	S202U-K16	128			
20	S202U-K20	128			
25	S202U-K25	130			
30	S202U-K30	134			
32	S202U-K32	134			
40	S202U-K40	134			
50	S202U-K50	162			
60	S202U-K60	182			
63	S202U-K63	182			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.2	S203U-K0.2	\$ 194			
0.3	S203U-K0.3	194			
0.5	S203U-K0.5	194			
0.75	S203U-K0.75	194			
1	S203U-K1	194			
1.6	S203U-K1.6	194			
2	S203U-K2	194			
3	S203U-K3	194			
4	S203U-K4	194			
5	S203U-K5	194			
6	S203U-K6	194			
8	S203U-K8	194			
10	S203U-K10	194	A	1	13.9
13	S203U-K13	194			
15	S203U-K15	194			
16	S203U-K16	194			
20	S203U-K20	194			
25	S203U-K25	196			
30	S203U-K30	200			
32	S203U-K32	200			
40	S203U-K40	214			
50	S203U-K50	246			
60	S203U-K60	280			
63	S203U-K63	280			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.2	S204U-K0.2	265			
0.3	S204U-K0.3	265			
0.5	S204U-K0.5	265			
0.75	S204U-K0.75	265			
1	S204U-K1	265			
1.6	S204U-K1.6	265			
2	S204U-K2	265			
3	S204U-K3	265			
4	S204U-K4	265			
5	S204U-K5	265			
6	S204U-K6	265			
8	S204U-K8	265			
10	S204U-K10	265	B	1	18.0
13	S204U-K13	265			
15	S204U-K15	265			
16	S204U-K16	265			
20	S204U-K20	265			
25	S204U-K25	275			
30	S204U-K30	285			
32	S204U-K32	285			
40	S204U-K40	314			
50	S204U-K50	343			
60	S204U-K60	392			
63	S204U-K63	392			

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

UL489 listed as branch circuit protective device

S200U

240 VAC

Miniature MCCBs

Z UL 489 CSA C22.2 - NO. 5
VDE 0660
Cable & equipment protection



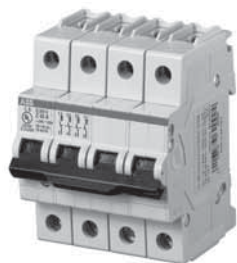
S201U-Z, 1 pole



S202U-Z, 2 pole

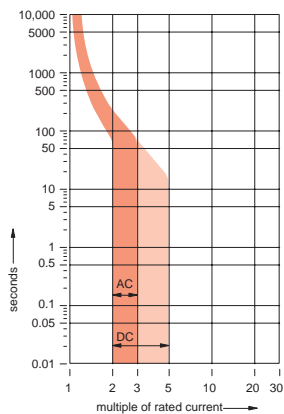


S203U-Z, 3 pole



S204U-Z, 4 pole

Z



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.5	S201U-Z0.5	70			
0.75	S201U-Z0.75	70			
1	S201U-Z1	70			
1.6	S201U-Z1.6	70			
2	S201U-Z2	70			
3	S201U-Z3	70			
4	S201U-Z4	70			
5	S201U-Z5	70			
6	S201U-Z6	70			
8	S201U-Z8	70			
10	S201U-Z10	70	A	10	4.6
15	S201U-Z15	70			
16	S201U-Z16	70			
20	S201U-Z20	70			
25	S201U-Z25	70			
30	S201U-Z30	74			
32	S201U-Z32	74			
40	S201U-Z40	78			
50	S201U-Z50	88			
60	S201U-Z60	100			
63	S201U-Z63	100			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.5	S202U-Z0.5	162			
0.75	S202U-Z0.75	162			
1	S202U-Z1	162			
1.6	S202U-Z1.6	162			
2	S202U-Z2	162			
3	S202U-Z3	162			
4	S202U-Z4	162			
5	S202U-Z5	162			
6	S202U-Z6	162			
8	S202U-Z8	162			
10	S202U-Z10	162	A	5	9.2
15	S202U-Z15	162			
16	S202U-Z16	162			
20	S202U-Z20	162			
25	S202U-Z25	170			
30	S202U-Z30	170			
32	S202U-Z32	170			
40	S202U-Z40	176			
50	S202U-Z50	206			
60	S202U-Z60	232			
63	S202U-Z63	232			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.5	S203U-Z0.5	244			
0.75	S203U-Z0.75	244			
1	S203U-Z1	244			
1.6	S203U-Z1.6	244			
2	S203U-Z2	244			
3	S203U-Z3	244			
4	S203U-Z4	244			
5	S203U-Z5	244			
6	S203U-Z6	244			
8	S203U-Z8	244			
10	S203U-Z10	244	A	1	13.9
15	S203U-Z15	244			
16	S203U-Z16	244			
20	S203U-Z20	244			
25	S203U-Z25	248			
30	S203U-Z30	254			
32	S203U-Z32	254			
40	S203U-Z40	266			
50	S203U-Z50	306			
60	S203U-Z60	344			
63	S203U-Z63	344			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.5	S204U-Z0.5	343			
0.75	S204U-Z0.75	343			
1	S204U-Z1	343			
1.6	S204U-Z1.6	343			
2	S204U-Z2	343			
3	S204U-Z3	343			
4	S204U-Z4	343			
5	S204U-Z5	343			
6	S204U-Z6	343			
8	S204U-Z8	343			
10	S204U-Z10	343	B	1	18.0
15	S204U-Z15	343			
16	S204U-Z16	343			
20	S204U-Z20	343			
25	S204U-Z25	343			
30	S204U-Z30	363			
32	S204U-Z32	363			
40	S204U-Z40	382			
50	S204U-Z50	431			
60	S204U-Z60	490			
63	S204U-Z63	490			

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

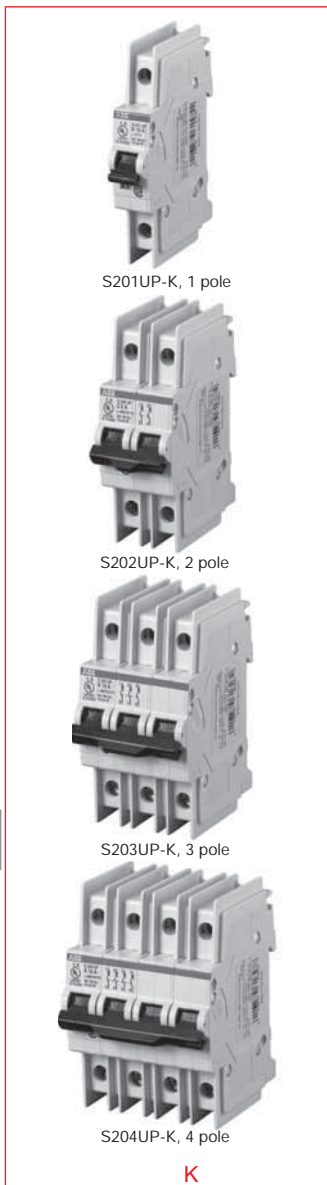
UL 489 listed as branch circuit protective device

S200UP

480Y/277 VAC

Miniature MCCBs

K UL 489 CSA C22.2 - NO. 5
VDE 0660
Cable & equipment protection



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.2	S201UP-K0.2	\$ 90			
0.3	S201UP-K0.3	90			
0.5	S201UP-K0.5	90			
0.75	S201UP-K0.75	90			
1	S201UP-K1	90			
1.6	S201UP-K1.6	90			
2	S201UP-K2	90			
3	S201UP-K3	90			
4	S201UP-K4	90			
5	S201UP-K5	90			
6	S201UP-K6	90			
8	S201UP-K8	90	A	10	4.6
10	S201UP-K10	90			
13	S201UP-K13	90			
15	S201UP-K15	90			
16	S201UP-K16	90			
20	S201UP-K20	90			
25	S201UP-K25	90			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.2	S202UP-K0.2	210			
0.3	S202UP-K0.3	210			
0.5	S202UP-K0.5	210			
0.75	S202UP-K0.75	210			
1	S202UP-K1	210			
1.6	S202UP-K1.6	210			
2	S202UP-K2	210			
3	S202UP-K3	210			
4	S202UP-K4	210			
5	S202UP-K5	210			
6	S202UP-K6	210	A	5	9.2
8	S202UP-K8	210			
10	S202UP-K10	210			
13	S202UP-K13	210			
15	S202UP-K15	210			
16	S202UP-K16	210			
20	S202UP-K20	210			
25	S202UP-K25	210			

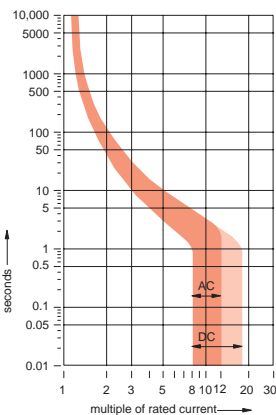
Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.2	S203UP-K0.2	\$ 320			
0.3	S203UP-K0.3	320			
0.5	S203UP-K0.5	320			
0.75	S203UP-K0.75	320			
1	S203UP-K1	320			
1.6	S203UP-K1.6	320			
2	S203UP-K2	320			
3	S203UP-K3	320			
4	S203UP-K4	320			
5	S203UP-K5	320			
6	S203UP-K6	320	A	1	13.9
8	S203UP-K8	320			
10	S203UP-K10	320			
13	S203UP-K13	320			
15	S203UP-K15	320			
16	S203UP-K16	320			
20	S203UP-K20	320			
25	S203UP-K25	320			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.2	S204UP-K0.2	440			
0.3	S204UP-K0.3	440			
0.5	S204UP-K0.5	440			
0.75	S204UP-K0.75	440			
1	S204UP-K1	440			
1.6	S204UP-K1.6	440			
2	S204UP-K2	440			
3	S204UP-K3	440			
4	S204UP-K4	440			
5	S204UP-K5	440			
6	S204UP-K6	440	B	1	18.0
8	S204UP-K8	440			
10	S204UP-K10	440			
13	S204UP-K13	440			
15	S204UP-K15	440			
16	S204UP-K16	440			
20	S204UP-K20	440			
25	S204UP-K25	440			

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

UL489 listed as branch
circuit protective device

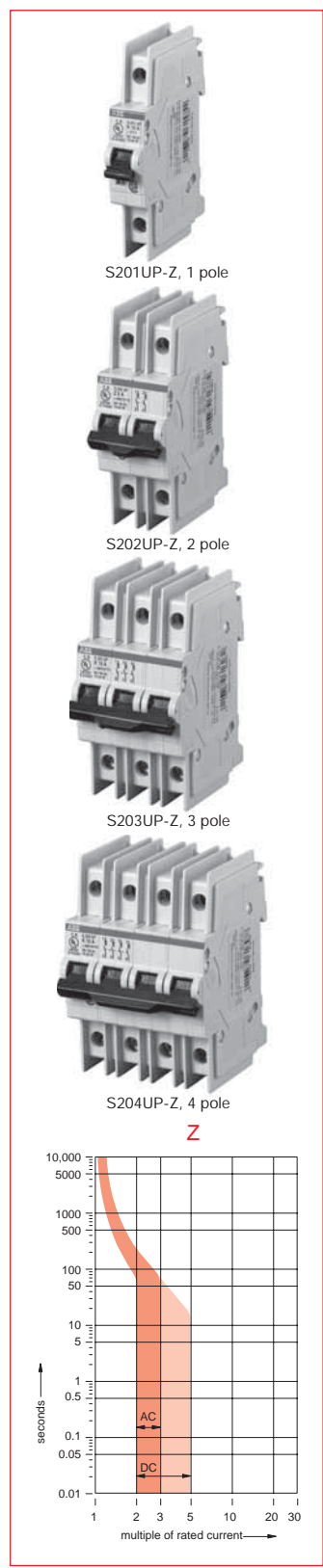


S200UP

480Y/277 VAC

Miniature MCCBs

Z UL 489 CSA C22.2 - NO. 5
VDE 0660
Cable & equipment protection



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.5	S201UP-Z0.5	115			
0.75	S201UP-Z0.75	115			
1	S201UP-Z1	115			
1.6	S201UP-Z1.6	115			
2	S201UP-Z2	115			
3	S201UP-Z3	115			
4	S201UP-Z4	115			
5	S201UP-Z5	115			
6	S201UP-Z6	115			
8	S201UP-Z8	115	A	10	4.6
10	S201UP-Z10	115			
15	S201UP-Z15	115			
16	S201UP-Z16	115			
20	S201UP-Z20	115			
25	S201UP-Z25	115			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.5	S202UP-Z0.5	270			
0.75	S202UP-Z0.75	270			
1	S202UP-Z1	270			
1.6	S202UP-Z1.6	270			
2	S202UP-Z2	270			
3	S202UP-Z3	270			
4	S202UP-Z4	270			
5	S202UP-Z5	270			
6	S202UP-Z6	270			
8	S202UP-Z8	270	A	5	9.2
10	S202UP-Z10	270			
15	S202UP-Z15	270			
16	S202UP-Z16	270			
20	S202UP-Z20	270			
25	S202UP-Z25	270			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.5	S203UP-Z0.5	400			
0.75	S203UP-Z0.75	400			
1	S203UP-Z1	400			
1.6	S203UP-Z1.6	400			
2	S203UP-Z2	400			
3	S203UP-Z3	400			
4	S203UP-Z4	400			
5	S203UP-Z5	400			
6	S203UP-Z6	400	A	1	13.9
8	S203UP-Z8	400			
10	S203UP-Z10	400			
15	S203UP-Z15	400			
16	S203UP-Z16	400			
20	S203UP-Z20	400			
25	S203UP-Z25	400			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.5	S204UP-Z0.5	564			
0.75	S204UP-Z0.75	564			
1	S204UP-Z1	564			
1.6	S204UP-Z1.6	564			
2	S204UP-Z2	564			
3	S204UP-Z3	564			
4	S204UP-Z4	564			
5	S204UP-Z5	564			
6	S204UP-Z6	564	B	1	18.0
8	S204UP-Z8	564			
10	S204UP-Z10	564			
15	S204UP-Z15	564			
16	S204UP-Z16	564			
20	S204UP-Z20	564			
25	S204UP-Z25	564			

Delivery Class
A - Standard item, stock to 2 weeks lead time
B - Stock to 4 weeks lead time
C - 6 to 8 week lead time

UL 489 listed as branch circuit protective device

S290

480Y/277 VAC

C VDE 0660
Cable and equipment protection



S291-C80



S290-H11

480 VAC

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
---------------	----------------	------------	----------------	-----------------	------------------

1 pole

80	S291-C80	\$ 138			
100	S291-C100	144	B	6	9.2
125	S291-C125	192			

2 pole

80	S292-C80	340			
100	S292-C100	364	B	3	18.4
125	S292-C125	568			

3 pole

80	S293-C80	536			
100	S293-C100	548	B	2	27.6
125	S293-C125	732			

4 pole

80	S294-C80	740			
100	S294-C100	756	B	1	36.8
125	S294-C125	948			

Auxiliary contact

	S290-H11	72	B	1	1.75
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Bell alarm

	S290-S	112	B	1	1.75
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Shunt trip

	S290-A1	144	B	1	6.2
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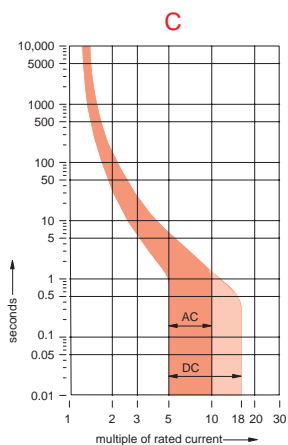
For field mounting, left side, 110V - 415VAC

	S290-A2	144	B	1	6.2
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For field mounting, left side, 24 - 48VDC

Delivery Class

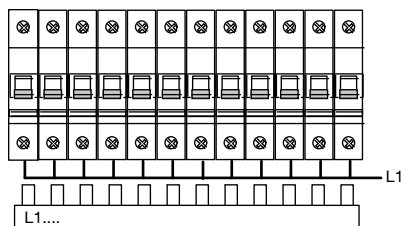
- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time



Accessories Busbars

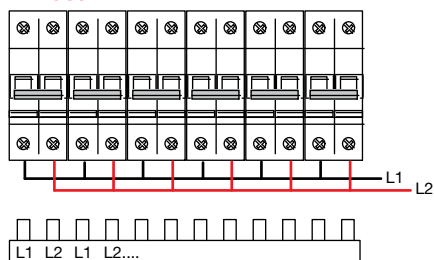
System pro M
S200 Series

1 Phase



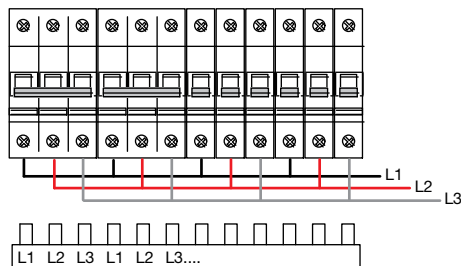
For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P ①	63	60	988	PS-END0	PS1/60	\$ 36	A	1	9
	80	60	988	PS-END0	PS1/60/16	46			
S200U & S200UP ②③	80	6	108	-	PS1/6/16BP	30	B	1	1.4
		12	216	-	PS1/12/16BP	60			2.9
		18	324	-	PS1/18/16BP	90			4.3

2 Phase



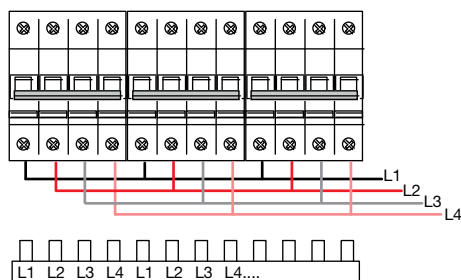
For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P ①	63	58	1035	PS-ENDSP	PS2/58SP	\$ 122	A	1	11
	80	58	1035	PS-ENDSP	PS2/58/16SP	152			18
S200U & S200UP ②③	80	6	108	-	PS2/6/16BP	40	B	1	1.8
		12	216	-	PS2/12/16BP	80			3.7
		18	324	-	PS2/18/16BP	120			5.5

3 Phase



For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P ①	63	60	1065	PS-ENDSP	PS3/60SP	\$ 130	A	1	12
	80	60	1065	PS-ENDSP	PS3/60/16SP	176			20
S200U & S200UP ②③	80	6	108	-	PS3/6/16BP	44	B	1	2
		12	216	-	PS3/12/16BP	88			4
		18	324	-	PS3/18/16BP	132			6

4 Phase



For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P	80	60	1056	PS-END1SP	PS4/60/16SP	\$ 236	B	1	22

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

NOTE

ALL BUS BARS MAY BE CENTER FED IN ORDER TO DOUBLE THE AMPACITY RATING

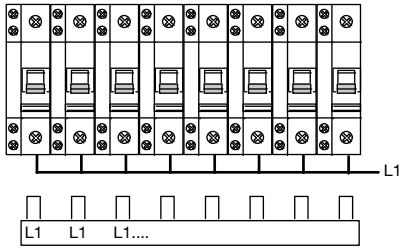
NOTE

BUS BARS MAY BE USED ON LINE OR LOAD SIDE OF MCBS

- ① UL Approved for use on UL1077 miniature circuit breakers. UL File #E76126
- ② UL approved for use on UL 489 miniature circuit breakers. UL File # E250145
- ③ UL 489 bus bars may not be cut.

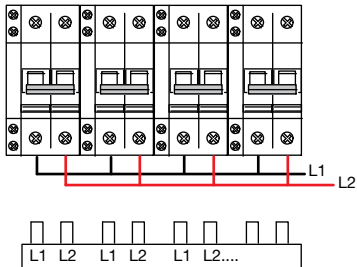
Accessories Busbars

1 Phase with 1 auxiliary



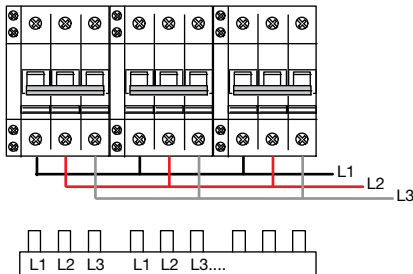
For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P	63 80	38 38	1044 1044	PS-END0 PS-END0	PS1/38H PS1/38/16H	\$ 50 56	B	1	7.4 10.1

2 Phase with 1 auxiliary



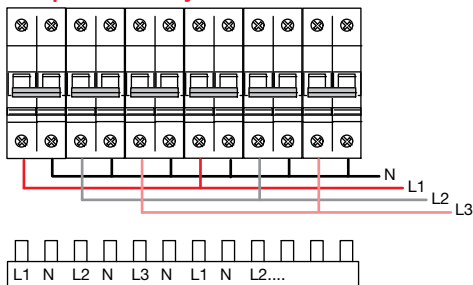
For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P	80	48	1065	PS-ENDSP	PS2/48/16SP	\$ 174	B	1	23.3

3 Phase with 1 auxiliary



For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P	80	39	980	PS-ENDSP	PS3/39/16SP	\$ 158	B	1	22.6

3 Phase + N, for use with 2 pole MCB's on 3 phase / 4W system



For use on:	Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
S200 & S200P	80	58	1048	PS-END1SP	PS4/58/16NSP	\$ 238	B	1	30.8

Insulated busbar assembly contains 4 separate circuits for use with 1+N or 2 pole MCBs.

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

NOTE

ALL BUS BARS MAY BE CENTER FED IN ORDER TO DOUBLE THE AMPACITY RATING

NOTE

BUS BARS MAY BE USED ON LINE OR LOAD SIDE OF MCBS

Accessories



S2C-H6R



S2C-S/H6R



S2C-A_



S2C-UA_

Electrical accessories	For use on:	Catalog number	List price	Delivery class	Suggested order quantities	Wgt. oz. (1 pc.)
Auxiliary contacts For field mounting: right side Form C 1 NO / 1 NC	S200 & S200P	S2C-H6R	\$ 36	A	1	1.4
	S200U & S200UP	S2C-H6RU				

The auxiliary contacts will signal whether the breaker is in the ON or OFF position. The contacts are rated 2A/277 VAC and 1.5A/125 VDC. Minimum operating voltage is 24 VAC/VDC. Wire size: 18 AWG to 16 AWG.

Bell alarm For field mounting, right side	S200 & S200P	S2C-S/H6R	48	A	1	1.4
	S200U & S200UP	S2C-S6RU				

The bell alarm includes a set of contacts that will only signal when the breaker has tripped. Typically the contacts would be connected to an alarm or bell to signal the operator that an overcurrent trip has occurred. The bell alarm also includes a test button for testing the alarm contacts without opening the breaker. The contact is rated 2A/277 VAC and 1.5A/125 VDC. Minimum operating voltage is 24 VAC/VDC.

* Combination bell alarm/auxiliary contact

Shunt trip For field mounting, right side A1: 12-60 VAC (12-60VDC) A2: 110-415 VAC (110-250 VDC)	S200 & S200P	S2C-A1 S2C-A2	138	A	1	5.2
	S200U & S200UP	S2C-A1U S2C-A2U				

For remote tripping of breaker, a shunt trip device can be added to the MCB. The solenoid device opens the breaker after control voltage is applied. Shunt trips are available for on control system voltage (12-415 VAC/VDC).

Undervoltage release For field mounting, right side 12 VDC 24 VAC 48 VAC 110 VAC 220 VAC 415 VAC	S200 & S200P	S2C-UA12	216	A	1	5.2
		S2C-UA24				
		S2C-UA48				
		S2C-UA110				
		S2C-UA230				
		S2C-UA400				

When control voltage drops below approximately 50% of rated voltage, the UVR opens the breaker. The breaker can not be operated unless proper control voltage is first applied to the UVR coil. Similar in size and mounting to the shunt trip accessory.

Factory mounting

All accessories may be easily mounted in the field. For factory mounting of any accessory devices, add \$30 list to total price per breaker. To create complete catalog number, take suffix of accessory device following "S2C-" and add suffix to end of breaker part number. Multiple suffixes must be added in alphabetical order.

Example: S202-K20A1 \$ 264 (2 pole, 20A breaker with type A1 shunt trip) S202-K20 @ \$96 + S2C-A1 @ \$138 + factory mounting @ \$30 = \$264
S202-K20A2H6R \$ 300 (2 pole, 20A breaker with type A2 shunt trip and H6R aux. contacts) S202-K20 @ \$96 + S2C-A1 @ \$138 + S2C-H6R @ \$36 + factory mounting @ \$30 = \$300

Auxiliary contacts and shunt trips may be mounted in combination.

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

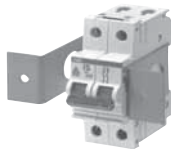
Accessories S200



S500-ME2



MB-CL



MB-3PD



SA1



SA2



12404



S2C-DH



SMR-39

Electrical accessories	Catalog number	List price	Delivery class	Suggested order quantities	Wgt. oz. (1 pc.)
Front mounting kit					
For 2 poles	S500-ME1	\$ 60	A	1	2.1
For 2 – 5 poles	S500-ME2	70			2.9
For 2 – 10 poles	S500-ME3	80			3.6
Optional rear terminals	S500-K1	16			1.5

Includes flange, mounting rail and hardware.

Front mounting clip

For 1 – 4 poles	MB-CL	35	A	1	2
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Simple mounting clip for up to four module mounting.

Front mounting bracket

For 1 – 3 poles	MB-3PD	35	A	1	2.5
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For flush mounting of three pole MCBs: includes hardware.

Locking device

Adaptor only	SA1	9	A	10	0.7
Padlock only w/ 2 keys	SA2	19			0.1

Allows breaker to be locked in ON or OFF position.

Labeling accessory

1 sheet = 40 blank labels	BS	74	A	1	—
1 sheet = 40 numbered labels	BS1/40	74			—

Adhesive labels mount on front face of components.

Enclosure, IP40

For 2 modules	12402	32	B	1	2.0
For 4 modules	12404	45			2.8
For 6 modules	12406	56			3.4
For 8 modules	12408	66			4.1

For additional protection against accidental contact. Includes integrated mounting rail.

Enclosure, IP55

For 4 modules	12644	84	A	1	8.1
For 6 modules	12646	98			10.8
For 10 modules	12650	126			20.4
For 20 modules	12652	210			41.0

Molded plastic complete with mounting rail and knock-outs for cable entries.

Blanking plates

Single pole (set of 10)	BP-1P	6	A	1	—
Twelve pole (snap-off, set of 1)	BP-12P	7	—	—	—

Handle mechanism

	S2C-DH	76	A	1	9.2
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For use with 2, 3 and 4 pole S2 MCBs and disconnect switch handles with 5mm shaft.

DIN rail

Universal mounting	SMR-39	21	A	1	8
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35mm DIN rails are available in 39-inch strips (1 meter).

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

Accessories S200

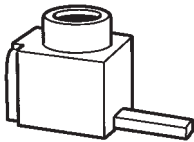
System pro M
S200 Series



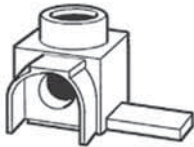
SZ-BSK



SZ-ESK2



SZ-AST55_



SZ-AST50_

Busbar accessories

Description	Catalog number	List price	Delivery class	Suggested order qty.	Weight ounce qty. (2 pc.)
Busbar end caps 2 & 3 phase 4 phase	PS-ENDSP PS-END1SP	\$ 2	A	10	—
Busbar tooth covers (shrouds unused portion of busbar)	SZ-BSK	4	A	10	—
Busbar mounted terminal block, 1 pole, for use on all busbars. Wire size: 14 AWG to 2 AWG	SZ-ESK2	10	A	1	1.0

Electrical accessories

Item	Catalog number	List price	Delivery class	Suggested order quantities	Wgt. oz. (1 pc.)
Posidrive tools					
Screwdriver, #1	SD-PZ1	\$ 40	A	1	4
Screwdriver, #2	SD-PZ2	40	A	1	4
Bit, #1	BIT-PZ1	4	A	1	4
Bit, #2	BIT-PZ2	4	A	1	4

Connection terminals

Cross section AWG/mm ²	For use on:	Catalog number	List price	Delivery class	Suggested order quantities	Wgt. oz. (1 pc.)
1/0 (50mm ²) Straight	S200 & S200P	SZ-AST55I	\$ 15	B	10	0.5
1/0 (50mm ²) 90°		SZ-AST50I	15			
1/0 (50mm ²) Straight	S200U & S200UP	SZ-AST55U	15	B	10	0.5
1/0 (50mm ²) 90°		SZ-AST50U	15			

Ring tongue accessories

Description	For use on	Catalog number	List price	Delivery class	Suggested order qty. (2 pc.)	Weight ounce
Ring tongue terminal	S200 & S200P S200U & S200UP	SZ-AST55UPRT	\$ 5	A	10	0.5
Plug		S2C-P	N/C	A	10	—

Factory mounting

Ring tongue connection terminals may be easily mounted in the field. For factory mounting, add \$5 list per connector. To create a complete catalog number, add the suffix as defined below:

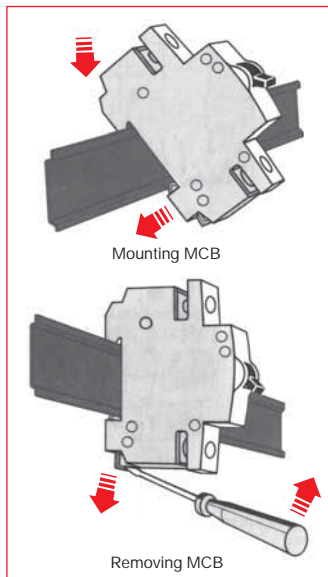
Top & bottom: S201 - K20W	\$ 62	(Single pole, 20A breaker with 2 ring tongue terminals) S201-K20 @ \$42 + SZ-AST55UPRT times 2 @ \$5 + factory mounting times 2 @ \$5 = \$62
Bottom only: S201 - K20BW	\$ 52	(Single pole, 20A breaker with 1 ring tongue terminal) S201-K20 @ \$42 + SZ-AST55UPRT @ \$5 + factory mounting @ \$5 = \$52
Top only, S201 - K20TW	\$ 52	(Single pole, 20A breaker with 1 ring tongue terminal) S201-K20 @ \$42 + SZ-AST55UPRT @ \$5 + factory mounting @ \$5 = \$52

Delivery Class

A - Standard item, stock to 2 weeks lead time
B - Stock to 4 weeks lead time
C - 6 to 8 week lead time

Technical data

Mounting and operating instructions



Mounting

Universal mounting position using snap-on mounting to standard 35x7.5mm DIN rail.

Miniature circuit breakers (MCBs) can also be mounted to front of door using a panel cut-out with breaker handle protruding through panel opening for external operation. Special front mounting kit page 23.

Connection

Terminals are suitable for solid or flexible conductors from 18 to 4 AWG (0.75 to 25mm²) with no busbar connected. When maximum busbar size of 36 mm² is used, maximum cable is 6 AWG (16 mm²).

Maximum tightening torque of 17.5 in-lb (2 Nm) for line/load terminals and 4.5 in-lb (0.5Nm) for accessory device terminals.

Operation

MCBs are switched on by moving the handle to the upper position. Stamped onto the handle switch, a "I" is visible confirming that the breaker is closed.

The MCBs are "trip-free," if the handle is being forced to the "ON" position, the breaker will still trip under fault conditions.

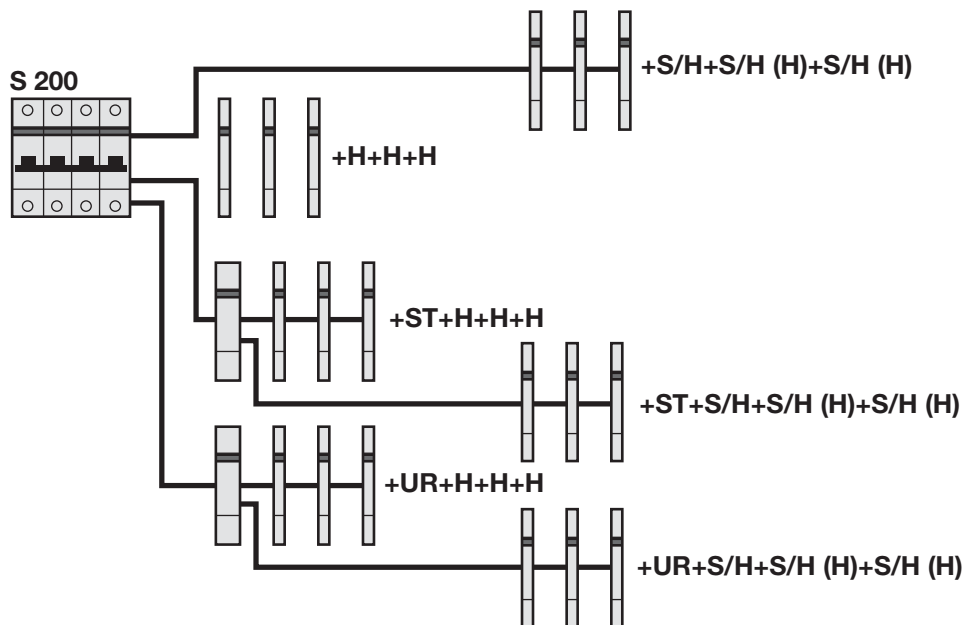
The "O" marking indicates that the breaker is in the "OFF" position. The MCB is now open and the load is disconnected from line power.

When a breaker has tripped, the MCB handle should first be set to the full "OFF" position to make certain the trip mechanism has been reset. Once the fault has been determined and cleared the MCB can again be switched "ON".

Maintenance

ABB miniature circuit breakers require no special maintenance; only normal electrical system maintenance procedures are required.

Possible mounting arrangements of MCB accessories



Legend

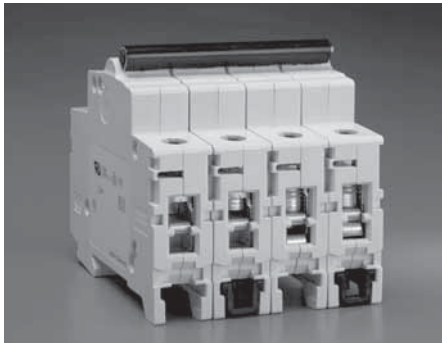
Auxiliary contact	H
Bell alarm/Auxiliary contact	S/H
Bell alarm/Auxiliary contact used as auxiliary contact	S/H (H)
Shunt trip	ST
Undervoltage release	UR

Technical data

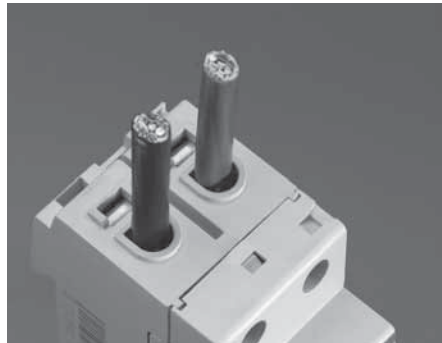
Busbars & connectors

Connection methods

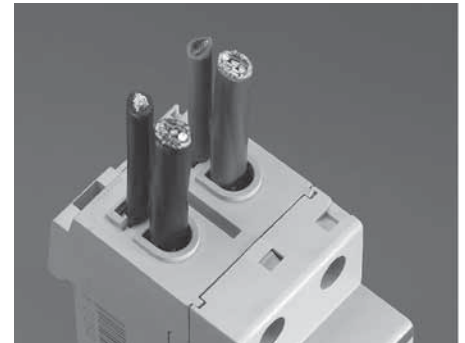
System pro M
S200 Series



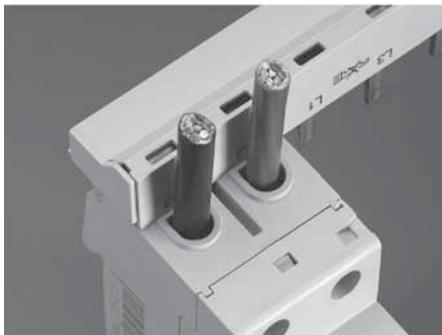
Top and bottom dual function terminals provided in open position for connection to busbars or cable.



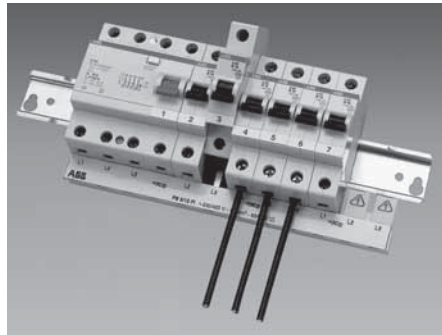
Terminals allow for connection of cable 18-4 AWG [top row] and 18-8 AWG [bottom row].



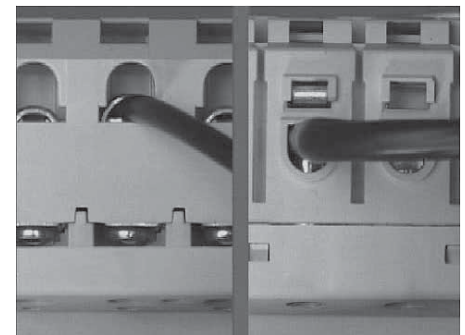
Two slots per terminal offer the ability to connect, independently, two conductors. This may be cables or bus bar.



Top and bottom terminals may be bussed together with single phase or multi-phase busbars as shown. Both line and load side terminals can be bus bar connected.



Easy removal of devices from an assembly when using bus bar in the bottom, load side terminals.



Conductors may only be inserted into open terminals, preventing mis-wiring and potential problems.

Technical data

Item	S200-B		S200-C, -D		S200-K		S200P-K	
Approvals:								
UL	1077		1077		1077		1077	
CSA	C22.2 — No. 235		C22.2 — No. 235		C22.2 — No. 235		—	
VDE	0641, 0660		0660		0660		0660	
IEC	898, 947		898, 947		898, 947		898, 947	
No. of poles:	1,2,3,4 1+N,3+N		1,2,3, 1+N,3+N		1,2,3,4, 1+N,3+N		1,2,3,4,1+N,3+N	
Tripping characteristic:	B		C,D		K		K	
Rated currents:	6 to 63A		0.5 to 63A		0.5 to 63A		0.2 to 63A	
Minimum operating voltage:	12V		12V		12V		12V	
UL/CSA rated voltage & interrupting capacity	Single pole	Multi pole	Single pole	Multi pole	Single pole	Multi pole	Single pole	Multi pole
120VAC	10kA	—	10kA	—	10kA	—	10kA	—
240VAC	6kA	10kA	6kA	10kA	6kA	10kA	10kA	10kA
277VAC	6kA	—	6kA	—	6kA	—	10kA	—
277/480 VAC	—	6kA	—	6kA	—	6kA	—	10kA
60VDC	10kA	10kA	10kA	10kA	10kA	10kA	—	—
125VDC	—	10kA	—	10kA	—	10kA	—	—
Frequency:	50/60Hz (See below)		50/60Hz (see below)		50/60Hz (see below)		50/60Hz (see below)	
Rated voltage								
IEC single pole	240/415VAC		240/415VAC		240/415VAC		240/415VAC	
	60VDC		60VDC		60VDC		60VDC	
IEC multi-pole	415VAC		415VAC		415VAC		415VAC	
	110VDC		110VDC		110VDC		110VDC	
Protection category:	IP20		IP20		IP20		IP20	
Depth of unit per DIN 43880:	68mm		68mm		68mm		68mm	
Mounting position:	optional		optional		optional		optional	
Standard mounting:	35mm DIN rail		35mm DIN rail		35mm DIN rail		35mm DIN rail	
Main and shunt trip terminals:								
Wire size	18-4 AWG [top] 18-8 [bottom]		18-4 AWG [top] 18-8 [bottom]		18-4 AWG [top] 18-8 [bottom]		18-4 AWG [top] 18-8 [bottom]	
Torque	17.5 in.-lbs.		17.5 in.-lbs.		17.5 in.-lbs.		17.5 in.-lbs.	
Tool	#2 Posidrive		#2 Posidrive		#2 Posidrive		#2 Posidrive	
Accessory terminals								
Wire size	18-16 AWG		18-16 AWG		18-16 AWG		18-16 AWG	
Torque	4.5 in.-lbs.		4.5 in.-lbs.		4.5 in.-lbs.		4.5 in.-lbs.	
Tool	#1 Posidrive		#1 Posidrive		#1 Posidrive		#1 Posidrive	
Service life at rated load:	$I_n < 32$ A, 20,000 operations $I_n > 32$ A, 10,000 operations		$I_n < 32$ A, 20,000 operations $I_n > 32$ A, 10,000 operations		$I_n < 32$ A, 20,000 operations $I_n > 32$ A, 10,000 operations		$I_n < 32$ A, 20,000 operations $I_n > 32$ A, 10,000 operations	
Ambient temperatures:	-25°C to +70°C		-25°C to +70°C		-25°C to +70°C		-25°C to +70°C	
Storage temperatures	-40°C to +70°C		-40°C to +70°C		-40°C to +70°C		-40°C to +70°C	
Shock resistance:	30g minimum of 2 impacts, shock duration of 13ms		30g minimum of 2 impacts, shock duration of 13ms		30g minimum of 2 impacts, shock duration of 13ms		30g minimum of 2 impacts, shock duration of 13ms	
Vibration resistance:	5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 - I_n		5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 - I_n		5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 - I_n		5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 - I_n	
Disconnecting neutral rating:	6kA switching		6kA switching		6kA switching		—	

Influence of frequency on electro-magnetic trips

Magnetic trip values shown on trip curves are valid for 50/60Hz applications.
For frequencies other than 50/60Hz, the magnetic (instantaneous) trip values are increased by the factor given below:

	16 2/3 - 60Hz	100Hz	200Hz	400Hz	DC
Approx. factor	1	1.1	1.2	1.5	1.5

Thermal tripping is independent of frequency.

Technical data

System pro M
S200 Series

Item	S280UC-K		S200P-Z		S280UC-Z		S290-C
Approvals:	1077		1077		1077		—
UL	—		—		—		—
CSA	0660		0660		0660		0660
VDE	898,947		898, 947		898, 947		898
IEC	—		—		—		—
No. of poles:	1,2,3		1,2,3,4		1,2,3		1,2,3,4
Tripping characteristic:	K		Z		Z		C
Rated currents:	0.2 to 63A		0.5 to 63A		0.5 to 63A		80 to 125A
Minimum operating voltage:	12V		12V		12V		12V
UL/CSA rated voltage & interrupting capacity	Single pole	Multi pole	Single pole	Multi pole	Single pole	Multi pole	
120VAC	10kA	—	10kA	—	10kA	—	—
240VAC	10kA	10kA	10kA	10kA	10kA	10kA	—
277VAC	10kA	—	10kA	—	10kA	—	—
277/480 VAC	—	4.5kA for 0.2-40A 5kA for 50-63A	—	10kA	—	4.5kA for 0.2-40A 5kA for 50-63A	—
60VDC	10kA	10kA	—	—	10kA	10kA	—
125VDC	10kA	10kA	—	—	10kA	10kA	—
250VDC	4.5kA	4.5kA	—	—	4.5kA	4.5kA	—
500VDC	—	4.5kA	—	—	—	4.5kA	—
Frequency:	50/60Hz (see below)		50/60 Hz (see below)		50/60Hz (see below)		50/60Hz (see below)
Rated voltage	240/415VAC		240/415VAC		240/415VAC		230/440VAC
IEC single pole	220VDC		60VDC		220VDC		60VDC
IEC multi-pole	415VAC		415VAC		415VAC		440VAC
	440VDC		110VDC		440VDC		110VDC
Protection category:	IP20		IP20		IP20		IP20
Depth of unit per DIN 43880:	68mm		68mm		68mm		70mm
Mounting position:	optional		optional		optional		optional
Standard mounting:	35mm DIN rail		35mm DIN rail		35mm DIN-rail		35mm DIN-rail
Main and shunt trip terminals:	0.2-40A 18-4 AWG		18-4 AWG [top]		0.5-40A 18-4 AWG		80-125A 14-1/0 AWG
Wire size	50A & above 18-2 AWG		18-8 AWG [bottom]		18-2 AWG		—
Torque	17.5 in.-lbs.		17.5 in.-lbs.		17.5 in.-lbs.		17.5 in.-lbs.
Tool	#2 Posidrive		#2 Posidrive		#2 Posidrive		#2 Posidrive
Accessory terminals	18-16 AWG		18-16 AWG		18-16 AWG		18-16 AWG
Wire size	4.5 in.-lbs.		4.5 in.-lbs.		4.5 in.-lbs.		4.5 in.-lbs.
Torque	#1 Posidrive		#1 Posidrive		#1 Posidrive		#1 Posidrive
Tool	—		—		—		—
Service life at rated load:	$I_n < 32$ A, 20,000 operations		$I_n < 32$ A, 20,000 operations		$I_n < 32$ A, 20,000 operations		10,000 operations
	$I_n > 32$ A, 10,000 operations		$I_n > 32$ A, 10,000 operations		$I_n > 32$ A, 10,000 operations		—
Ambient temperatures:	-25°C to +55°C		-25°C to +70°C		-25°C to +55°C		-5°C to +45°C
Storage temperatures	-40°C to +70°C		-40°C to +70°C		-40°C to +70°C		-40°C to +70°C
Shock resistance:	30g minimum of 2 impacts, shock duration of 13ms		30g minimum of 2 impacts, shock duration of 13ms		30g minimum of 2 impacts, shock duration of 13ms		30g minimum of 2 impacts, shock duration of 13ms
Vibration resistance:	5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 - I_n		5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 - I_n		5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 - I_n		60m/s ² , at 10 - 150 Hz

Influence of frequency on electro-magnetic trips

Magnetic trip values shown on trip curves are valid for 50/60Hz applications.

For frequencies other than 50/60Hz, the magnetic (instantaneous) trip values are increased by the factor given below:

	16 2/3 - 60Hz	100Hz	200Hz	400Hz	DC
Approx. factor	1	1.1	1.2	1.5	1.5

Thermal tripping is independent of frequency.

Technical data

Item	S200U-K	S200U-Z	S200UP-K	S200UP-Z
Approvals:				
UL	489	489	489	489
CSA	C22.2 No.5	C22.2 No.5	C22.2 No.5	C22.2 No.5
VDE	0660	0660	0660	0660
IEC	898,947	898,947	898,947	898
No. of poles:	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Tripping characteristic:	K	Z	K	Z
Rated currents:	0.2 to 63A	0.2 to 63A	0.2 to 25A	0.2 to 25A
Minimum operating voltage:	12V	12V	12V	12V
UL/CSA rated voltage & interrupting capacity				
120VAC	10kA	10kA	10kA	10kA
240VAC	10kA	10kA	10kA	10kA
277VAC	10kA	10kA		
480/277 VAC	—	—	10kA	10kA
Frequency:	50/60Hz (see below)	50/60 Hz (see below)	50/60Hz (see below)	50/60Hz (see below)
Rated voltage				
IEC single pole	240/415VAC	240/415VAC	240/415VAC	240/415VAC
	220VDC	60VDC	220VDC	220VDC
IEC multi-pole	415VAC	415VAC	415VAC	415VAC
	440VDC	110VDC	440VDC	440VDC
Protection category:	IP20	IP20	IP20	IP20
Depth of unit per DIN 43880:	68mm	68mm	68mm	68mm
Mounting position:	optional	optional	optional	optional
Standard mounting:	35mm DIN rail	35mm DIN rail	35mm DIN-rail	35mm DIN-rail
Main and shunt trip terminals:				
Wire size	18-4 AWG [top] 18-8 AWG [bottom]	18-4 AWG [top] 18-8 AWG [bottom]	18-4 AWG [top] 18-8 AWG [bottom]	18-4 AWG [top] 18-8 AWG [bottom]
Torque	17.5 in-lbs.	17.5 in-lbs.	17.5 in-lbs.	17.5 in-lbs.
Tool	#2 Posidrive	#2 Posidrive	#2 Posidrive	#2 Posidrive
Accessory terminals				
Wire size	18-16 AWG	18-16 AWG	18-16 AWG	18-16 AWG
Torque	4.5 in-lbs.	4.5 in-lbs.	4.5 in-lbs.	4.5 in-lbs.
Tool	#1 Posidrive	#1 Posidrive	#1 Posidrive	#1 Posidrive
Service life at rated load:	$I_n < 32 A$, 20,000 operations $I_n > 32 A$, 10,000 operations	$I_n < 32 A$, 20,000 operations $I_n > 32 A$, 10,000 operations	$I_n < 32 A$, 20,000 operations $I_n > 32 A$, 10,000 operations	$I_n < 32 A$, 20,000 operations $I_n > 32 A$, 10,000 operations
Ambient temperatures:	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C
Storage temperatures	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C
Shock resistance:	30g minimum of 2 impacts, shock duration of 13ms	30g minimum of 2 impacts, shock duration of 13ms	30g minimum of 2 impacts, shock duration of 13ms	30g minimum of 2 impacts, shock duration of 13ms
Vibration resistance:	5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 ~ I_n	5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 ~ I_n	5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 ~ I_n	5g, 20 cycles, 5 Hz, 150 Hz @ 0.8 ~ I_n

Influence of frequency on electro-magnetic trips

Magnetic trip values shown on trip curves are valid for 50/60Hz applications. For frequencies other than 50/60Hz, the magnetic (instantaneous) trip values are increased by the factor given below:

	16 2/3 - 60Hz	100Hz	200Hz	400Hz	DC
Approx. factor	1	1.1	1.2	1.5	1.5

Thermal tripping is independent of frequency.

Technical data

Wire size comparison



Comparison of IEC and AWG wire sizes

mm	AWG (mm)	Amps / UL	Amps / IEC
1.0	—	—	8
—	16 (1.3)	10	—
1.5	—	—	12
—	14 (2.1)	15	—
2.5	—	—	20
—	12 (3.3)	20	—
4	—	—	25
—	10 (5.3)	30	—
6	—	—	32
—	8 (8.4)	50	—
10	—	—	50
—	6 (13.3)	65	—
16	—	—	65
—	4 (21.2)	85	—
25	—	—	85
—	3 (26.7)	100	—
—	2 (33.6)	115	—
35	—	—	115

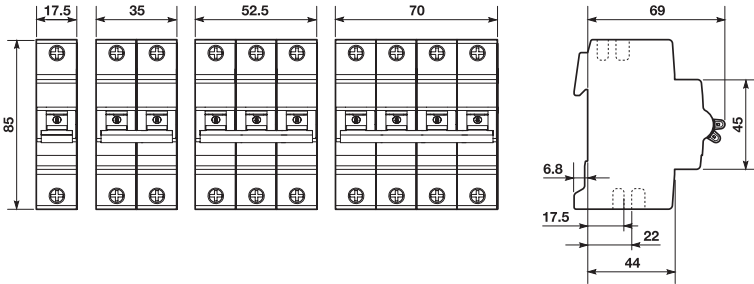
Ampacities for AWG wire are based on copper cable rated 75° C, except for 16AWG which is based on 60° C wire. Taken from UL508 Table 52.2.

Consult applicable standards for further detail and information.

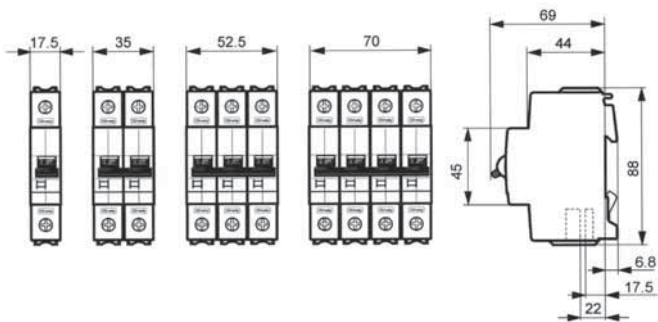
Approximate dimensions S200, S200P, S200U, S200UP

00.00 Inches
00.00 [Millimeters]

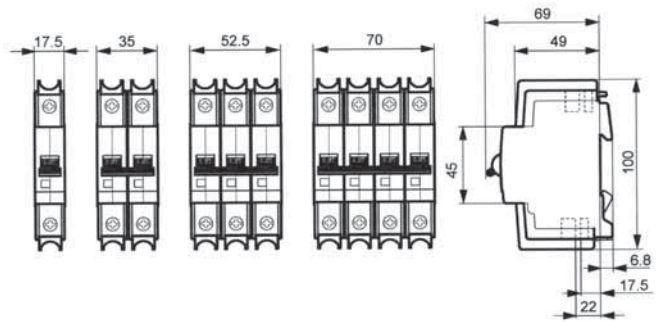
S200 & S200P



S200U

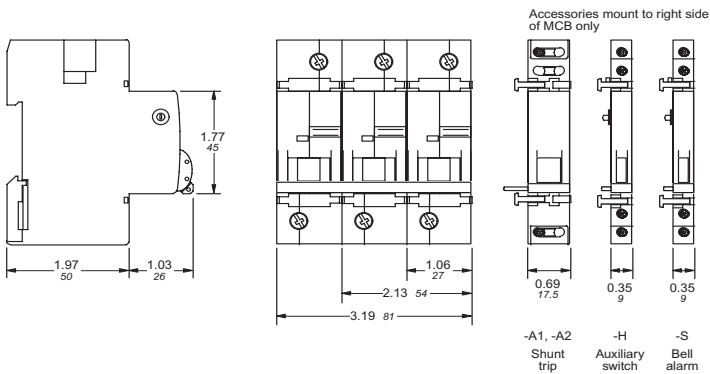


S200UP



14

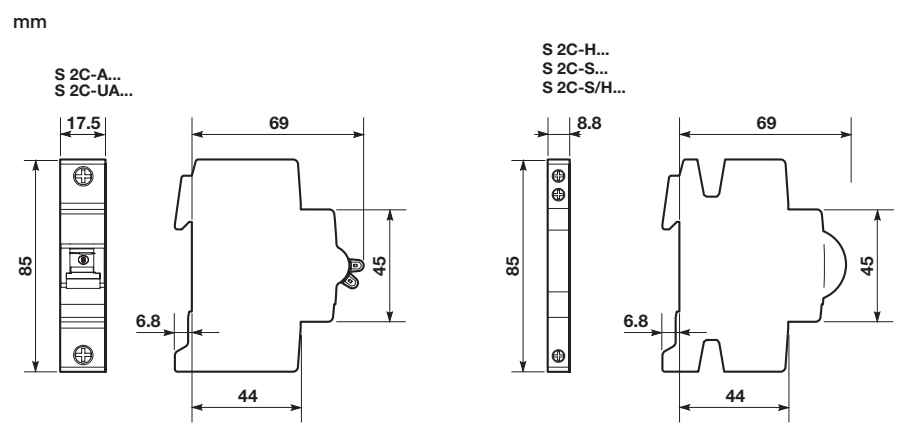
S290



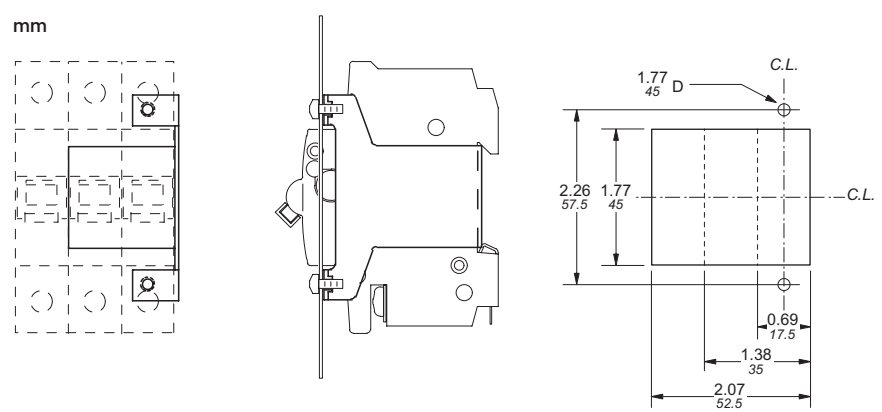
Approximate dimensions Accessories

00.00 Inches
00.00 [Millimeters]

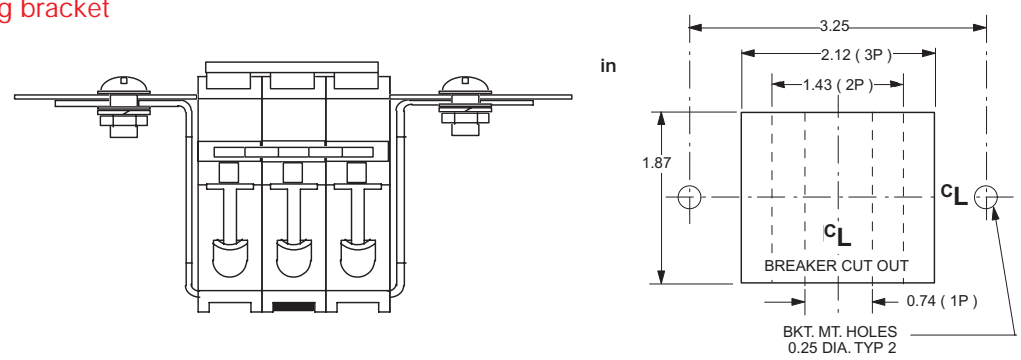
Accessories



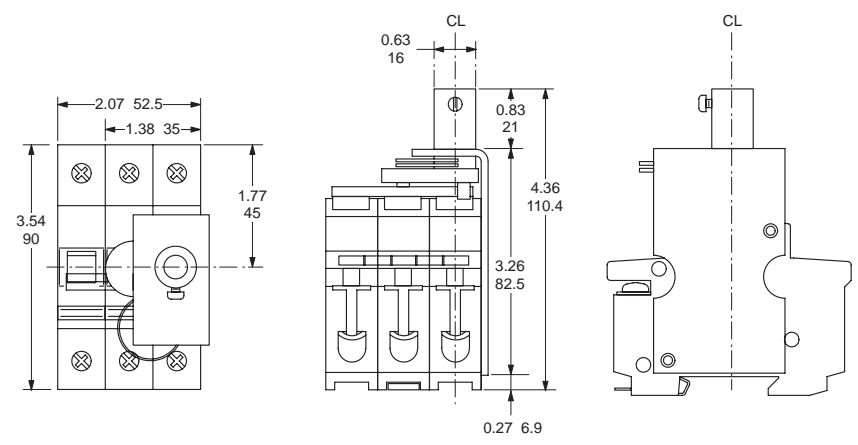
MB-CL Front mounting clip



MB-3PD Front mounting bracket



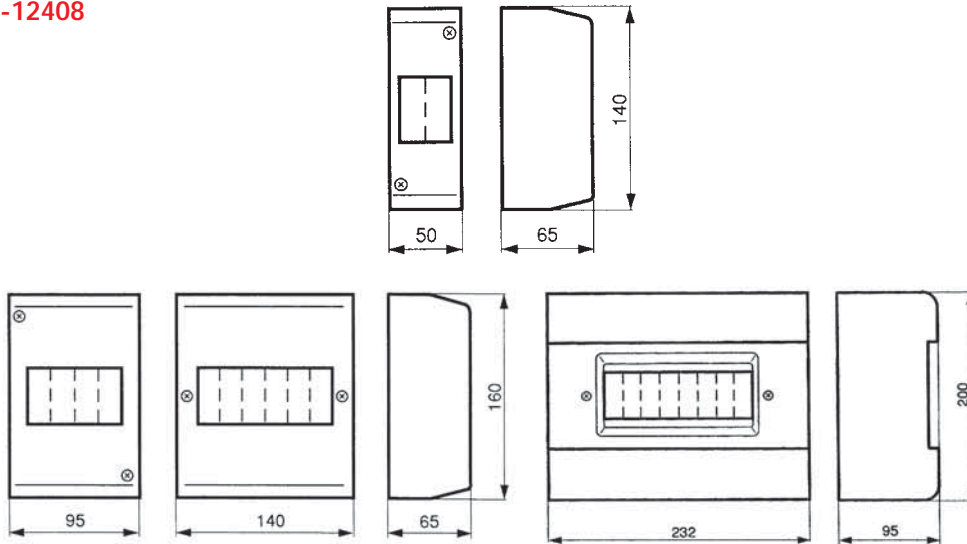
S2C-DH Handle mechanism



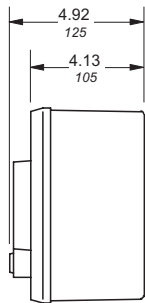
Approximate dimensions Accessories

00.00 Inches
00.00 [Millimeters]

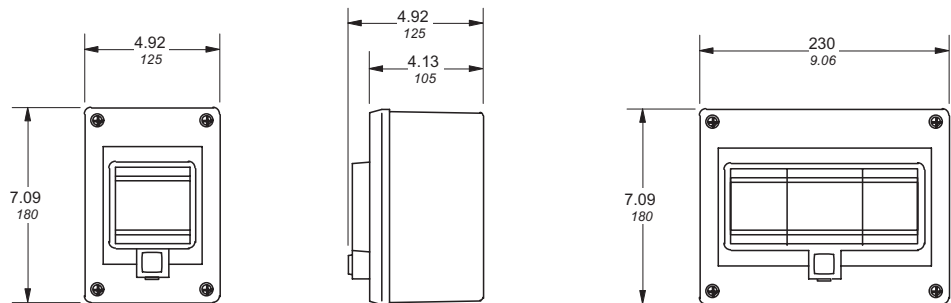
12402-12408



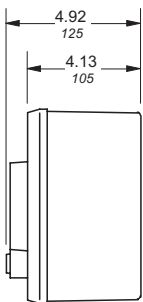
12644



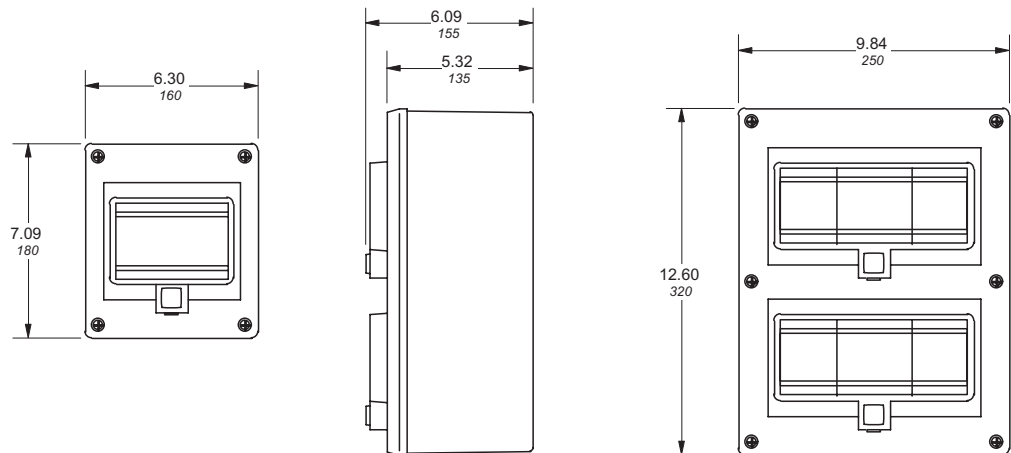
12650



12646



12652



Cross-reference

System pro M
S200 Series

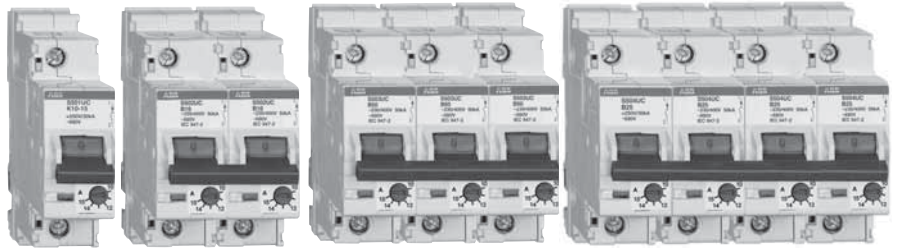
Older version	Suggested replacement series	Physical comparison	Electrical comparison
S260-B	S200-B	Same pole spacing	Same trip characteristic
S260-C	S200-C	Same pole spacing	Same trip characteristic
S260-D	S200-D	Same pole spacing	Same trip characteristic
S270-K	S200-K	Same pole spacing	Same trip characteristic
S280-K	S200P-K	Same pole spacing	Same trip characteristic
S280-Z	S200P-Z	Same pole spacing	Same trip characteristic
S280U-K	S200U-K	Same pole spacing	Same trip characteristic
S280UX-K	S200U-K	Smaller pole spacing	Same trip characteristic

Many older styles of ABB miniature circuit breakers have been replaced by new and improved versions. Many of these newer styles can be directly interchanged, both electrically and physically, with the older version. There are also many international styles of ABB circuit breakers which are not normal stock items and may be interchanged with stocked ABB versions.

S500 Miniature circuit breakers



System pro M compact Miniature Circuit Breakers S500 Series



Description

Increasing energy requirements result in larger short-circuit currents which place heavy demands on protective switchgear regarding safety, reliability and switching capacities.

The S500 heavy-duty circuit breaker fulfills these requirements by virtue of its technical features. It is equipped with a thermal and/or electromagnetic release to protect circuits, motors, switchgear and systems from the effects of overload and short-circuit currents.

For the worldwide market, the S500 breakers carry UL, CSA, IEC, CE and many other agency approvals.

Features

- High breaking capacity
- Energy-limiting
- Current-limiting
- Extremely fast breaking time
- Optimal selectivity
- Various versions for special applications
- Compact dimensions, DIN cap size
- Easy and quick to install
- Easy to connect; finger safe terminals
- Wide range of accessories
- UL 1077 recognized 600VAC and 500VDC versions

UL File # E167556

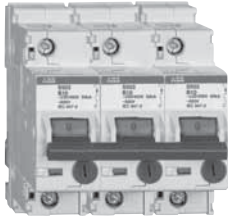
S500 600Y/277 VAC



S501-C16

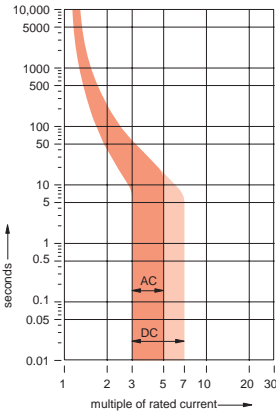


S502-C6

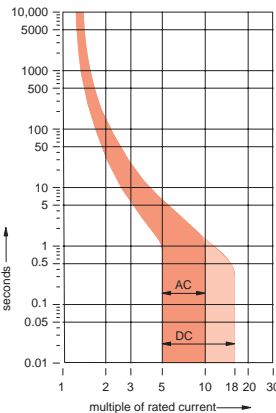


S503-C10

B



C



B UL 1077 CSA C22.2
VDE 0641 IEC 947-2

Rated current	Catalog number	List price	Delivery class	Weight (oz.) 1 pc
1 pole				
6	S501-B6	\$ 168	B	8.90
10	S501-B10	168		
13	S501-B13	168		
16	S501-B16	168		
20	S501-B20	168		
25	S501-B25	168		
32	S501-B32	168		
40	S501-B40	168		
50	S501-B50	186		
63	S501-B63	202		
2 pole				
6	S502-B6	328	B	17.85
10	S502-B10	328		
13	S502-B13	328		
16	S502-B16	328		
20	S502-B20	328		
25	S502-B25	328		
32	S502-B32	328		
40	S502-B40	328		
50	S502-B50	362		
63	S502-B63	392		
3 pole				
6	S503-B6	478	B	25.36
10	S503-B10	478		
13	S503-B13	478		
16	S503-B16	478		
20	S503-B20	478		
25	S503-B25	478		
32	S503-B32	478		
40	S503-B40	478		
50	S503-B50	526		
63	S503-B63	574		

C UL 1077 CSA C22.2
VDE 0641 IEC 947-2

Rated current	Catalog number	List price	Delivery class	Weight (oz.) 1 pc
1 pole				
6	S501-C6	\$ 168	B	8.90
10	S501-C10	168		
13	S501-C13	168		
16	S501-C16	168		
20	S501-C20	168		
25	S501-C25	168		
32	S501-C32	168		
40	S501-C40	168		
50	S501-C50	184		
63	S501-C63	202		
2 pole				
6	S502-C6	328	B	17.85
10	S502-C10	328		
13	S502-C13	328		
16	S502-C16	328		
20	S502-C20	328		
25	S502-C25	328		
32	S502-C32	328		
40	S502-C40	328		
50	S502-C50	362		
63	S502-C63	392		
3 pole				
6	S503-C6	478	B	25.36
10	S503-C10	478		
13	S503-C13	478		
16	S503-C16	478		
20	S503-C20	478		
25	S503-C25	478		
32	S503-C32	478		
40	S503-C40	478		
50	S503-C50	526		
63	S503-C63	574		

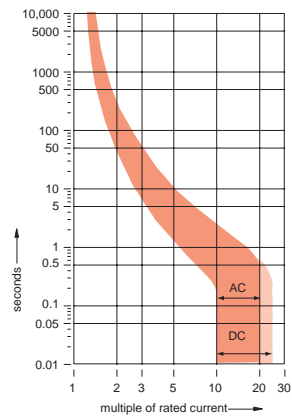
D UL 1077 CSA C22.2
VDE 0641 IEC 947-1

Rated current	Catalog number	List price	Delivery class	Wgt. oz. (1 Pc.)		
1 pole						
13	S501-D13	\$ 190	B	8.90		
16	S501-D16	190				
20	S501-D20	190				
25	S501-D25	190				
32	S501-D32	190				
40	S501-D40	190				
50	S501-D50	210				
63	S501-D63	226				
2 pole						
13	S502-D13	372			B	17.85
16	S502-D16	372				
20	S502-D20	372				
25	S502-D25	372				
32	S502-D32	372				
40	S502-D40	372				
50	S502-D50	408				
63	S502-D63	442				
3 pole						
13	S503-D13	544	B	25.36		
16	S503-D16	544				
20	S503-D20	544				
25	S503-D25	544				
32	S503-D32	544				
40	S503-D40	544				
50	S503-D50	600				
63	S503-D63	646				

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

D



S500 600Y/277 VAC

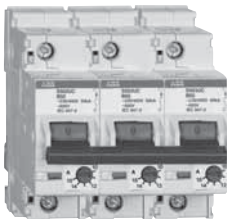
System pro M
S500 Series



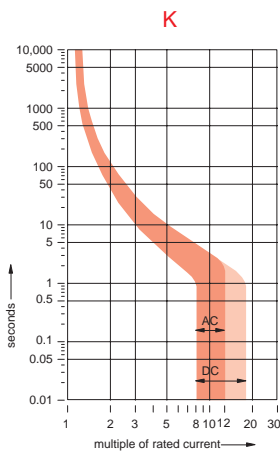
S501-D20



S502-D13



S503-K6



K UL 1077 CSA C22.2
VDE 0641 IEC-898

Delivery Class

A - Standard item, stock to 2 weeks lead time
B - Stock to 4 weeks lead time
C - 6 to 8 week lead time

Rated current	Catalog number	List price	Delivery class	Wgt. oz. (1 Pc.)
1 pole				
0.1 - 0.15	S501-K0.15	\$ 182	B	8.90
0.14 - 0.21	S501-K0.21	182		
0.2 - 0.3	S501-K0.3	182		
0.28 - 0.42	S501-K0.42	182		
0.38 - 0.58	S501-K0.58	182		
0.53 - 0.8	S501-K0.8	182		
0.73 - 1.1	S501-K1.1	182		
1 - 1.5	S501-K1.5	182		
1.4 - 2.1	S501-K2.1	182		
2 - 3	S501-K3	182		
2.8 - 4.2	S501-K4.2	182		
3.8 - 5.8	S501-K5.8	182		
5.3 - 8	S501-K8	182		
7.3 - 11	S501-K11	182		
10 - 15	S501-K15	182		
14 - 20	S501-K20	182		
18 - 26	S501-K26	182		
23 - 32	S501-K32	202		
29 - 37	S501-K37	202		
34 - 41	S501-K41	226		
38 - 45	S501-K45	226		
2 pole				
0.1 - 0.15	S502-K0.15	356	B	17.85
0.14 - 0.21	S502-K0.21	356		
0.2 - 0.3	S502-K0.3	356		
0.28 - 0.42	S502-K0.42	356		
0.38 - 0.58	S502-K0.58	356		
0.53 - 0.8	S502-K0.8	356		
0.73 - 1.1	S502-K1.1	356		
1 - 1.5	S502-K1.5	356		
1.4 - 2.1	S502-K2.1	356		
2 - 3	S502-K3	356		
2.8 - 4.2	S502-K4.2	356		
3.8 - 5.8	S502-K5.8	356		
5.3 - 8	S502-K8	356		
7.3 - 11	S502-K11	356		
10 - 15	S502-K15	356		
14 - 20	S502-K20	356		
18 - 26	S502-K26	356		
23 - 32	S502-K32	392		
29 - 37	S502-K37	392		
34 - 41	S502-K41	442		
38 - 45	S502-K45	442		
3 pole				
0.1 - 0.15	S503-K0.15	518	B	25.36
0.14 - 0.21	S503-K0.21	518		
0.2 - 0.3	S503-K0.3	518		
0.28 - 0.42	S503-K0.42	518		
0.38 - 0.58	S503-K0.58	518		
0.53 - 0.8	S503-K0.8	518		
0.73 - 1.1	S503-K1.1	518		
1 - 1.5	S503-K1.5	518		
1.4 - 2.1	S503-K2.1	518		
2 - 3	S503-K3	518		
2.8 - 4.2	S503-K4.2	518		
3.8 - 5.8	S503-K5.8	518		
5.3 - 8	S503-K8	518		
7.3 - 11	S503-K11	518		
10 - 15	S503-K15	518		
14 - 20	S503-K20	518		
18 - 26	S503-K26	518		
23 - 32	S503-K32	574		
29 - 37	S503-K37	574		
34 - 41	S503-K41	644		
38 - 45	S503-K45	828		

S500UC

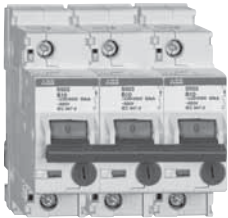
600Y/277 VAC
600 VDC



S501UC-B40



S502UC-B16



S503UC-B50

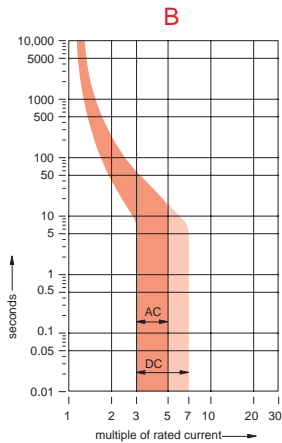
B UL 1077 CSA C22.2
VDE 0660

Rated current	Catalog number	List price	Delivery class	Weight (oz.) 1 pc
1 pole				
6	S501UC-B6	\$ 226	C	8.90
10	S501UC-B10	226		
13	S501UC-B13	226		
16	S501UC-B16	226		
20	S501UC-B20	226		
25	S501UC-B25	226		
32	S501UC-B32	226		
40	S501UC-B40	226		
50	S501UC-B50	258		
63	S501UC-B63	292		
2 pole				
6	S502UC-B6	442	C	17.85
10	S502UC-B10	442		
13	S502UC-B13	442		
16	S502UC-B16	442		
20	S502UC-B20	442		
25	S502UC-B25	442		
32	S502UC-B32	442		
40	S502UC-B40	442		
50	S502UC-B50	502		
63	S502UC-B63	568		

Rated current	Catalog number	List price	Delivery class	Weight (oz.) 1 pc
3 pole				
6	S503UC-B6	\$ 646	C	25.36
10	S503UC-B10	646		
13	S503UC-B13	646		
16	S503UC-B16	646		
20	S503UC-B20	646		
25	S503UC-B25	646		
32	S503UC-B32	646		
40	S503UC-B40	646		
50	S503UC-B50	734		
63	S503UC-B63	832		
4 pole				
6	S504UC-B6	908	C	35.75
10	S504UC-B10	908		
13	S504UC-B13	908		
16	S504UC-B16	908		
20	S504UC-B20	908		
25	S504UC-B25	908		
32	S504UC-B32	908		
40	S504UC-B40	908		
50	S504UC-B50	1030		
63	S504UC-B63	1164		

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time



S500 UC 600Y/277 VAC 600 VDC

System pro M
S500 Series

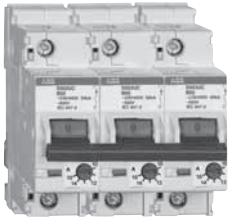
K UL 1077 CSA C22.2
VDE 0660



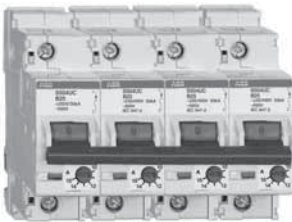
S501UC-K0.15



S502UC-K0.15

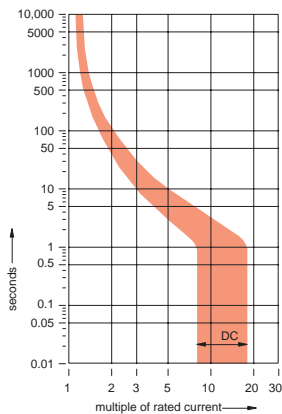


S503UC-K0.15



S504UC-K0.15

UC-K



Rated current	Catalog number	List price	Delivery class	Weight (oz.) 1 pc	Rated current	Catalog number	List price	Delivery class	Weight (oz.) 1 pc
1 pole					3 pole				
0.1 - 0.15	S501UC-K0.15	\$ 250	C	8.90	0.1 - 0.15	S503UC-K0.15	\$ 712	C	25.36
0.14 - 0.21	S501UC-K0.21	250			0.14 - 0.21	S503UC-K0.21	712		
0.2 - 0.3	S501UC-K0.3	250			0.2 - 0.3	S503UC-K0.3	712		
0.28 - 0.42	S501UC-K0.42	250			0.28 - 0.42	S503UC-K0.42	712		
0.38 - 0.58	S501UC-K0.58	250			0.38 - 0.58	S503UC-K0.58	712		
0.53 - 0.8	S501UC-K0.8	250			0.53 - 0.8	S503UC-K0.8	712		
0.73 - 1.1	S501UC-K1.1	250			0.73 - 1.1	S503UC-K1.1	712		
1 - 1.5	S501UC-K1.5	250			1 - 1.5	S503UC-K1.5	712		
1.4 - 2.1	S501UC-K2.1	250			1.4 - 2.1	S503UC-K2.1	712		
2 - 3	S501UC-K3	250			2 - 3	S503UC-K3	712		
2.8 - 4.2	S501UC-K4.2	250			2.8 - 4.2	S503UC-K4.2	712		
3.8 - 5.8	S501UC-K5.8	250			3.8 - 5.8	S503UC-K5.8	712		
5.3 - 8	S501UC-K8	250			5.3 - 8	S503UC-K8	712		
7.3 - 11	S501UC-K11	250			7.3 - 11	S503UC-K11	712		
10 - 15	S501UC-K15	250			10 - 15	S503UC-K15	712		
14 - 20	S501UC-K20	250			14 - 20	S503UC-K20	712		
18 - 26	S501UC-K26	250	18 - 26	S503UC-K26	712				
23 - 32	S501UC-K32	286	23 - 32	S503UC-K32	814				
29 - 37	S501UC-K37	286	29 - 37	S503UC-K37	814				
34 - 41	S501UC-K41	320	34 - 41	S503UC-K41	910				
38 - 45	S501UC-K45	320	38 - 45	S503UC-K45	910				
2 pole					4 pole				
0.1 - 0.15	S502UC-K0.15	488	C	17.85	0.1 - 0.15	S504UC-K0.15	996	C	35.75
0.14 - 0.21	S502UC-K0.21	488			0.14 - 0.21	S504UC-K0.21	996		
0.2 - 0.3	S502UC-K0.3	488			0.2 - 0.3	S504UC-K0.3	996		
0.28 - 0.42	S502UC-K0.42	488			0.28 - 0.42	S504UC-K0.42	996		
0.38 - 0.58	S502UC-K0.58	488			0.38 - 0.58	S504UC-K0.58	996		
0.53 - 0.8	S502UC-K0.8	488			0.53 - 0.8	S504UC-K0.8	996		
0.73 - 1.1	S502UC-K1.1	488			0.73 - 1.1	S504UC-K1.1	996		
1 - 1.5	S502UC-K1.5	488			1 - 1.5	S504UC-K1.5	996		
1.4 - 2.1	S502UC-K2.1	488			1.4 - 2.1	S504UC-K2.1	996		
2 - 3	S502UC-K3	488			2 - 3	S504UC-K3	996		
2.8 - 4.2	S502UC-K4.2	488			2.8 - 4.2	S504UC-K4.2	996		
3.8 - 5.8	S502UC-K5.8	488			3.8 - 5.8	S504UC-K5.8	996		
5.3 - 8	S502UC-K8	488			5.3 - 8	S504UC-K8	996		
7.3 - 11	S502UC-K11	488			7.3 - 11	S504UC-K11	996		
10 - 15	S502UC-K15	488			10 - 15	S504UC-K15	996		
14 - 20	S502UC-K20	488			14 - 20	S504UC-K20	996		
18 - 26	S502UC-K26	488	18 - 26	S504UC-K26	996				
23 - 32	S502UC-K32	558	23 - 32	S504UC-K32	1142				
29 - 37	S502UC-K37	558	29 - 37	S504UC-K37	1142				
34 - 41	S502UC-K41	622	34 - 41	S504UC-K41	1276				
38 - 45	S502UC-K45	622	38 - 45	S504UC-K45	1276				

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time



S500-H11
Auxiliary contacts



S500-RD3



S500-K2



S500-BB38

Electrical accessories	Catalog number	List price	Delivery class	Wgt. oz. (1pc.)
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Auxiliary contacts

1 N.O./1 N.C.	S500-H11	\$ 84	B	2.14
2 N.O.	S500-H20			
2 N.C.	S500-H02			

For field mounting left side

Bell alarm with auxiliary contacts

1 N.O./1 N.C.	S500-S11	92	B	2.14
2 N.O.	S500-S20			
2 N.C.	S500-S02			

For field mounting left side

Handle mechanism

S500-RD3	100	B	6.5
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For use with 1-4 pole S500 MCBs and disconnect switch selector handles with 5mm shafts

Front mounting kit

For 1 pole	S500-ME1	60	A	2.1
1 to 3 poles	S500-ME2	70		2.9
1 to 7 poles	S500-ME3	80		3.6

Power feed terminal – Accepts into 2/0 AWG

S500-K2	25	A	2
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Suggested order quantity is 5.

Busbars – 3 phase L1, L2, L3

Amp rating	Number of poles	Busbar length (mm)	End cap catalog number	Catalog number	List price	Delivery class	Suggested order qty. quantity	Weight (ozs)
150	3 x 8	650	—	S500-BB38	\$ 182	A	1	1
	4 x 4	435	—	S500-BB44	142			
	3 x 13	1055	—	S500-BB313	274			

Busbar end caps

Electrical accessories	Catalog number	List price	Delivery class	Wgt. oz. (1pc.)
	S500-EK	\$ 25	A	10

Electrical accessories	Catalog number suffix	List price	Delivery class	Wgt. oz. (1pc.)
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Undervoltage release

12 V	UA12	\$ 266	B	5.71
24 V	UA24			
48 V	UA48			
110 V	UA110			
230 V	UA230			
500 V	UA500			

Factory mount only.

Shunt trip

12 V	AL12	224	B	5.71
24 V	AL24			
48 V	AL48			
110 V	AL110			
230 V	AL230			
500 V	AL500			

Factory mount only.

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

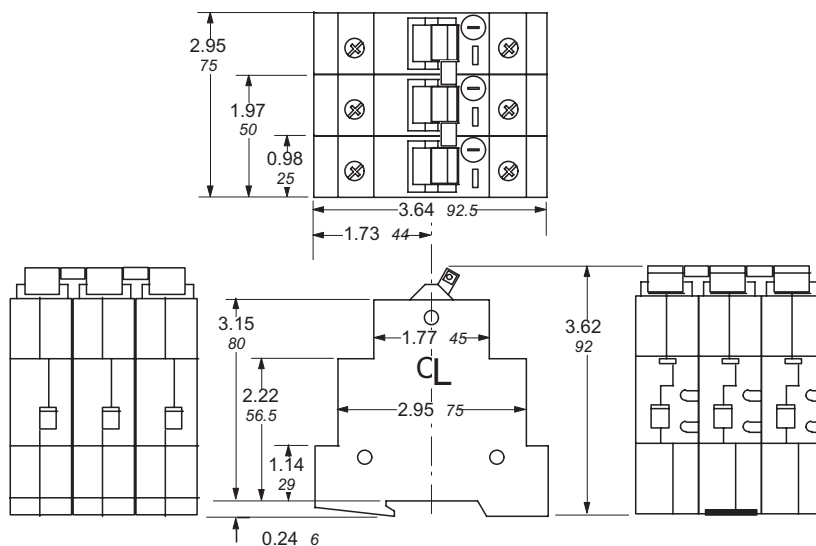
Technical data

System pro M
S500 Series

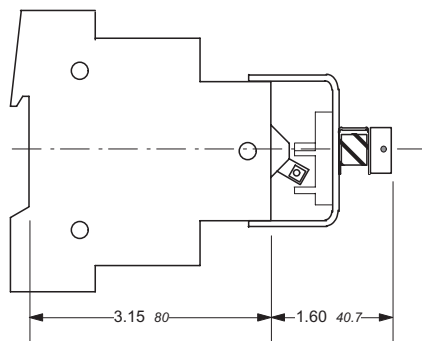
Item	S500-B, C, D	S500-K
Approvals:		
UL	1077	1077
CSA	C22.2 - No.235	C22.2 - No. 235
VDE	0641/6.78	0641/6.78
IEC	947-2	—
No. of poles:	1,2,3, +N, +NA	1,2,3, +N, +NA
Tripping characteristic:	B.C.D.	K
Rated currents:	6 to 63A	0.1 to 45A
Rated voltage:		
UL/CSA single pole	277VAC	277VAC
UL/CSA multi pole	600VAC	600VAC
IEC single pole	690VAC	690VAC
Rated interrupting capacity:		
Single pole	6-25A – 30KA/240VAC 14KA/277VAC	0.15-25A – 30KA/240VAC 14KA/277VAC
	32-63A – 18KA/240VAC 14KA/277VAC	26-45A – 18KA/240VAC 14KA/277VAC
Multi-pole	6-63A – 14KA/480VAC 6KA/600VAC	0.15-45A – 14KA/480VAC 6KA/600VAC
Frequency:	50/60 Hz	50/60Hz
Mounting position:	optional	optional
Standard mounting:	35mm DIN rail	35mm DIN rail
Terminals:	Conductors from 16-4AWG (1-25sq mm)	Conductors from 16-4AWG (1-25sq mm)
Service life at rated load:	20,000 operations	20,000 operations
Calibration temperature:	40°C	40°C

Item	S500UC-B, K			
Approvals:				
UL			1077	
CSA			C22.2	
VDE			0660	
No. of poles:			1,2,3, 4	
Tripping characteristic:			B, K	
Rated currents:			B: 6 to 63A K: 0.15 to 45A	
Rated voltage:				
UL single pole			277VAC/250VDC	
UL multi pole			600VAC/600VDC	
IEC multi pole			690VAC/750VDC	
Rated interrupting capacity:				
	B single pole:			
	6 – 25A	18KA/240VAC	14KA/277VAC	30KA/250VDC
	32 – 63A	30KA/240VAC	14KA/277VAC	30KA/250VDC
	B two-pole:			
	6 – 63A	14KA/480VAC	6KA/600VAC	30KA/500VDC
	B three-pole:			
	6 – 63A	14KA/480VAC	6KA/600VAC	30KA/600VDC
	K single pole:			
	0.15 – 25A	30KA/240VAC	14KA/277VAC	30KA/250VDC
	32 – 45A	18KA/240VAC	14KA/277VAC	30KA/250VDC
	K two-pole:			
	0.15 – 45A	14KA/480VAC	6KA/600VAC	30KA/500VDC
	K three-pole:			
	0.5 – 45A	14KA/480VAC	6KA/600VAC	30KA/600VDC
Frequency:			50/60Hz	
Mounting position:			optional	
Standard mounting:			35mm DIN-rail	
Terminals:			Conductors from 16 to 4AWG (1-25sq mm)	
Service life at rated load:			20,000 operations	

S500

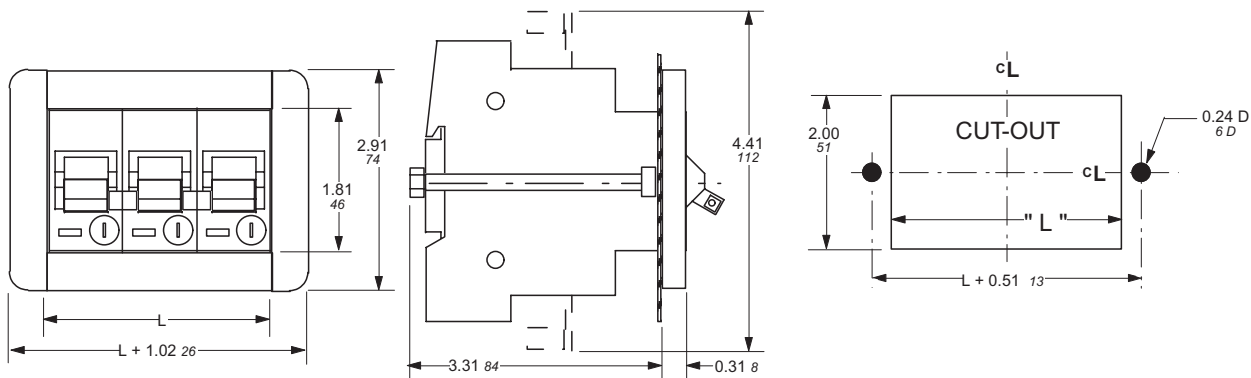


S500-RD3 Handle mechanism



14

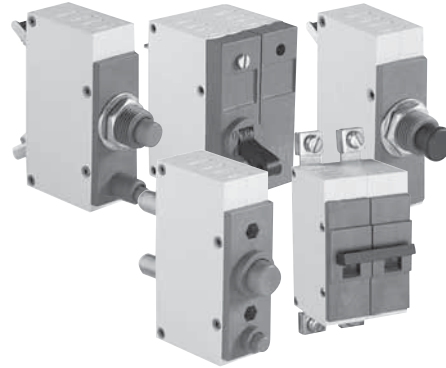
S500 Front mounting kit



Series GD, GH, GN & GV Circuit breakers



Galaxie circuit breakers GD, GH, GN & GV



Description

Galaxie circuit breakers are door mounted for AC and DC applications. The breakers offer thermal-magnetic and magnetic-only trip protection.

For the worldwide market, the Galaxie breakers carry UL, CSA, IEC, CE and many other agency approvals and certifications.

Features

- Convenient actuators: Switch type, rocker switch & pushbutton
- Various termination mountings
- Tropicalization protection
- 480Y/277 VAC
- UL 1077 Recognized – supplemental protective device. UL File # E75741.

GD, GH, GN & GV Series circuit breakers

Fitted, unpluggable or projecting type



Catalog number explanation

Circuit Breakers

SERIES

- GD** Standard Galaxie AC 240/415 V 50/60 Hz can be used at 48 V DC max.
- GH** High rupturing capacity Galaxie AC 240/415 V 50/60 Hz
- GN** Special Galaxie 100 V DC max.
- GV** Special Galaxie 150 V DC max.
- GA** Severe environment Galaxie (i.e. military use) consult us

VERSIONS

- U** One-pole (1 protected pole)
- B** Two-pole (2 protected poles)
- T** Three-pole (3 protected poles)
- Q** Four-pole (4 protected poles)
- 1+N** Two-pole (1 protected pole + neutral)
- 3+N** Four-pole (3 protected poles + neutral)

RATING (In : Amps)

0.1 - 0.2 - 0.3 - 0.5 - 1 - 1.5 - 2 - 2.5 - 3 - 4 - 5
6 - 8 - 10 - 12 - 13 - 16 - 20 - 25 - 30 - 32
 Heavy duty types : ratings according to NF EN60 898 Other ratings, consult us.

MODELS

- L** Thermal-magnetic - Curve B according to NF EN60 898
- U** Thermal-magnetic - Curve C according to NF EN60 898
- D** Thermal-magnetic - Curve D according to NF EN60 898 Ratings 6 to 32 A
- S** Thermal-magnetic (series GN and GV only) according to NF F 62001
- T** Thermal (except series GH)

FASTENINGS AND OPERATIONS ①

00 - 01 - 02 - 03 - 04 - 05 - 06 - 07 - 08 - 09

TERMINATIONS ①

00 - 01 - 02 - 03 - 07 - 08 - 09 - 33 - 43

OPTIONS

RATING ENGRAVED

- J** On resetting button

METAL THREADED BUSHING

- W** For fastening and operations 6-7-8. Tightening torque : 3 Nm max. (compulsory with option K)

CIRCUIT BREAKER SERIES GD MODEL D ②

- R** With adjustable thermal protection (Not possible with option K)

MECHANICAL IMPACT

- V** 50 g
- E** 100 G

TROPICALIZATION

- T** (Compulsory with option E 100)

THERMAL PROTECTION

- C** Temperature compensated from + 20°C to + 60°C
- K** Temperature compensated from - 40°C to + 85°C series GD, GH and GA (Compulsory with Option W)

AUXILIARY CONTACT FOR POSITION SIGNALLING O/F

- P1** on 1 pole
- P2** on 2 poles
- P3** on 3 poles
- P4** on 4 poles

① See next page

② Series GD, Model D only

EXAMPLE :

1 **Circuit breaker** Series : Galaxie standard AC - Version : 2 protected poles - Rating : 10 A - Model : magnetic-thermal, curve C - Fastenings and operations : Threaded bushing flush type 2 buttons - Terminations : Screws and back connectors - With Options Auxiliary for position signalling O/F : on 2 poles - Tropicalization has reference **GDB10U0703 P2T**

GD B 10 U 07 03 P2 - T - - - -

Technical data

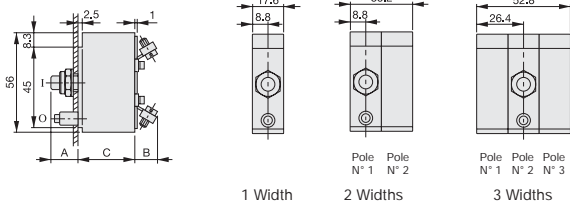
Galaxie
circuit breakers

Characteristics	CE	UL, CSA : For list of certified products : consult us		Circuit breakers NF F62 001 : consult us	
		SERIES GD	SERIES GH	SERIES GN	SERIES GV
Rated voltage					
1 + neutral version		240 V AC (50/60 Hz)			
One pole version		240/415 V AC (50/60 Hz)	240/415 V AC (50/60 Hz)		
Multipole version		415 V AC (50/60 Hz)	415 V AC (50/60 Hz)		
One pole and two pole version		48 V DC max.		100 V DC max.	150 V DC max.
Interrupting capacity					
According to standard IEC 898		3 000 A	4 500 A (models U and D: rating \geq 5 A) 4 500 A (model L: rating \geq 10 A)		
According to standard NF F62 001		1 000 A (48 V DC max.)		500 A	1 000 A (48 V DC max.)
		10 In cal. < 5 A ; 20 In cal > 5 A		10 In cal. < 5 A ; 20 In cal > 5 A	10 In cal. < 5 A ; 20 In cal > 5 A
Other characteristics					
Life, number of cycles (On+Off)		4 000	4 000	4 000	4 000
Dielectric withstanding voltage		2 000 V rms	2 000 V rms	2 000 V rms	2 000 V rms
Tripping curves (1) (2)	S	Curve B : 3 In < S < 5 In - Curve C : 5 In < S < 10 In - Curve D : 10 In < S < 20 In < 14 In		Nominal current 0.1 to 2 A : 5 In < S < 10 In - 3 to 32 A : 7 In < S	
Mechanical shock		30 g.	30 g.	30 g.	30 g.
Ambient temperature		-5° C to 40° C	-5° C to 40° C	-25° C to + 70° C	-25° C to + 70° C

Approximate dimensions

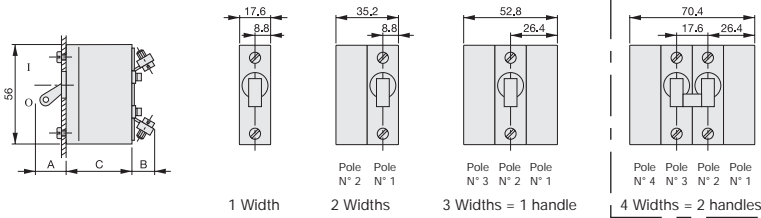
← 00.00 → Millimeters

Fastenings and operations N° 00 - 01 - 02 - 03 - 04 - 06 - 07 - 08



Fastenings / Operations	00	01	02	03	04	05	06	07	08	09
Size A	8	8	8	8	8	17,5	15	15	21	28
Size C	32	32	32	32	32	37	32	32	32	32
Terminations	00	01	02	03	33	43		07	08	09
Size B	15	4	4	12	4	4		4	4	11

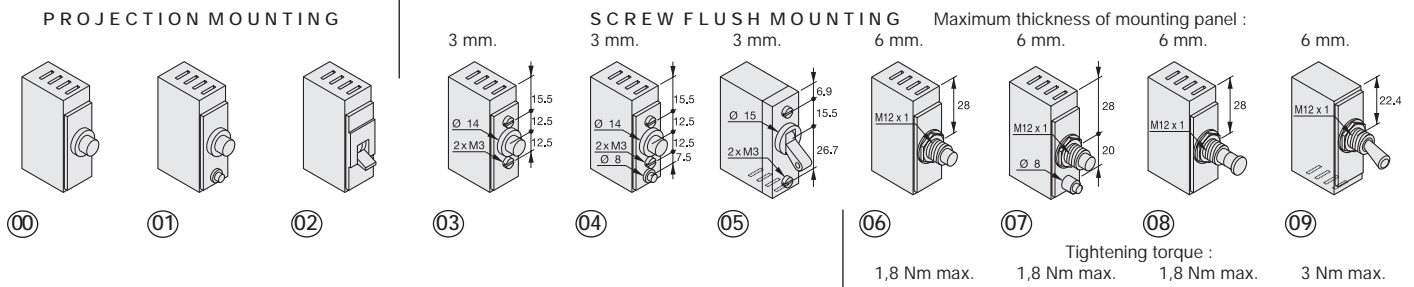
Fastenings and operations N° 05 - 09



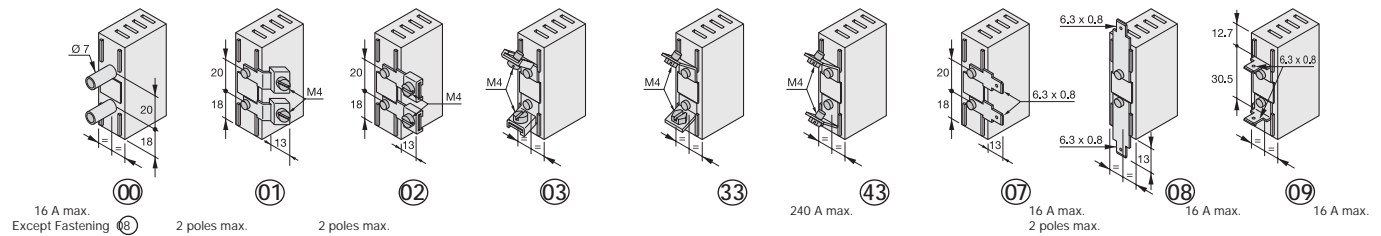
Four-pole circuit breaker :
Fastening and operation N° 05 only

NOTE :
Neutral on pole N° 1
any
Fastenings and operations

Fastenings and operations (3 poles max. except 02 : 2 poles and 05 : 4 poles)



Terminations



F200 – F670

Residual current devices



System pro M compact Residual current devices F200, F670 series



2 Pole

4 Pole

Description

RCDs provide ground fault equipment protection by monitoring the leakage of current to ground. The F200 and F670 series will trip when ground faults are detected in excess of the GF trip rating of the device. These devices provide GF protection only and are used in series with standard MCBs which provide overload and short circuit protection. The F200 and F670 series can be used as a main device providing GF protection for several MCB branch devices.

The F200 and F670 series are UL1053 recognized for use in 480Y/277VAC applications.

The F202 and F672 is for use in single phase/two wire or two wire systems. The F204 and F674 is for use in three phase/four wire systems.

The F200 and F670 series RCDs replace the F360, F370 and F660 series with no change in fit, form or function.

The F200 and F670 have a profile similar to the S2 MCBs and can be used with the MCB busbars.

F200 & F670



F202, F672



F204, F674

Residual current devices

Breaker	GF trip level	Rated current	Catalog number	List price	Delivery class	Suggested order qty	Wgt. oz (1 Pc.)					
F202 F672	Two pole 480Y/277VAC	10mA	16	F202AC-16/0.01	\$ 500	B	1	13.8				
			25	F202AC-25/0.03	300							
			40	F202AC-40/0.03	400							
			63	F202AC-63/0.03	550							
			80	F672-80/0.03	1600							
	30mA	100	F672-100/0.03	2200								
		100mA	25	F202AC-25/0.1	300							
			40	F202AC-40/0.1	400							
			63	F202AC-63/0.1	550							
			80	F672-80/0.1	1600							
	100		F672-100/0.1	2200								
	F204 F674	Four pole 480Y/277VAC	30mA	25	F204AC-25/0.03				350	B	1	19.0
				40	F204AC-40/0.03				450			
				63	F204AC-63/0.03				600			
				80	F674-80/0.03				1300			
100				F674-100/0.03	1800							
100mA		125	F674-125/0.03	1800								
		300mA	25	F204AC-25/0.1	350							
			40	F204AC-40/0.1	450							
			63	F204AC-63/0.1	600							
			80	F674-80/0.1	1300							
100			F674-100/0.1	1800								
500mA		125	F674-125/0.1	1800								
		500mA	25	F204AC-25/0.3	350							
			40	F204AC-40/0.3	450							
			63	F204AC-63/0.3	600							
	80		F674-80/0.3	1200								
100	F674-100/0.3		1600									
500mA	125	F674-125/0.3	1600									
	25	F204AC-25/0.5	450									
	40	F204AC-40/0.5	600									
		63	F204AC-63/0.5	650								

Above devices are UL 1053 recognized and IEC 1008 approved.

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

Accessories

F200 ①

System pro M
Residual current
devices



S2C-H6R



S2C-S/H6R



S2C-A_



S2C-UA_

Electrical accessories	For use on:	Catalog number	List price	Delivery class	Suggested order quantities	Wgt. oz. (1 pc.)
Auxiliary contacts						
For field mounting: right side Form C 1 NO/ 1 NC	F200	S2C-H6R	\$ 36	A	1	1.4

The auxiliary contacts will signal whether the breaker is in the ON or OFF position. The contacts are rated 2A/277 VAC and 1.5A/125 VDC. Minimum operating voltage is 24 VAC/VDC. Wire size: 18 AWG to 16 AWG.

Bell alarm

For field mounting, right side	F200	S2C-S/H6R	48	A	1	1.4
--------------------------------	------	-----------	-----------	---	---	-----

The bell alarm includes a set of contacts that will only signal when the breaker has tripped. Typically the contacts would be connected to an alarm or bell to signal the operator that an overcurrent trip has occurred. The bell alarm also includes a test button for testing the alarm contacts without opening the breaker. The contact is rated 2A/277 VAC and 1.5A/125 VDC. Minimum operating voltage is 24 VAC/VDC.

* Combination bell alarm/auxiliary contact

Shunt trip

For field mounting, right side A1: 12-60 VAC (12-60VDC) A2: 110-415 VAC (110-250 VDC)	F200	S2C-A1 S2C-A2	138	A	1	5.2
---	------	------------------	------------	---	---	-----

For remote tripping of breaker, a shunt trip device can be added to the MCB. The solenoid device opens the breaker after control voltage is applied. Shunt trips are available for on control system voltage (12-415 VAC/VDC).

Undervoltage release

For field mounting, right side 12 VDC 24 VAC 48 VAC 110 VAC 220 VAC 380 VAC	F200	S2C-UA12 S2C-UA24 S2C-UA48 S2C-UA110 S2C-UA230 S2C-UA400	216	A	1	5.2
---	------	---	------------	---	---	-----

When control voltage drops below approximately 50% of rated voltage, the UVR opens the breaker. The breaker can not be operated unless proper control voltage is first applied to the UVR coil. Similar in size and mounting to the shunt trip accessory.

Factory mounting

All accessories can be easily mounted in the field. For factory mounting of any accessory devices, add \$30 list to total price per breaker. To create complete catalog number, take suffix of accessory device following "S2C-" and add suffix to end of breaker part number. Multiple suffixes must be added in alphabetical order.

Delivery Class

- A** - Standard item, stock to 2 weeks lead time
- B** - Stock to 4 weeks lead time
- C** - 6 to 8 week lead time

① Please consult factory for F670 accessories.

Technical data

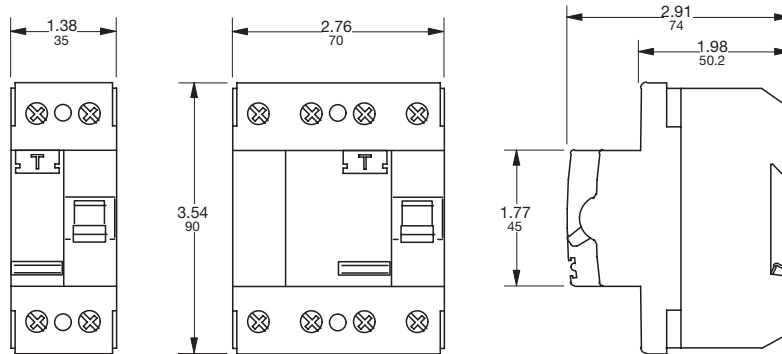
F200, F670

	F200AC	F670
Electrical features		
Standards	UL 1053 & IEC 61008	UL1053 & IEC 61008
Poles	2P, 4P	2P, 4P
Rated current In	16,25,40,63 AMPS	2P- 80,100 4P- 80,100,125
Rated Voltage Ui	480Y/277 VAC	480Y/277 VAC
Max operating voltage of circuit test	254 (440 for F200 left neutral)	254 (440 for left neutral)
Min operating voltage of circuit test	110 (195 for F200 left neutral)	110 (195 for left neutral)
Rated Frequency	50...60 Hz	50...60 Hz
Rated conditional	50...60 Hz	50...60 Hz
Short-circuit current	10 KA	10 KA
Rated residual breaking capacity	1 KA	2 KA
Rated impulse withstand voltage (1.2/50) Uimp	6 KV	6 KV
Power- frequency voltage dielectric strength	2.5 KV	2.5 KV
Surge current resistance acc. To VDE 0432 Part 2 (wave 8/20)	250 AMPS	250 AMPS
Mechanical features		
Toggle	Blue sealable in ON-OFF position	Blue sealable in ON-OFF position
Contact position indicator	yes	yes
Electrical Life	10000	10000
Mechanical life	20000	20000
Ambient temperature	-25°C... +55°C	-25°C... +55°C
Storage temp.	-40°C... +70°C	-40°C... +70°C
Installation		
Terminal Type	failsafe bidirectional cylinder-lift terminal at top and bottom (shock protected)	
Terminal size top/bottom per cable	6 AWG Max.	6 AWG Max.
Tightening torque	17.5 in-lb max.	17.5 in-lb max.
mounting	35mm din rail by means of fast clip	35mm din rail by means of fast clip
Connection	From top & bottom	From top & bottom
Withdraw from busbar	Possible without the use of tools	Possible without the use of tools
Approximate dimensions		
2 Pole mm	85x69x35 MM	85x69x35 MM
4 Pole mm	85x69x70 MM	85x69x70 MM
Weight		
2 Pole g	200g	200g
4 Pole g	350g	350g
Combination with auxiliary elements		
Auxiliary contact	yes	yes
signal contact/ auxiliary switch	yes	yes
shunt trip	yes	yes
undervoltage release	yes	yes

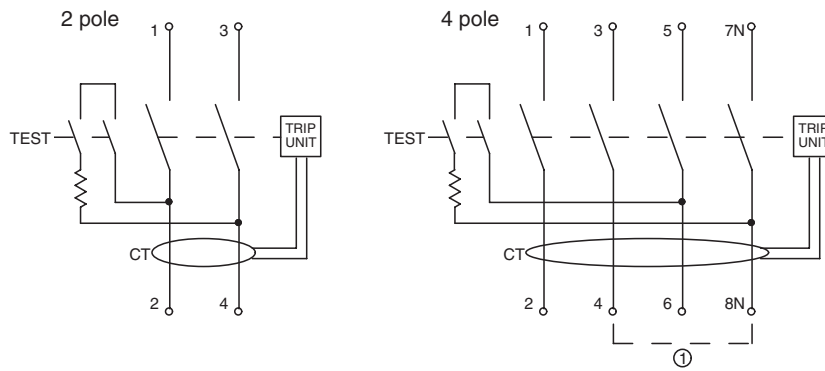
Approximate dimensions Circuit diagrams F200, F670

00.00 Inches
00.00 [Millimeters]

Approximate dimensions



Circuit diagrams



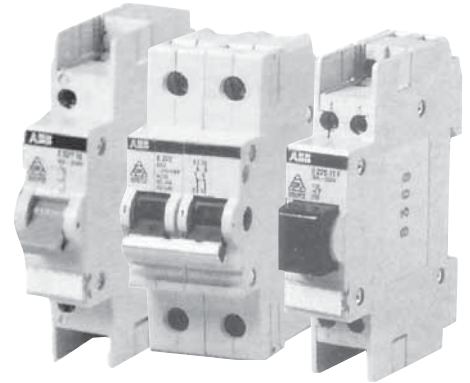
① To use on 3p/3w systems, add jumper between 4 and 8N for operation of test button.

Notes

E220 – E270 Modular DIN rail components



System pro M compact Modular DIN rail components E220 - E270 Series



Description

- Safe connection by box terminals
- Captive screws with Pozidrive slotted head, Pozidrive system, Gr. 1
- Snap-on labels available
- Quick mounting with snap-on clip, easily accessible and detachable at the bottom
- Protection against unintentional direct touch
- System approach for control and circuit protection
- Compact size that dimensionally matches the S2 MCB series
- Control and pilot functions can be along side protective devices
- DIN rail mounted with 45mm front opening
- For use in auxiliary and logic devices
- Provide additional user functions for system control and operation
- Include pushbuttons, indicating lights and selector switches
- ABB System Pro M compatibility
- Most devices are both UL 508 recognized and are IEC compliant
- Labeled with the CE Mark

E221 & E222 Switches, 240VAC 16 & 25A



E221-10

Type	Rated current	Catalog number	List price	Delivery schedule	Suggested order qty's	Weight (Oz.) 1 piece
Switches						
1 N.O. + 1 N.C.	16	E221-11	\$ 90	B	10	2.46
2 N.O. + 2 N.C.	16	E221-22	177			
3 N.O. + 1 N.C.	16	E221-31	177			
1 N.O.	16	E221-10	59	B	10	1.94
2 N.O.	16	E221-20	110			2.12
3 N.O.	16	E221-30	120			2.29
4 N.O.	16	E221-40	159			2.47
1 N.O. + 1 N.C.	25	E222-11	140	B	10	2.47
1 N.O.	25	E222-10	107			1.94
2 N.O.	25	E222-20	141			2.12
3 N.O.	25	E222-30	159			2.29
4 N.O.	25	E222-40	239			2.47
Form "C" switches						
1 Change-over contact	16	E221-6	69	B	10	2.12
2 Change-over contacts	16	E221-6/2	125			2.47
1 Change-over contact	25	E222-6	128	B	10	2.12
Form "C" switches (I-O-II, Hand-OFF-Automatic)						
1 Pole	16	E221-4	99	B	10	2.12
2 Pole	16	E221-4/2	147			2.47
1 Pole	25	E222-4	150	B	10	2.12

Note: Above devices are UL 508 recognized and IEC certified.
A300 pilot duty UL file # E171252

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

**E241 - E274 Disconnect switches
45, 63, 80 & 100A**

System pro M
Modular DIN rail
components

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14

E225 - E229, E10 Pilot devices



E225-11F



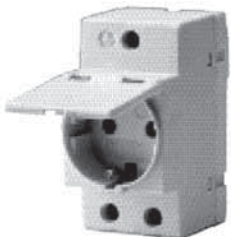
E227-10E



E233-120/60



E1175



E1175-C

Type	Catalog number	List price	Delivery schedule	Pack units pcs.	Weight (Oz.) 1 piece
Pushbutton, 1 N.O. + 1 N.C. contact					
Grey	E225-11B	\$ 75	A	10	1.94
Red	E225-11C				
Green	E225-11D				
Yellow	E225-11E				
Black	E225-11F				
Blue	E225-11G				

Illuminated pushbutton, 1 N.O. contact with lamp, 120 VAC					
Clear	E227-10B/110	100	A	10	1.94
Red	E227-10C/110				
Green	E227-10D/110				
Yellow	E227-10E/110				
Blue	E227-10G/110				

Pilot light with lamp, 120 VAC					
Clear	E229-B/110	93	A	10	1.59
Red	E229-C/110				
Green	E229-D/110				
Yellow	E229-E/110				
Blue	E229-G/110				

Lamps					
24 VAC/DC	E10/24	24	A	1	0.14
120 VAC/DC	E10/110				
220 VAC/DC	E10/220				

Note: Above devices are UL 508 recognized and IEC certified. UL file # E171252

Special features

- Safe connection via box terminals
- Captive screws with Phillips/Slotted head, Posidriv system, Gr. 1
- Snap-on labels available
- Protection against unintentional touch acc. to DIN VDE 0106 Part 100
- Lenses and pushbuttons in six colors

Elapsed time meter

Type	Catalog number	List price	Delivery schedule	Pack units pcs.	Weight (KG) 1 piece
24 VAC, 60 Hz	E233-24/60	\$ 130	B	1	0.045
120 VAC, 60 Hz	E233-120/60		A		
240 VAC, 60 Hz	E233-240/60		B		

- Non-resettable
 - 100,000 hours (99999.99)
- UL file #171252

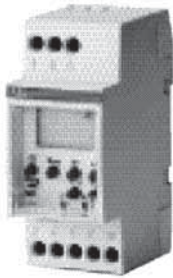
Sockets

Type	Catalog number	List price	Delivery schedule	Pack units pcs.	Weight (KG) 1 piece
Socket, 250 VAC, 50/60 Hz Italian standard	E1173	\$ 57	B	1	0.2
Socket, 250 VAC, 50/60 Hz French standard	E1174	\$ 57	B	1	0.2
Socket, 250 VAC, 50/60 Hz Schuko standard	E1175	\$ 57	B	1	0.2
Socket w/cover, 250 VAC, 50/60 Hz Schuko standard	E1175-C	\$ 57	B	1	0.2

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

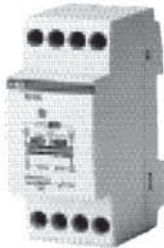
Digital meters



DTS7/1



VLMD-1-2



TM15/12

Measuring instruments

Type	Catalog number	List price	Delivery schedule	Pack units pcs.	Weight (KG) 1 piece
Digital timer, 230 VAC, 50/60 Hz	DTS7/1	\$ 422	B	1	0.3
Voltmeter 600 VAC, 50-400 Hz	VLMD-1-2	510	B	1	0.3
Ammeter 15-20-25-40-60A, 250-400-600A, 50-400 Hz	AMTD-1	510	B	1	0.3
Transformer, 230 VAC, 50/60 Hz 4-8-12 VAC sec	TM15/12	135	B	1	0.3

Components for quick mounting onto DIN rails (35mm)

Mounting depth: 68mm
Mounting width: 1, 2, 3 and 4 pole switches = 17.5mm (= 1 module)

E220 Switches, 16 & 25A

Switching capacity: $1.25 I_n$, $1.1 U_n$, $\cos j = 0.6$
Short-circuit withstanding capacity: 3 kA, 380V, $\cos j = 0.9$
Toggle sealable: In ON and OFF positions
Connection cross-sections: Up to $1 \times 6\text{mm}^2$ or $2 \times 2.5\text{mm}^2$
Rated AC voltage: 240 VAC UL/CSA (E171252)
250/440 VAC IEC

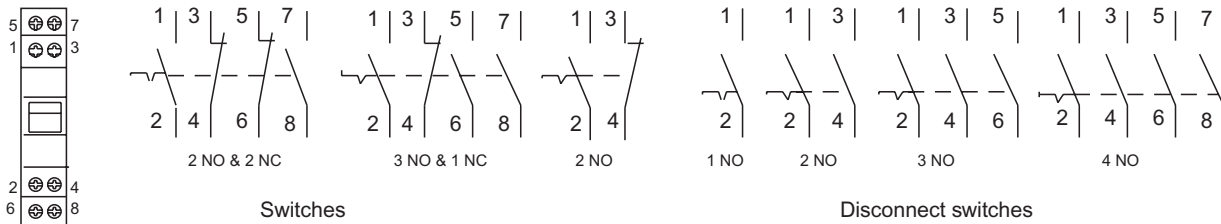
E240/270 Disconnect switches, 45, 63, 80, & 100A

Switching capacity: $1.25 I_n$, $1.1 U_n$, $\cos j = 0.3$
Short-circuit withstanding capacity: E240 = 10kA, E270 = 25kA RMS
Connection cross-sections: E240 up to 25mm^2
E270 up to 50mm^2
Rated AC voltage: 240/400/415 VAC

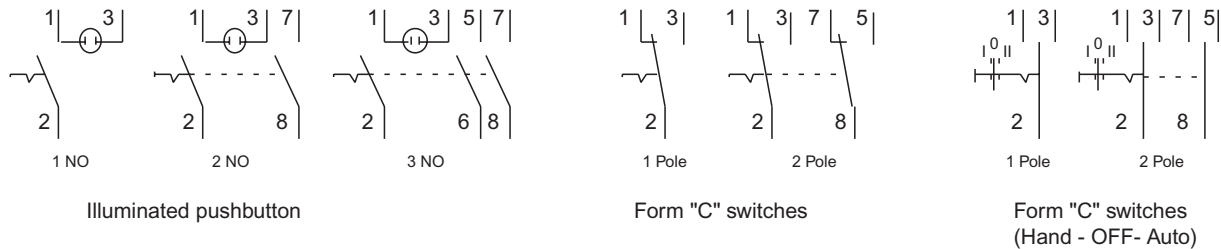
E Series components for quick mounting onto DIN rails (35mm)

Mounting depth: 68mm
Mounting width: 17.5mm (=1 module)
Color: RAL 7035, grey
Connection cross sections: Up to $1 \times 6\text{mm}^2$ or $2 \times 2.5\text{mm}^2$
Rated current: 16A
Rated voltage: 250 VAC IEC
Rated voltage: 240 VAC UL/CSA (E171252)

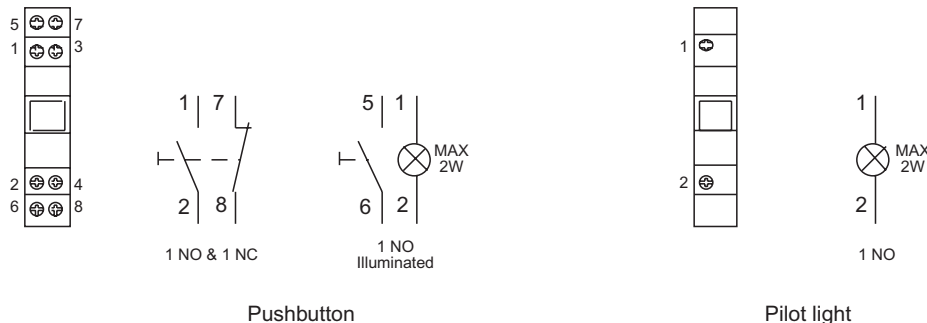
Terminal markings



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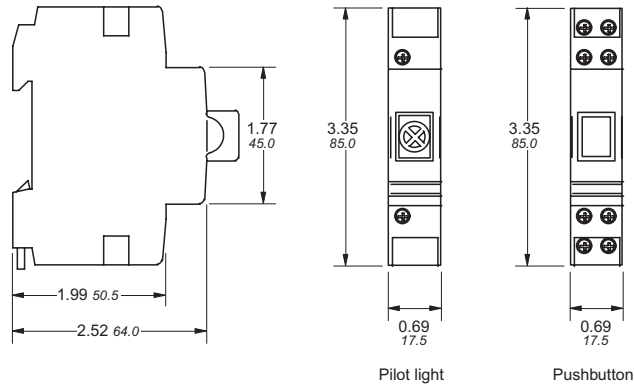
Terminal assignments for pushbuttons and indicator lights



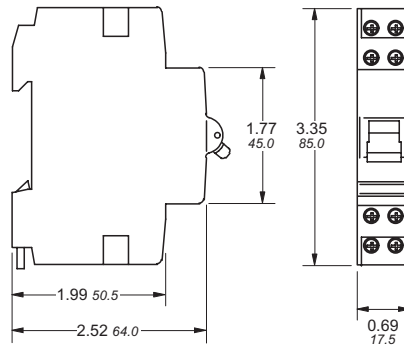
Approximate dimensions

00.00 → Inches
00.00 → [Millimeters]

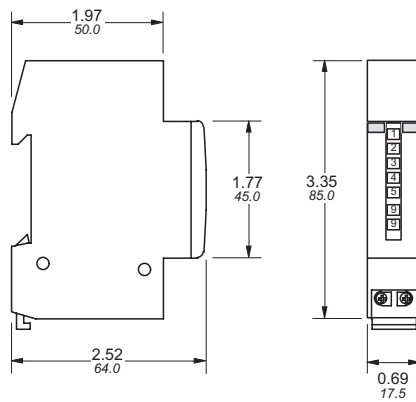
E220



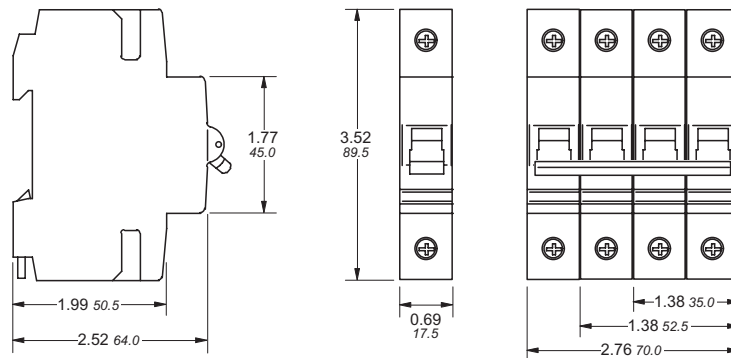
E220, 16 & 25A



E233

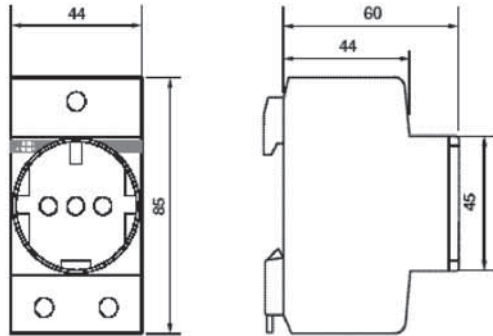


E240/270

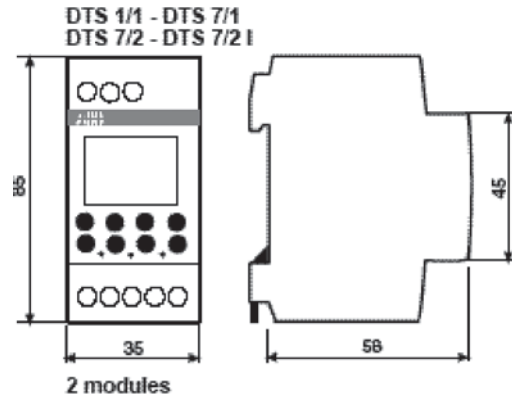


Approximate dimensions

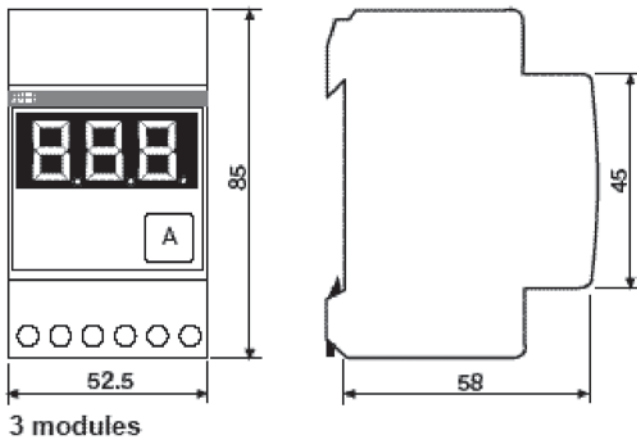
E1173 - E1175



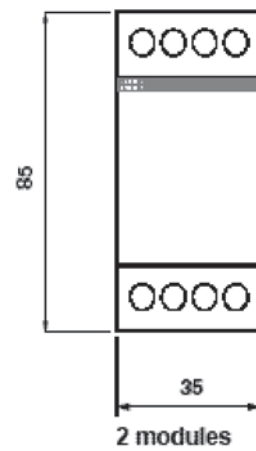
DTS



VLMD, AMTD



TMS



TVSS Transient voltage surge suppressors



Transient voltage surge suppressors
TVSS, OVR range



Description

- Compact
- DIN rail mounting
- Broad range
- 1, 2, 3, & 4 pole versions
- Replaceable plug cartridges
- Finger safe
- 15, 40, 65 & 100 kA versions
- Three position visual status indication
- Auxiliary contact for remote signalling
- UL 1449, File # E238957 & E22406

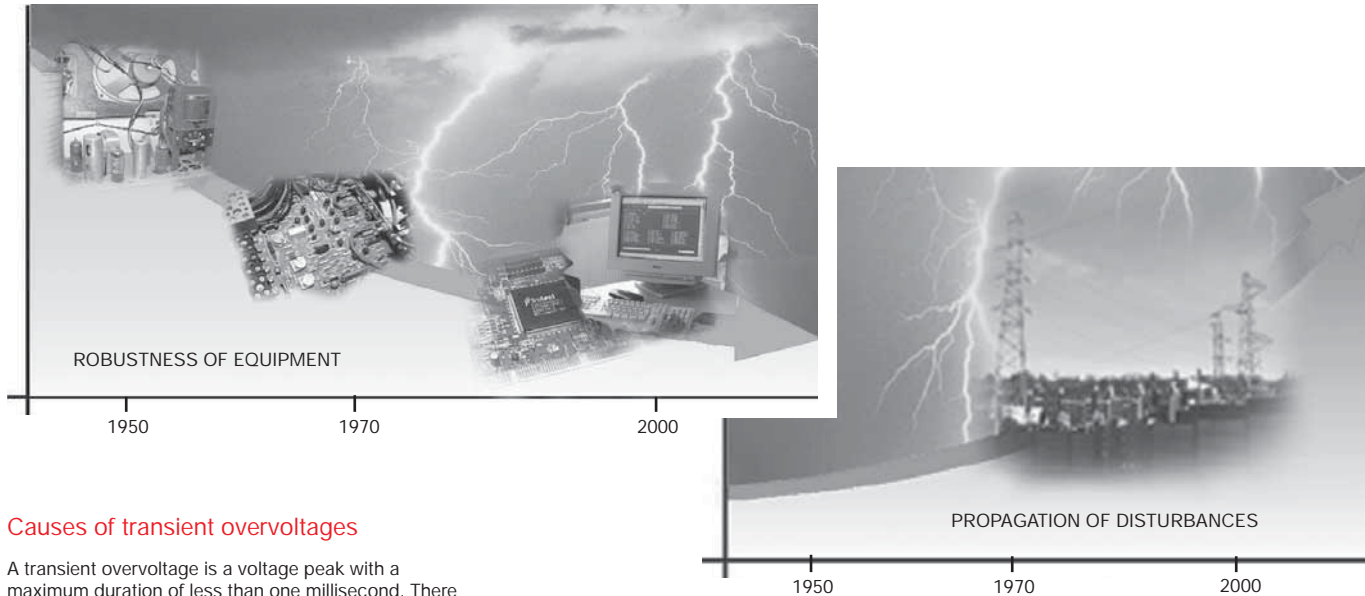
General points on lightning and its risks

Causes of transient overvoltages

The most serious consequences of lightning are the death of people and farm animals, and the destruction of equipment: telephone lines, transformers connected to the electrical distribution network, electrical meters, household appliances, etc.
At the same time, the growing amount of equipment incorporating very sensitive electronic devices increases the number of incidences linked to lightning.

Within companies, if office automation equipment or machines (in factories) are put out of action, it nearly always leads to operating losses, the cost of which is much more than that of the damaged equipment.

For example, if a bank's computers are no longer operational, it suffers large operating losses. For the general public, the damage is mainly material: computer, household appliances, home cinema, etc.



Causes of transient overvoltages

A transient overvoltage is a voltage peak with a maximum duration of less than one millisecond. There are two possible causes of overvoltages on electrical networks:

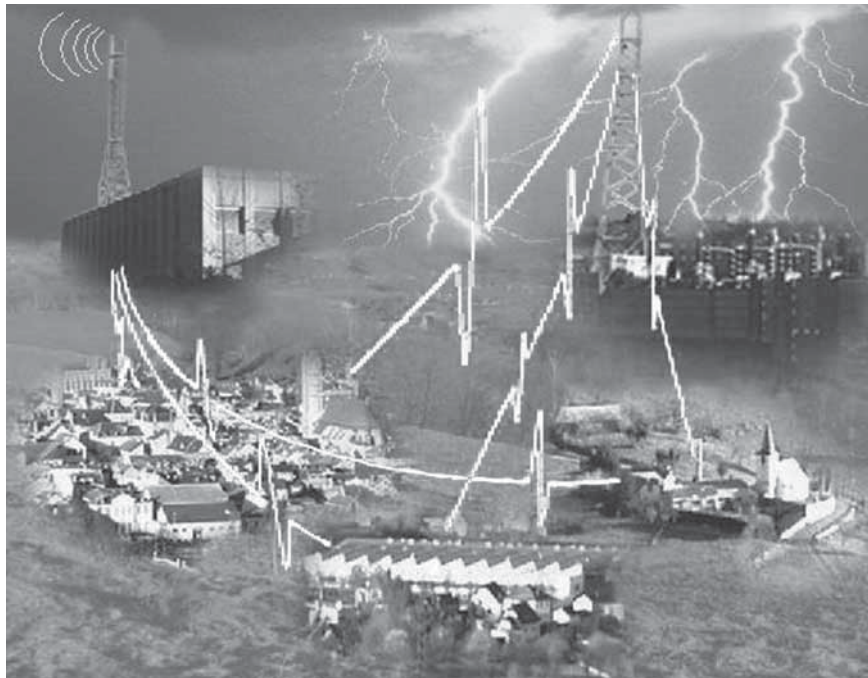
- natural causes (lightning),
- other causes due to equipment or switching devices.

Natural overvoltages on low voltage networks are caused by direct lightning strikes. The high level of energy contained in a direct lightning strike on a lightning conductor or an overhead low voltage line leads to considerable damage of the installation. The overvoltage can be over 20 times the nominal voltage.

Operating or switching overvoltages linked to a network's equipment create overvoltages of a lower level (3 to 5 times the nominal voltage) but occur much more frequently, thus causing premature ageing of the equipment.

Three categories of overvoltage propagate on low voltage networks:

- direct lightning strikes,
- indirect effects of lightning strikes,
- operating or switching overvoltages.



Propagation of overvoltages by electrical networks (power and low current)

General points on lightning and its risks

Causes of transient overvoltages

Overvoltages due to direct lightning strikes

These can take two forms:

- When lightning strikes a lightning conductor or the roof of a building which is earthed, the lightning current is dissipated into the ground. The impedance of the ground and the current flowing through it create large difference of potential: this is the overvoltage. This overvoltage then propagates throughout the building via the cables, damaging equipment along the way.
- When lightning strikes an overhead low voltage line, the latter conducts high currents which penetrate into the building creating large overvoltages. The damage caused by this type of overvoltage is usually spectacular (e.g. fire in the electrical switchboard causing the destruction of buildings and industrial equipment) and results in explosions.



Direct lightning strike on a lightning conductor or the roof of a building



Direct lightning strike on an overhead line

Overvoltages due to the indirect effects of lightning strikes

The overvoltages previously mentioned are also found when lightning strikes in the vicinity of a building, due to the increase in potential of the ground at the point of impact. The electromagnetic fields created by the lightning current generate inductive and capacitive coupling, leading to other overvoltages.

Within a radius up to several kilometres, the electromagnetic field caused by lightning in clouds can also create sudden increases in voltage.

Although less spectacular than in the previous case, irreparable damage is also caused to so called sensitive equipment such as fax machines, computer power supplies and safety and communication systems.



Increase in ground potential



Magnetic field

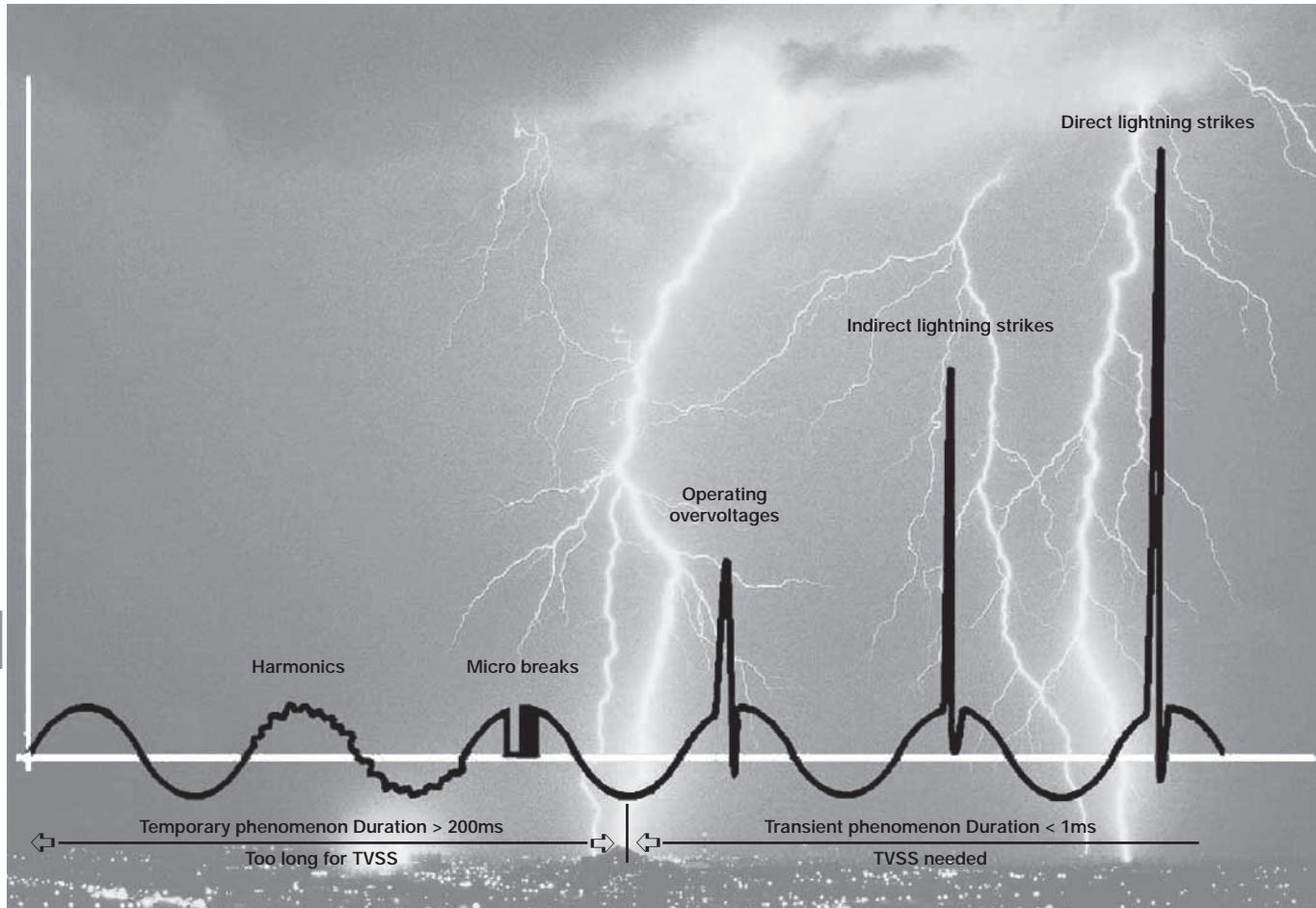


Electrostatic field

Different types of surges

Equipment containing electronic switching components is also likely to generate electrical disturbances comparable to overvoltages. The consequences of which on sensitive equipment, albeit not visible, are no less detrimental: premature ageing and unpredictable or fleeting breakdowns.

Operating overvoltages are produced when reactive or capacitive equipment is switched on and off. Furthermore, interrupting factory production, lighting or transformers can generate overvoltages which will themselves cause greater damage to nearby electrical equipment.



Representation of the various disturbances on electrical networks

Different type of power supply disturbances

- Atmospheric discharges
- Industrial interferences
- Switching operations on the power distribution system

Main effects

- Destruction of the equipment
- Premature aging
- Incorrect operations

OVR Range Main features

TVSSs protect installations by limiting transient overvoltages and run-off lightning currents for electric and electronic equipment.

They are divided into three families:

- **Type 2 TVSSs** provide protection for equipment against transient over-voltage and they are installed in the Main Switch Board (MSB), or in the Sub-Distribution Board (SDB).

In addition to the standard TVSSs, two options are available: the Safety reserve system and the remote indication (TS), in order to ensure a preventive maintenance of the installation.

ABB TVSS (OVR range) offer the same "plus" advantages of the other System pro M compact devices, in order to get a perfect compatibility with all the modular range of products.

All these TVSS products comply with the international standard IEC 61643-1 and the European standard EN 61643-11.

They also comply with UL 1449 and CSA C22.2.

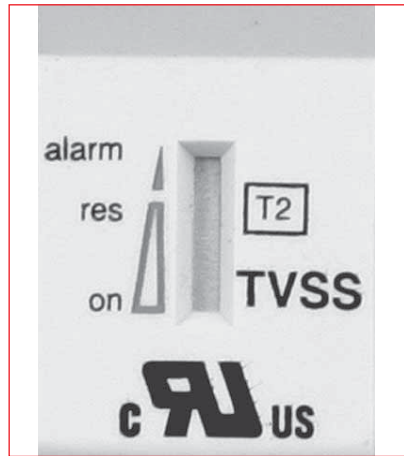
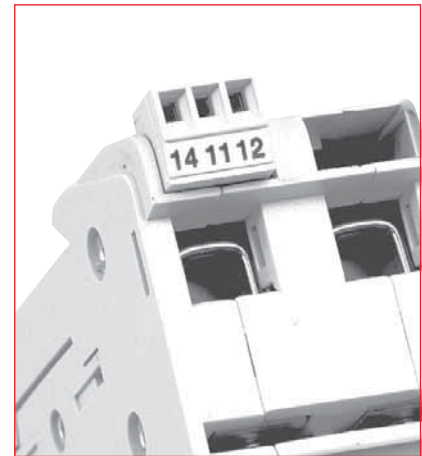
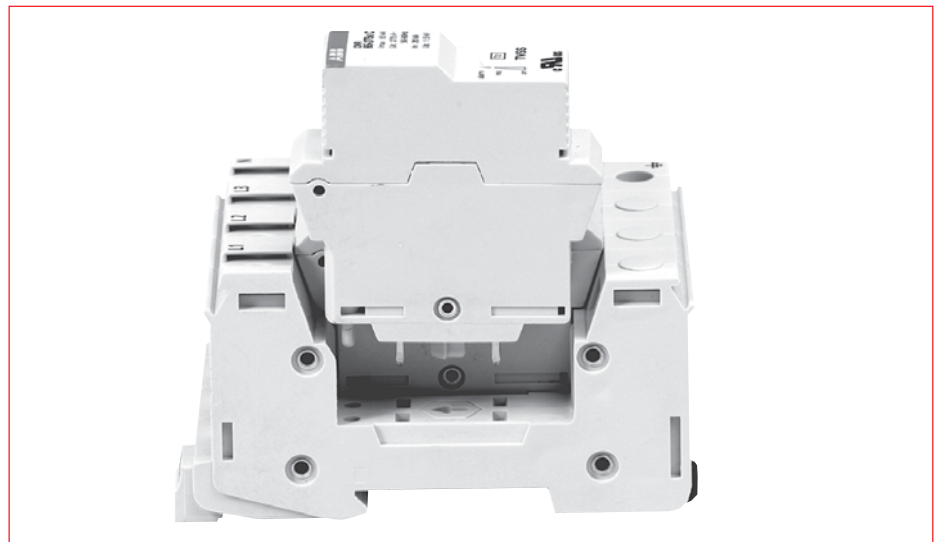


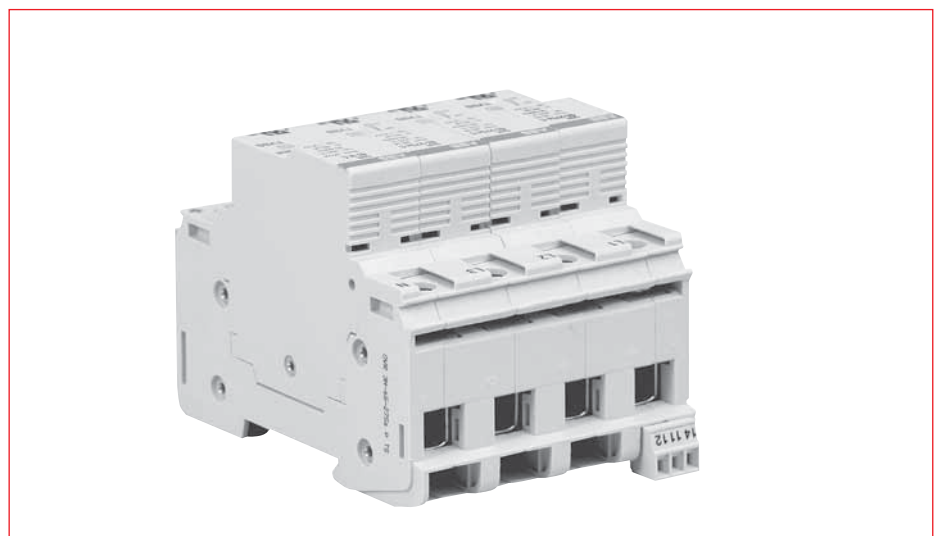
ABB safety reserve system



Contact for alarm connection



Pluggable unit / replacement modules



DIN rail unit, easy installation and wiring

Technical data

OVR range



Technical Features				Type 2
Electrical features	Standards			IEC 61643-1 / EN 61643-11 / UL1499 / CSA
	Type / test class			T2 / II
Electrical features	Poles			1P / 1P+N / 3P / 3P+N / 4P
	Types of networks			TNS - TT - TNC - IT / Wye / Delta
	Type of current			A.C.
	Nominal voltage Un		V	All US network voltages
	Max. cont. operating voltage Uc	(L-N / L-PE / N-PE)	V	150 / 275 / 320 / 440 / 550 / 660
	Voltage protection level Up at In	(L-N / L-PE / N-PE)	kV	0.6 / 1.2 / 1.4 / 1.8 / 2.5 / 2.9
	Nominal discharge current In (8/20)		kA	5 / 15 / 20 / 30
	Maximal discharge current Imax (8/20)		kA	15 / 40 / 65 / 100
	Impulse current Iimp (10/350)		kA	/
	Follow current If		kA	None
	Operating current Ic		mA	< 1
	Short circuit withstand Icc		kA	50
	Disconnecter			
	gG - gL fuse		A	16 - 25
	curve C circuit breaker		A	10 - 40
curve K circuit breaker				
Mechanical features	Stocking temperature		°C	-40 to +80
	Operating temperature		°C	-40 to +80
	Degree of protection			IP 20
	Fire resistance according to UL 94			V2
	Material of Housing			PC grey RAL 7035
	Maximal altitude		m	2000
	Integrated thermal disconnecter			Yes
	State indicator			Yes
	Compatibility with OVR Sign			Yes
	Safety reserve			Option
TS remote indicator			Option	
Installation	Wire range L/N			
	solid wire		mm ²	2.5 ... 25
	stranded wire		mm ²	2.5 ... 16
	Stripping length L/N		mm	12.5
	Tightening torque L/N		Nm	2
	Wire range PE			
	solid wire		mm ²	2.5 ... 25
	stranded wire		mm ²	2.5 ... 16
Stripping length PE		mm	12.5	
Tightening torque PE		Nm	2	
Dimensions and weight	Pole dimensions (H x D x W)		mm	85 x 58 x 17.5
	Pole weight		g	120
Technical Features of the integrated auxiliary contact				
Electrical features	Contact complement			1NO (1 make contact), 1NC (1 normally closed contact)
	Min. load			12V D.C. - 10 mA
	Max. load			250V A.C. - 1A
Installation	Connection cross-section		mm ²	1.5

OVR Range Single pole

Transient voltage
surge suppressors



Transient voltage surge suppressor

Function: TVSS provides protection for equipment against transient overvoltage (indirect lightning strike) that occur on the electrical network (mains); the maximum discharge current (I_{max}) ranges from 15 to 100 kA per pole, based on MOV technology.

Application: residential, commercial, industrial
Standard: CEI 61643-1 / EN 61643-11 / UL 1449 / CSA
8/20 current wave

Type 2 - Surge Protection Devices – Single pole

Max Discharge Current (kA)	Nominal Voltage (V)	MOV Voltage (V)	Voltage Protection Level Up (KV)	Catalog number	List price
15	120	150	.06	OVR 15 150 OVR 15 150 s P	\$ 230 350
	230	275	1.2	OVR 15 275 OVR 15 275 P TS	220 340
	277	320	1.4	OVR 15 320	220
	400	440	1.8	OVR 15 440 OVR 15 440 P	220 350
	480	550	2.5	OVR 15 550	275
	600	660	2.9	OVR 15 660	290
40	120	150	0.6	OVR 40 150 s P OVR 40 150 s P TS	440 510
	230	275	1.2	OVR 40 275 P OVR 40 275 s P OVR 40 275 s P TS	320 345 400
	277	320	1.4	OVR 40 320 P OVR 40 320 s P OVR 40 320 s P TS	320 350 405
	400	440	1.8	OVR 40 440 OVR 40 440 s P OVR 40 440 s P TS	285 350 400
	480	550	2.5	OVR 40 550 OVR 40 550 s	435 475
	600	660	2.9	OVR 40 660 s	490
65	120	150	0.6	OVR 65 150 s P	395
	230	275	1.2	OVR 65 275 s P OVR 65 275 s P TS	490 565
	277	320	1.4	OVR 65 320 s P OVR 65 320 s P TS	495 520
	400	440	1.8	OVR 65 440 s P OVR 65 440 s P TS	465 530
	480	550	2.5	OVR 65 550 s	600
	600	660	2.9	OVR 65 660 s	675
100	230	275	1.2	OVR 100 275 s P OVR 100 275 s P TS	830 955
	277	320	1.4	OVR 100 320 s P OVR 100 320 s P TS	890 1025
	400	440	1.8	OVR 100 440 s OVR 100 440 s P OVR 100 440 s P TS	800 870 1005

14

OVR 1N 65 275 s P TS

Network

- 1N Single phase (left), neutral (right)
- 3N Three phase (left), neutral (right)
- N1 Neutral (left), single phase (right)
- N3 Neutral (left), three phases (right)
- 3L Three poles
- 4L Four poles
- Nothing Single pole

Max. discharge current 8/20

I_{max} (kA)	15
	40
	65
	100

- TS Integrated remote indication
- P Pluggable unit
- Nothing: Single block
- s with safety reserve

Max. continuous operating voltage

U_c (V)	660
	550
	440
	385
	320
	275
	150
	75

OVR TVSS Multi-pole

Transient voltage surge protector

Function: TVSS provides protection for equipment against transient overvoltage (indirect lightning strike) that occur on the electrical network (mains); the maximum discharge current (I_{max}) ranges from 15 to 100 kA per pole, based on MOV technology.

Application: residential, commercial, industrial
Standard: CEI 61643-1 / EN 61643-11 / UL 1449 / CSA
8/20 current wave



Max Discharge Current (kA)	Nominal Voltage (V)	MOV Voltage (V)	Voltage Protection Level Up (kV)	Catalog number	List price			
15	120	150	0.6	OVR 1N 15 150	\$ 365			
				OVR 1N 15 150 s P TS	665			
				OVR 3N 15 150	625			
40	230	275	1.2	OVR 3L 15 275 P	625			
				OVR 3N 15 275	690			
				OVR 3N 15 320	980			
65	120	150	0.6	OVR 1N 40 150 s P	665			
				OVR 1N 40 150 s P TS	935			
				OVR 3N 40 150 s P TS	1160			
				OVR 3N 40 275 s P	1120			
100	230	275	1.2	OVR 3L 40 275 s P	950			
				OVR 3N 40 275 s P	1175			
				OVR 3N 40 320 P	1250			
				OVR 3N 40 320 s P TS	1450			
65	400	440	1.8	OVR 3N 40 440 s P	1290			
				120	150	0.6	OVR 1N 65 150 s P	1000
							OVR 3N 65 150 s P	1535
							OVR 3N 65 150 s P TS	1640
OVR 3L 65 275 s P	1045							
100	230	275	1.2	OVR 3N 65 275 s P	1280			
				277	320	1.4	OVR 3N 65 320 s P	1650
							OVR 3N 65 320 s P TS	1900
							OVR 3N 65 440 s P	1245
OVR 4L 65 440 s	1320							
100	277	320	1.4	OVR 3N 100 320 s P	3200			
				OVR 3N 100 320 s P TS	3600			

OVR 1N 65 275 s P TS

Network

1N Single phase (left), neutral (right)
3N Three phase (left), neutral (right)
N1 Neutral (left), single phase (right)
N3 Neutral (left), three phases (right)
3L Three poles
4L Four poles
Nothing Single pole

Max. discharge current 8/20

I_{max} (kA) 15
40
65
100

L TS Integrated remote indication

P Pluggable unit
Nothing: Single block

s with safety reserve

Max. continuous operating voltage

U_c (V) 660
550
440
385
320
275
150
75

OVR Range

Very low voltage transmission lines protection



OVR TC 06 V

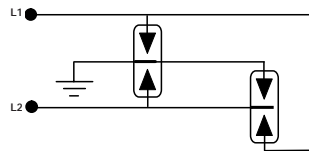


OVR TC 200 FR

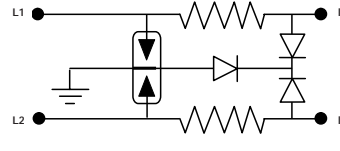
Transmission line surge arresters (OVR TC) provide protection against transient overvoltages for equipment connected to telephone lines (digital or analog) & current loops.

Standards Info:
Modular low current surge arresters comply with IEC 61643-21 / UL 1449.

Schematic diagrams



OVR TC 200 V in parallel

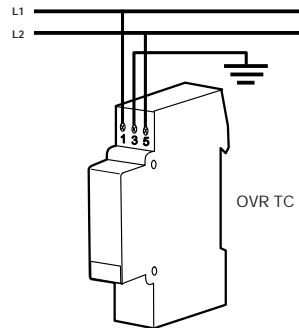


OVR TC / xx V / 200 FR in series

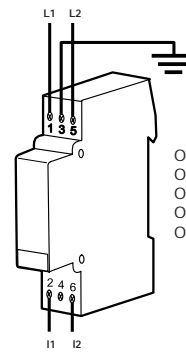
Dimensions

Dimensions (mm)	W	H	D
OVR TC (all models)	17,5	85	63

Connection



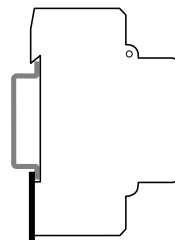
OVR TC 200 V in parallel



OVR TC / xx V / 200 FR in series

OVR TC 200 FR
OVR TC 48 V
OVR TC 24 V
OVR TC 12 V
OVR TC 06 V

Fixing



Simply clips onto DIN rail.

Practical info:
Telecom and dataline protection surge arresters are installed in electrical switchboards or enclosures using DIN rail.

Technical data

Electrical characteristics	6 V	12 V	24 V	48 V	200 V	200 V
	OVR TC 06 V	OVR TC 12 V	OVR TC 24 V	OVR TC 48 V	OVR TC 200 V	OVR TC 200 FR
Types of network	Communication	Communication	Communication	Communication	Communication	Communication
Number of pairs	1	1	1	1	1	1
Type of protection	Series	Series	Series	Series	Parallel	Series
Type of current	Low currents	Low currents	Low currents	Low currents	Low currents	Low currents
Nominal voltage: U_n	6 V	12 V	24 V	48 V	200 V	200 V
Max cont operating voltage: U_c	7 V	14 V	27 V	53 V	220 V	220 V
Voltage protection level: U_p at I_n	15 V	20 V	35 V	70 V	700 V	300 V
Nominal discharge current: I_n (8/20)	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Maximum discharge current: I_{max} (8/20)	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
Bandwidth	10 MHz	2 MHz	4 MHz	6 MHz	100 MHz	3 MHz
Operating current: I_c	20 mA	20 mA	20 mA	20 mA	-	20 mA
Degree of protection	IP 203	IP 203	IP 203	IP 203	IP 203	IP 203
50 Hz withstand (15 mn)	10 A	10 A	10 A	10 A	-	10 A
Mechanical characteristics						
L/N connection terminals:						
- solid wire	0.5 ... 2.5 mm ²					
- stranded wire	0.5 ... 2.5 mm ²					
PE connection terminal:						
- solid wire	0.5 ... 2.5 mm ²					
- stranded wire	0.5 ... 2.5 mm ²					
Integrated thermal disconnecter		Yes			No	Yes
End of life indicator		Yes			No	Yes
Compatibility with OVR Sign		Yes			No	Yes
Miscellaneous characteristics						
Storage temperature	-40 °C to +80 °C					
Operating temperature	-40 °C to +80 °C					
Maximum altitude	2000 m					
Case material	PC grey RAL 7032					
Insulating material	UL94 V0 classification					
Reference standard	IEC 61643-21 / UL 1449					
Weight	150 g					

Installation rules

Principles of coordination for TVSS

The first surge arrester does not provide effective protection for the whole installation by itself. Certain electrical phenomena can double the protection's residual voltage if cable lengths exceed 10m. Surge arresters must be coordinated when they are installed refer to the tables below.

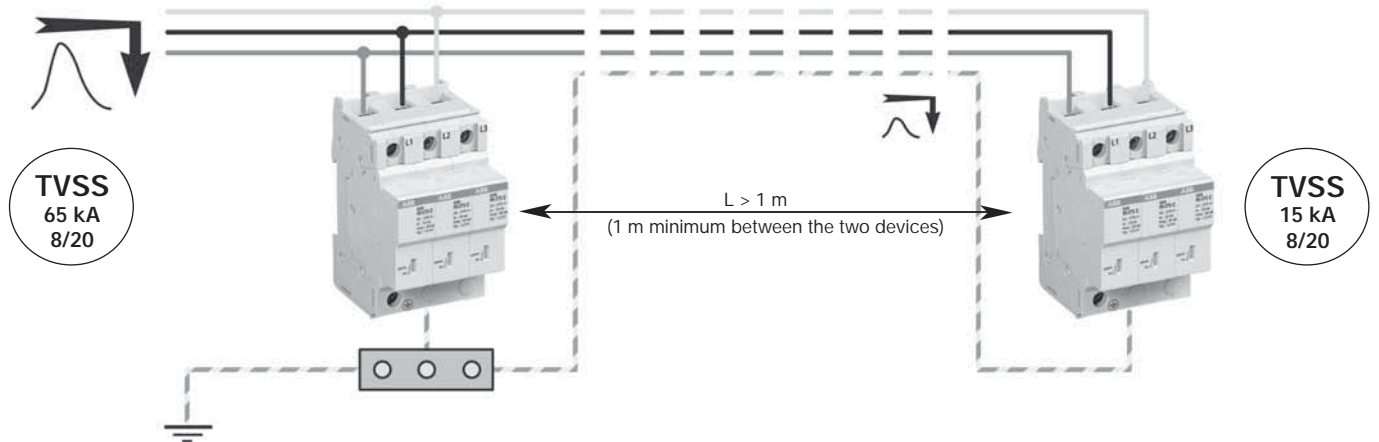
Coordination required if:

The first surge arrester does not reach the protection voltage (U_p) by itself.
The first surge arrester is more than 10m away from the equipment to be protected.

The first surge arrester diverts most of the current to the ground and the remaining surge current is diverted to the ground by the second surge arrester.

The value of this remaining surge current gets lower as the distance between both surge arresters gets longer. The lower is the current going through the last surge arrester, the lower is the voltage protection level applied to the downstream equipment.

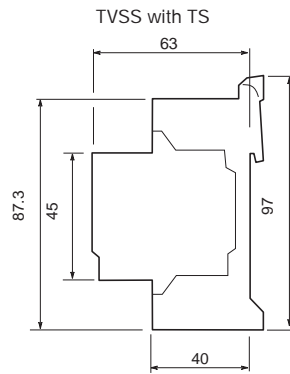
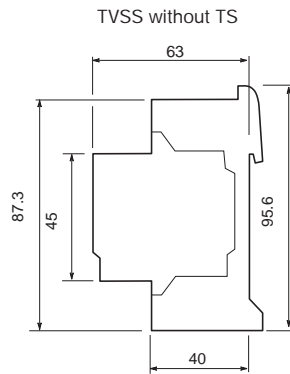
Coordination between Type 2 TVSS units



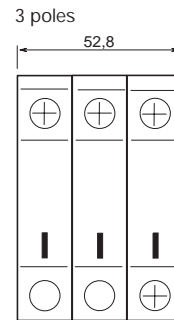
Approximate dimensions OVR range



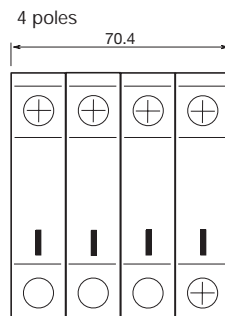
Transient voltage surge suppressor



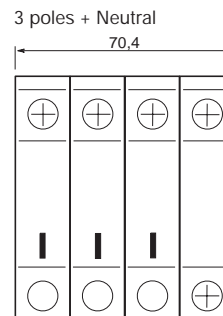
- OVR 15 275 P
- OVR 15 440 P
- OVR 40 275 P
- OVR 40 275 s P TS
- OVR 40 440 P
- OVR 40 440 s P TS
- OVR 65 275 s P TS
- OVR 65 440 s P TS



- OVR 3L 15 275 P
- OVR 3L 40 275 P
- OVR 3L 40 275 s P TS
- OVR 3L 65 275 s P TS



- OVR 4L 15 275 P
- OVR 4L 40 275 P
- OVR 4L 40 275 s P TS
- OVR 4L 65 275 s P TS



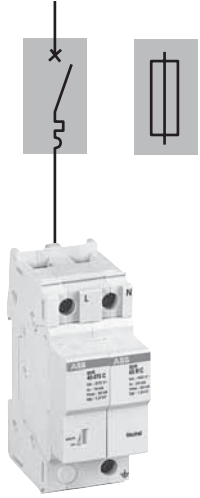
- OVR 3N 15 275 P
- OVR 3N 40 275 P
- OVR 3N 40 275 s P TS
- OVR 3N 65 275 s P TS

Technical details

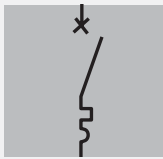
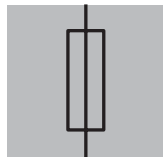
Installation rules for TVSS choice of associated breaking devices (fuse/circuit breaker)

Choice of disconnecter

Surge arresters must be associated with upstream short-circuit protection and residual current protection against indirect contact (usually already present in the installation)

	Function	Application
	Protection against fault currents	The breaking device associated with the surge arrester can be either a circuit breaker or a fuse. Its rating should take into consideration the surge arrester's characteristics and the short-circuit current of the installation.
	Thermal protection	Thermal protection is integrated into the surge arrester.

Maximum circuit-breaker or fuse protection rating depending on I_{max} and I_{imp} of the surge arrester.

	 Circuit-breaker (curve K)	 Fuse (gG)
TVSS surge arresters 100 kA (8/20) <ul style="list-style-type: none"> I_{cc} = 300 A to 1 kA I_{cc} = 1 kA to 7 kA I_{cc} = 7 kA and above 	40 A 40 A 40 A	25 A 25 A 25 A
TVSS surge arresters 65 kA (8/20) <ul style="list-style-type: none"> I_{cc} = 300 A to 1 kA I_{cc} = 1 kA to 7 kA I_{cc} = 7 kA and above 	30 A 32 A to 40 A 32 A to 63 A	20 A 40 A 63 A
40 kA (8/20) <ul style="list-style-type: none"> I_{cc} = 300 A to 1 kA I_{cc} = 1 kA to 7 kA I_{cc} = 7 kA and above 	25 A 25 A 25 A to 50 A	16 A 25 A 50 A
15 kA (8/20) <ul style="list-style-type: none"> I_{cc} = 300 A to 1 kA I_{cc} = 1 kA to 7 kA I_{cc} = 7 kA and above 	10 A to 25 A 10 A to 32 A 10 A to 40 A	16 A 16 A 25 A to 40 A

Technical details

Cabling and installation of Surge Protection Devices in an electrical panel

50 cm rule

Remember that a 10 kA lightning current passing through a 1 m length of cable generates 1000 Volts. Equipment protected by a surge arrester is subjected to a voltage equal to the sum of the U_p voltage of the surge arrester, U_o of its disconnector and the sum of the inductive voltages of connecting cables ($U_1+U_2+U_3$). It is therefore essential that the total length ($L = L_1+L_2+L_3$) of the connecting cables is as short as possible (0.50 m).

If this length ($L = L_1 + L_2+L_3$) exceeds 0.50m, it is necessary to carry out one of the following:

- Reduce this length by moving the connection terminals.
- Choose a surge arrester with a lower U_p value.
- Install a second, coordinated surge arrester near the device to be protected so as to adapt the combined U_p value to the impulse withstand of the equipment to be protected.

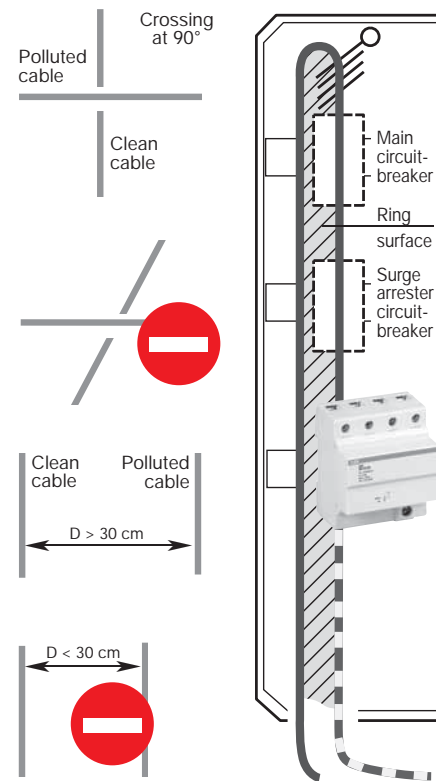
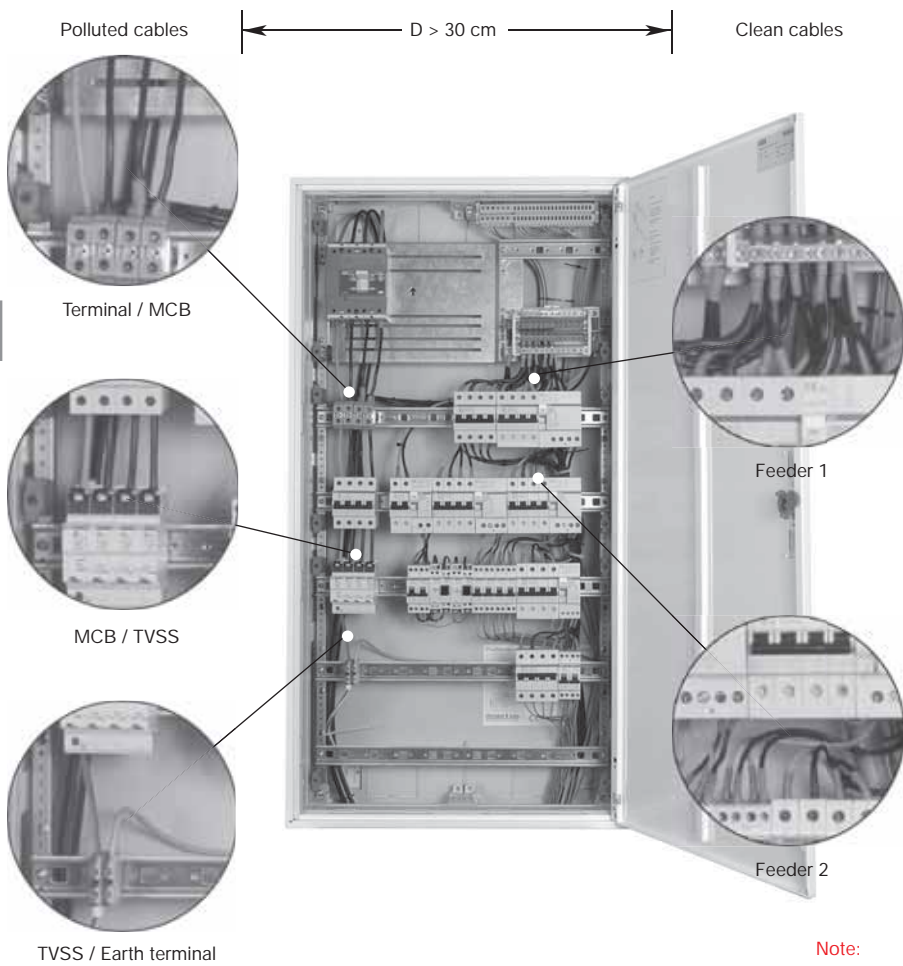
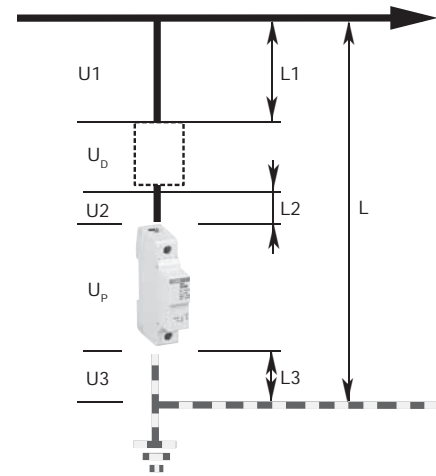
Wiring ring surfaces

The wires must be arranged in such a way that they are as close to each other as possible (see adjacent diagram) to avoid overvoltages induced by a ring surface between phases, the neutral and the PE conductor.

Routing of clean cables and polluted cables

During installation, lay clean cables (protected) and polluted cables as shown in the adjacent diagrams.

To avoid magnetic coupling between the different cable types (clean and polluted), it is strongly advised that they are kept apart (> 30 cm) and if a crossing cannot be avoided, it should be at right angles (90°).



Note:

The cross-section of the connecting cables is calculated according to the local short-circuit current level (where the surge arrester is installed). It must be equal to the cross-section of the installation's upstream cables.

The minimum cross-section for the earth conductor is 4 mm² if there is not a lightning conductor and 10 mm² if there is a lightning conductor.

Application sheets OVR Surge Protection Devices



Operating principle

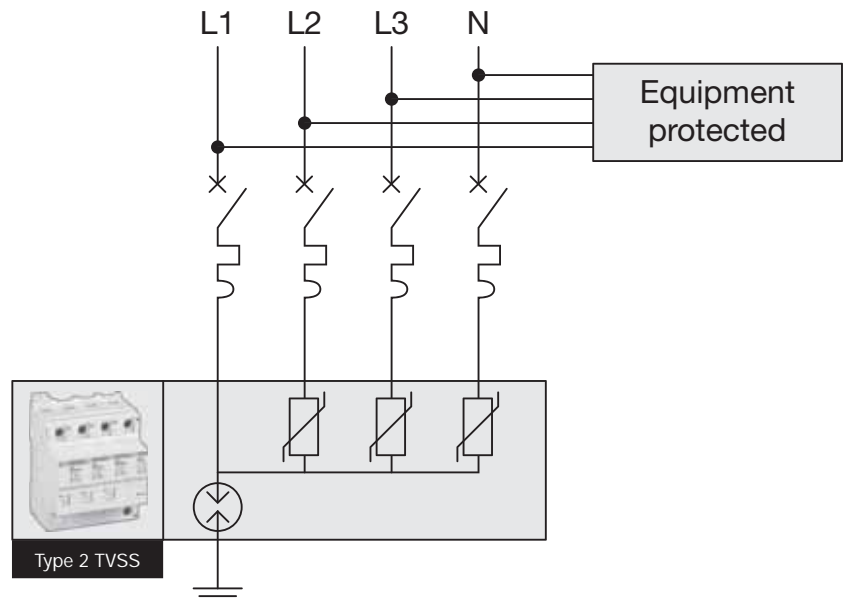
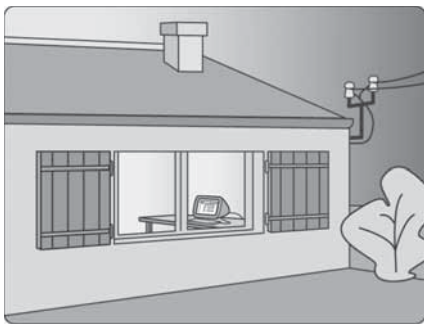
The Surge Protection Devices (TVSS), suitable for residential, commercial and industrial applications, are designed to limit transient overvoltage and run-off lightning currents.

Application environments

The Surge Protection Devices (TVSS) are necessary in any environment where the lightning risk exists (direct lightning strike / overvoltage).

Example of installation

As shown in the diagrams, one of the possible applications is to protect the equipment (TV, computer, ...) against overvoltage thanks to a Surge Protection Device (TVSS) which ensures the protection in common mode (Ph-PE / N-PE) and differential mode (Ph-N).



General points on lightning and its risks

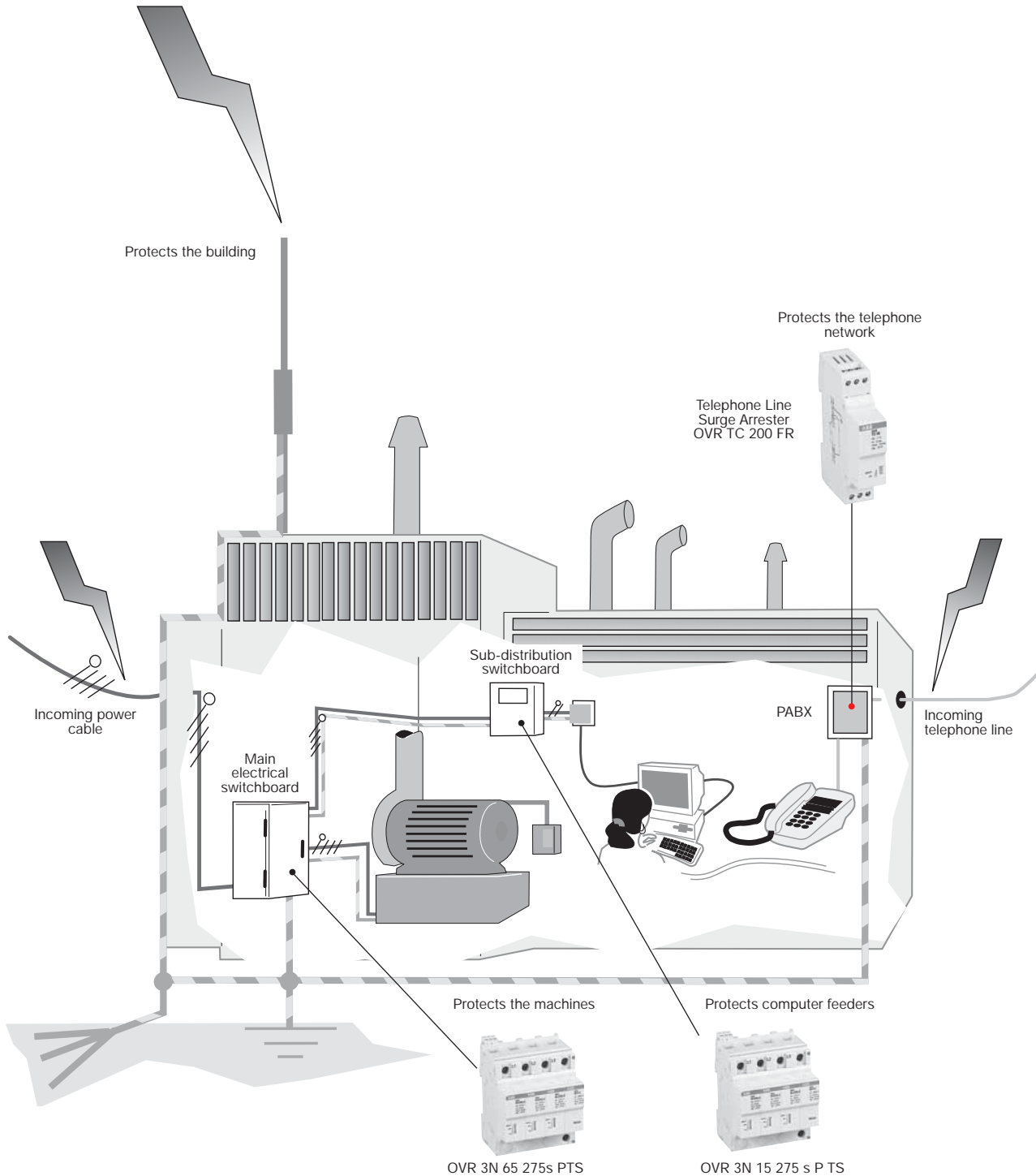
Diagram of an installation protected against lightning and its indirect effects

The 100KA or 65KA surge arrester (depending on the lightning risk) fitted in the installation's main incoming electrical switchboard, is capable of deviating the energy of a direct lightning strike. This is the first stage of the electrical network's protection.

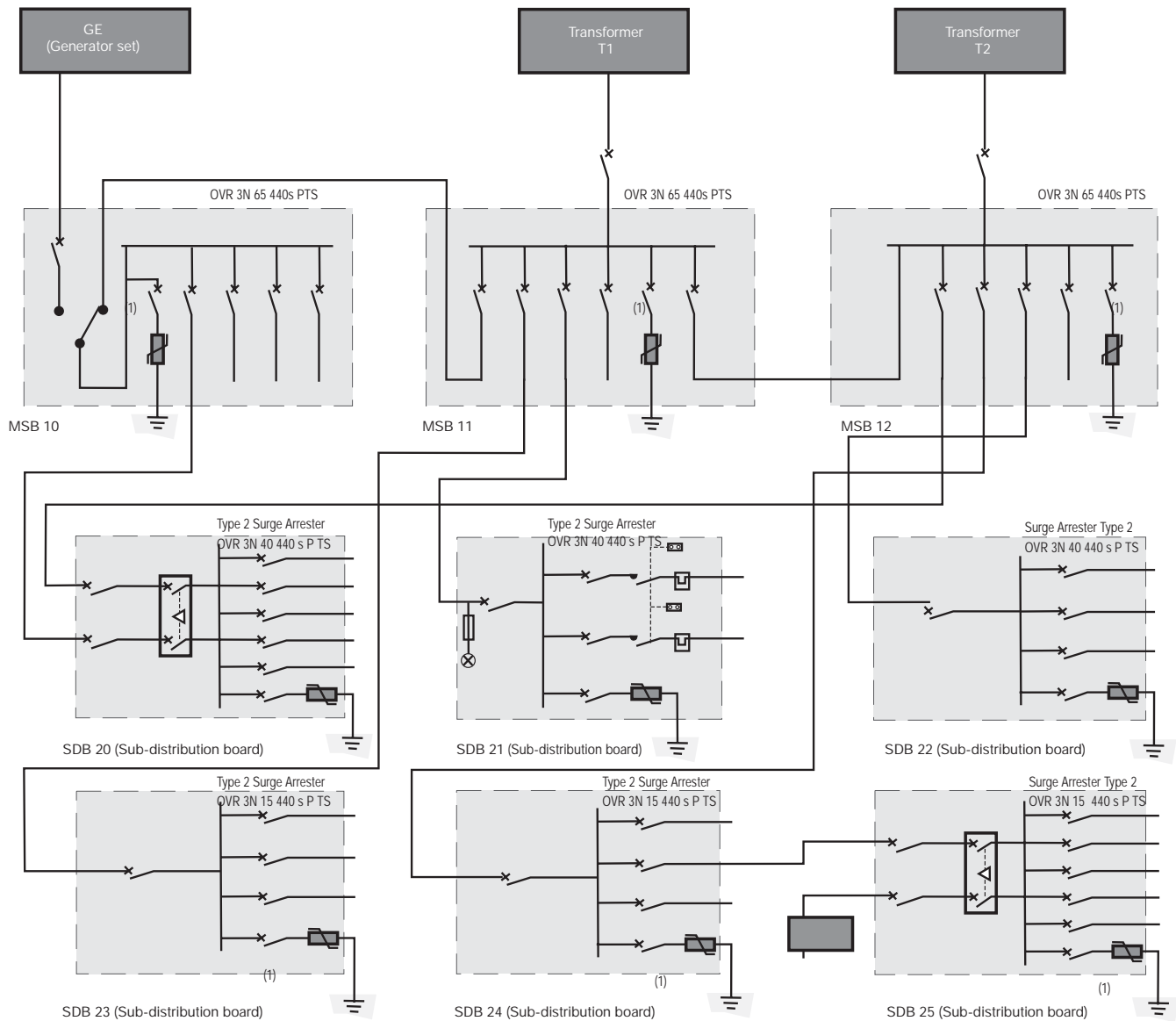
The behaviour of the cables, subjected to a transient signal, limits the effectiveness of a surge arrester to 10 m of cable. It is therefore necessary to use one or more surge arresters in the installation in order to obtain the required level of protection for the equipment.

Here, a 40KA or 15KA surge arrester (depending on the lightning risk) should be used in coordination with the incoming surge arrester. This is the second stage of the protection.

Finally, if there is a risk of overvoltage on the electrical network, this risk also exists for the auxiliary wiring network. The appropriate protection is a surge arrester designed to protect telephone or data transmission lines (**OVR TC**). This is fitted in series on the network.



Selection Example of a protected industrial installation



The above diagram is an example of an industrial application located in an area where the lightning strike density (N_g) is 1.2 lightning strikes per km^2 and per year:

- the building is protected by a lightning conductor.
- the lightning conductor's earthing strip is connected to the installation's earth network.
- the earthing system is IT (with distributed neutral) and then TNS for the sub-distribution boards.
- main switch boards (MSB) 10, 11 and 12 are fitted with Type 2 surge arresters OVR 3N 65 440 s PTS.
- sub-distribution boards (SDB) 20, 21 and 22 are fitted with Type 2 surge arresters OVR 3N 40 440 s P TS.
- sub-distribution boards (SDB) 23, 24 and 25 are fitted with Type 2 surge arresters OVR 3N 15 440 s P TS.

Surge arrester:

Device designed to limit transient overvoltages and run-off lightning currents. It consists of at least one non-linear component. It must comply with European standard EN 61643-11.

1.2/50 wave:

Standardized overvoltage waveform created on networks and which adds to the network's voltage.

8/20 wave:

Current waveform which passes through equipment when subjected to an overvoltage.

Type 2 surge arrester:

Surge arrester designed to run-off energy caused by an overvoltage comparable to that of an indirect lightning strike or an operating overvoltage. It has successfully passed testing to the standard with the 8/20 wave (class II test).

U_p :

Voltage protection level / Let through voltage

Parameter characterising surge arrester operation by the level of voltage limitation between its terminals and which is selected from the list of preferred values in the standard. This value is greater than the highest value obtained during voltage limitation measurements (at I_n).

I_n :

Nominal discharge current.

Peak current value of an 8/20 waveform (15 times) flowing in the surge arrester. It is used to determine the U_p value of the surge arrester.

I_{max} :

Maximum discharge current for class II testing.

Peak current value of an 8/20 waveform flowing in the surge arrester with an amplitude complying with the class II operating test sequence.

14 I_{max} is greater than I_n .

U_n :

Nominal AC voltage of the network : nominal voltage between phase and neutral (AC rms value).



Type 2 Surge Arresters
 I_{max} : current wave



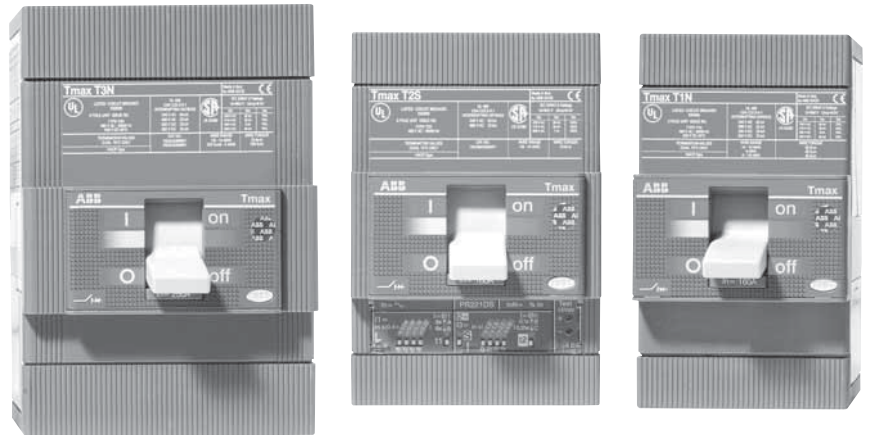
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Tmax Molded case circuit breakers



Tmax Molded case circuit breakers



Introduction

ABB is once again demonstrating its commitment to new product development and its superiority in product performance. Never before has the industry seen such high performance, versatility and standardization in a range of molded case circuit breakers.

The ABB Tmax has been developed to complement the performance-proven Isomax line of circuit breakers. This new breaker, with a range up to 600A, has several very big features that go along with its very small size:

- Double insulation – this construction characteristic allows for the UL Listed field installation of internal accessories without exposure to the power poles.
- Positive operation – all molded case breakers from ABB ensure that the toggle indicates the precise position of the moving contacts. This guarantees safe and reliable signaling by the device.
- Installation – Tmax Series can be installed in panels and switchboards in either the horizontal or vertical planes while being fed from either end without any derating of their performance characteristics.
- Two ranges of accessories – in the pursuit of standardization, all Tmax internal and external accessories can be utilized across the entire range from 15A to 600A.
- Interrupt ratings at 480VAC up to 150kAIC.
- Compact size
- UL Listed and IEC rated for global application and acceptance.

The ABB Tmax has the performance and accessories to satisfy all industry requirements in the 600VAC to 600VDC ranges. A single pole molded case version is available for the first time.

Frame sizes — five basic sizes

The ABB Tmax series includes five basic frame sizes as well as the T1 single pole with the range rated from 15A to 600A at 480VAC. The various versions carry the following interrupting capacities:

- **B** Basic breaking capacity
- **N** Normal breaking capacity
- **S** Standard breaking capacity
- **H** High breaking capacity
- **L** Limiting capacity
- **V** Very high breaking capacity

Derived versions

- T2, T4 & T5 circuit breakers with LS/I electronic trip units
- Switch disconnectors in T1, T3, T4 and T5 frames
- Circuit breakers for motor circuit protection (MCPs)
- Circuit breakers for direct current

ABB Tmax versions

- Fixed: all models
- Plug-in: T2, T3, T4 and T5 UL
- UL File #E93565 (breakers and MCPs) #E116596 (Accessories) #E116595 (Molded case switches)



General information

Circuit breakers for power distribution

T1 – T3



T1



T2



T3

			Tmax T1 1P	Tmax T1	Tmax T2	Tmax T3	
UL 489 CSA C22.2							
Frame size	A		100	100	100	225	
Number of poles	Nr		1	3, 4	3, 4	3, 4	
Rated voltage	AC (50-60 Hz)	V	277	600Y / 347V	480	600Y/347V	
	DC	V		500		500	
Interrupting ratings			B	N	S	H	
	AC 240 V	kA		50 ②	65	100	
	277 V	kA	18 ①				
	480 V	kA		22 ②	35	65	
	600Y/347	kA		10			
	600 V	kA				25	
	DC 250 V - 2 poles in series	kA		25		25	
	500 V - 3 poles in series	kA		25		35	
Trip units	500 V - 2 poles in series	kA				25	
	600 V - 3 poles in series	kA				35	
	TMF		■	■	■	■	
	TMD/TMA						
	ELT				■		
	MA				■	■	
	MCCB		■	■	■	■	
	MCS			■		■	
MCP				■	■		
IEC 60947-2							
Rated uninterrupted current, Iu	A		160	160	160	250	
Number of poles	Nr		1	3,4	3,4	3,4	
Rated service voltage, Ue	AC (50-60 Hz)	V	240	690	690	690	
	DC	V	125	500	500	500	
Rated ultimate short circuit breaking capacity, Icu			B	C	N	N	S
	AC (50-60 Hz)	kA	25	25	40	50	65
	220/230 V	kA		16	25	36	36
	380/415 V	kA		10	15	22	30
	440 V	kA		8	10	15	25
	500 V	kA		3	4	6	6
	690 V	kA		16	25	36	36
	DC	kA		20	30	40	40
	250 V - 2 poles in series	kA					
	250 V - 3 poles in series	kA					
500 V - 2 poles in series	kA						
500 V - 3 poles in series	kA						
750 V - 3 poles in series	kA						
Trip units	TMF		■				
	TMD/TMA			■		■	
	ELT						
	MF						
	MA						
UL 489 CSA C22.2 and IEC 60947-2							
Dimensions	H	in/mm	5.12/130	5.12/130	5.12/130	5.9/150	
	W 1p or 3p	in/mm	1/25.4	3/76	3.54/90	4.13/105	
	W 4p	in/mm		4/102	4.72/120	5.51/140	
	D	in/mm	2.76/70	2.76/70	2.76/70	2.76/70	
Mechanical life	No. operations		25,000	25,000	25,000	25,000	
	No. Hourly operations		240	240	240	240	
	No. operations		8000	8000	8000	8000	
	No. hourly operations		120	120	120	120	
Weights (Fixed 3P)	Lbs.		1.06	2.34	2.86	5.45	

① In15A = 10kA @ 277 VAC

② In15A = 35kA @ 240 VAC, 14 kA @ 480 VAC

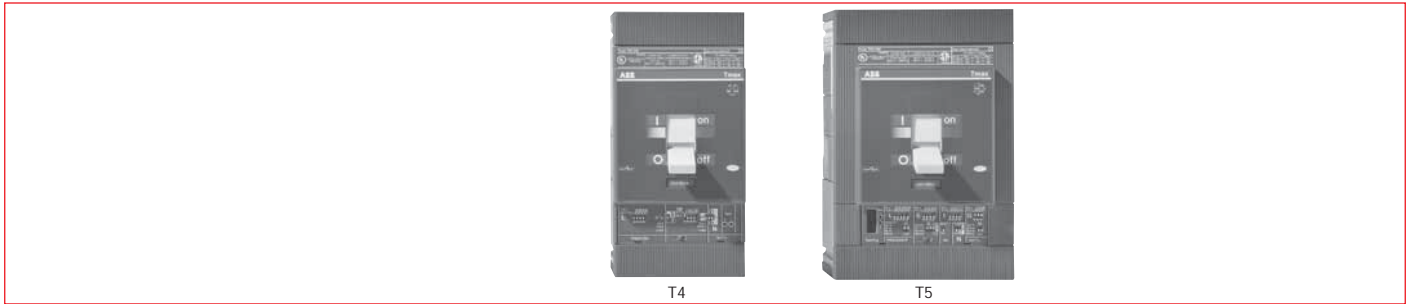
TMF = Thermomagnetic trip unit with fixed thermal and magnetic threshold

TMD = Thermomagnetic trip unit with adjustable thermal threshold and fixed magnetic threshold.

General information

Circuit breakers for power distribution

T4 – T5



			Tmax T4					Tmax T5					
UL 489 CSA C22.2													
Frame size		A	250					600					
Number of poles		Nr	3, 4					3, 4					
Rated voltage	AC (50-60 Hz)	V	600					600					
	DC	V	600					600					
Interrupting ratings	AC 240 V	kA	N	S	H	L	V	N	S	H	L	V	
		kA	65	100	150	200	200	65	100	150	200	200	
		kA	25	35	65	100	150	25	35	65	100	150	
		kA	18	25	35	65	100	18	25	35	65	100	
		kA	25	35	50	65	100	25	35	50	65	100	
	DC 250 V - 2 poles in series	kA	25	35	50	65	100	25	35	50	65	100	
		500 V - 3 poles in series	kA	16	25	35	50	65	16	25	35	50	65
		500 V - 2 poles in series	kA										
		600 V - 3 poles in series	kA										
			kA										
Trip units	TMF		■										
	TMD/TMA		■					■					
	ELT		■					■					
	MA							■					
	MCCB		■					■					
Versions	MCS		■					■					
	MCP		■					■					
IEC 60947-2													
Rated uninterrupted current, Iu		A	250 - 320					400 - 630					
Number of poles		Nr	3, 4					3, 4					
Rated service voltage, Ue	AC (50-60 Hz)	V	690					690					
	DC	V	750					750					
Rated ultimate short circuit breaking capacity, Icu	AC (50-60 Hz)	kA	N	S	H	L	V	N	S	H	L	V	
		kA	70	85	100	200	300	70	85	100	200	300	
		kA	36	50	70	120	200	36	50	70	120	200	
		kA	30	40	65	100	180	30	40	65	100	180	
		kA	25	30	50	85	150	25	30	50	85	150	
	DC	kA	20	25	40	70	80	20	25	40	70	80	
		250 V - 2 poles in series	kA	36	50	70	120	200	36	50	70	120	200
		250 V - 3 poles in series	kA	25	36	50	70	100	25	36	50	70	100
		500 V - 2 poles in series	kA										
		500 V - 3 poles in series	kA										
Trip units	TMF		■					■					
	TMD/TMA		■					■					
	ELT		■					■					
	MF												
	MA		■										
UL 489 CSA C22.2 and IEC 60947-2													
Dimensions	H	in/mm	8.07/205					8.07/205					
	W 1p or 3p	in/mm	4.13/105					5.51/140					
	W 4p	in/mm	5.51/140					7.24/184					
	D	in/mm	4.07/103.5					4.07/103.5					
Mechanical life		No. operations	20,000					20,000					
		No. hourly operations	240					120					
		No. operations	8000 (250A)-6000 (320A)					7000 (400A)-5000 (630A)					
		No. hourly operations	120					60					
Weights (Fixed 3P)		Lbs.	6.18					8.55					

TMA = thermomagnetic trip unit with adjustable thermal and magnetic threshold
 MF = Magnetic fixed trip unit
 MA = Magnetic adjustable trip unit
 ELT = Electronic trip unit



General information

Circuit breakers for specific applications in accordance with IEC 60947-2



T1



T2



T3

			Tmax T1 1P	Tmax T1	Tmax T2	Tmax T3
Circuit breakers for distribution AC-DC						
Rated uninterrupted circuit		A	160	160	160	225
Number of poles		Nr	1	3, 4	3, 4	3, 4
Rated voltage	AC 50-60 Hz	V	240	690	690	690
		kA rms	B	B C N	N S H L	N S
	380/415 VAC	kA rms	25 ①	16 25 36	36 50 70 85	36 50
	440 VAC	kA rms		10 15 22	30 45 55 75	25 40
	690 VAC	kA rms		3 4 6	6 7 8 10	5 8
Ics/Icu @ 380/415 VAC %				100 100 50	100 100 100 75	75 50
Dimensions fixed version (3p)	H	in-mm	5.12 - 130	5.12 - 130	5.12 - 130	5.0 - 150
	W	in-mm	1 - 25.4	3 - 76	3.54 - 90	4.13 - 105
	D	in-mm	2.76 - 70	2.76 - 70	2.76 - 70	2.76 - 70
Circuit breakers for motor protection						
Iu		A			160	250
Poles					3	3
In		A			1 - 100	100 - 200
Ue		V			690	690
Trip unit	Adjustable magnetic only Electronic	(6 - 12xin) PR221DS-I PR222/MP (IEC 60947-4-1) PR212/P-I PR212/MP (IEC 60947-4-1)			■ ■	■
Switch-disconnectors						
Poles		Nr		3, 4		3, 4
Ith		A		160		250
Ue		V		690		690
Uimp		kV		8		8
Ui		V		800		800
Icm		kA		2.8		5.3
Icw (1s)		kA		2		3.6

① For In 16A and In 20A: Icu @ 220/230 VAC = 16 kA

General information

Circuit breakers for specific applications in accordance with IEC 60947-2

Tmax
MCCBs



T4



T5

		Tmax T4	Tmax T5	
Circuit breakers for distribution AC-DC				
Rated uninterrupted current	A	250	400 - 630	
Number of poles	Nr	3, 4	3, 4	
Rated voltage	V	690	690	
Icu	kA rms	N S H L V	N S H L V	
	kA rms	36 50 70 120 200	36 50 70 120 200	
	kA	30 40 65 100 180	30 40 65 100 180	
	kA	20 25 40 70 80	20 25 40 70 80	
	kA	20 25 40 70 80	20 25 40 70 80	
Ics/Icu @ 380/415 VAC	kA	100 100 100 100 100	100 100 100 100 100	
Dimensions fixed version (3p)				
H	in-mm	8.07/205	8.07 - 205	
W	in-mm	4.13/105	5.51/140	
D	in-mm	4.07/103.5	4.07/103.5	
Circuit breakers for motor protection				
Iu	A	250	400	
Poles		3	3	
In	V	80 - 250	320 - 400	
Ue	V	690	690	
Trip unit		Adjustable magnetic only (6 - 12xin)		
		Electronic		
		PR221DS-I	■	
		PR222/MP (IEC 60947-4-1)	■	
		PR212P-I	■	
		PR212/MP (IEC 60947-4-1)	■	
Switch-disconnectors				
Poles	Nr	3/4	3/4	
Ith		250 - 320	400 - 630	
Ue	V	690	690	
Uimp	kV	8	8	
Ui	V	800	800	
Icm	kA	5.3	5.3	
Icw (1s)	kA	3.6	6	

① For In 16A and In 20A: Icu @ 220/230 VAC = 16 kA



General information

Catalog number explanation

T3 S 080 T W - 4 xxx

● **Accessories (added in alpha-numeric order) ①**

- A = Auxiliary Switch
- S_ = Shunt trip with voltage code
- U_ = Undervoltage release with voltage code

● **Number of poles**

- 1 = 1 pole (T1 only)
- 4 = 4 pole
- None = 3 pole

● **Type connectors**

- W = None
- L = Lugs included

● **Trip unit function**

- B = LS/I (AC only)
- D = Molded Case Switch (MCS)
- T = Thermal-magnetic – 10X Mag
- M = Magnetic only (MCP)
- E5 = Electronic MCP (AC only)
- C = LSI (AC only)
- E = LSIG (AC only)

● **Current rating**

- 015 = 15A
- 080 = 80A
- 100 = 100A
- 225 = 225A
- 250 = 250A
- 400 = 400A

● **Interrupting rating class**

- B = Basic
- N = Normal
- S = Standard
- H = High
- L = Limiting
- V = Very high

● **Frame size**

- T1 = 100A
- T2 = 100A
- T3 = 225A
- T4 = 250A
- T5 = 600A

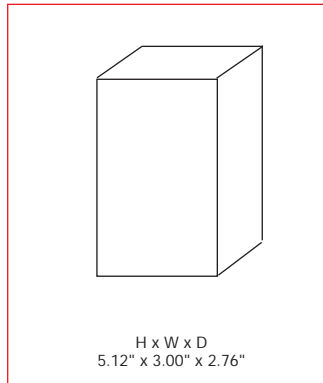
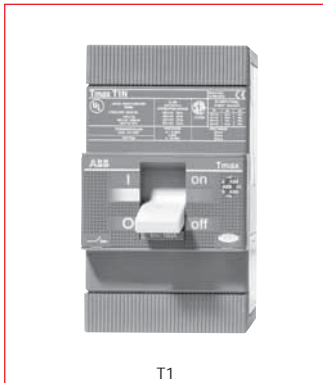


① Consult ABB for factory installed accessories.

T1

100A, 600Y/347

Standard thermal-magnetic



General

The T1 breaker family ranges from 15 through 100 amperes. The T1 trip units are non-interchangeable and use the very latest technology in electromagnetic relays for overcurrent trip protection. Thermal overload protection is provided by heat sensitive bimetals. Short circuit protection for the breaker is accomplished using a precise magnetic coil. State of the art construction in contacts and arcing chambers aid in limiting damaging fault currents through the protected circuits.

Versions

The T1 frame is available in two versions:

- T = Thermal-magnetic, fixed
- D = Molded case switch

Performance levels

The T1 breaker has two performance levels available:

- B = 277V Single pole
- N = 600Y / 347V Three pole

Number of poles

The UL/CSA version of the T1 is available in single, three and four pole versions. IEC versions of the T1 are also available with the same dimensions up to 160 amperes.

Accessory mounting

The T1 frame is double insulated allowing for UL/CSA factory or field installation of internal accessories. No extra control cables are required for field installation. Shunt trips or UVR's mount in the left cavity and auxiliary contacts with bell alarm mount in the right cavity.

Reverse feeding

All versions of the T1 family are suitable for reverse feed applications.

Molded case switches

UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection.

UL489 / CSA C22.2 Interrupting capacity (kA RMS)

Voltage	Continuous rating	B (1 pole)	N
240VAC	15 – 100A	—	50 ①
277VAC	15A	10	—
	20 – 100A	18	—
480VAC	15A	—	14
	20 – 100A	—	22
600Y/347VAC	15 – 100A	—	10
250VDC 2 pole series	15 – 100A	—	25
500VDC 3 pole series	15 – 100A	—	25

IEC-947 Interrupting capacity (kA RMS)

Voltage	Continuous rating	B (1 pole)	N
230V	15 – 100A	25	50
415V	15 – 100A	—	36
440V	15 – 100A	—	22
500V	15 – 100A	—	15
690V	15 – 100A	—	6
250VDC 2 pole series	15 – 100A	—	36
500VDC 3 pole series	15 – 100A	—	36

① In 15A 35kA @ 240VAC.



T1

100A, 600Y/347

Standard thermal-magnetic

T1N TMF

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 600Y/347VAC/500VDC catalog number	List price
T1N	14kA	15A	1000A	T1N015TL ^①	\$ 402
		20A	1000A	T1N020TL	402
	22kA	25A	1000A	T1N025TL	402
		30A	1000A	T1N030TL	402
		40A	1000A	T1N040TL	402
		50A	1500A	T1N050TL	402
		60A	1500A	T1N060TL	402
		70A	1500A	T1N070TL	479
		80A	1500A	T1N080TL	479
		90A	1500A	T1N090TL	479
		100A	1500A	T1N100TL	479

T1B TMF — Single pole

Breaker	IC at 277VAC	Rating	Magnetic trip	1 pole, 277VAC catalog number	List price
T1B	10kA	15A	1000A	T1B015TL-1	\$ 230
		20A	1000A	T1B020TL-1	230
	18kA	25A	1000A	T1B025TL-1	230
		30A	1000A	T1B030TL-1	230
		40A	1000A	T1B040TL-1	230
		50A	1500A	T1B050TL-1	230
		60A	1500A	T1B060TL-1	230
		70A	1500A	T1B070TL-1	262
		80A	1500A	T1B080TL-1	262
		90A	1500A	T1B090TL-1	262
		100A	1500A	T1B100TL-1	262

T1N-D — Molded case switch

Breaker	Interrupting capacity ^②	Rating	Magnetic trip	480VAC/500VDC catalog number	List price
T1-D	240V, 50kA	100A	1000A	T1N100DL	\$ 431

T1N TMF — 100% Rated standard thermal-magnetic

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole 600Y/347 500VDC catalog number	List price
T1N	14kA	15 ^①	1000A	T1NQ015TL	\$ 442
		20	1000A	T1NQ020TL	
	25	1000A	T1NQ025TL		
	30	1000A	T1NQ030TL		
	40	1000A	T1NQ040TL		
	50	1500A	T1NQ050TL		
	22kA	60	1500A	T1NQ060TL	527
		70	1500A	T1NQ070TL	
		80	1500A	T1NQ080TL	
		90	1500A	T1NQ090TL	
		100	1500A	T1NQ100TL	

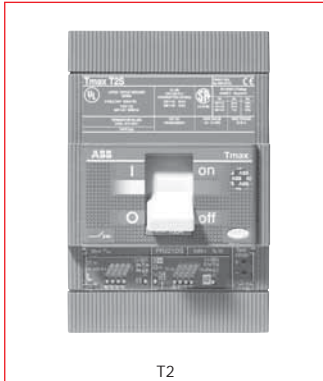
① Rated 277/480Y for 15A.

② With fuse or MCCB protected circuit.

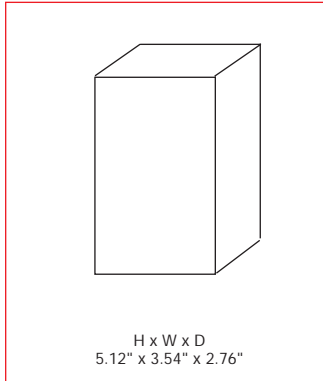
T2

100A, 480V

Thermal-magnetic/electronic



T2



H x W x D
5.12" x 3.54" x 2.76"

General

The T2 breaker family ranges from 10 through 100 amperes. The T2 trip units are non-interchangeable and use the very latest technology in electromagnetic relays for overcurrent trip protection as well as a version with microprocessor-based electronic trip unit. Thermal overload protection is provided by heat sensitive bimetals. State of the art construction in contacts and arcing chambers aid in limiting damaging fault currents through the protected circuits.

Versions

The T2 frame is available in four versions:

- T = Thermal-magnetic, fixed
- B = Adjustable LS/I electronic
- M = Magnetic only (MCP)
- E5 = Electronic instantaneous only (MCP)

Trip functions

These tripping functions are available:

- L = Long time
- S = Short time
- I = Instantaneous

Performance levels

The T2 breaker has two performance levels available:

- S = Standard
- H = High

Number of poles

The UL/CSA version of the T2 is available in three and four pole versions. IEC versions of the T2 are also available with the same dimensions up to 160 amperes.

Accessory mounting

The T2 frame is double insulated allowing for UL/CSA factory or field installation of internal accessories. No extra control cables are required for field installation. Shunt trips or UVR's mount in the left cavity and auxiliary contacts with bell alarm mount in the right cavity.

Reverse feeding

All versions of the T2 family are suitable for reverse feed applications.

UL489 / CSA C22.2 Interrupting capacity (kA RMS)

Voltage	Continuous rating	S	H
240VAC	15 – 100A	65	100
480VAC	15 – 100A	35	65

IEC-947 Interrupting capacity (kA RMS)

Voltage	Continuous rating	S	H
230V	15 – 100A	85	100
415V	15 – 100A	50	70
440V	15 – 100A	45	55
500V	15 – 100A	30	36
690V	15 – 100A	7	8
250VDC 2 pole series	15 – 100A	50	70
500VDC 3 pole series	15 – 100A	50	70



T2

100A, 480V

Thermal-magnetic/electronic

T2 — 100A TMF

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 480VAC catalog number	List price
T2S	35kA	15A	500A	T2S015TW	\$ 690
		20A	500A	T2S020TW	690
		25A	500A	T2S025TW	690
		30A	500A	T2S030TW	690
		40A	500A	T2S040TW	690
		50A	500A	T2S050TW	690
		60A	600A	T2S060TW	690
		70A	700A	T2S070TW	793
		80A	800A	T2S080TW	793
		90A	900A	T2S090TW	793
		100A	1000A	T2S100TW	793

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 480VAC catalog number	List price
T2H	65kA	15A	500A	T2H015TW	\$ 942
		20A	500A	T2H020TW	942
		25A	500A	T2H025TW	942
		30A	500A	T2H030TW	942
		40A	500A	T2H040TW	942
		50A	500A	T2H050TW	942
		60A	600A	T2H060TW	942
		70A	700A	T2H070TW	1153
		80A	800A	T2H080TW	1153
		90A	900A	T2H090TW	1153
		100A	1000A	T2H100TW	1153

T2 — 100A frame electronic trip unit (AC only)

Breaker	IC at 480VAC	Trip unit type	CT rating	3 pole, 480VAC catalog number	List price
T2S	35kA	PR221DS-LS/I	25A	T2S025BW	\$ 1240
			60A	T2S060BW	1240
			100A	T2S100BW	1343
T2H	65kA	PR221DS-LS/I	25A	T2H025BW	1492
			60A	T2H060BW	1492
			100A	T2H100BW	1703

T2 — 100A frame magnetic only (MCP)

15

Breaker	IC at 480VAC	Trip unit type	Rating	Adjustment range	3 pole, 480VAC catalog number	List price
T2S	35kA	Mag only	20A	120 - 240	T2S020MW	\$ 598
			50A	300 - 600	T2S050MW	670
			100A	600 - 1200	T2S100MW	804
T2H	65kA	Mag only	20A	120 - 240	T2H020MW	673
			50A	300 - 600	T2H050MW	754
			100A	600 - 1200	T2H100MW	904

T2 — 100A frame instantaneous only, electronic (MCP - AC only)

Breaker	IC at 480VAC	Trip unit type	Rating	Adjustment range	3 pole, 480VAC catalog number	List price
T2S	35kA	Instantaneous only	25A	25 - 250	T2S025E5W	\$ 1178
			60A	60 - 600	T2S060E5W	1178
			100A	100 - 1000	T2S100E5W	1276
T2H	65kA	Instantaneous only	25A	25 - 250	T2H025E5W	1417
			60A	60 - 600	T2H060E5W	1417
			100A	100 - 1000	T2H100E5W	1618

T2

100A, 480V, 100% rated

Thermal-magnetic/electronic



T2 – 100A TMF, 100% rated

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 480VAC catalog number	List price	
T2S	35kA	15A	500A	T2SQ015TW	\$ 760	
		20A	500A	T2SQ020TW		
		25A	500A	T2SQ025TW		
		30A	500A	T2SQ030TW		
		40A	500A	T2SQ040TW		
		50A	500A	T2SQ050TW		
		60A	600A	T2SQ060TW		
		70A	700A	T2SQ070TW		872
		80A	800A	T2SQ080TW		
		90A	900A	T2SQ090TW		
100A	1000A	T2SQ100TW				

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 480VAC catalog number	List price	
T2H	65kA	15A	500A	T2HQ015TW	\$ 1025	
		20A	500A	T2HQ020TW		
		25A	500A	T2HQ025TW		
		30A	500A	T2HQ030TW		
		40A	500A	T2HQ040TW		
		50A	500A	T2HQ050TW		
		60A	600A	T2HQ060TW		
		70A	700A	T2HQ070TW		1268
		80A	800A	T2HQ080TW		
		90A	900A	T2HQ090TW		
100A	1000A	T2HQ100TW				

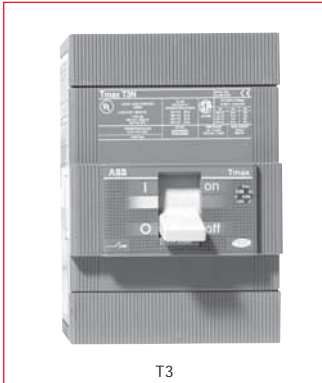
T2 – 100A frame electronic trip unit (AC only)

Breaker	IC at 480VAC	Trip unit type	CT rating	3 pole, 480VAC catalog number	List price
T2S	35kA	PR221DS-LS/I	25A	T2SQ025BW	\$ 1363
			60A	T2SQ060BW	
			100A	T2SQ100BW	1477
T2H	65kA	PR221DS-LS/I	25A	T2HQ025BW	1640
			60A	T2HQ060BW	1873
			100A	T2HQ100BW	

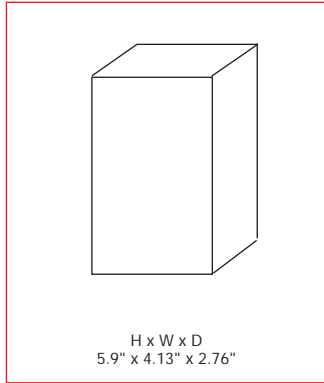
T3

600Y/347V

Thermal-magnetic



T3



H x W x D
5.9" x 4.13" x 2.76"

General

The T3 breaker family ranges from 60 through 225 amperes. The T3 trip units are non-interchangeable and use the very latest technology in electromagnetic relays for overcurrent trip protection. Thermal overload protection is provided by heat sensitive bimetals. Short circuit protection begins at 10 times the thermal rating of the breaker using a precise magnetic coil. State of the art construction in contacts and arcing chambers aid in limiting damaging fault currents through the protected circuits.

Versions

The T3 frame is available in three versions:

- T = Thermal-magnetic, fixed
- M = Magnetic only (MCP)
- D = Molded case switch

Performance levels

The T3 breaker has two performance levels available:

- N = Normal
- S = Standard

Number of poles

The UL/CSA version of the T3 is available in three and four pole versions. IEC versions of the T3 are also available with the same dimensions up to 250 amperes.

Accessory mounting

The T3 frame is double insulated allowing for UL/CSA factory or field installation of internal accessories. No extra control cables are required for field installation. Shunt trips or UVR's mount in the left cavity and auxiliary contacts with bell alarm mount in the right cavity.

Reverse feeding

All versions of the T3 family are suitable for reverse feed applications.

Molded case switches

UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection.

UL489 / CSA C22.2 Interrupting capacity (kA RMS)

Voltage	Continuous rating	N	S
240VAC	60 – 225A	50	65
480VAC	60 – 225A	25	35
600Y/347VAC	60 – 225A	10	10
250VDC 2 pole series	60 – 225A	25	35
500VDC 3 pole series	60 – 225A	25	35

IEC-947 Interrupting capacity (kA RMS)

Voltage	Continuous rating	N	S
230V	60 – 225A	50	85
415V	60 – 225A	36	50
440V	60 – 225A	25	40
500V	60 – 225A	20	30
690V	60 – 225A	5	8
250VDC 2 pole series	60 – 225A	36	50
500VDC 3 pole series	60 – 225A	36	50

T3

225A, 600Y/347V

Thermal-magnetic trip units



T3 — 225A Frame TMF

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 480VAC/500VDC catalog number	List price
T3N	25kA	60A	600A	T3N060TW	\$ 615
		70A	700A	T3N070TW	740
		80A	800A	T3N080TW	740
		90A	900A	T3N090TW	740
		100A	1000A	T3N100TW	740
		125A	1250A	T3N125TW	1560
		150A	1500A	T3N150TW	1560
		175A	1750A	T3N175TW	1560
		200A	2000A	T3N200TW	1560
		225A	2250A	T3N225TW	1560

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 480VAC/500VDC catalog number	List price
T3S	35kA	60A	600A	T3S060TW	\$ 790
		70A	700A	T3S070TW	970
		80A	800A	T3S080TW	970
		90A	900A	T3S090TW	970
		100A	1000A	T3S100TW	970
		125A	1250A	T3S125TW	2160
		150A	1500A	T3S150TW	2160
		175A	1750A	T3S175TW	2160
		200A	2000A	T3S200TW	2160
		225A	2250A	T3S225TW	2160

T3 — 225A frame magnetic only, (MCP)

Breaker	IC at 480VAC	Trip unit type	Rating	Adjustment range	3 pole, 480VAC catalog number	List price
T3S	35kA	Mag only	100A	600 - 1200	T3S100MW	\$ 1074
			125A	750 - 1500	T3S125MW	1108
			150A	900 - 1800	T3S150MW	1299
			200A	1200 - 2400	T3S200MW	1382

T3S-D — Molded case switch

Breaker	Interrupting ^① capacity	Rating	Magnetic trip	3 pole, 480VAC/500VDC catalog number	List price
T3S-D	240V, 65kA	150A	1500A	T3S150DW	\$ 1078
	480V, 35kA	225A	2250A	T3S225DW	1515

^① With fuse or MCCB protected circuit.



T3

225A, 600Y/347V, 100% rated

Thermal-magnetic trip units

T3 – 225A Frame TMF, 100% rated

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 600/347V VAC/500VDC catalog number	List price
T3N	25kA	60A	600A	T3NQ060TW	\$ 656
		70A	700A	T3NQ070TW	812
		80A	800A	T3NQ080TW	
		90A	900A	T3NQ090TW	
		100A	1000A	T3NQ100TW	
		125A	1250A	T3NQ125TW	1717
		150A	1500A	T3NQ150TW	
		175A	1750A	T3NQ175TW	
		200A	2000A	T3NQ200TW	
		225A	2250A	T3NQ225TW	

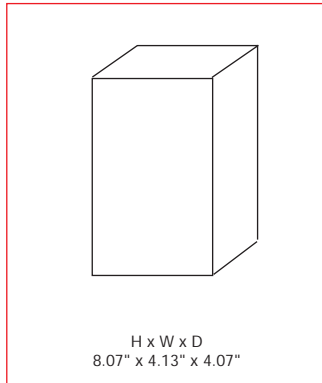
Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole, 600/347V VAC/500VDC catalog number	List price
T3S	35kA	60A	600A	T3SQ060TW	\$ 778
		70A	700A	T3SQ070TW	1065
		80A	800A	T3SQ080TW	
		90A	900A	T3SQ090TW	
		100A	1000A	T3SQ100TW	
		125A	1250A	T3SQ125TW	2399
		150A	1500A	T3SQ150TW	
		175A	1750A	T3SQ175TW	
		200A	2000A	T3SQ200TW	
		225A	2250A	T3SQ225TW	

Ⓞ With fuse or MCCB protected circuit.

T4

250A, 600V

Electronic and thermal magnetic trip units



General

The T4 breaker is a 250 amp frame with either a microprocessor based over current protective trip system or a thermal magnetic trip unit. As an electronic breaker, the T4 is available in 100A, 150A and 250A frames. The T4 is available as a thermal magnetic unit from 20A to 250A.

Versions

To meet all application requirements, the T4 is available in the following versions:

- T = Thermal-magnetic, fixed
- B = Selectable & adjustable LI or LS
- C = Adjustable LSI
- E = Adjustable LSIG
- D = Molded Case Switch
- E5 = Electronic instantaneous only (MCP)

Trip functions

These trip functions are available:

- L = Long time
- S = Short time
- I = Instantaneous
- G = Ground fault

Performance levels

Each version is also available in different maximum fault interrupting levels:

- N = Normal
- S = Standard
- H = High
- L = Extra high
- V = Very high

Number of poles

The T4 is available as a 3 and 4 pole breaker. Estimate 4 pole pricing by adding 35% to the 3 pole price and contact your ABB sales person for details.

Accessory mounting

Internal accessories are UL/CSA approved for both factory and field installation. No extra control connectors are required for field connection. Shunt trips and UVRs mount in the left cavity and auxiliary contacts and bell alarms mount in the right cavity.

Reverse feeding

All versions of the T4 family are suitable for reverse feed applications.

UL489 / CSA C22.2 Interrupting capacity (kA RMS)

Voltage	N	S	H	L	V
240VAC	65	100	150	200	200
480VAC	25	35	65	100	150
600VAC	18	25	35	65	100
500VDC ①	25	35	50	65	100
600VDC ②	16	25	35	50	65

IEC-947 Interrupting capacity (kA RMS)

Voltage	N	S	H	L	V
230VAC	70	85	100	200	300
415VAC	36	50	70	120	200
440VAC	30	40	65	100	180
500VDC	25	30	50	85	150
690VDC	20	25	40	70	80

① 2 poles in series.
② 3 poles in series.



T4

250A, 600V

Electronic trip units (AC only)

100A Frame (40 - 100A adjustable range)

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T4N	25	PR221 LS/I	T4N100BW	\$ 1903
		PR222 LSI	T4N100CW	2540
		PR222 LSIG	T4N100EW	3330
T4S	35	PR221 LS/I	T4S100BW	2370
		PR222 LSI	T4S100CW	3164
		PR222 LSIG	T4S100EW	4148
T4H	65	PR221 LS/I	T4H100BW	4498
		PR222 LSI	T4H100CW	4845
		PR222 LSIG	T4H100EW	5877
T4L	100	PR221 LS/I	T4L100BW	5954
		PR222 LSI	T4L100CW	6063
		PR222 LSIG	T4L100EW	7091
T4V	150	PR221 LS/I	T4V100BW	8555
		PR222 LSI	T4V100CW	9213
		PR222 LSIG	T4V100EW	9957

150A Frame (60 - 150A adjustable range)

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T4N	25	PR221 LS/I	T4N150BW	\$ 2050
		PR222 LSI	T4N150CW	2737
		PR222 LSIG	T4N150EW	3588
T4S	35	PR221 LS/I	T4S150BW	2542
		PR222 LSI	T4S150CW	3394
		PR222 LSIG	T4S150EW	4449
T4H	65	PR221 LS/I	T4H150BW	4633
		PR222 LSI	T4H150CW	5024
		PR222 LSIG	T4H150EW	6094
T4L	100	PR221 LS/I	T4L150BW	6174
		PR222 LSI	T4L150CW	6288
		PR222 LSIG	T4L150EW	7354
T4V	150	PR221 LS/I	T4V150BW	8872
		PR222 LSI	T4V150CW	9555
		PR222 LSIG	T4V150EW	10,326

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250A Frame (100 - 250A adjustable range)

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T4N	25	PR221 LS/I	T4N250BW	\$ 2112
		PR222 LSI	T4N250CW	2819
		PR222 LSIG	T4N250EW	3696
T4S	35	PR221 LS/I	T4S250BW	2573
		PR222 LSI	T4S250CW	3435
		PR222 LSIG	T4S250EW	4503
T4H	65	PR221 LS/I	T4H250BW	4713
		PR222 LSI	T4H250CW	5127
		PR222 LSIG	T4H250EW	6219
T4L	100	PR221 LS/I	T4L250BW	6300
		PR222 LSI	T4L250CW	6416
		PR222 LSIG	T4L250EW	7504
T4V	150	PR221 LS/I	T4V250BW	9053
		PR222 LSI	T4V250CW	9750
		PR222 LSIG	T4V250EW	10,537

T4

250A, 600V

Thermal magnetic trip units



20A - 250A Frame

Breaker	IC at 480VAC kA	Rating	Magnetic trip	3 pole, 600VAC/600VDC Catalog number	List price
T4N	25	20A	500	T4N020TW	\$ 1517
		30A	500	T4N030TW	1517
		40A	500	T4N040TW	1517
		50A	500	T4N050TW	1517
		80A	400-800	T4N080TW	1547
		100A	500-1000	T4N100TW	1547
		125A	625-1250	T4N125TW	1667
		150A	750-1500	T4N150TW	1667
		200A	1000-2000	T4N200TW	1667
		250A	1250-2500	T4N250TW	1717
		T4S	35	20A	500
30A	500			T4S030TW	1887
40A	500			T4S040TW	1887
50A	500			T4S050TW	1887
80A	400-800			T4S080TW	1927
100A	500-1000			T4S100TW	1927
125A	625-1250			T4S125TW	2067
150A	750-1500			T4S150TW	2067
200A	1000-2000			T4S200TW	2067
250A	1250-2500			T4S250TW	2092
T4H	65			20A	500
		30A	500	T4H030TW	3617
		40A	500	T4H040TW	3617
		50A	500	T4H050TW	3617
		80A	400-800	T4H080TW	3657
		100A	500-1000	T4H100TW	3657
		125A	625-1250	T4H125TW	3767
		150A	750-1500	T4H150TW	3767
		200A	1000-2000	T4H200TW	3767
		250A	1250-2500	T4H250TW	3832
		T4L	100	20A	500
30A	500			T4L030TW	5915
40A	500			T4L040TW	5915
50A	500			T4L050TW	5915
80A	400-800			T4L080TW	5965
100A	500-1000			T4L100TW	5965
125A	625-1250			T4L125TW	5995
150A	750-1500			T4L150TW	5995
200A	1000-2000			T4L200TW	5995
250A	1250-2500			T4L250TW	6110
T4V	150			20A	500
		30A	500	T4V030TW	6780
		40A	500	T4V040TW	6780
		50A	500	T4V050TW	6780
		80A	400-800	T4V080TW	6817
		100A	500-1000	T4V100TW	6817
		125A	625-1250	T4V125TW	6847
		150A	750-1500	T4V150TW	6847
		200A	1000-2000	T4V200TW	6847
		250A	1250-2500	T4V250TW	6887

Molded case switch

Type	Amps	Magnetic trip	3 Pole, 600V Catalog number	List price
T4H-D	250	3000	T4H250DW	\$ 2154
T4L-D	250	3000	T4L250DW	3419
T4V-D	250	3000	T4V250DW	3842



T4

250A, 600V, 100% Rated Electronic trip units (AC only)

100A Frame (40 - 100A adjustable range)

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T4N	25	PR221 LS/I	T4NQ100BW	\$ 2124
		PR222 LSI	T4NQ100CW	2835
		PR222 LSIG	T4NQ100EW	3716
T4S	35	PR221 LS/I	T4SQ100BW	2645
		PR222 LSI	T4SQ100CW	3531
		PR222 LSIG	T4SQ100EW	4629
T4H	65	PR221 LS/I	T4HQ100BW	5020
		PR222 LSI	T4HQ100CW	5383
		PR222 LSIG	T4HQ100EW	6530
T4L	100	PR221 LS/I	T4LQ100BW	6616
		PR222 LSI	T4LQ100CW	6737
		PR222 LSIG	T4LQ100EW	7879
T4V	150	PR221 LS/I	T4VQ100BW	9506
		PR222 LSI	T4VQ100CW	10,237
		PR222 LSIG	T4VQ100EW	11,063

150A Frame (60 - 150A adjustable range)

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T4N	25	PR221 LS/I	T4NQ150BW	\$ 2288
		PR222 LSI	T4NQ150CW	3055
		PR222 LSIG	T4NQ150EW	4004
T4S	35	PR221 LS/I	T4SQ150BW	2837
		PR222 LSI	T4SQ150CW	3788
		PR222 LSIG	T4SQ150EW	4965
T4H	65	PR221 LS/I	T4HQ150BW	5171
		PR222 LSI	T4HQ150CW	5582
		PR222 LSIG	T4HQ150EW	6771
T4L	100	PR221 LS/I	T4LQ150BW	6860
		PR222 LSI	T4LQ150CW	6987
		PR222 LSIG	T4LQ150EW	8171
T4V	150	PR221 LS/I	T4VQ150BW	9858
		PR222 LSI	T4VQ150CW	10,616
		PR222 LSIG	T4VQ150EW	11,473

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250A Frame (100 - 250A adjustable range)

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T4N	25	PR221 LS/I	T4NQ250BW	\$ 2357
		PR222 LSI	T4NQ250CW	3146
		PR222 LSIG	T4NQ250EW	4125
T4S	35	PR221 LS/I	T4SQ250BW	2872
		PR222 LSI	T4SQ250CW	3834
		PR222 LSIG	T4SQ250EW	5025
T4H	65	PR221 LS/I	T4HQ250BW	5260
		PR222 LSI	T4HQ250CW	5697
		PR222 LSIG	T4HQ250EW	6910
T4L	100	PR221 LS/I	T4LQ250BW	7000
		PR222 LSI	T4LQ250CW	7129
		PR222 LSIG	T4LQ250EW	8338
T4V	150	PR221 LS/I	T4VQ250BW	10,058
		PR222 LSI	T4VQ250CW	10,833
		PR222 LSIG	T4VQ250EW	11,708

T4

250A, 600V, 100% rated thermal-magnetic trip units

Magnetic only MCPs



30A - 250A Frame

Breaker	IC at 480 VAC kA	Rating	Magnetic trip	3 pole, 600VAC/600VDC Catalog number	List price
T4N	25	20A	500	T4NQ020TW	\$ 1673
		30A	500	T4NQ030TW	1673
		40A	500	T4NQ040TW	1673
		50A	500	T4NQ050TW	1673
		80A	400-800	T4NQ080TW	1706
		100A	500-1000	T4NQ100TW	1706
		125A	625-1250	T4NQ125TW	1839
		150A	750-1500	T4NQ150TW	1839
		200A	1000-2000	T4NQ200TW	1839
		250A	1250-2500	T4NQ250TW	1894
T4S	35	20A	500	T4SQ020TW	2081
		30A	500	T4SQ030TW	2081
		40A	500	T4SQ040TW	2081
		50A	500	T4SQ050TW	2081
		80A	400-800	T4SQ080TW	2125
		100A	500-1000	T4SQ100TW	2125
		125A	625-1250	T4SQ125TW	2280
		150A	750-1500	T4SQ150TW	2280
		200A	1000-2000	T4SQ200TW	2280
		250A	1250-2500	T4SQ250TW	2307
T4H	65	20A	500	T4HQ020TW	3990
		30A	500	T4HQ030TW	3990
		40A	500	T4HQ040TW	3990
		50A	500	T4HQ050TW	3990
		80A	400-800	T4HQ080TW	4034
		100A	500-1000	T4HQ100TW	4034
		125A	625-1250	T4HQ125TW	4155
		150A	750-1500	T4HQ150TW	4155
		200A	1000-2000	T4HQ200TW	4155
		250A	1250-2500	T4HQ250TW	4227
T4L	100	20A	500	T4LQ020TW	6524
		30A	500	T4LQ030TW	6524
		40A	500	T4LQ040TW	6524
		50A	500	T4LQ050TW	6524
		80A	400-800	T4LQ080TW	6579
		100A	500-1000	T4LQ100TW	6579
		125A	625-1250	T4LQ125TW	6612
		150A	750-1500	T4LQ150TW	6612
		200A	1000-2000	T4LQ200TW	6612
		250A	1250-2500	T4LQ250TW	6739
T4V	150	20A	500	T4VQ020TW	7478
		30A	500	T4VQ030TW	7478
		40A	500	T4VQ040TW	7478
		50A	500	T4VQ050TW	7478
		80A	400-800	T4VQ080TW	7519
		100A	500-1000	T4VQ100TW	7519
		125A	625-1250	T4VQ125TW	7552
		150A	750-1500	T4VQ150TW	7552
		200A	1000-2000	T4VQ200TW	7552
		250A	1250-2500	T4VQ250TW	7569

Magnetic-only MCPs

T4 - 250A Frame magnetic only (MCP - AC only)

Breaker	IC at 480VAC	Trip unit type	Rating	Adjustment range	3 pole, 600VAC Catalog number	List price
T4N	25kA	Instantaneous only	100A	100-1000	T4N100E5W	\$ 1808
			150A	150-1500	T4N150E5W	1948
			250A	250-2500	T4N250E5W	2006
T4S	35kA	Instantaneous only	100A	100-1000	T4S100E5W	2252
			150A	150-1500	T4S150E5W	2415
			250A	250-2500	T4S250E5W	2444
T4H	65kA	Instantaneous only	100A	100-1000	T4H100E5W	4273
			150A	150-1500	T4H150E5W	4401
			250A	250-2500	T4H250E5W	4477
T4L	100kA	Instantaneous only	100A	100-1000	T4L100E5W	5656
			150A	150-1500	T4L150E5W	5865
			250A	250-2500	T4L250E5W	5985



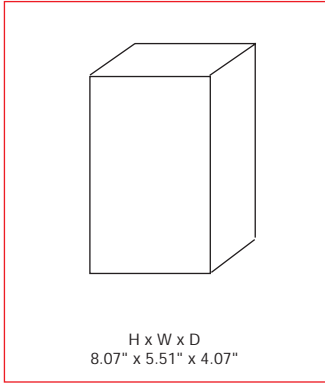
T5

600A, 600V

Electronic and thermal magnetic trip units



T5



H x W x D
8.07" x 5.51" x 4.07"

General

The T5 breaker is a 600 amp frame with either a microprocessor based over current protective trip system or a thermal magnetic trip unit. As an electronic breaker, the T5 is available in 300A, 400A and 600A frames. The T5 is available as a thermal magnetic unit of 300A or 400A.

Versions

To meet all application requirements, the T5 is available in the following versions:

- T = Thermal-magnetic
- B = Selectable & adjustable LI or LS
- C = Adjustable LSI
- E = Adjustable LSI^G
- D = Molded Case Switch
- E5 = Electronic instantaneous only (MCP)

Trip functions

These trip functions are available:

- L = Long time
- S = Short time
- I = Instantaneous
- G = Ground fault

Performance levels

Each version is also available in different maximum fault interrupting levels:

- N = Normal
- S = Standard
- H = High
- L = Extra high
- V = Very high

Number of poles

The T5 is available as a 3 and 4 pole breaker. Estimate 4 pole pricing by adding 35% to the 3 pole price and contact your ABB sales person for details.

Accessory mounting

Internal accessories are UL/CSA approved for both factory and field installation. No extra control connectors are required for field connection. Shunt trips and UVRs mount in the left cavity and auxiliary contacts and bell alarms mount in the right cavity.

Reverse feeding

All versions of the T5 family are suitable for reverse feed applications.

UL489 / CSA C22.2 Interrupting capacity (kA RMS)

Voltage	N	S	H	L	V
240VAC	65	100	150	200	200
480VAC	25	35	65	100	150
600VAC	18	25	35	65	100
500VDC ^①	25	35	50	65	100
600VDC ^②	16	25	35	50	65

IEC-947 Interrupting capacity (kA RMS)

Voltage	N	S	H	L	V
230VAC	70	85	100	200	300
415VAC	36	50	70	120	200
440VAC	30	40	65	100	180
500VDC	25	30	50	85	150
690VDC	20	25	40	70	80

^① 2 poles in series.
^② 3 poles in series.

T5

600A, 600V

Electronic trip units (AC only)



300A Frame

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T5N	25	PR221 LS/I	T5N300BW	\$ 3260
		PR222 LSI	T5N300CW	3865
		PR222 LSIG	T5N300EW	4965
T5S	35	PR221 LS/I	T5S300BW	3350
		PR222 LSI	T5S300CW	3945
		PR222 LSIG	T5S300EW	5138
T5H	65	PR221 LS/I	T5H300BW	5395
		PR222 LSI	T5H300CW	5893
		PR222 LSIG	T5H300EW	7148
T5L	100	PR221 LS/I	T5L300BW	6860
		PR222 LSI	T5L300CW	7375
		PR222 LSIG	T5L300EW	8625
T5V	150	PR221 LS/I	T5V300BW	10,406
		PR222 LSI	T5V300CW	11,206
		PR222 LSIG	T5V300EW	12,111

400A Frame

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T5N	25	PR221 LS/I	T5N400BW	\$ 3260
		PR222 LSI	T5N400CW	3865
		PR222 LSIG	T5N400EW	4965
T5S	35	PR221 LS/I	T5S400BW	3350
		PR222 LSI	T5S400CW	3945
		PR222 LSIG	T5S400EW	5138
T5H	65	PR221 LS/I	T5H400BW	5395
		PR222 LSI	T5H400CW	5893
		PR222 LSIG	T5H400EW	7148
T5L	100	PR221 LS/I	T5L400BW	6860
		PR222 LSI	T5L400CW	7375
		PR222 LSIG	T5L400EW	8625
T5V	150	PR221 LS/I	T5V400BW	10,406
		PR222 LSI	T5V400CW	11,206
		PR222 LSIG	T5V400EW	12,111

600A Frame

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T5N	25	PR221 LS/I	T5N600BW	\$ 5750
		PR222 LSI	T5N600CW	6460
		PR222 LSIG	T5N600EW	8360
T5S	35	PR221 LS/I	T5S600BW	5910
		PR222 LSI	T5S600CW	6595
		PR222 LSIG	T5S600EW	8645
T5H	65	PR221 LS/I	T5H600BW	8170
		PR222 LSI	T5H600CW	8805
		PR222 LSIG	T5H600EW	10,890
T5L	100	PR221 LS/I	T5L600BW	9860
		PR222 LSI	T5L600CW	10,440
		PR222 LSIG	T5L600EW	12,630
T5V	150	PR221 LS/I	T5V600BW	13,550
		PR222 LSI	T5V600CW	14,375
		PR222 LSIG	T5V600EW	16,350



T5

400A, 600V

Thermal magnetic trip units ①

300A - 400A Frames

Breaker	IC at 480VAC kA	Rating	Magnetic trip	3 pole, 600VAC/600VDC Catalog number	List price
T5N	25	300A 400A	1500-3000 2000-4000	T5N300TW T5N400TW	\$ 2612
T5S	35	300A 400A	1500-3000 2000-4000	T5S300TW T5S400TW	2880
T5H	65	300A 400A	1500-3000 2000-4000	T5H300TW T5H400TW	4950
T5L	100	300A 400A	1500-3000 2000-4000	T5L300TW T5L400TW	6400
T5V	150	300A 400A	1500-3000 2000-4000	T5V300TW T5V400TW	9873

Molded case switch

Type	Amps	Magnetic trip	3 Pole, 600V Catalog number	List price
T5H-D	400	5000	T5H400DW	\$ 4585
T5H-D	600	6000	T5H600DW	6550
T5L-D	600	6000	T5L600DW	8350
T5V-D	600	6000	T5V600DW	11,575

① 600A not available with thermal magnetic trip unit.

T5

400A, 600V, 100% Rated ①



Electronic trip units (AC only)

300A Frame

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T5N	25	PR221 LS/I	T5NQ300BW	\$ 3628
		PR222 LSI	T5NQ300CW	4302
		PR222 LSIG	T5NQ300EW	5526
T5S	35	PR221 LS/I	T5SQ300BW	3729
		PR222 LSI	T5SQ300CW	4391
		PR222 LSIG	T5SQ300EW	5719
T5H	65	PR221 LS/I	T5HQ300BW	6005
		PR222 LSI	T5HQ300CW	6559
		PR222 LSIG	T5HQ300EW	7956
T5L	100	PR221 LS/I	T5LQ300BW	7635
		PR222 LSI	T5LQ300CW	8208
		PR222 LSIG	T5LQ300EW	9600
T5V	150	PR221 LS/I	T5VQ300BW	11,582
		PR222 LSI	T5VQ300CW	12,473
		PR222 LSIG	T5VQ300EW	13,480

400A Frame

Breaker	Ic at 480VAC kA	Trip Unit	3 Pole, 600V Catalog number	List price
T5N	25	PR221 LS/I	T5NQ400BW	\$ 3628
		PR222 LSI	T5NQ400CW	4302
		PR222 LSIG	T5NQ400EW	5526
T5S	35	PR221 LS/I	T5SQ400BW	3729
		PR222 LSI	T5SQ400CW	4391
		PR222 LSIG	T5SQ400EW	5719
T5H	65	PR221 LS/I	T5HQ400BW	6005
		PR222 LSI	T5HQ400CW	6559
		PR222 LSIG	T5HQ400EW	7956
T5L	100	PR221 LS/I	T5LQ400BW	7635
		PR222 LSI	T5LQ400CW	8208
		PR222 LSIG	T5LQ400EW	9600
T5V	150	PR221 LS/I	T5VQ400BW	11,582
		PR222 LSI	T5VQ400CW	12,473
		PR222 LSIG	T5VQ400EW	13,480

Thermal magnetic trip units

300A - 400A Frames

Breaker	IC at 480VAC kA	Rating	Magnetic trip	3 pole, 600VAC/600VDC Catalog number	List price
T5N	25	300A 400A	1500-3000	T5NQ300TW	\$ 2888
			2000-4000	T5NQ400TW	
T5S	35	300A 400A	1500-3000	T5SQ300TW	3185
			2000-4000	T5SQ400TW	
T5H	65	300A 400A	1500-3000	T5HQ300TW	5475
			2000-4000	T5HQ400TW	
T5L	100	300A 400A	1500-3000	T5LQ300TW	7078
			2000-4000	T5LQ400TW	
T5V	150	300A 400A	1500-3000	T5VQ300TW	10,920
			2000-4000	T5VQ400TW	

① 600A not available in 100% rated frame.



T5

400A, 600V ^①

Magnetic only, MCP

T5 - 400A Frame magnetic only (MCP - AC only)

Breaker	IC at 480VAC	Trip unit type	Rating	Adjustment range	3 pole, 600VAC Catalog number	List price
T5N	25kA	Instantaneous only	300A 400A	300-3000 400-4000	T5N300E5W T5N400E5W	\$ 3097
T5S	35kA	Instantaneous only	300A 400A	300-3000 400-4000	T5S300E5W T5S400E5W	3183
T5H	65kA	Instantaneous only	300A 400A	300-3000 400-4000	T5H300E5W T5H400E5W	5125
T5L	100kA	Instantaneous only	300A 400A	300-3000 400-4000	T5L300E5W T5L400E5W	6517

T5 - 600A Frame magnetic only (MCP - AC only)

Breaker	IC at 480VAC	Trip unit type	Rating	Adjustment range	3 pole, 600VAC Catalog number	List price
T5N	25kA	Instantaneous only	600A	600-6000	T5N600E5W	\$ 5615
T5S	35kA	Instantaneous only	600A	600-6000	T5S600E5W	5770
T5H	65kA	Instantaneous only	600A	600-6000	T5H600E5W	7761
T5L	100kA	Instantaneous only	600A	600-6000	T5L600E5W	9370

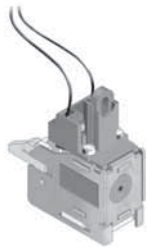
^① 600A Not available with thermal magnetic trip unit.

Accessories

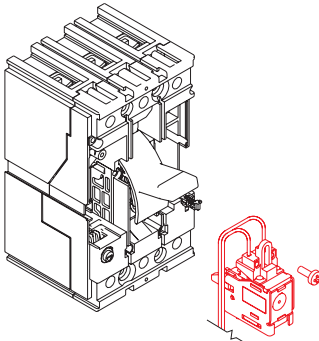
Electrical

T1 - T3

Tmax
MCCBs



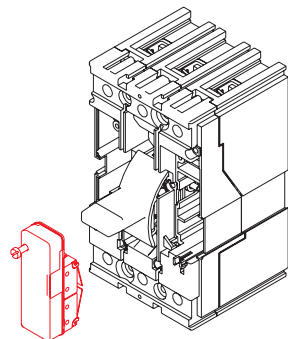
KT3S4



T1 with KT3S4



KT3U2



T1 with K3TAS



KT3M1

Shunt trips

Voltage	Factory installation		Field installation	
	Catalog number suffix ①	List price adder	Catalog number T1 - T3	List price
480 - 500VAC	S1	\$ 535	KT3S1	\$ 490
220/250VAC/DC	S2		KT3S2	
380 - 440VAC	S3		KT3S3	
110 - 125VAC/DC	S4		KT3S4	
48 - 60VAC/DC	S7		KT3S7	
24 - 30VAC/DC	S8		KT3S8	
12VDC	S9		KT3S9	

For remote opening of circuit breaker and includes internal cut-off switch to protect solenoid. All shunt trips are left pole mounted and can not be used with undervoltage releases. All shunt trips are approved for use in ground fault systems.

Electrical specifications

Voltage	AC VA	DC Watts
24, 120, 240	50	50
48 - 60	60	60
480 - 500	55	—

Undervoltage releases

Voltage	Factory installation		Field installation	
	Catalog number suffix ①	List price adder	Catalog number T1 - T3	List Price
480 - 500VAC	U1	\$ 535	KT3U1	\$ 490
220 - 250VAC/DC	U2		KT3U2	
380 - 440VAC	U3		KT3U3	
110 - 125VAC/DC	U4		KT3U4	
60VAC/DC	U5		KT3U5	
48VAC/DC	U7		KT3U7	
24 - 30VAC/DC	U8		KT3U8	

Will trip circuit breaker when connected voltage drops to 35 - 70% of undervoltage release voltage rating. Will allow circuit breaker to close (ON) when voltage is approximately 85% of rated voltage. All undervoltage releases are left pole mounted and can not be used with shunt trips.

Electrical specifications

Voltage	AC VA	DC Watts
24	1.5	1.5
48 - 60	1	1
120	2	2
220 - 250	2.5	2.5
480 - 500	4	—

Auxiliary contacts — T1 - T3

Contacts	Factory installation		Field installation	
	Catalog number suffix	List price adder	Catalog number	List Price
1 Form C + 1 BA	A	\$ 433	KT3AS	\$ 380
3 Form C + 1 BA	A3	770	KT3AS3	725
T2 PR221DS 1 Form C + 1 BA	A	433	KT2AS-E	380
3 form C + 1 BA 24VDC	A3AU	770	KT3AS3-AU	725

Electrical operators

Voltage	Field installation	
	Catalog number	List Price
48 - 60VAC/DC	KT3M1	\$ 850
110 - 250VAC/DC	KT3M2	

Electrical specifications

Voltage range	Inrush power
85 - 110% rated voltage	2500VA / 1000W

① For factory installation add suffix given to end of circuit breaker catalog number per accessory format.

Accessories Mechanical T1 - T3



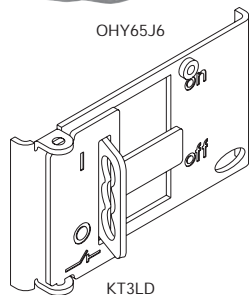
KT3RH



OHB65J6



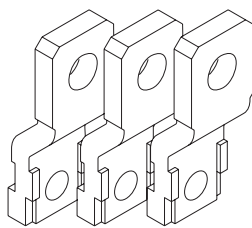
OHY65J6



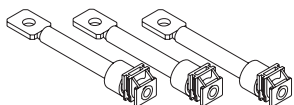
KT3LD



KT3100-3



KT2EF-3



KT2R-3

Direct mount rotary operator handle

	Catalog number	List price
Direct mount rotary	KT3RH	\$ 146

Variable depth rotary handles

Frame	Mechanism catalog number	List price	Shaft catalog number	List price	Handle catalog number	List price
NEMA 1, 3R, 12						
Tmax	KT3VD-M	\$ 72	OXp6X430 ①	\$ 28	OHY65J6 ① OHB65J6 ①	\$ 80
NEMA 4, 4X						
Tmax	KT3VD-M	72	OXp6X430 ①	28	OHY80L6 ① OHB80L6 ①	130
NEMA 1						
Tmax	KT3VD-M	72	KT3VD-S	35	KT3VD-H	87

Locking device

	Catalog number	List price
Locking device, open/closed	KT3LD	\$ 35
Locking device, open	KT3LDO	35

Lugs

For breakers	Amps	Wire size	Set of 3 catalog number	List price	Set of 4 catalog number	List price number
Standard cable lugs						
T1	100	14AWG -1/0	Integral	—	Integral	—
T2	100	14AWG -1/0	KT2100-3	\$ 9	KT2100-4	\$ 12
T3	60	14AWG -2AWG	KT3060-3	9	KT3060-4	12
	100	14AWG -1/0	KT3100-3	9	KT3100-4	12
	150	2AWG -4/0	KT3150-3	12	KT3150-4	18
	225	4AWG-300kcmil	KT3225-3	18	KT3225-4	24

Standard cable lug kits with power controls taps

For breakers	Amps	Wire size	Set of 3		Set of 4	
			Catalog number	List price	Catalog number	List price
T3	100	14AWG - 1/0	KT3100-3C	\$ 16	KT3100-4C	\$ 19
	150	2AWG - 4/0	KT3150-3C	16	KT3150-4C	19
	225	4AWG - 350kcmil	KT3225-3C	25	KT3225-4C	31

Extended front terminals

For breakers	Amps	Set of 3		Set of 4	
		Catalog number	List price adder	Catalog number	List Price
T2	100	KT2EF-3	\$ 26	KT2EF-4	\$ 35
T3	225	KT3EF-3	33	KT3EF-4	44

Rear terminals

For breakers	Amps	Set of 3		Set of 4	
		Catalog number	List price adder	Catalog number	List Price
T2	100	KT2R-3	\$ 78	KT2R-4	\$ 105
T3	225	KT3R-3	98	KT3R-4	131
Distribution cable lug kit		Set of 3		Catalog number	List Price
		Wire range			
T3		(6) #14-6		KT3TN	\$ 125

OHB 65 J 6

Color ●
B = Black
Y = Red/Yellow

Physical size (length in mm) ●

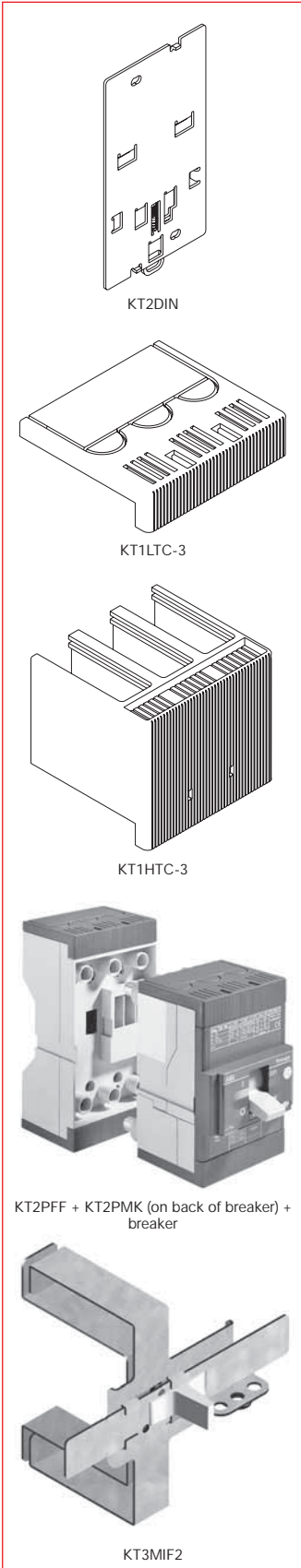
● **Shaft size** (diameter in mm)

● **J** = Type 1, 3R, 12

● **L** = Type 1, 3R, 12, 4, 4X

① Use Discount Schedule H6.

Accessories Mechanical T1 - T3



DIN Rail mounting kits — 35mm DIN ①

For breakers	Catalog number	List price
T1 / T2	KT2DIN	\$ 33
T3	KT3DIN	41

Terminal covers for fixed breakers

For breakers	Low profile 3-pole		Low profile 4-pole	
	Catalog number	List price	Catalog number	List Price
T1	KT1LTC-3	\$ 35	KT1LTC-4	\$ 47
T2	KT2LTC-3	40	KT2LTC-4	54
T3	KT3LTC-3	50	KT3LTC-4	68

For breakers	High profile 3-pole		High profile 4-pole	
	Catalog number	List price	Catalog number	List Price
T1	KT1HTC-3	\$ 37	KT1HTC-4	\$ 50
T2	KT2HTC-3	43	KT2HTC-4	58
T3	KT3HTC-3	53	KT3HTC-4	72

Kit consists of two pieces.

Plug-in kits for T2 and T3 ②

For breakers	Moving part		Fixed part	
	Catalog number	List price	Catalog number	List Price
T2 — 3-Pole	KT2PMK	\$ 171	KT2PFF	\$ 238
T3 — 3-Pole	KT3PMK	190	KT3PFF	264

Fixed parts accept the same cable and rear terminal kits as the circuit breakers.

Sliding bar interlock — front mounted

For breakers	For 2 breakers		For 3 breakers	
	Catalog number	List price	Catalog number	List Price
T1 – T3	KT3MIF2	\$ 625	KT3MIF3	\$ 844

Plug connectors

Item	3 Way	6 Way	12 Way	Catalog number	List price
Shunt trip or UVR	■			KT3PC-3	\$ 18
1 form C + 1BA auxiliary contact		■		KT3PC-6	21
3 form C + 1BA auxiliary contact			■	KT3PC-12	24

Cable kits

Item	Catalog number	List price
2 Cables, 2M	KT3PC-2CK	\$ 18
6 Cables, 2M	KT3PC-6CK	24
12 Cables, 2M	KT3PC-12CK	30

① For use with 15mm high DIN rail.

② Plug connectors and cable kit required when mounting accessories.



External accessories

Flange handle operators

T1 – T3

Flange handle — Cable linkage

Breaker	NEMA Type	Mechanism only	List price	Cable only	Cable length	List price	Handle only	List price
T1/T2	1,3R,12	KT2FPM	\$ 123	K5C036	36" (91cm)	\$ 114	K5FCH	\$ 213
T1/T2	4,4X	KT2FPM		K5C048	48" (122cm)	146	K5FCH4	243
T3	1,3R,12	KT3FPM		K5C060	60" (152cm)	160	K5FCH	213
T3	4,4X	KT3FPM		K5C072	72" (183cm)	175	K5FCH4	243

Notes: For complete assembly; mechanism, cable and handle are required.
 All cables mount onto the right side of the breaker.
 Handle can be mounted on the right or left side.

Door hardware kits — T1 - T5 Cable operated

Item	Catalog number	List price
Door hardware kit, right hand, 2 point latch for enclosures less than 40 inches high	KDH2R	\$ 200
Door hardware kit, right hand, 3 point latch for enclosures 40 inches high or greater	KDH3R	225

Enclosure depths

Minimum

Breaker	Depth (inches)
T1 - T3	8

Maximum

Maximum depth is determined by cable length.

Accessories Electrical T4 - T5



Shunt trips (Standard)

Voltage	Factory installation		Field installation	
	Catalog number suffix ①	List price adder	Catalog number T4 - T5	List price
480 – 500VAC 220/250VAC/DC 380 – 440VAC 110 – 125VAC/DC 48 – 60VAC/DC 24 VAC/DC 12VDC	S1	\$ 535	KT5S1	\$ 490
	S2		KT5S2	
	S3		KT5S3	
	S4		KT5S4	
	S7		KT5S7	
	S8		KT5S8	
	S9		KT5S9	

Shunt trip (Permanent supply)

Voltage	Factory installation		Field installation	
	Catalog number suffix ①	List price adder	Catalog number T4 - T5	List price
110 – 120 VAC 24 – 30 VAC/DC	SP4	\$ 535	KT5SP4	\$ 490
	SP8		KT5SP8	

Undervoltage release

Voltage	Factory installation		Field installation	
	Catalog number suffix ①	List price adder	Catalog number T4 - T5	List Price
480 – 500 VAC 220 – 250 VAC/DC 380 – 440 VAC 110 – 125 VAC/DC 60 VAC/DC 48 VAC/DC 24 VAC/DC	U1	\$ 535	KT5U1	\$ 490
	U2		KT5U2	
	U3		KT5U3	
	U4		KT5U4	
	U5		KT5U5	
	U7		KT5U7	
	U8		KT5U8	

Auxiliary contacts

Contacts	Factory installation		Field installation		
	Catalog number suffix	List price adder	Catalog number	List Price	
1 Form C + 1 BA, 250 VAC/VDC	A	\$ 433	KT5AS	\$ 380	
3 Form C + 1 BA, 250 VAC/VDC	A3		KT5AS3		725
3 Form C + 1 BA, 24 VDC	A3AU		KT5AS3-AU		725

Stored energy motor operator

Voltage	Field installation	
	Catalog number	List Price
220 – 250 VAC/DC 110 – 125 VAC/DC 48 – 60 VDC 24 VDC	KT5M2	\$ 2385
	KT5M4	
	KT5M7	
	KT5M8	

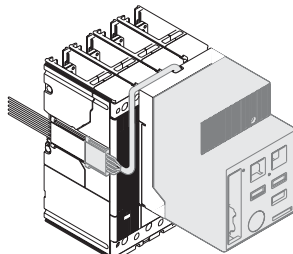
Stored energy motor operator – Contact remote/manual operation

Contacts	Factory installation		Field installation	
	Catalog number suffix	List price adder	Catalog number	List Price
1 Form C	MA	\$ 265	KT5MA	\$ 220

Adapters ②

Item	6 Way	10 Way	12 Way	Catalog number	List price
	1 Form C + 1BA	■			
Shunt trip / UVR	■			KT5ADP-6	24
Stored energy motor operator		■		KT5ADP-10	30
Stored energy motor operator plus shunt trip/UVR		■		KT5ADP-10	30
3 Form C + 1BA			■	KT5ADP-12	35

① For factory installation add suffix given to end of circuit breaker catalog number per accessory format.
② Required when mounting accessories on plug-in/drawout breakers



KT5M2

Accessories Mechanical T4 - T5



KT5RH

Direct mount rotary operator handle

Item	Catalog number	List Price
Direct mount rotary handle (for fixed and plug-in breakers)	KT5RH	\$ 135
Direct mount rotary handle (for withdrawable breakers)	KT5RHW	

Variable depth rotary handles

Item	Catalog number	List Price
Mechanism	KT5VD-M	\$ 65
NEMA 1, 12, 3R Handle (Black)	OHB95J10 ①	80
NEMA 1, 12, 3R Handle (Grey)	OHG95J10 ①	80
NEMA 4, 4X Handle (Black)	OHB95L10 ①	120
NEMA 4, 4X Handle (Grey)	OHG95L10 ①	120
Shaft (148mm / 5.8 in)	OXF10X148 ①	24
Shaft (225mm / 8.9 in)	OXF10X225 ①	26
Shaft (500mm / 19.7 in)	OXF10X500 ①	32
NEMA 1 Handle, square profile	KT5VD-H	87
Shaft (500mm/19.7in)	KT5VD-S	

Locking devices

	Catalog number	List price
Locking device	KT5FLD	\$ 40
Locking device draw out	KT5FLDW	55

Plug-in kits

Contacts	Breaker adapter kit		Plug-in base	
	Catalog number suffix	List price adder	Catalog number	List Price
T4, 3 pole with extended front terminal	KT4PMK	\$ 250	KT4PFEE	\$ 710
T4, 3 pole with rear horizontal terminal			KT4PFHR	766
T4, 3 pole with rear vertical terminal			KT4PFVR	766
T5, 3 pole with extended front terminal	KT5PMK	350	KT5PFEE	810
T5, 3 pole with rear horizontal terminal			KT5PFHR	866
T5, 3 pole with rear vertical terminal			KT5PFVR	866

Draw-out kits

Contacts	Breaker adapter kit		Plug-in base	
	Catalog number suffix	List price adder	Catalog number	List price
T4, 3 pole with extended front terminal	KT4WMK	\$ 290	KT4WFEF	\$ 816
T4, 3 pole with rear horizontal terminal			KT4WFHR	1021
T4, 3 pole with rear vertical terminal			KT4WFVR	1021
T5, 3 pole with extended front terminal	KT5WMK	407	KT5WFEF	931
T5, 3 pole with rear horizontal terminal			KT5WFHR	1154
T5, 3 pole with rear vertical terminal			KT5WFVR	1154

Standard cable lugs

For breakers	Amps	Wire size	Set of 2 catalog number	List price	Set of 3 catalog number	List price	Set of 4 catalog number	List price
T4	100	14 AWG-1/0	KT4100-2	\$ 6	KT4100-3	\$ 9	KT4100-4	\$ 12
	250	6 AWG - 350 kcmil	KT4250-2	20	KT4250-3	30	KT4250-4	40
T5	300	250kcmil - 500 kcmil	KT5300-2	30	KT5300-3	45	KT5300-4	60
	400	(2) 3/0 - 250 kcmil	KT5400-2	30	KT5400-3	45	KT5400-4	60
T5	600	(2) 3/0 - 500 kcmil	KT5600-2	TBD	KT5600-3	TBD	KT5600-4	TBD

Standard cable lug kits with power control taps

For breakers	Amps	Wire size	Set of 2 catalog number	List price	Set of 3 catalog number	List price	Set of 4 catalog number	List price
T4	100	14 AWG-1/0	KT4100-2C	\$ 10	KT4100-3C	\$ 15	KT4100-4C	\$ 20
	250	6 AWG - 350 kcmil	KT4250-2C	24	KT4250-3C	36	KT4250-4C	48
T5	300	250 kcmil - 500 kcmil	KT5300-2C	34	KT5300-3C	51	KT5300-4C	68
	400	(2) 3/0 - 250 kcmil	KT5400-2C	34	KT5400-3C	51	KT5400-4C	68

① Use Discount schedule SH



KT4PFVR

KT4PMK (on back of breaker)



KT4WMK (on back of breaker)

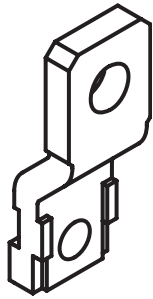


KT5WFVR

Accessories

Mechanical

T4 - T5



KT4EF-₂

Extended front terminals

Breaker	Amps	Set of three		Set of four	
		Catalog number suffix	List price adder	Catalog number	List Price
T4	250	KT4EF-3	\$ 55	KT4EF-4	\$ 73
T5	400	KT5EF-3	115	KT5EF-4	155

Rear terminals

Breaker	Amps	Set of three		Set of four	
		Catalog number suffix	List price adder	Catalog number	List Price
T4	250	KT4R-3	\$ 60	KT4R-4	\$ 80
T5	400	KT5R-3	122	KT5R-4	163

Distribution cable lug kit

Breaker	Amps	Wire range	Set of 3 catalog number	List price
T4	250	(6) #14-6	KT4TN	\$ 125
T5	400	(6) #14-1/0	KT5TGD	240

Terminal covers for fixed breakers

Low profile

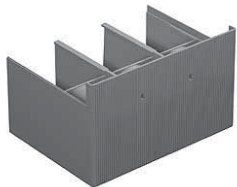
For breakers	Low profile 3-pole		Low profile 4-pole	
	Catalog number	List price	Catalog number	List price
T4	KT4LTC-3	\$ 55	KT4LTC-4	\$ 74
T5	KT5LTC-3	60	KT5LTC-4	81

High profile

For breakers	High profile 3-pole		High profile 4-pole	
	Catalog number	List price	Catalog number	List price
T4	KT4HTC-3	\$ 58	KT4HTC-4	\$ 78
T5	KT5HTC-3	63	KT5HTC-4	85



KT4LTC-3



KT4HTC-3

Mechanical interlock plate — complete assembly consists of one frame and one plate

Interlock frame			Catalog number	List price
Mechanical interlock horizontal frame			KT5MIR-HB	\$ 490
Mechanical interlock vertical frame			KT5MIR-VB	588
Plate type			Catalog number	List price
A	T4 (F-P-W)	+	T4 (F-P-W)	\$ 210
B	T4 (F-P-W)	+	T5 400 (F-P-W) or T5 630 (F)	
C	T4 (F-P-W)	+	T5 630 (P-W)	
D	T5 400 (F-P-W) or T5 630 (F)	+	T5 400 (F-P-W) or 630 (F)	
E	T5 400 (F-P-W) or T5 630 (F)	+	T5 630 (P-W)	
F	T5 630 (P-W)	+	T5 630 (P-W)	



External accessories

Flange handle operators

T4 & T5

Flange handle — Cable linkage

Breaker	NEMA Type	Mechanism only	List price	Cable only	Cable length	List price	Handle only	List price
T4	1, 3R, 12	KT4FPM	\$ 148	K5C036	36" (91 _{cm})	\$ 114	K5FCH	\$ 213
T4	4, 4X	KT4FPM		K5C048	48" (122 _{cm})	146	K5FCH4	243
T5	1, 3R, 12	KT5FPM	193	K5C060	60" (152 _{cm})	160	K5FCH	213
T5	4, 4X	KT5FPM		K5C060	72" (183 _{cm})	175	K5FCH4	243
-	-	-	-	K5C084	84" (213 _{cm})	204	-	-
-	-	-	-	K5C096	96" (244 _{cm})	221	-	-
-	-	-	-	K5C108	108" (274 _{cm})	238	-	-
-	-	-	-	K5C120	120" (305 _{cm})	256	-	-

Notes: For complete assembly; mechanism, cable and handle are required.
 All cables mount onto the right side of the breaker.
 Handle can be mounted on the right or left side.

Door hardware kits – T4 & T5 Cable operated

Item	Catalog number	List price
Door hardware kit, right hand, 2 point latch for enclosures less than 40 inches high	KDH2R	\$ 200
Door hardware kit, right hand, 3 point latch for enclosures 40 inches high or greater	KDH3R	225

Enclosure depths

Minimum

Breaker	Depth (inches)
T4 & T5	8

Maximum

Maximum depth is determined by cable length.

Enclosures Type 1 & 3R/12



Enclosures (Price does not include circuit breaker; order as a separate item.) ④

NEMA designation	Breaker type	Enclosure maximum rating		Approximate dimensions① H x W x D (inches)	Catalog number	List price
		AL cables	CU cables			
Type 1 ①	T1	100A	100A	15 x 8.5 x 4	T1E-1	\$ 267
	T2	100A	100A	15 x 8.5 x 4	T2E-1	267
	T3	175A	225A	20 x 11 x 4	T3E-1	315
	T4	200A	250A	26 x 15 x 6.25	T4E-1 ②	407
	T5	325A	400A	26 x 15 x 6.25	T5E-1 ②	435
Type 3R/12③	T1	100A	100A	15 x 8.5 x 7	T1E-3R12	407
	T2	100A	100A	15 x 8.5 x 7	T2E-3R12	407
	T3	175A	225A	20 x 11 x 7	T3E-3R12	527
	T4	200A	250A	26 x 15 x 9	T4E-3R12	625
	T5	325A	400A	26 x 15 x 9	T5E-3R12	767

Neutral kits

Breaker type	Neutral cable capacity and wire range	Neutral kit catalog number	List price
T1 – T2	Neutral #14-1/0 Bonding Lug #14-1/0	T2NK125	\$ 140
T3	Neutral #6-250 kcmil Bonding Lug #14-1/0	T3NK225	150
T4	Neutral #6-250 kcmil Bonding Lug #14-1/0 kcmil	T4NK250	200
T5	Neutral (2) #6-250 kcmil Bonding Lug #14-1/0 kcmil	T5NK400	295

NOTE: The list price adder for factory installation of an enclosed circuit breaker is 50% of the enclosure list price.

Description

Type 1

- General purpose indoor enclosure intended for use in normal environments to provide a degree of protection against contact with enclosed equipment.
- Sheet steel, surface mount.
- Breaker is front-operable and can be padlocked via a separately ordered padlock device.
- Available through 400A, 600VAC
- (SUSE) suitable for use as service equipment.

Type 3R/12

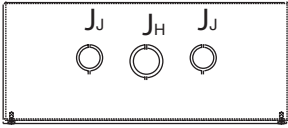
- Type 3R is intended for outdoor use providing protection against rain, sleet or snow.
- Type 12 is for use in indoor atmospheres to provide a degree of protection against circulating dust, lint, sawdust, falling dirt and dripping non-corrosive liquids.
- Surface-mounted, sheet steel enclosure.
- Breaker can be operated via **separately ordered** handle mechanism; door is interlocked with mechanism.
- Available through 400A, 600VAC.
- (SUSE) suitable for use as service equipment.

① Padlocking provision must be ordered separately.
 ② Must order KT5FLD (padlock device) separately.
 ③ Variable depth rotary handle must be ordered separately.
 ④ Consult ABB for breakers installed in enclosures.

Enclosures

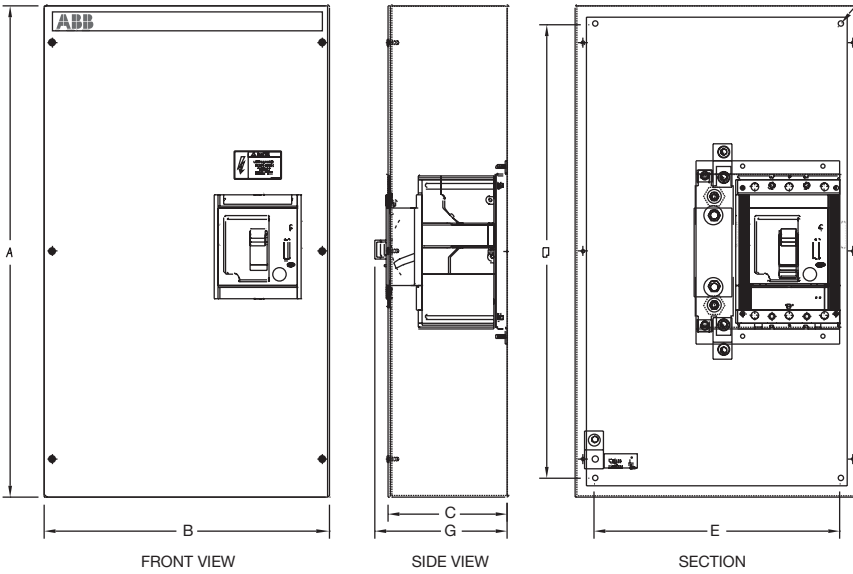
Approximate dimensions, T1 – T5 NEMA 1, 3R & 12

NEMA 1



SHOWN WITH BREAKER, PADLOCK DEVICE AND NEUTRAL KIT ORDERED SEPARATELY

F MTG HOLES
4 PLACES



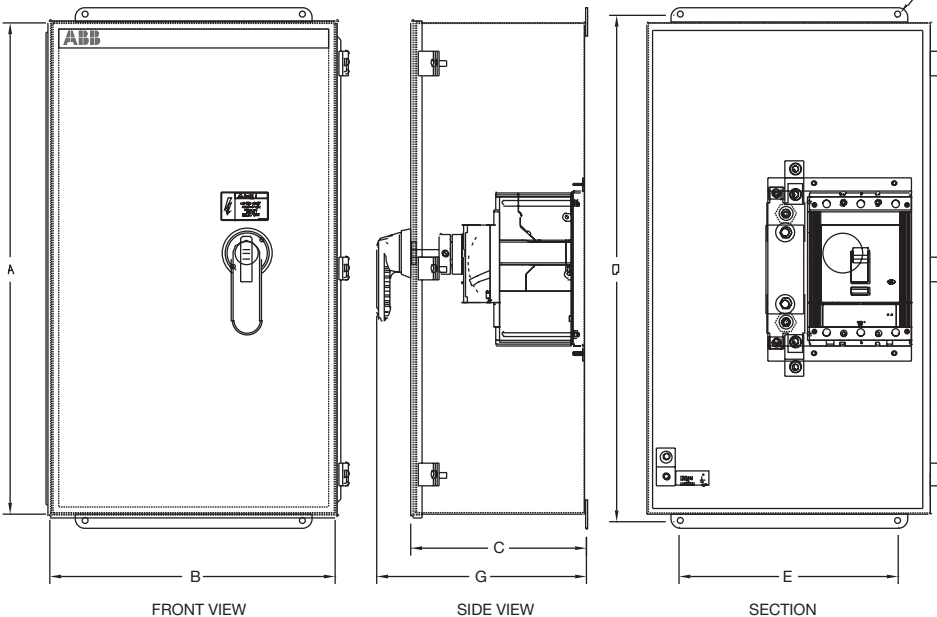
Cat. #	A	B	C	D	E	F	G	H	J
T1E-1	15.00 381	8.50 216	4.00 102	13.00 330	6.50 165	0.281 7	4.93 125	1, 1-1/4 25, 32	3/4, 1 19, 25
T2E-1	15.00 381	8.50 216	4.00 102	13.00 330	6.50 165	0.281 7	4.93 125	1, 1-1/4 25, 32	3/4, 1 19, 25
T3E-1	20.00 508	11.00 279	4.00 102	18.00 457	9.00 229	0.281 7	4.93 125	1, 1-1/4 25, 32	3/4, 1 19, 25
T4E-1	26.00 660	15.00 381	6.25 159	24.00 610	13.00 330	0.281 7	7.01 178	1, 1-1/4 25, 32	3/4, 1 19, 25
T5E-1	26.00 660	15.00 381	6.25 159	24.00 610	13.00 330	0.281 7	7.01 178	1, 1-1/4 25, 32	3/4, 1 19, 25

NEMA 3R, 12

15

SHOWN WITH BREAKER, VARI-DEPTH MECHANISM, HANDLE, SHAFT AND NEUTRAL KIT, ORDERED SEPARATELY

F MTG HOLES
4 PLACES



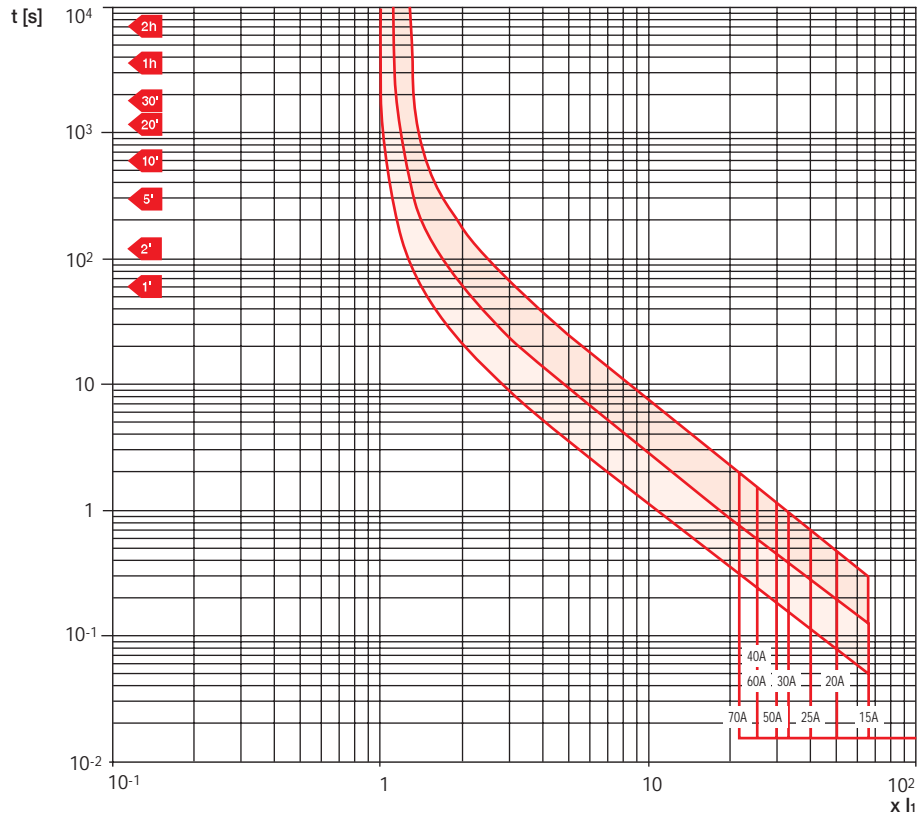
Cat. #	A	B	C	D	E	F	G
T1E-3R12	15.00 381	8.50 216	7.00 178	15.75 400	5.00 127	0.313 8	9.06 230
T2E-3R12	15.00 381	8.50 216	7.00 178	15.75 400	5.00 127	0.313 8	9.06 230
T3E-3R12	20.00 508	11.00 279	7.00 178	20.75 527	7.50 191	0.313 8	9.06 230
T4E-3R12	26.00 660	15.00 381	9.00 229	26.75 679	11.50 292	0.313 8	11.06 281
T5E-3R12	26.00 660	15.00 381	9.00 229	26.75 679	11.50 292	0.313 8	11.06 281

Trip curves for distribution Circuit breakers w/thermagnetic trip units Tmax T1



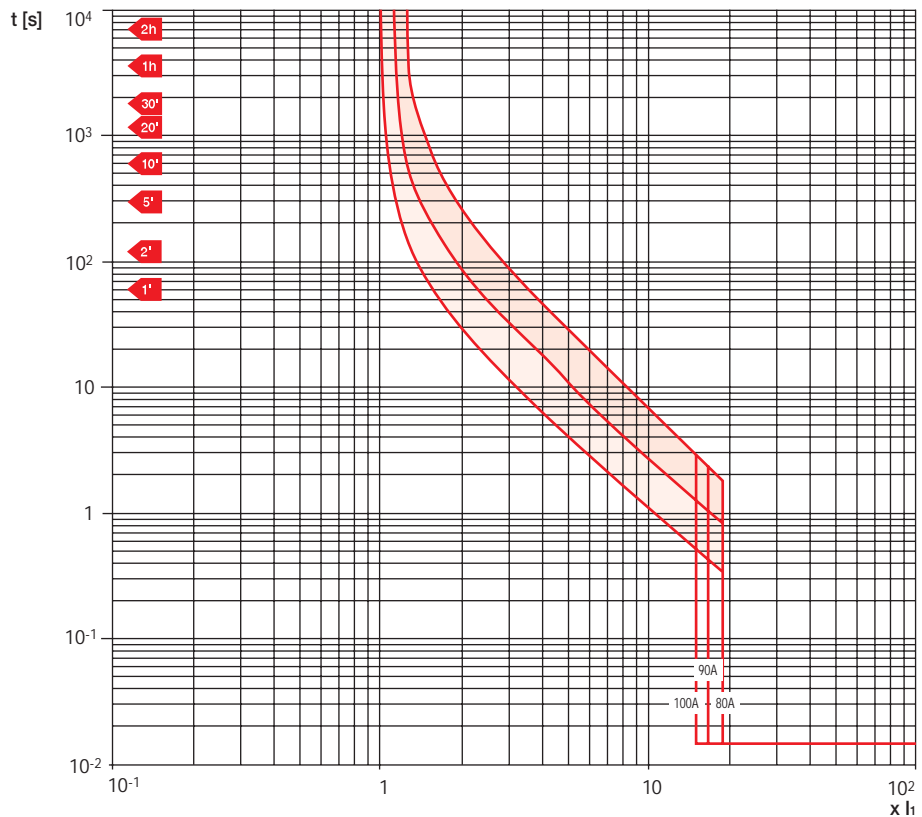
T1 100-T1 100 1P TMF

$I_n = 15 \div 70 \text{ A}$



T1 100-T1 100 1P TMF

$I_n = 80 \div 100 \text{ A}$

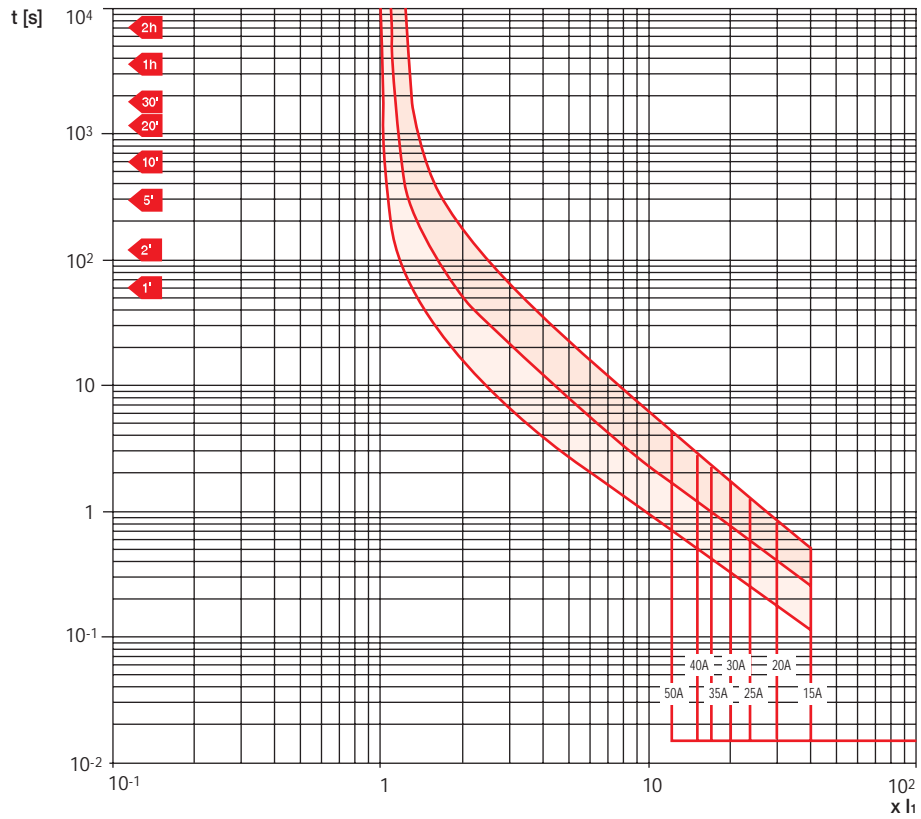




Trip curves for distribution Circuit breakers w/thermagnetic trip units Tmax T2

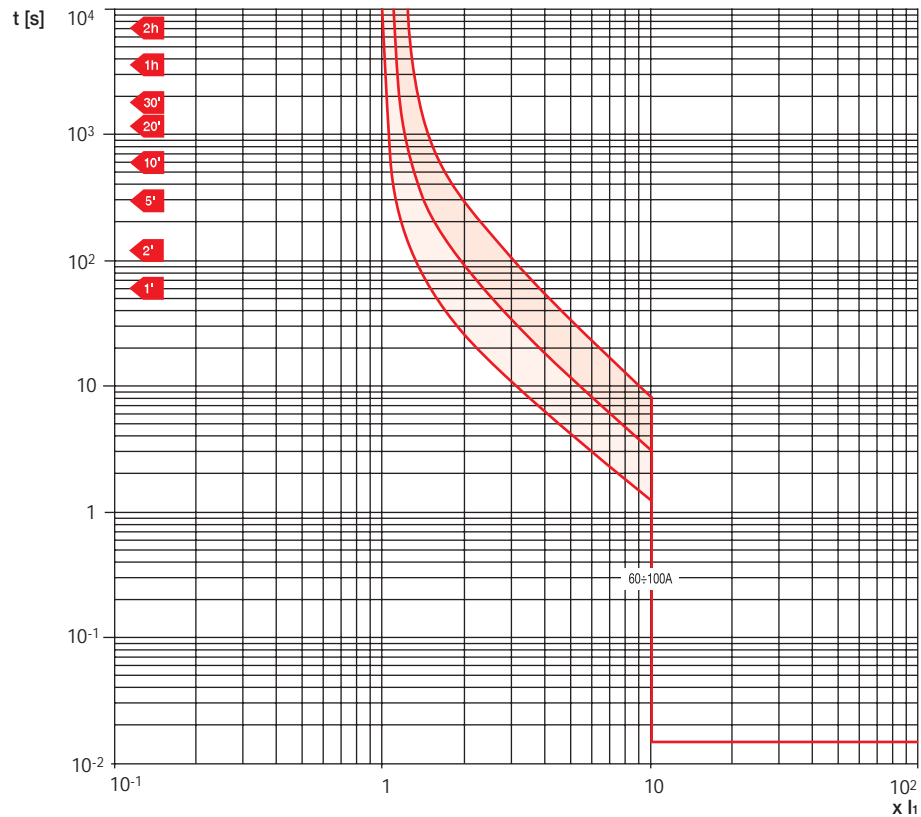
T2 100 TMF

$I_n = 15 \div 50 \text{ A}$



T2 100 TMF

$I_n = 60 \div 100 \text{ A}$



Trip curves for distribution

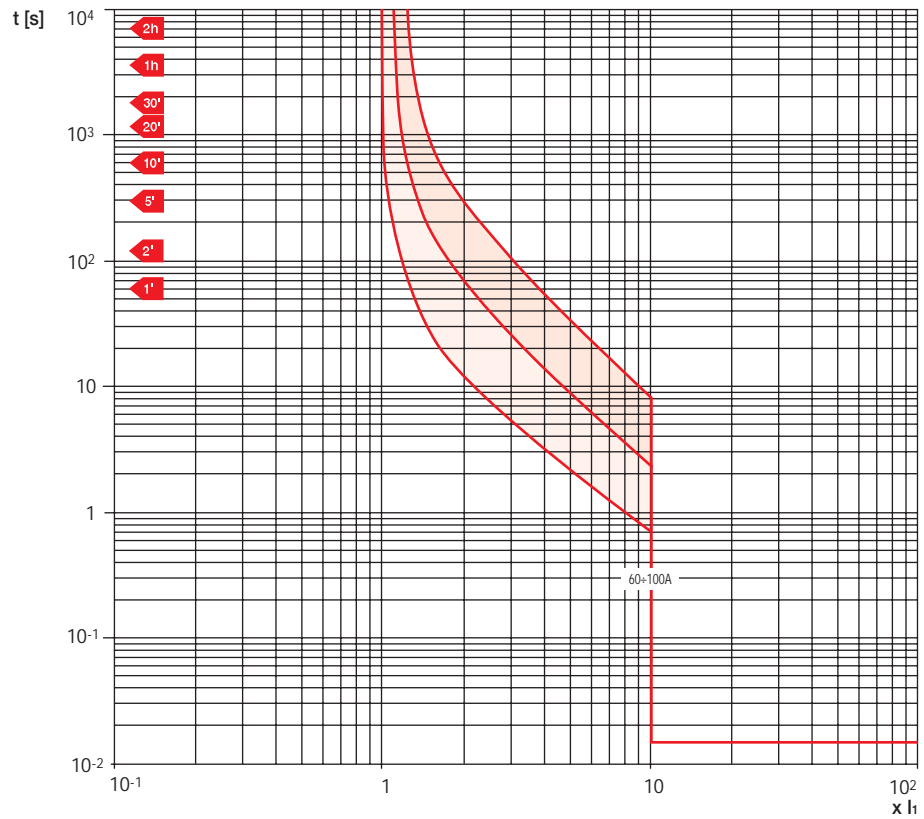
Circuit breakers w/thermagnetic trip units

Tmax T3



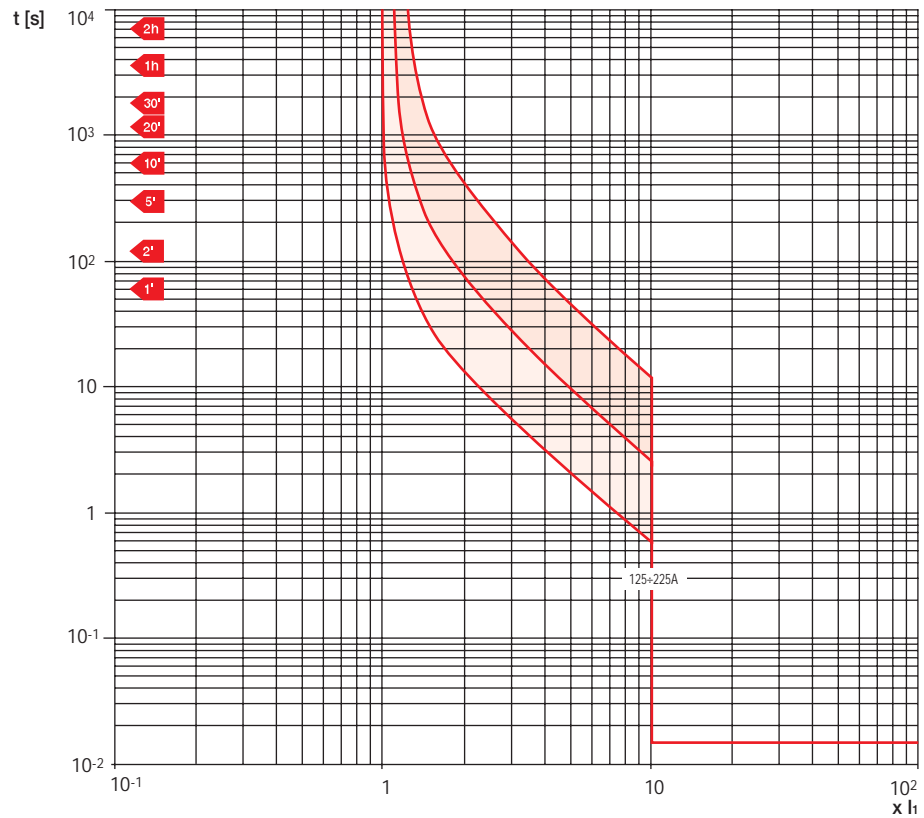
T3 225 TMF

In = 60 ÷ 100 A



T3 225 TMF

In = 125 ÷ 225 A

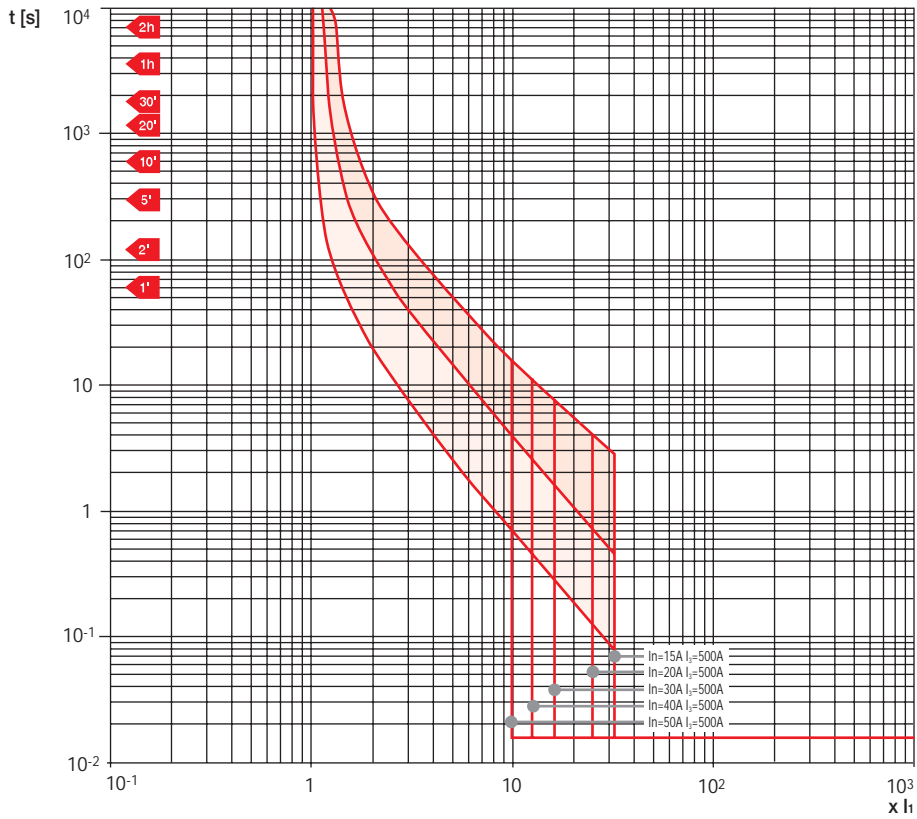




Trip curves for distribution Circuit breakers w/thermagnetic trip units Tmax T4

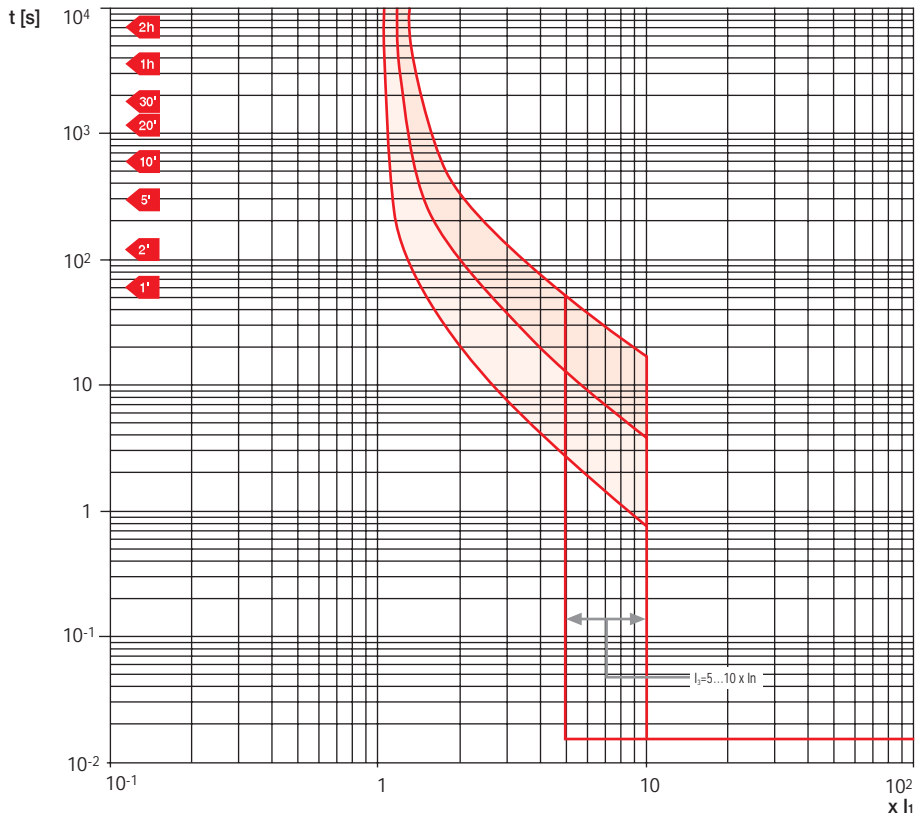
T4 250 TMF/TMD

$I_n = 20 \div 50$ A
 $I_n = 15, 20$ TMF
 $I_n = 30, 40, 50$ TMD



T4 250 TMA

$I_n = 80 \div 250$ A

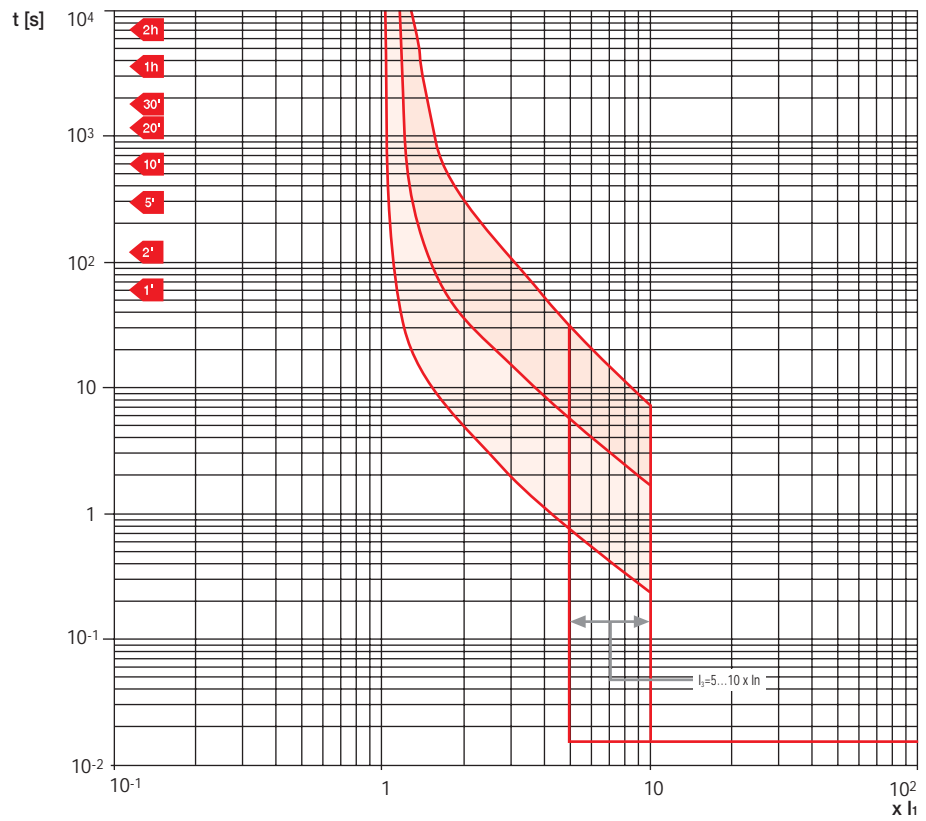


Trip curves for distribution Circuit breakers w/thermagnetic trip units Tmax T5



T5 400 TMA

$I_n = 300 \div 400 \text{ A}$

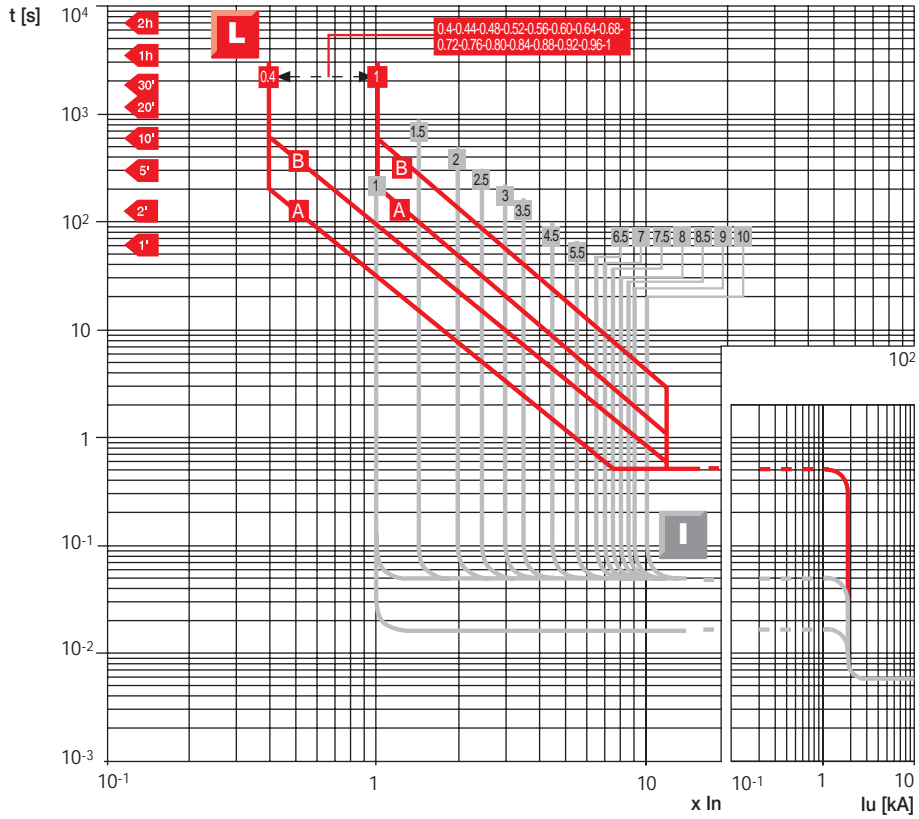




Trip curves for distribution Circuit breakers w/electronic trip units Tmax T2

T2 100
PR221DS-LS

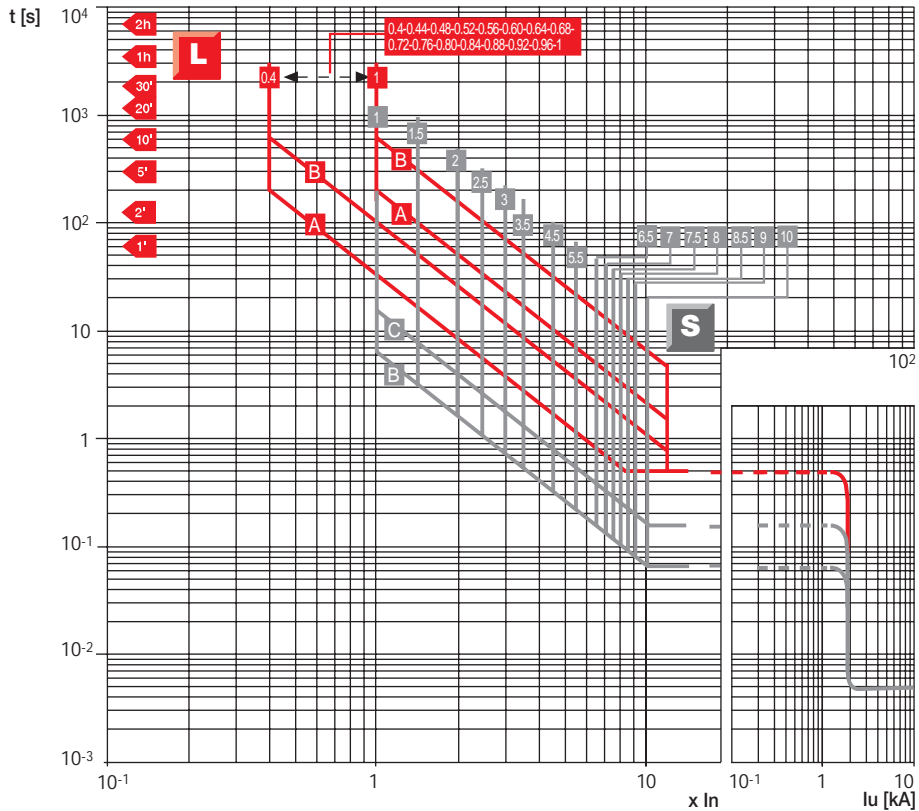
L-I Functions



T2 100
PR221DS-LS

L-I Functions

15

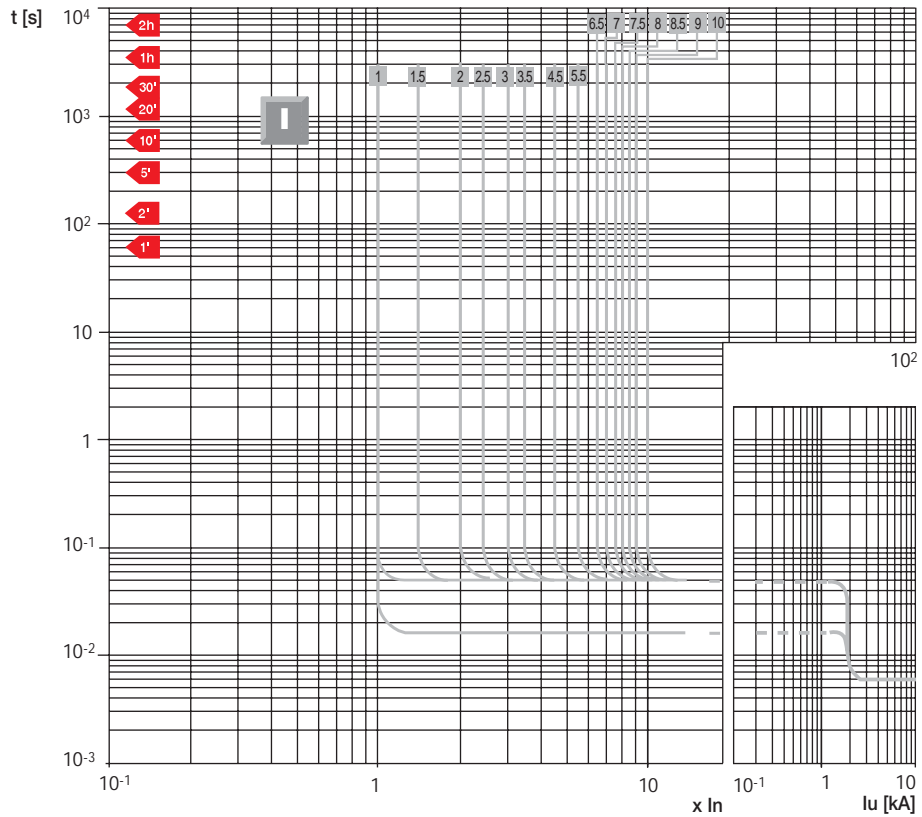


Trip curves for distribution Circuit breakers w/electronic trip units Tmax T2, T4 & T5



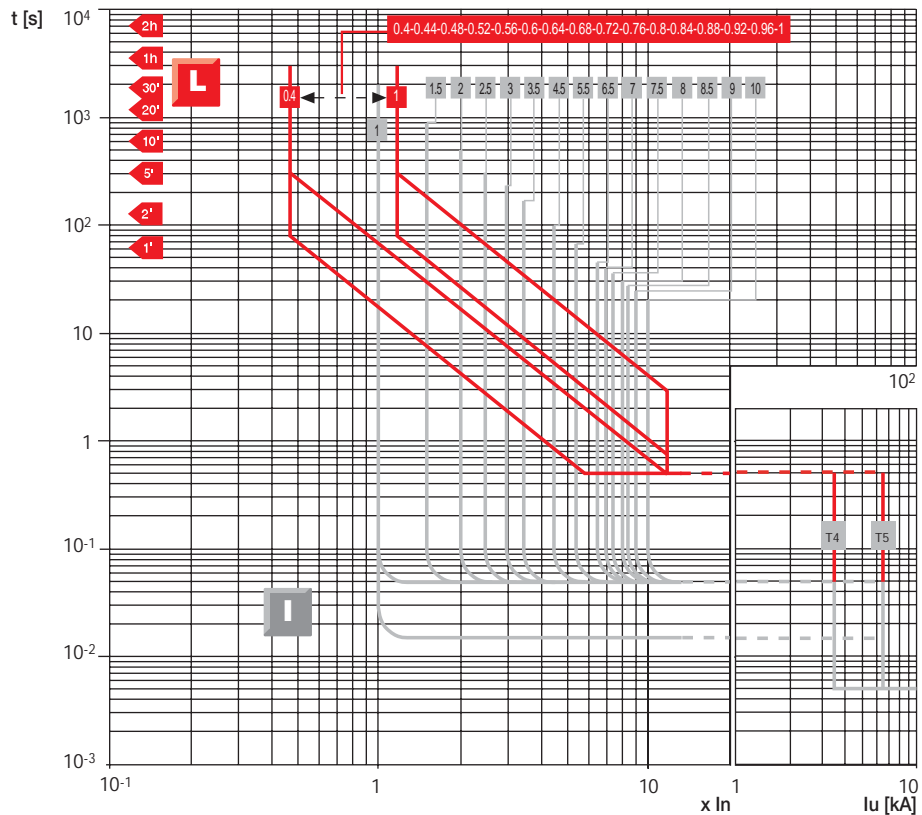
**T2 100
PR221DS-I**

I Function



**T4 250 - T5 600
PR221DS**

L-I Functions

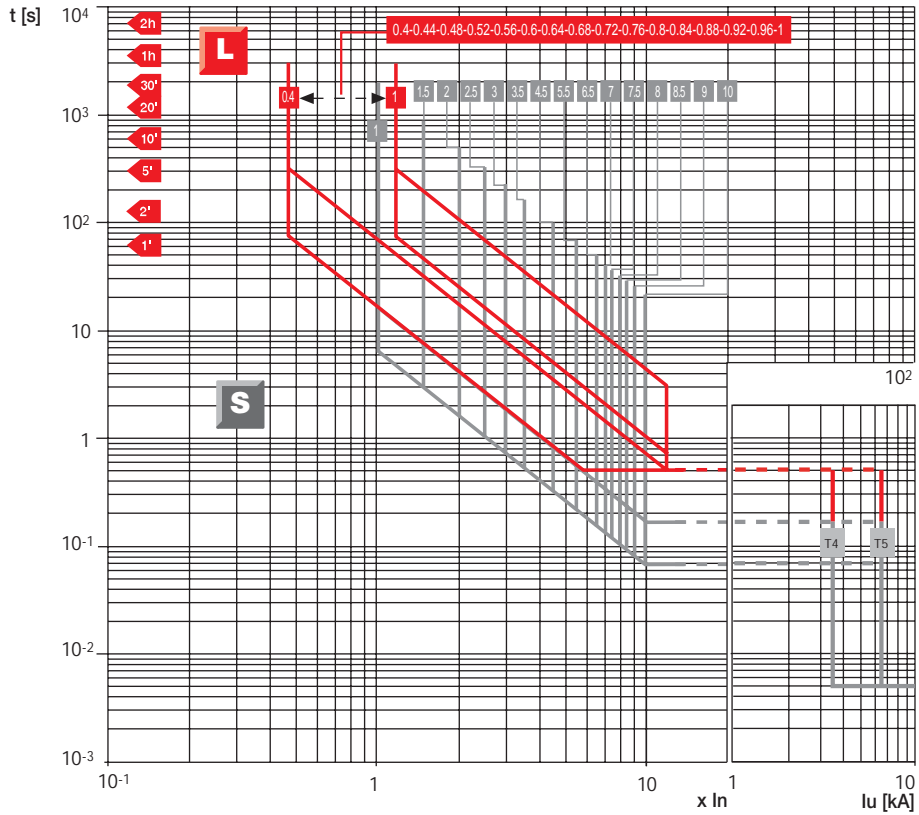




Trip curves for distribution Circuit breakers w/electronic trip units Tmax T4 & T5

T4 250 - T5 600
PR221DS

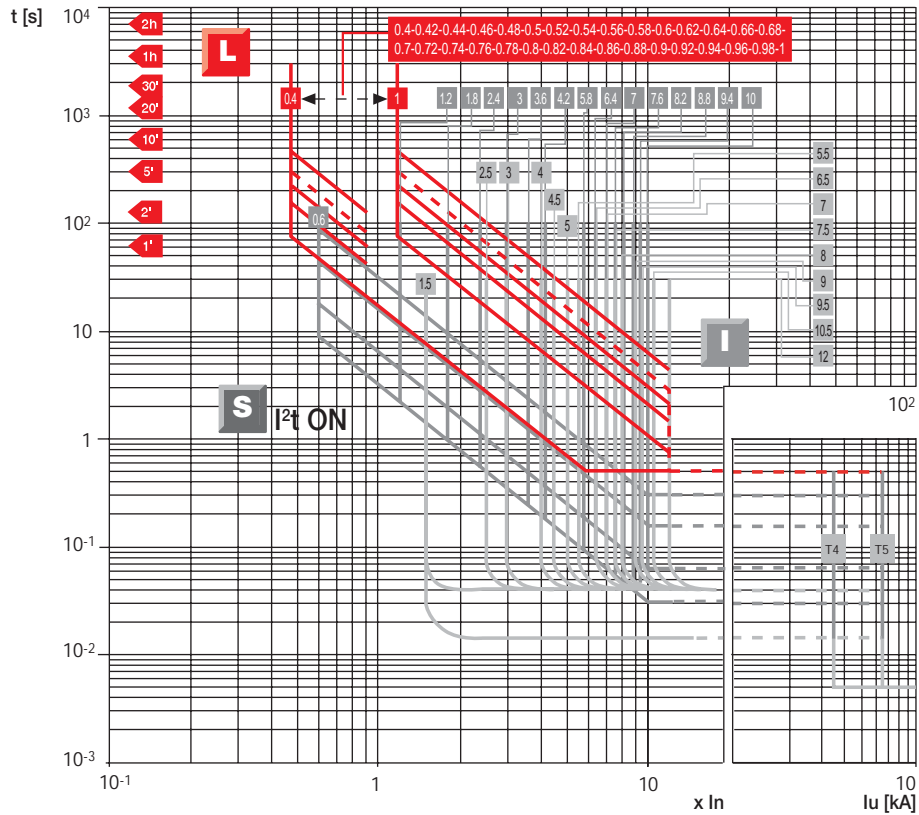
L-S Functions



T4 250 - T5 600
PR222DS/P and
PR222DS/PD

15

L-S-I Functions
(I²t const = ON)

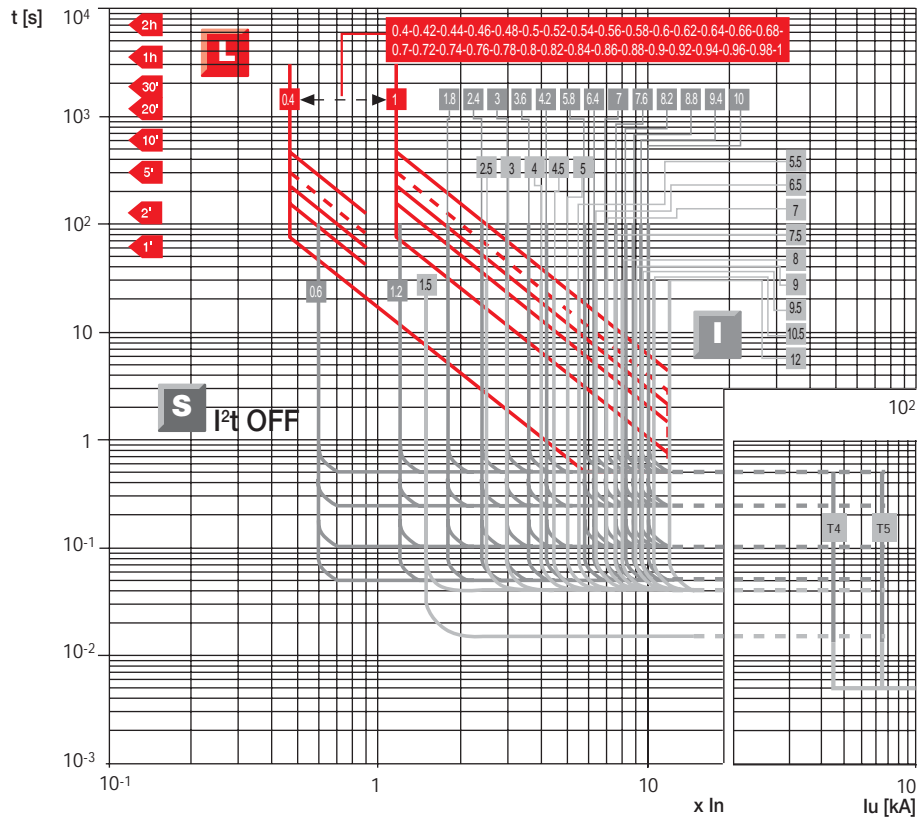


Trip curves for distribution Circuit breakers w/electronic trip units Tmax T4 & T5



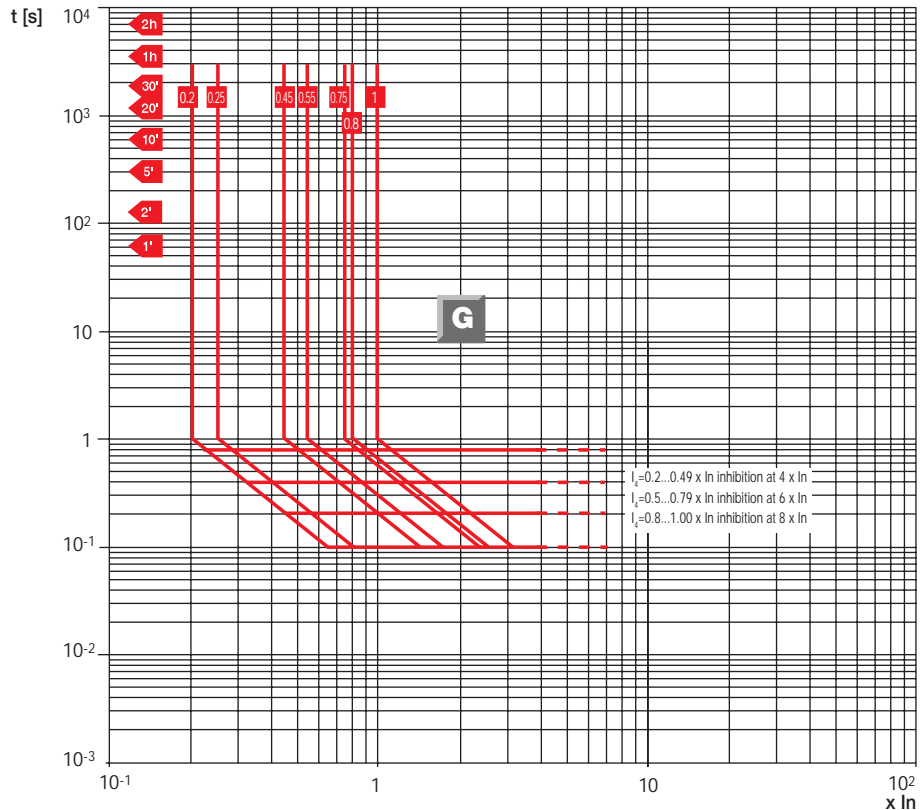
T4 250 - T5 600
PR222DS/P and
PR222DS/PD

L-S-I Functions
(I²t const = OFF)



T4 250 - T5 600
PR222DS/P and
PR222DS/PD

G Function





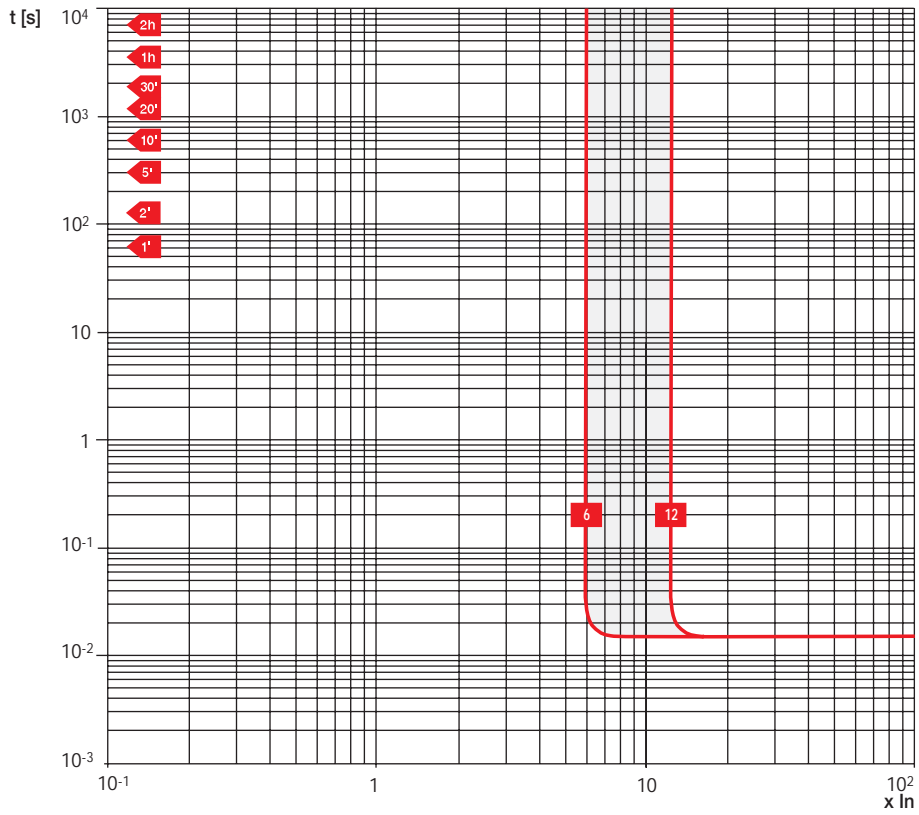
Trip curves for MCP

Circuit breakers w/magnetic only trip units

Tmax T2 & T3

T2-T3 100 MCP

Adjustable magnetic only trip unit
 $I_3 = 6 \dots 12 \times I_n$



Trip curves for MCP

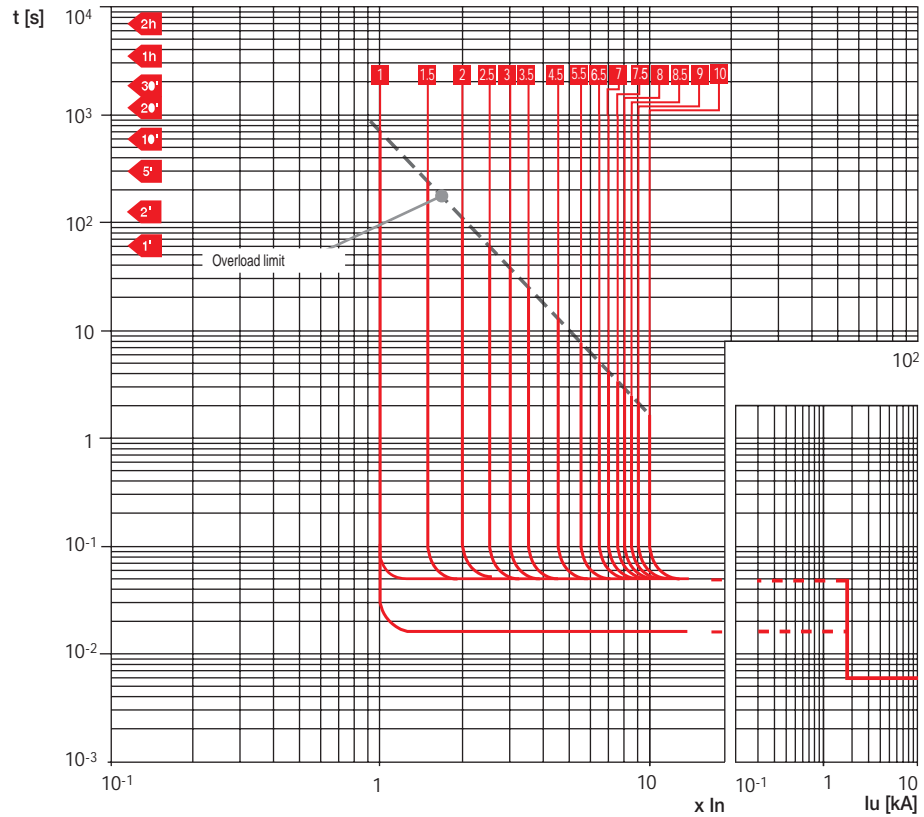
Circuit breakers w/PR221DS-I electronic trip unit

Tmax T2, T4 & T5



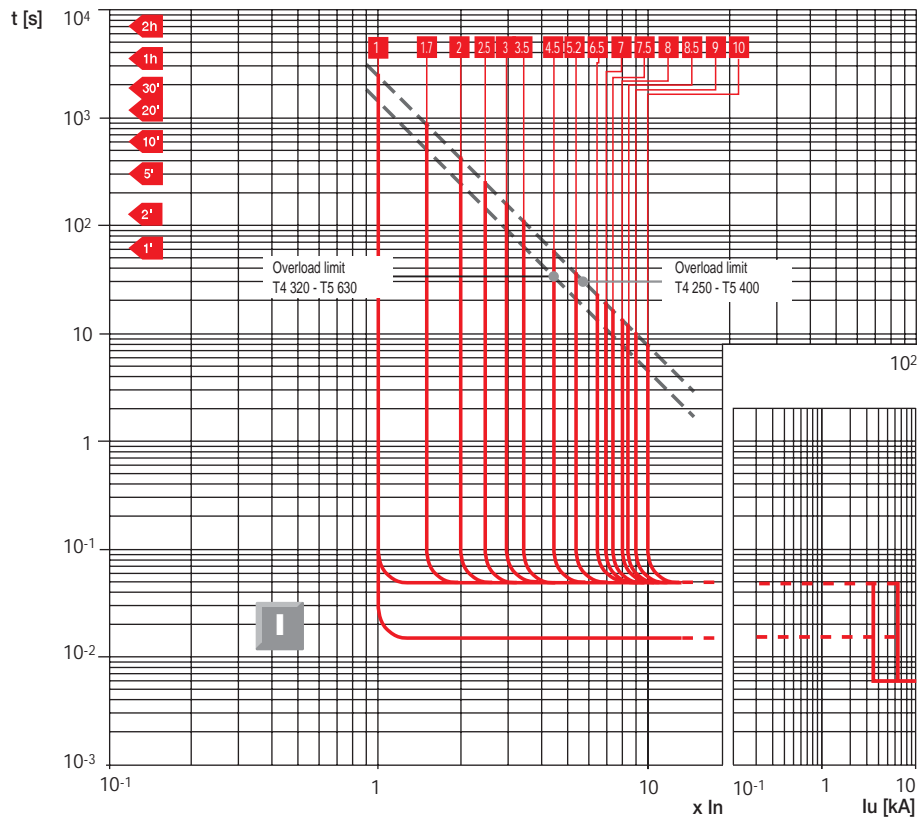
T2 100
PR221DS-I

I Function



T4 250 - T5 600
PR221DS-I

I Function



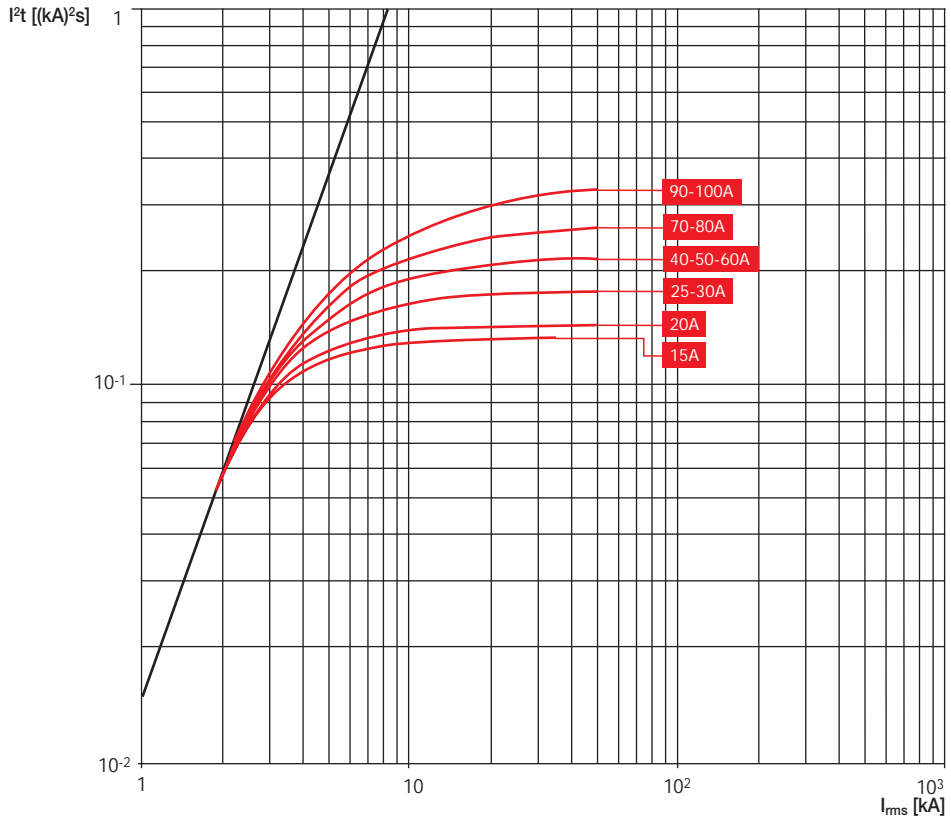


Specific let-through energy curves

Tmax T1 & T2, 240V

T1 100

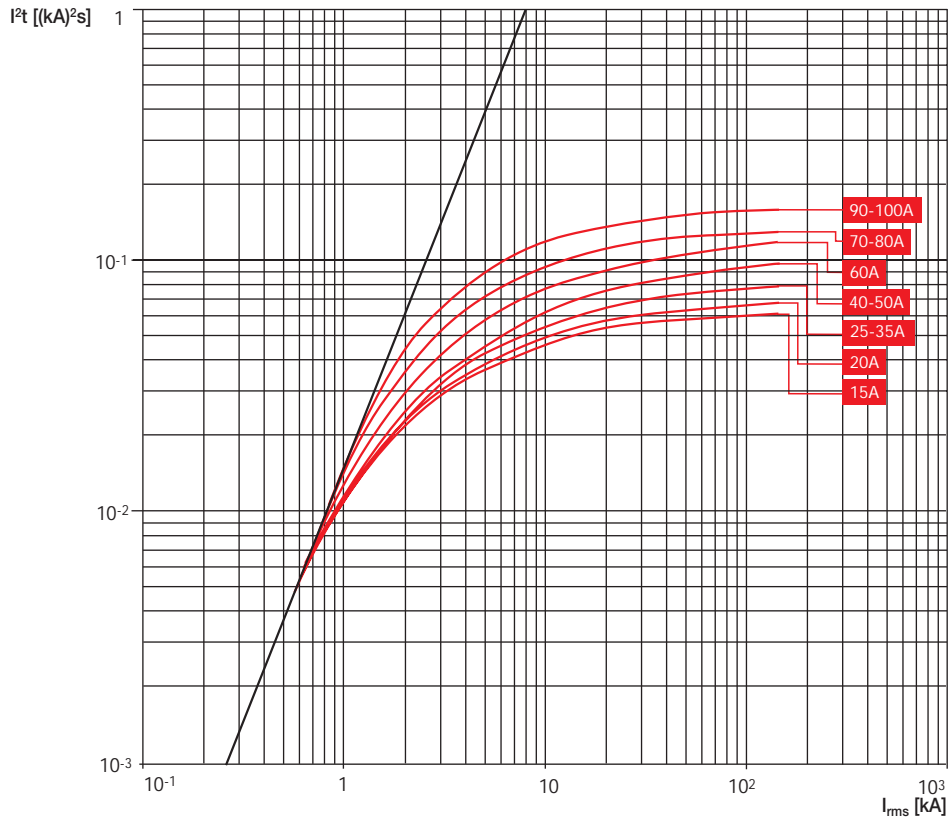
240 V



T2 100

240 V

15



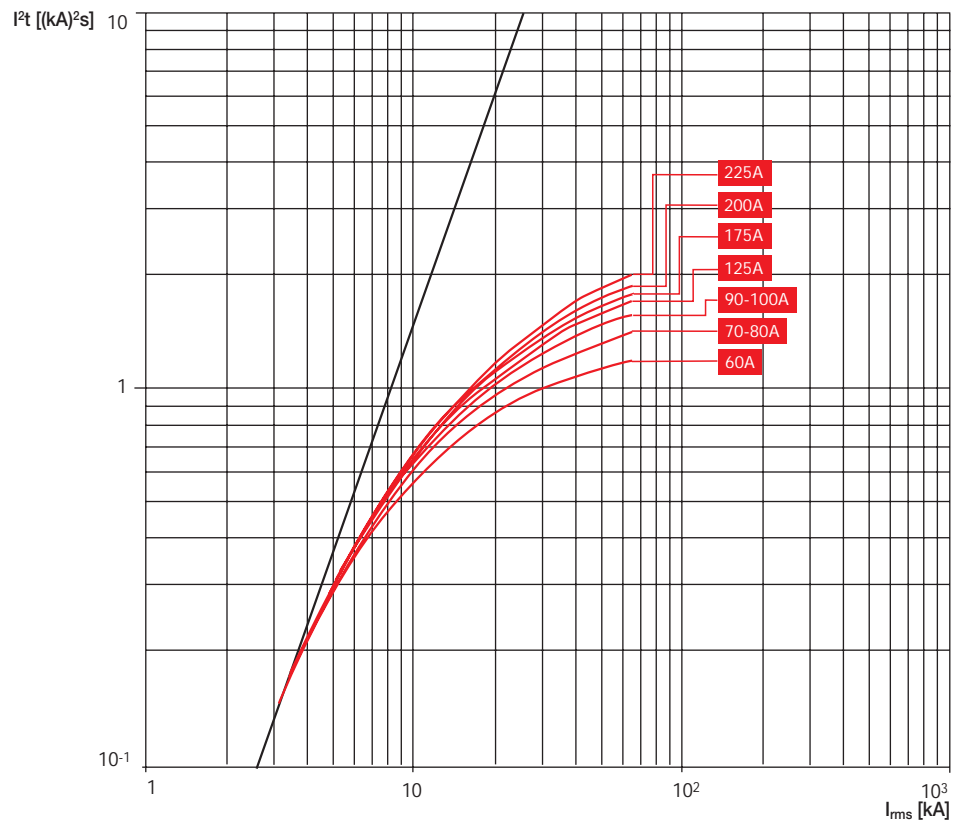
Specific let-through energy curves

Tmax T3 & T4, 240V



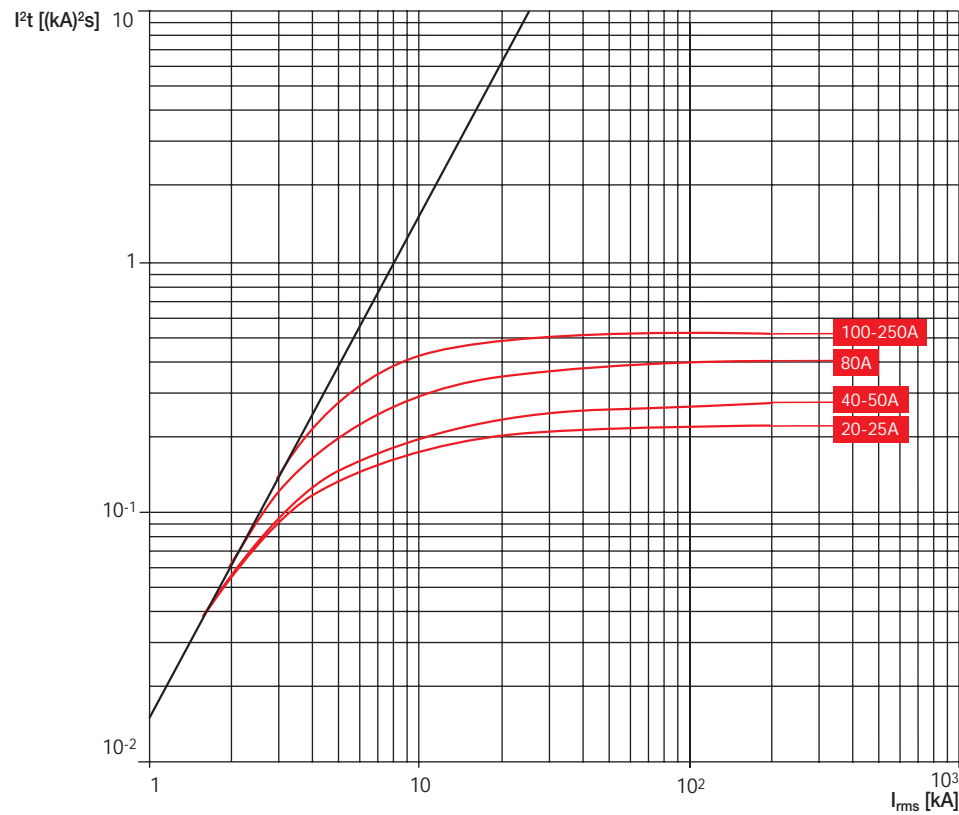
T3 225

240 V



T4 250

240 V





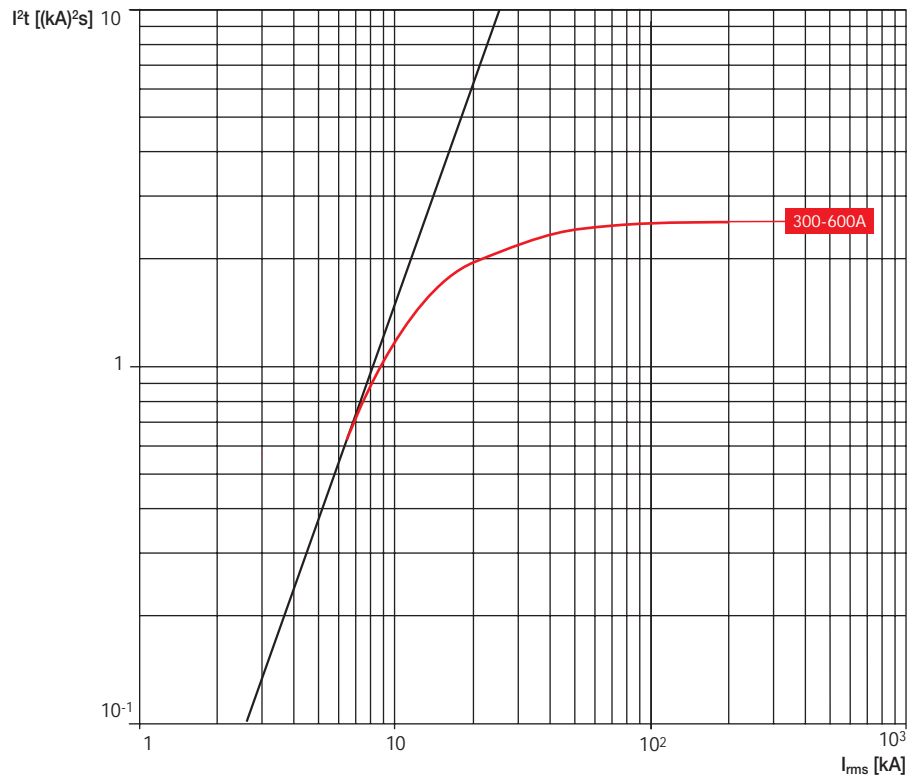
Specific let-through energy curves

Tmax T5, 240V

T5 600

240 V

* Please ad ABB for 600 A availability



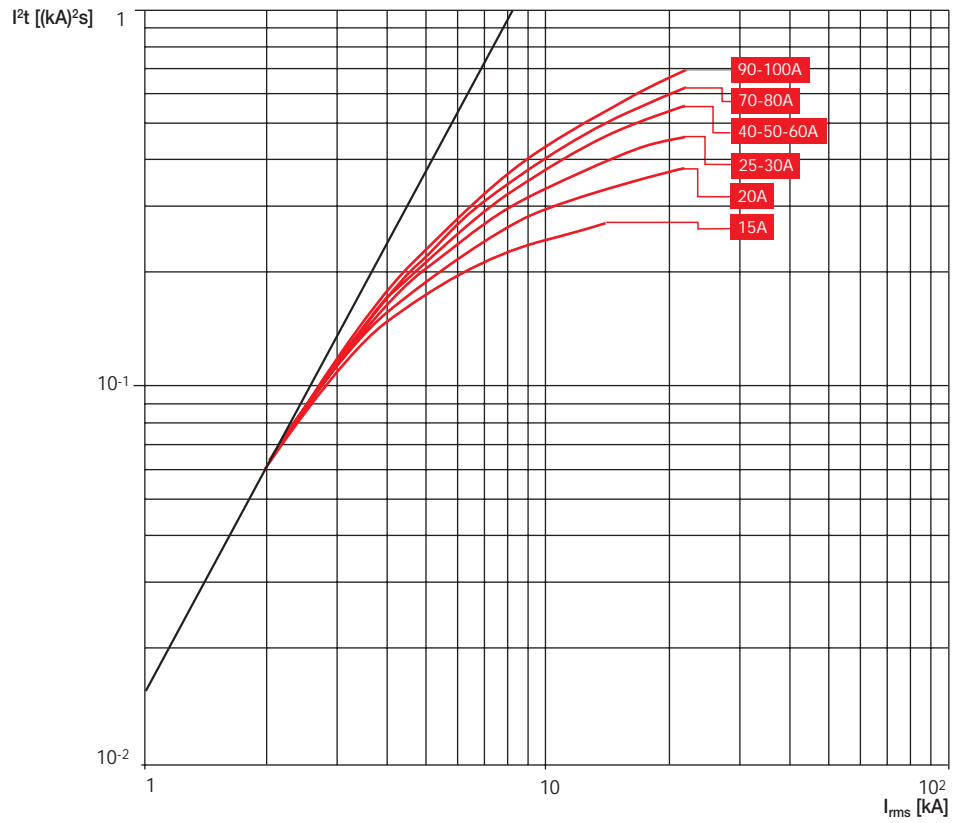
Specific let-through energy curves

Tmax T1 & T2, 480V



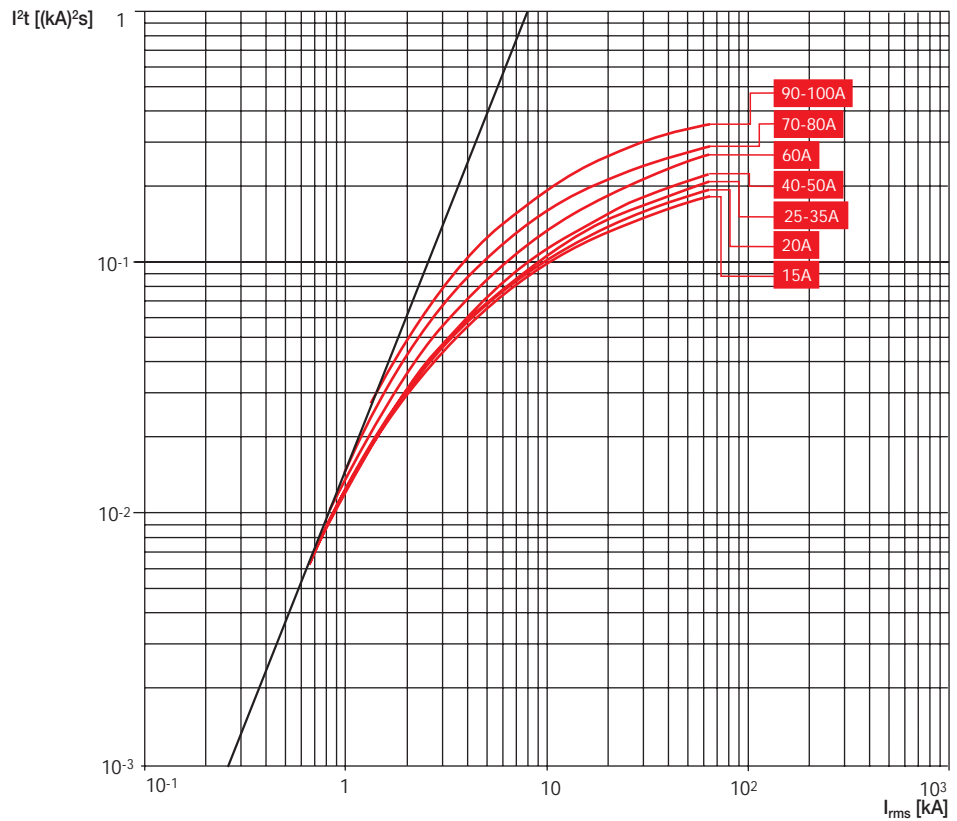
T1 100

480 V



T2 100

480 V

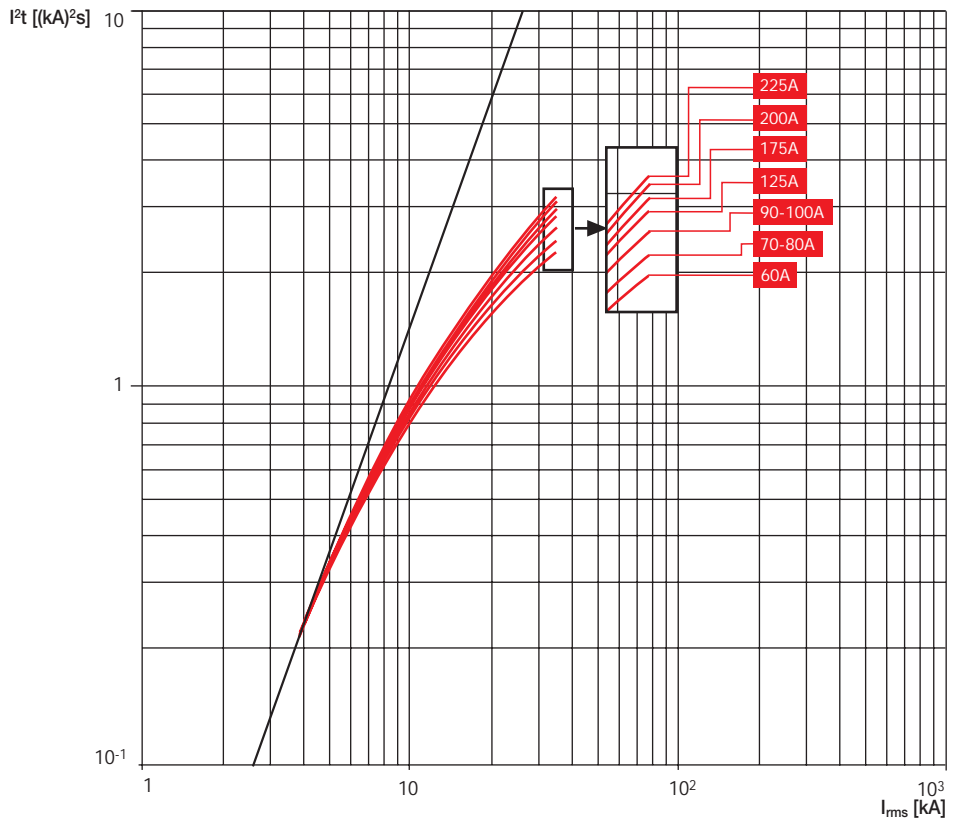




Specific let-through energy curves Tmax T3 & T4, 480V

T3 225

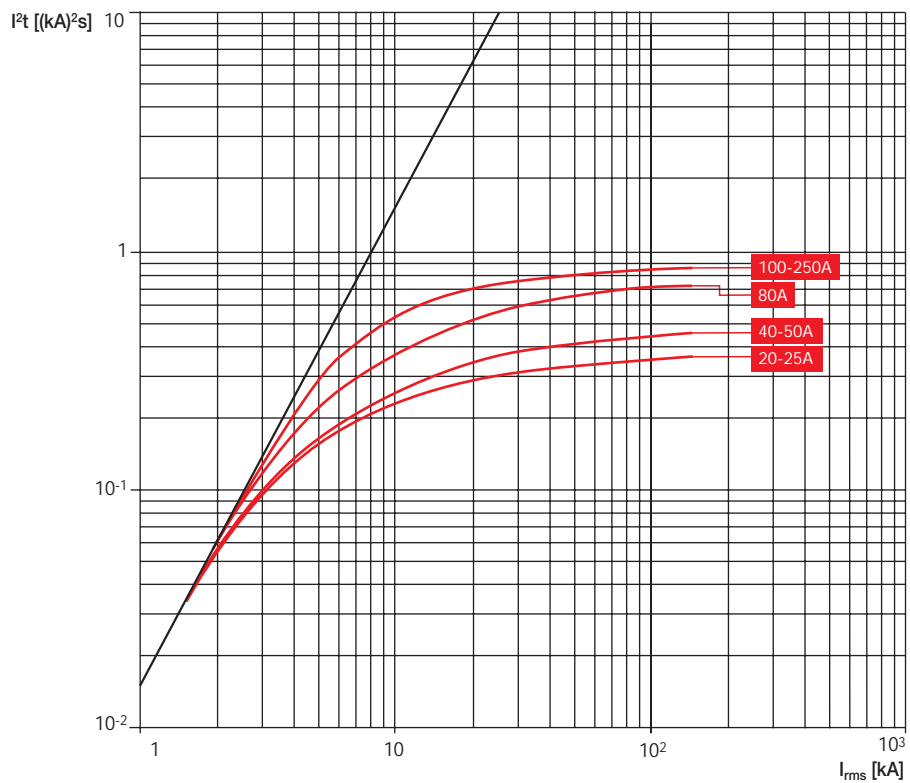
480 V



T4 250

480 V

15



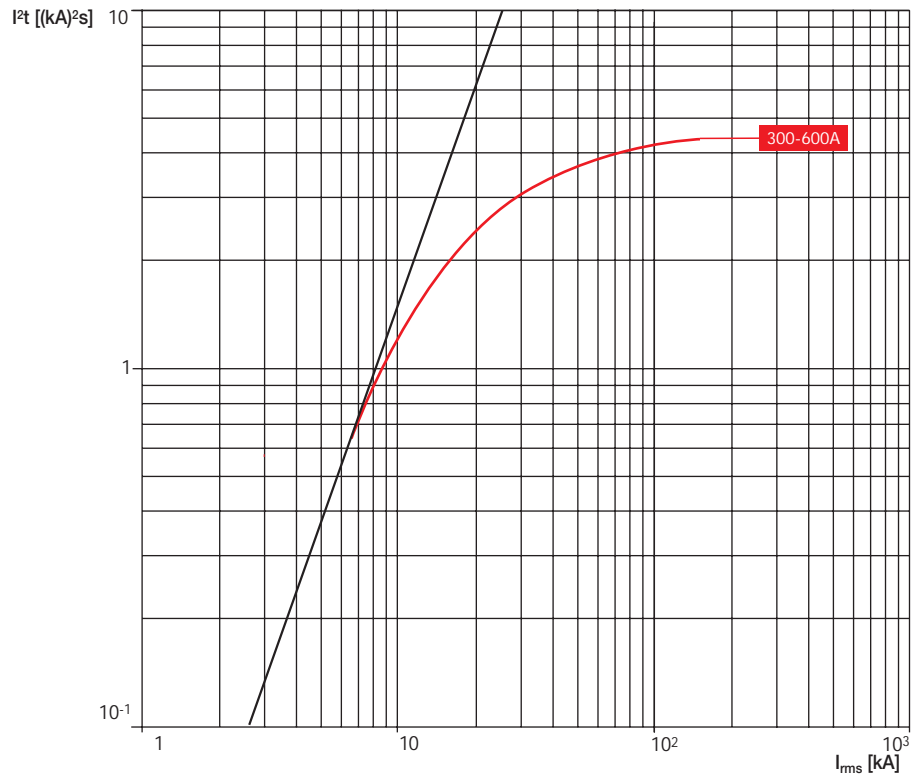
Specific let-through energy curves

Tmax T5, 480V



T5 600

480 V

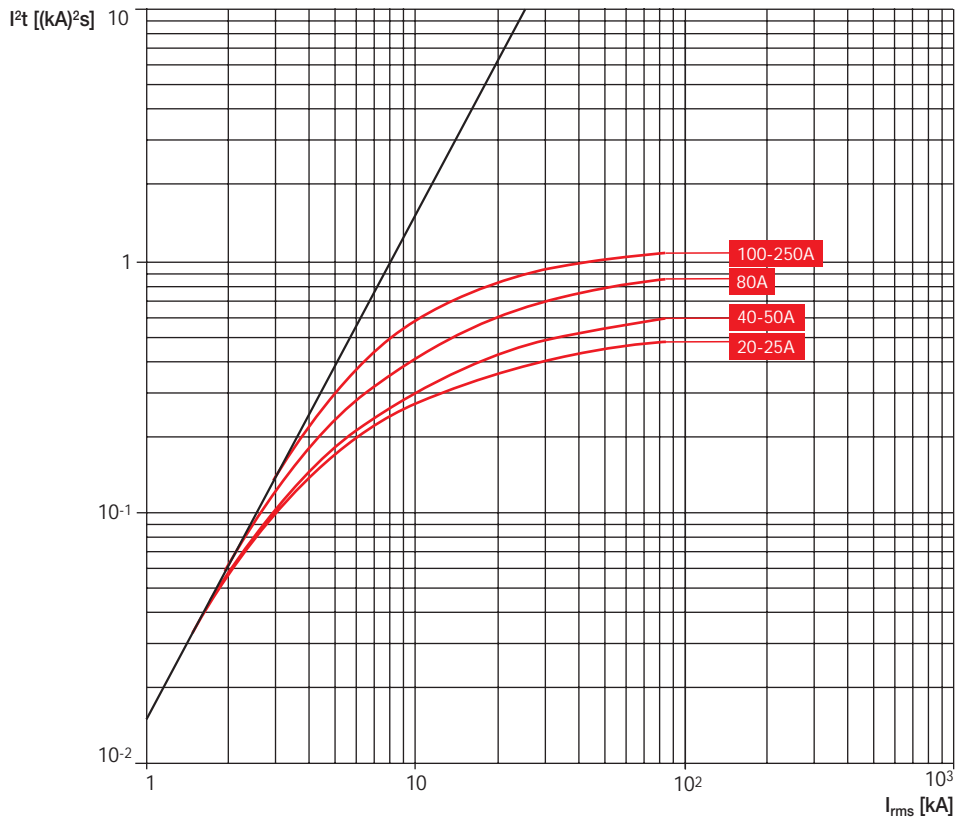




Specific let-through energy curves Tmax T4 & T5, 600V

T4 250

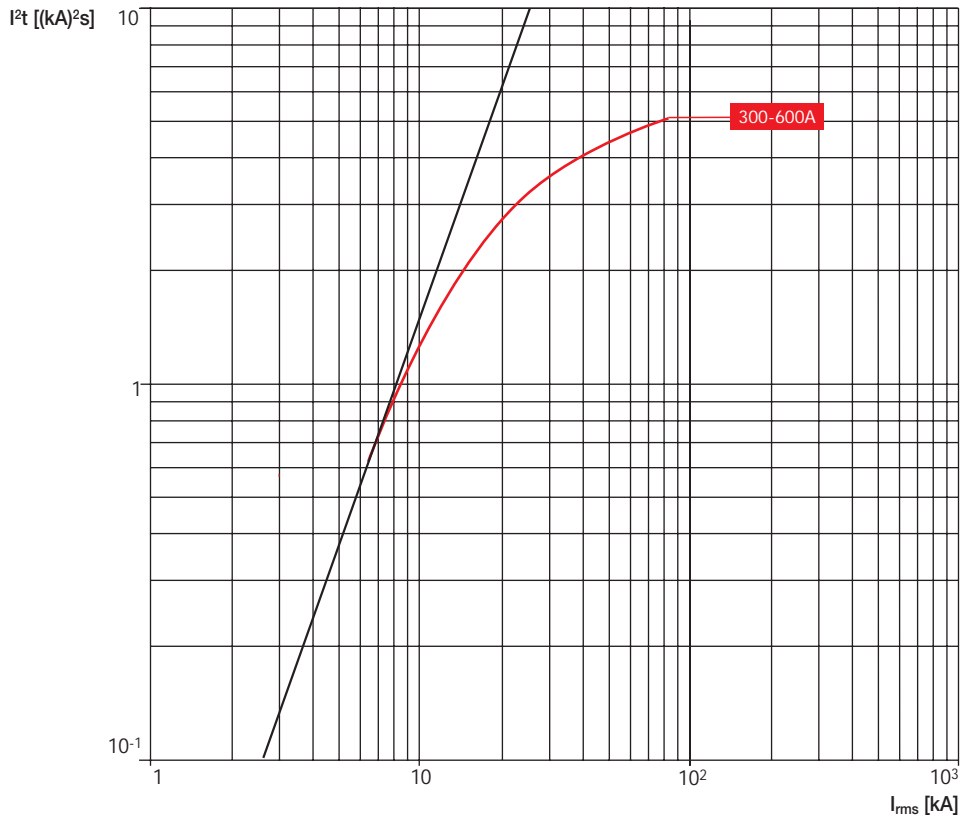
600 V



T5 600

600 V

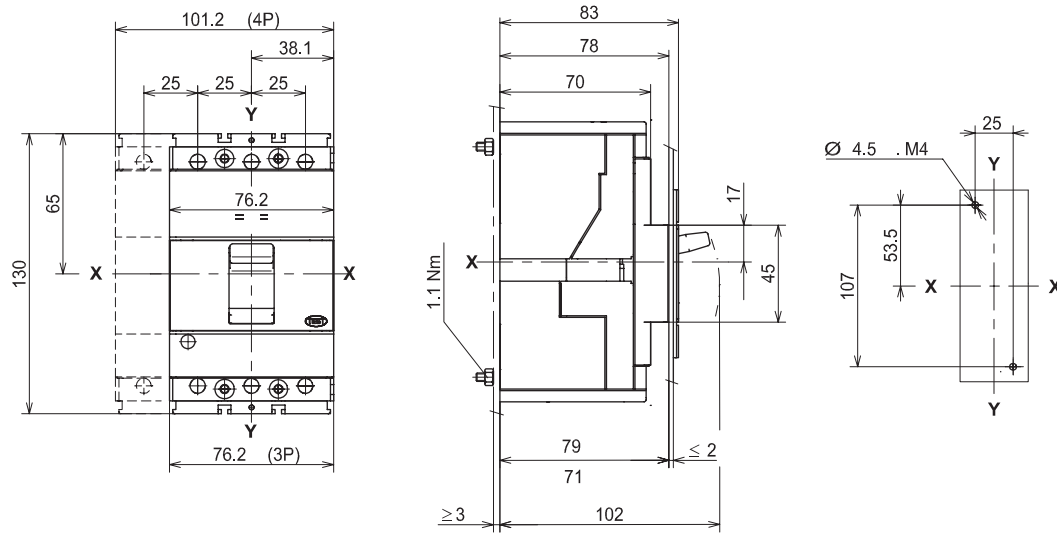
15



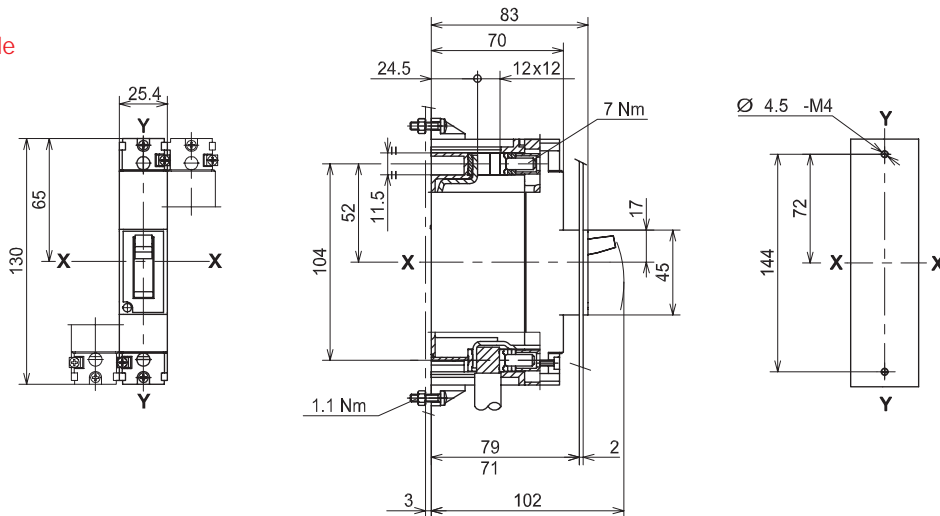
Approximate dimensions T1 & T2

Tmax
MCCBs

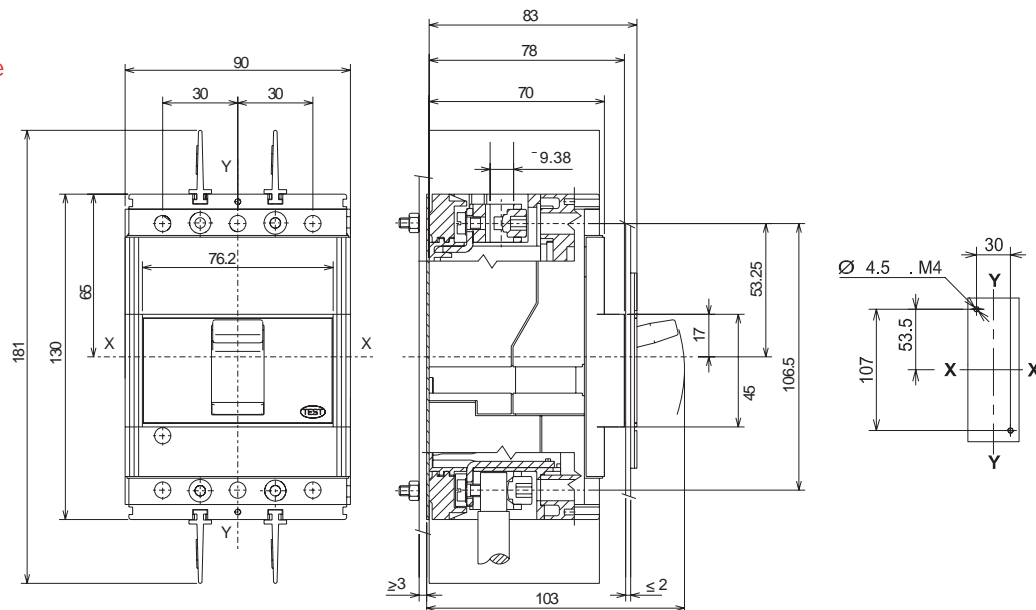
T1 — 3 pole



T1 — Single pole



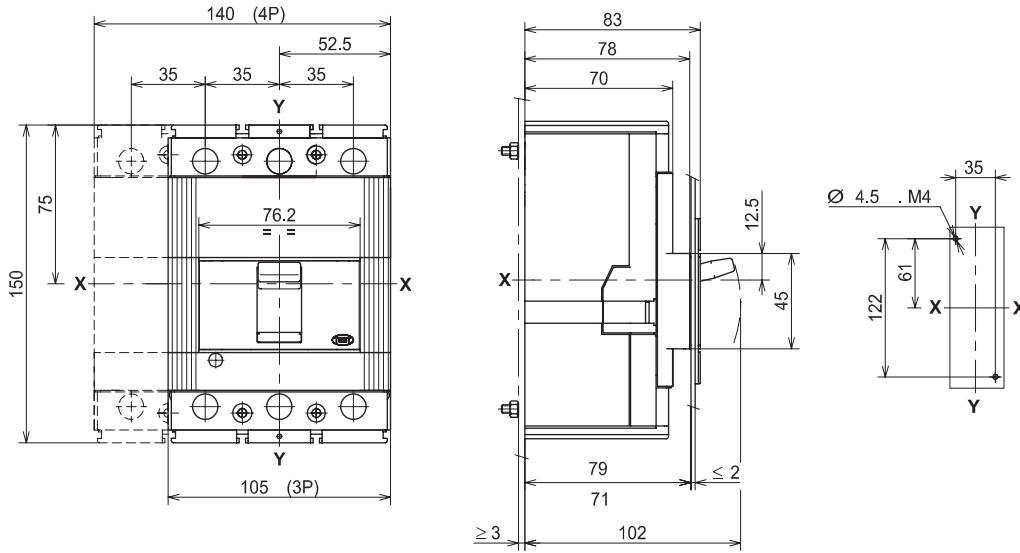
T2 — 2 & 3 pole



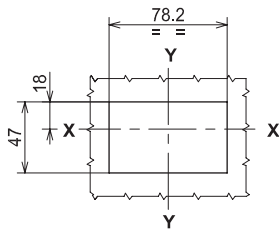


Approximate dimensions T3

T3 — 2 & 3 pole



Door cut-out for Tmax without faceplate



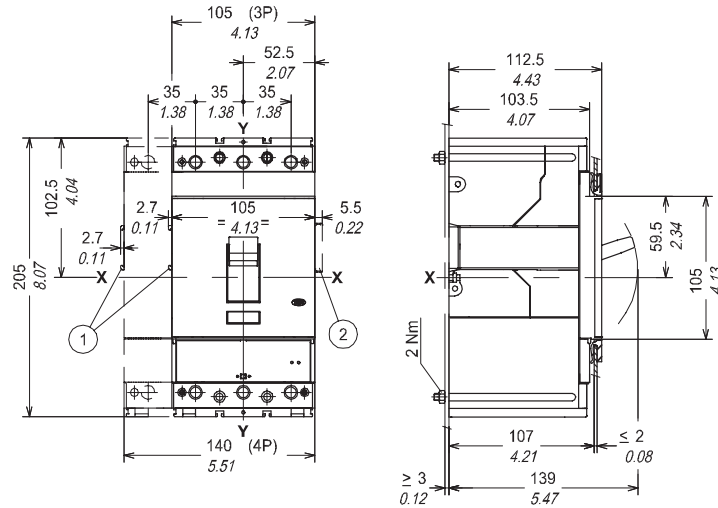
Approximate dimensions T4

Tmax
MCCBs

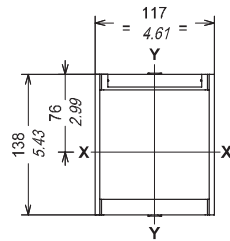
Fixed circuit breaker

Caption

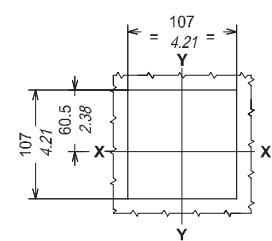
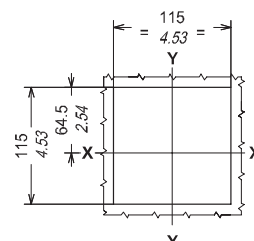
- ① Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC221-222)
- ② Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



Flange for compartment door



Drilling templates of the compartment door

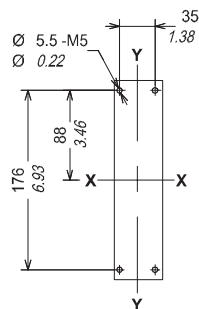


3-4 POLES
With flange

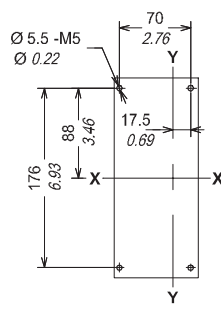
3-4 POLES
Without flange

Drilling templates for support sheet

For front terminals

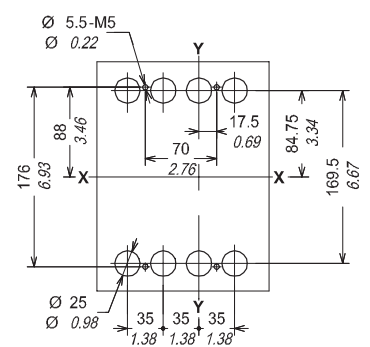
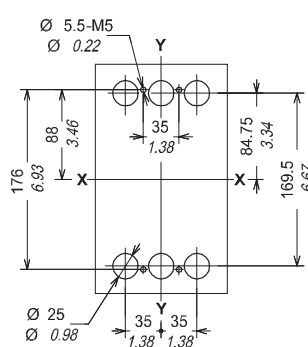


3 POLES



4 POLES

For rear terminals

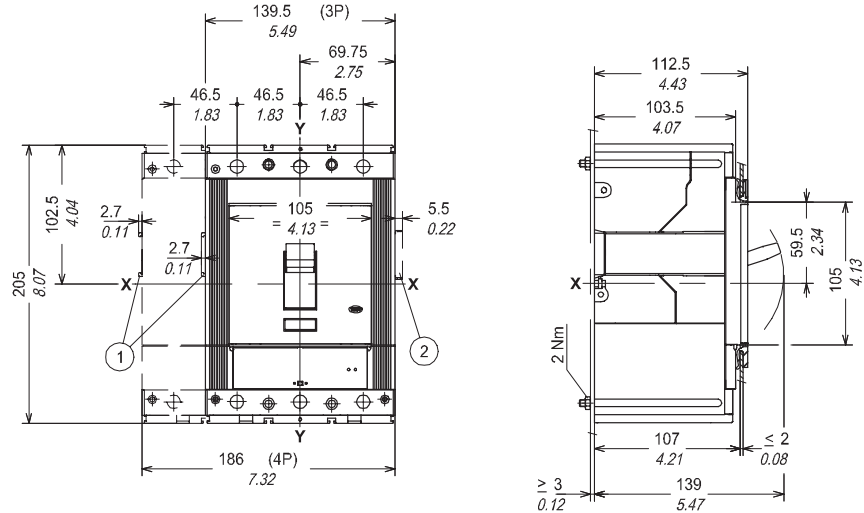


Fixed circuit breaker

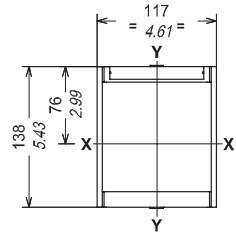
Fixing on sheet

Caption

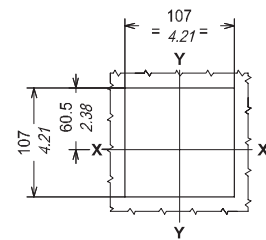
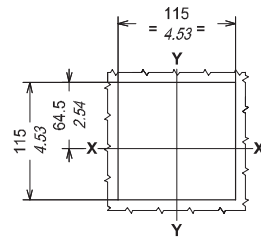
- ① Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC221-222)
- ② Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



Flange for compartment door



Drilling templates of the compartment door

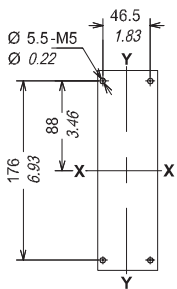


With flange (3-4 POLES)

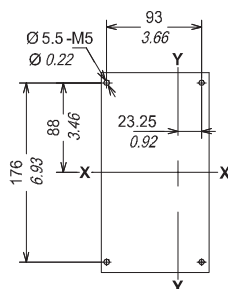
Without flange (3-4 POLES)

Drilling templates for support sheet

For front terminals

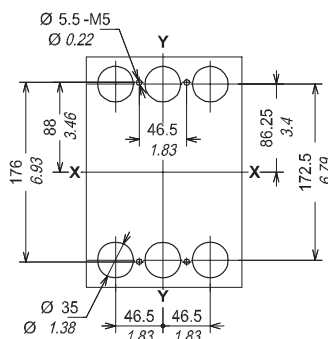


3 POLES

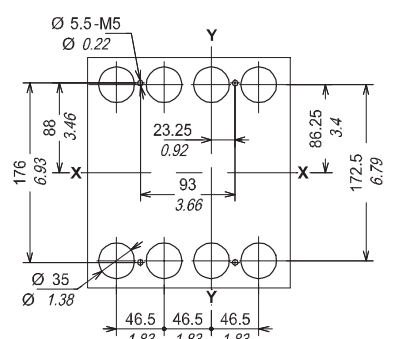


4 POLES

For rear terminals



3 POLES



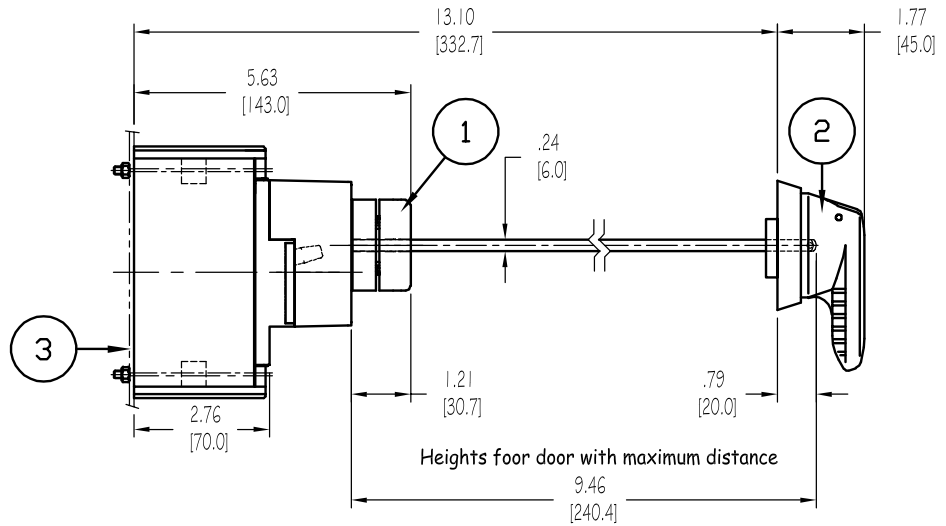
4 POLES

Approximate dimensions

T1 - T3 variable depth mechanism with OHB handle

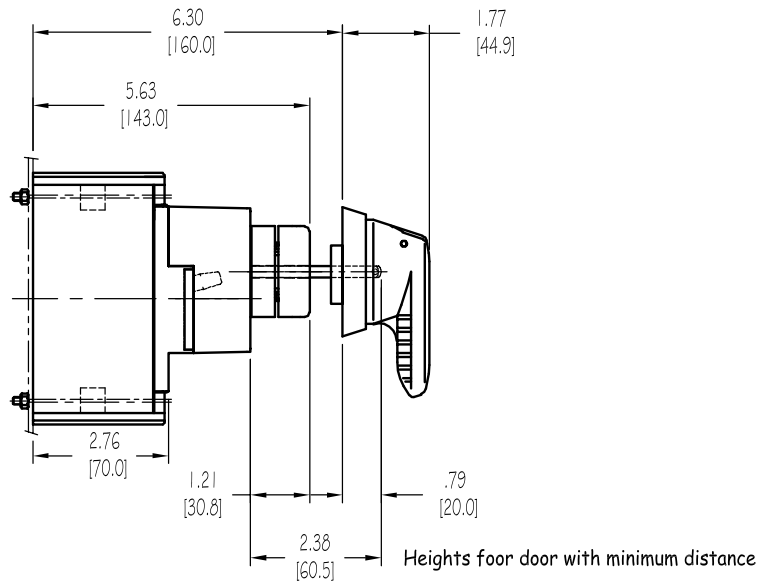


Pistol handle operating mechanism on the compartment door



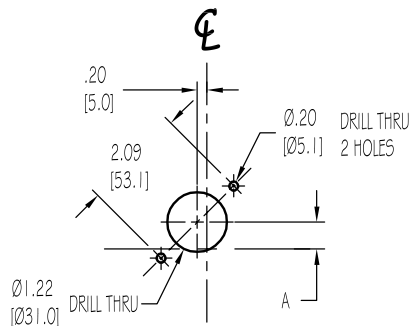
Caption

- ① Transmission unit
- ② Pistol handle operating mechanism on the compartment door
- ③ Insulating plate



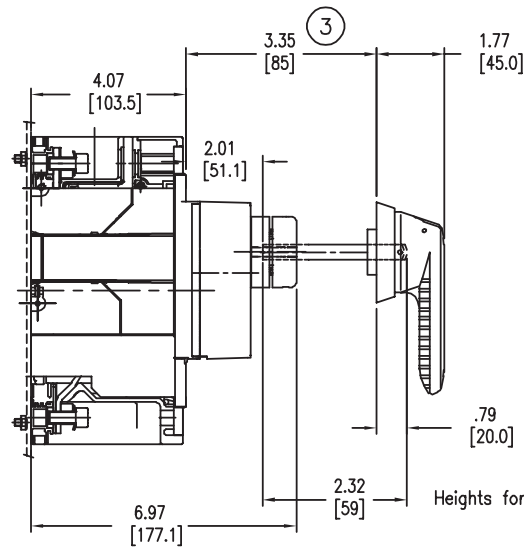
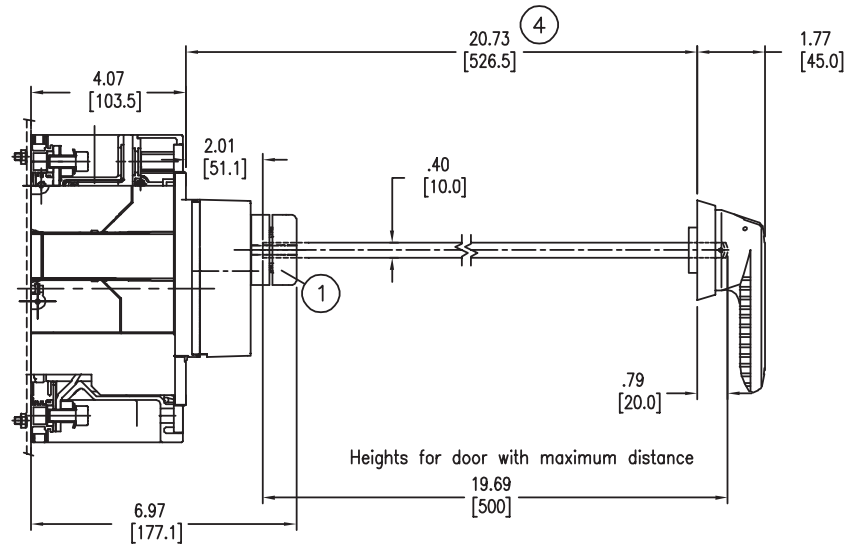
Drilling template of the compartment door

A	
T1 - T2	T3
0.55 [13.97]	0.37 [9.4]



Approximate dimensions T4 - T5 variable depth mechanism with OHB handle

Pistol handle operating mechanism on the compartment door

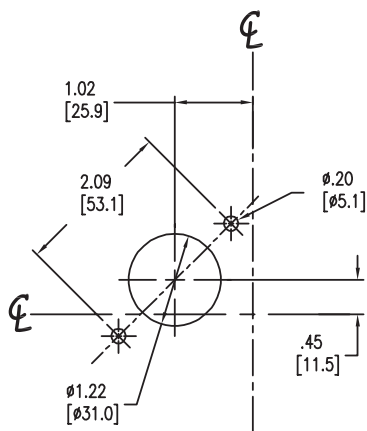


Note:
Minimum distance from hinge of enclosure door to center of shaft is 7.87 in. [200mm]

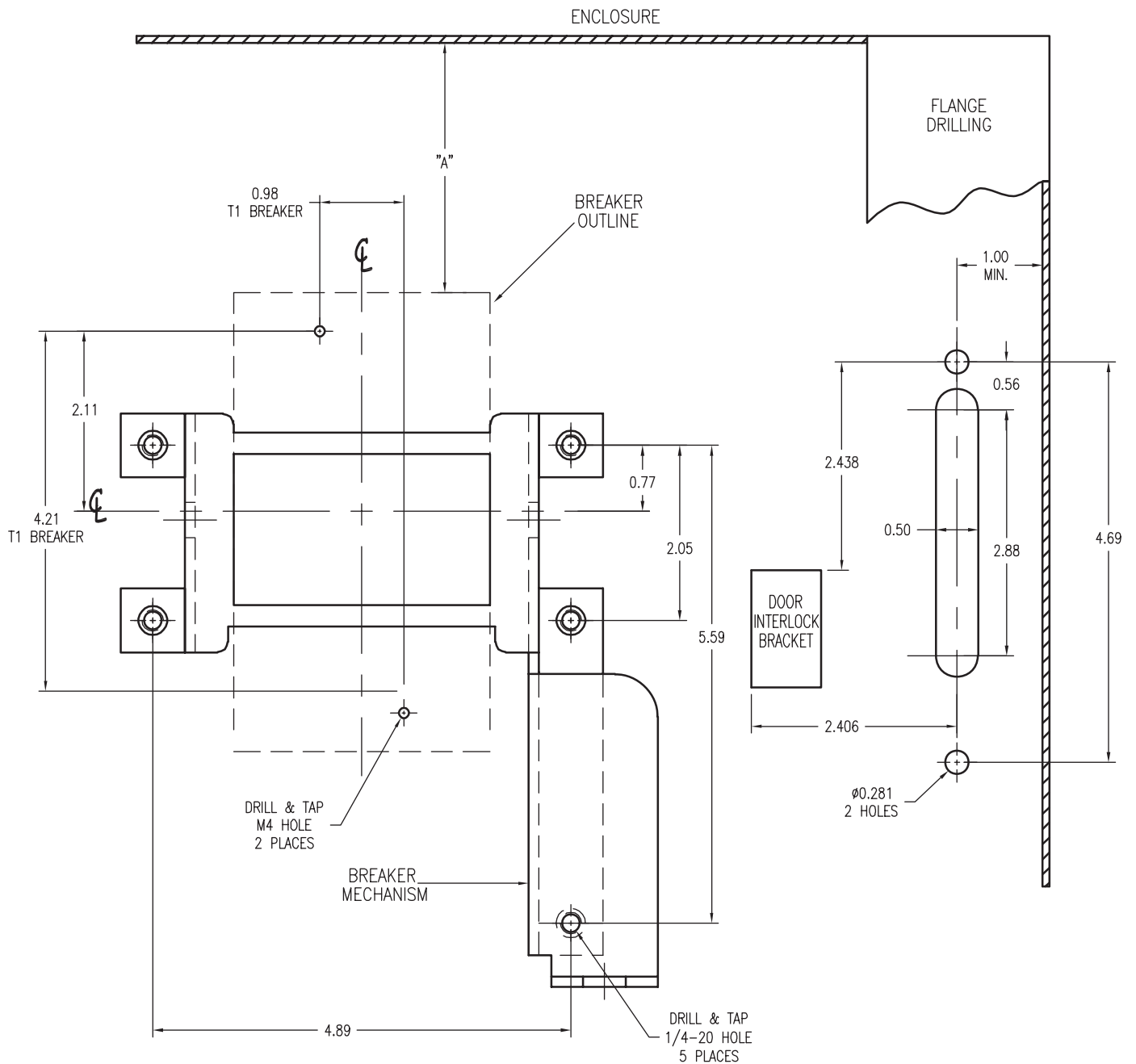
Caption

- ① Transmission unit
- ② Pistol handle operating mechanism on the compartment door
- ③ Minimum distance from the front door with accessory
- ④ Maximum distance from the front door with accessory

Drilling template of the compartment door



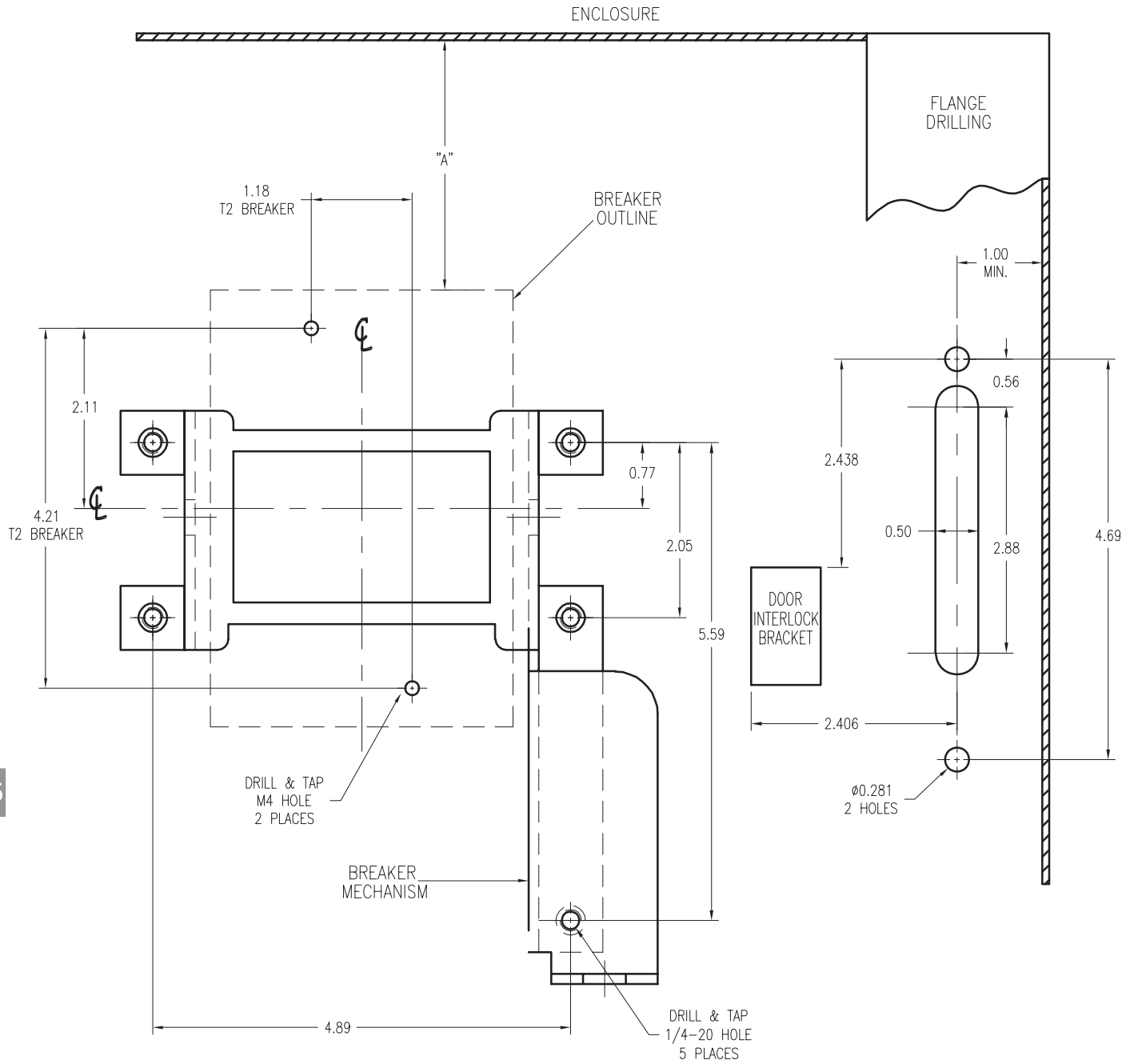
Approximate dimensions T1 Flange handle, cable operated



NOTES:

1. "A" DIM. IS THE WIRING BENDING SPACE AS REQUIRED BY THE NATIONAL ELECTRIC CODE.
2. THE MINIMUM BEND RADIUS OF THE CABLE IS 3 INCHES.

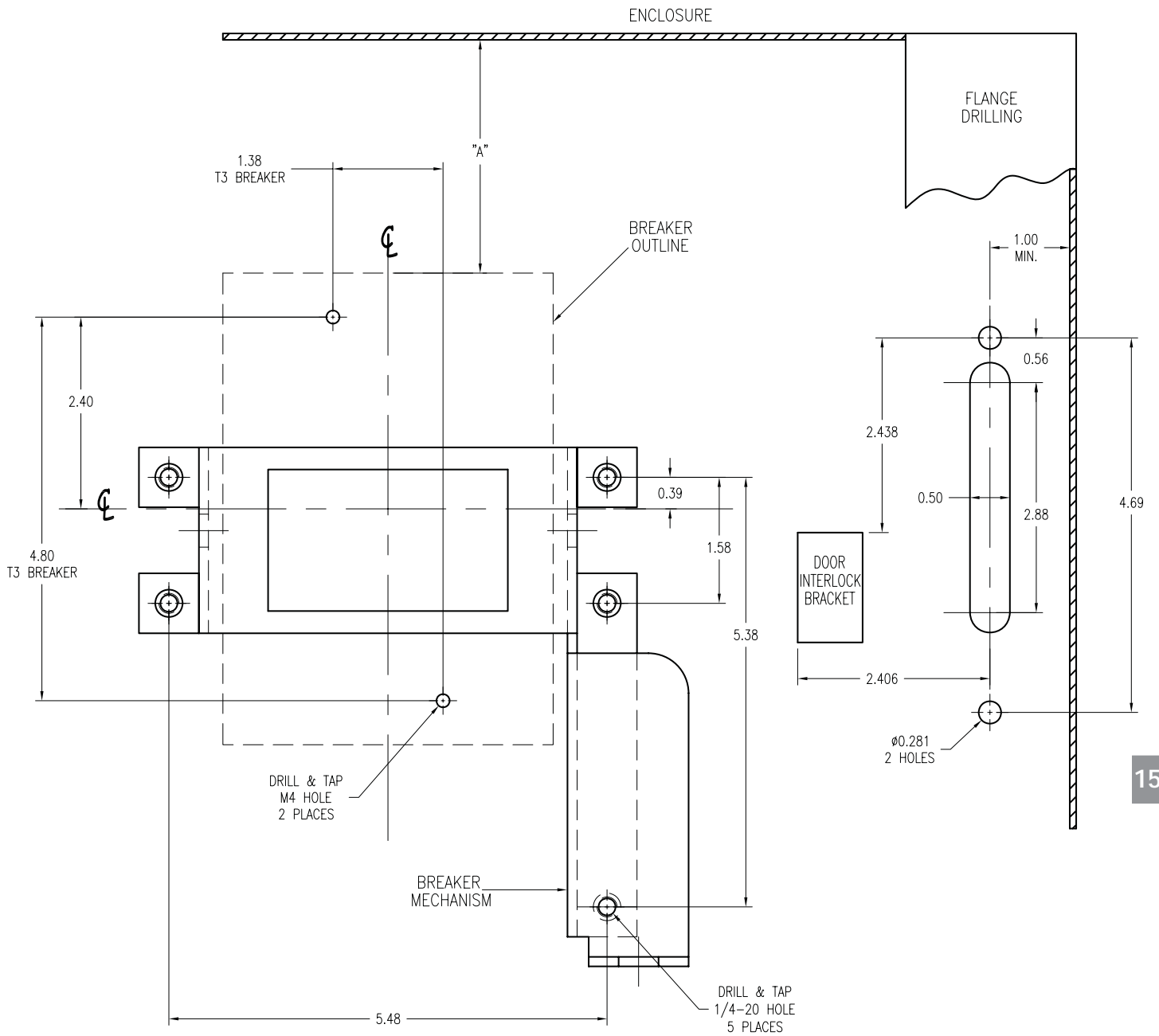
Approximate dimensions T2 Flange handle, cable operated



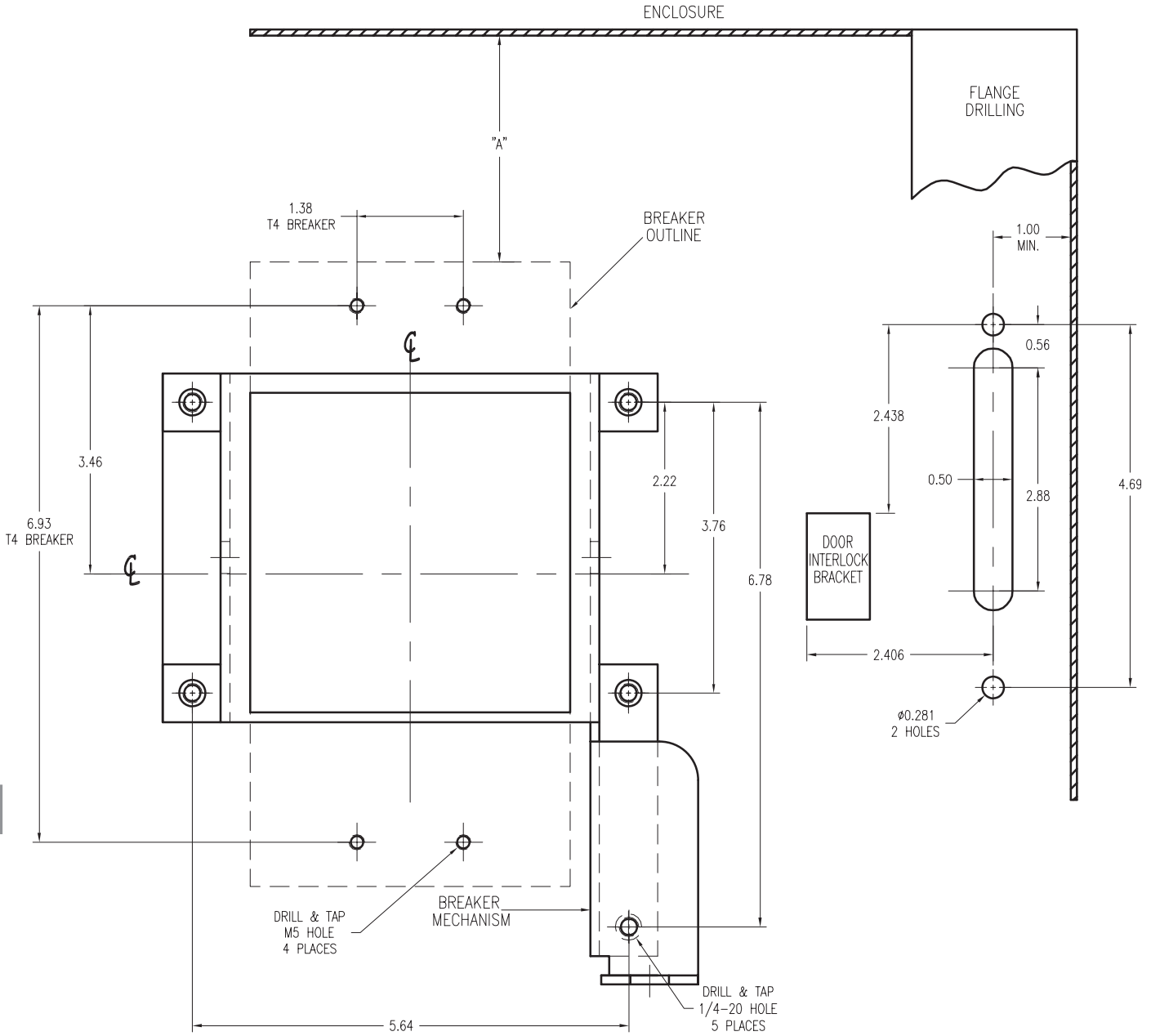
NOTES:

1. "A" DIM. IS THE WIRING BENDING SPACE AS REQUIRED BY THE NATIONAL ELECTRIC CODE.
2. THE MINIMUM BEND RADIUS OF THE CABLE IS 3 INCHES.

Approximate dimensions T3 Flange handle, cable operated



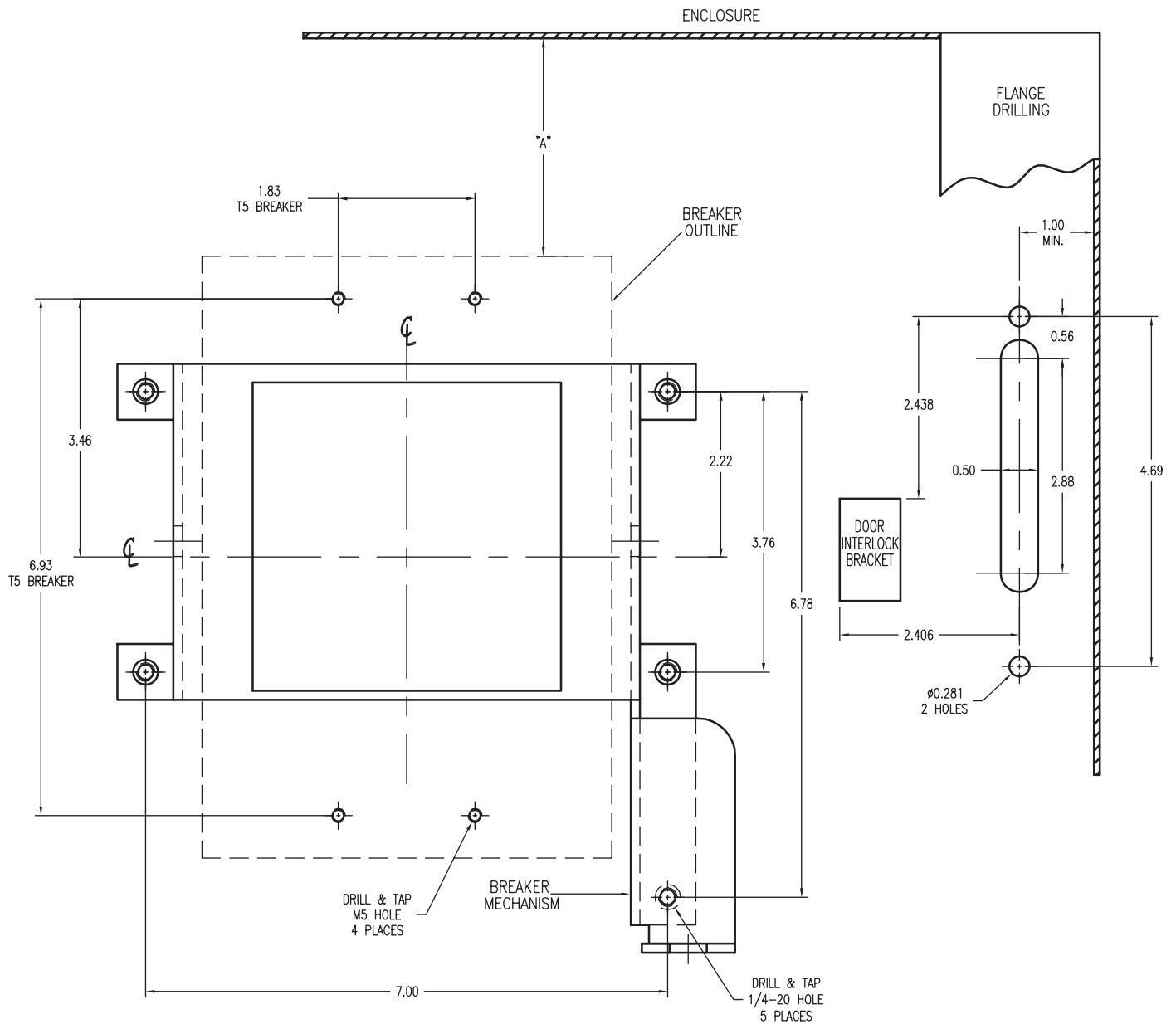
Approximate dimensions T4 Flange handle, cable operated



NOTES:

1. "A" DIM. IS THE WIRING BENDING SPACE AS REQUIRED BY THE NATIONAL ELECTRIC CODE.
2. THE MINIMUM BEND RADIUS OF THE CABLE IS 3 INCHES.

Approximate dimensions T5 Flange handle, cable operated



NOTES:

1. "A" DIM. IS THE WIRING BENDING SPACE AS REQUIRED BY THE NATIONAL ELECTRIC CODE.
2. THE MINIMUM BEND RADIUS OF THE CABLE IS 3 INCHES.



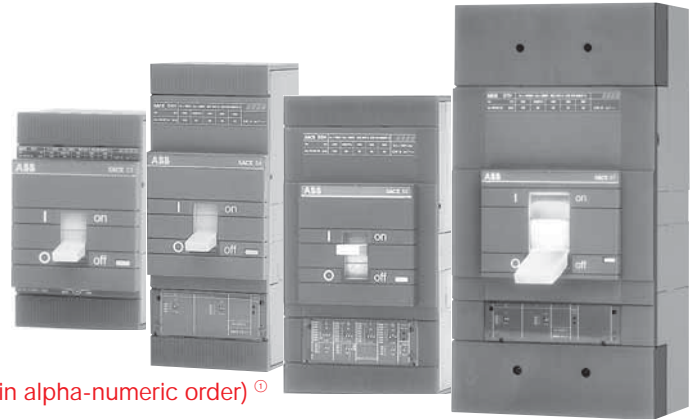
Notes



Isomax

Molded case circuit breakers

S3 – S8



S4 N 250 B W - 2 xxx

Accessories (added in alpha-numeric order) ①

- A = Auxiliary Switch
- BA = Bell Alarm
- BA3 = Bell Alarm (S6/S7 only)
- S_ = Shunt trip with voltage code
- U_ = Undervoltage release with voltage code

Number of poles

- 2 = 2 pole
- 4 = 4 pole
- None = 3 pole

Type connectors

- W = None

Trip unit function

- | | |
|---------------------------------------|-------------------------|
| B = LI | F = LSIG/K |
| C = LSI | H = LSIG/D |
| D = Molded Case Switch (MCS) | J = LSIG/DT |
| E = LSIG | K = LSIG/DTK |
| T = Thermal-magnetic – 10X Mag | M = Magnetic only (MCP) |
| G = Thermal-magnetic – 2.5 - 3X Mag ② | |

Current rating

- 015 = 15A
- 250 = 250A
- 400 = 400A
- 1200 = 1200A

Interrupting rating class

- | | |
|------------------------|--------------------------------|
| B = Basic (240VAC) | NQ = Normal, 100% rated |
| N = Normal | HQ = High, 100% rated |
| H = High | LQ = Extra High, 100% rated |
| L = Extra High | D = Special molded case switch |
| BQ = Basic, 100% rated | |

(No trip IEC)

Frame size

- | | |
|-----------------|-----------------|
| S3 = 150 / 225A | S6 = 600 / 800A |
| S4 = 250A | S7 = 1200A |
| S5 = 400A | |

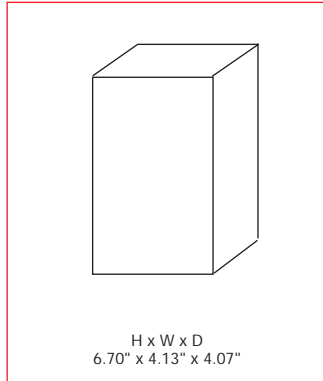
① Consult ABB for factory installed accessories.
② Consult ABB for availability.



S3

150/225A

Standard thermal-magnetic



Standard S3 package includes complete circuit breaker and mounting hardware. Order cable lugs as a separate item, standard copper/aluminum (Cu/Al) lugs are no charge when ordered with breaker.

General

The S3 breaker family ranges from 15 through 225 amperes. The S3 trip mechanisms are non-interchangeable and use sensitive electromagnetic relays for overcurrent trip protection. Heat sensitive bimetals are used for thermal overcurrent protection. Short circuit current protection begins at 10 times the thermal rating of the breaker and uses a magnetic coil principle.

Versions

To meet all application needs, the S3 is available in various versions:

- T = Thermal-magnetic
- O = 100% UL rated
- D = Molded case switch
- M = Magnetic only (MCP)
- G = 3X Mag (100 - 225A 3-pole only)

Performance level

Each version is also available in different maximum fault interrupting levels

- B = 240VAC
- N = Normal
- H = High
- L = Extra high

Number of poles

In UL/CSA form, the S3 is available in two pole or three pole versions, both with the same dimensions. A four pole version is also available in UL/ IEC form. For price estimate, add 35% to list price of selected version three pole breaker, contact ABB Control for details.

Accessory mounting

Internal accessories are UL/CSA approved for both factory or field installation. Accessories require control cable connectors. Shunt trips or UVR's mount in the left cavity. Auxiliary or bell alarm switches mount in the right cavity.

Reverse feeding

All versions of the S3 family are suitable for reverse feed applications.

Molded case switches

UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection. IEC type molded case switches with no trip protection are also available.

UL/CSA Interrupting capacity (kA RMS) UL489 / CSA C22.2

Voltage	N	H	L
240VAC	65	100	150
480VAC	25	50	85 [Ⓢ]
600VAC	14	14	25
500VDC	35	50	65
600VDC	20	35	50

IEC-947 Interrupting capacity (kA RMS)

Voltage	N	H	L
230VAC	65	100	170
380/400/415VAC	35	65	85
440VAC	30	50	65
500VAC	25	40	50
690VAC	14	18	20
500VDC	35	50	65
750VDC	20	35	50

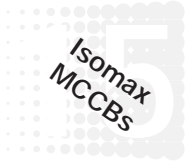
15

Ⓢ 15-30A are 65kA at 480VAC

S3

150/225A

Standard thermal-magnetic



S3B

Breaker	IC at 240VAC	Rating	Magnetic trip	2 pole, 240VAC catalog number	List price	3 pole, 240VAC catalog number	List price
S3B	150kA	175A 200A 225A	1750A 2000A 2250A	S3B175TW-2 S3B200TW-2 S3B225TW-2	\$ 460	S3B175TW S3B200TW S3B225TW	\$ 590

S3N

Breaker	IC at 480VAC	Rating	Magnetic trip	2 pole, 600VAC/500VDC catalog number	List price	3 pole, 600VAC/DC catalog number	List price	
S3N	25kA	15A	500A	S3N015TW-2	\$ 316	S3N015TW	\$ 413	
		20A	500A	S3N020TW-2		S3N020TW		
		25A	500A	S3N025TW-2		S3N025TW		
		30A	500A	S3N030TW-2		S3N030TW		
		35A	500A	S3N035TW-2		S3N035TW		
		40A	500A	S3N040TW-2		S3N040TW		
		50A	500A	S3N050TW-2	S3N050TW			
		60A	600A	S3N060TW-2	S3N060TW			
		70A	700A	S3N070TW-2	S3N070TW	407	S3N070TW	504
		80A	800A	S3N080TW-2	S3N080TW			
		90A	900A	S3N090TW-2	S3N090TW			
		100A	1000A	S3N100TW-2	S3N100TW			
125A	1250A	S3N125TW-2	S3N125TW	911	S3N125TW	1131		
150A	1500A	S3N150TW-2	S3N150TW					
175A ^①	1750A	S3N175TW-2	S3N175TW					
200A ^①	2000A	S3N200TW-2	S3N200TW					
225A ^①	2250A	S3N225TW-2	S3N225TW					

S3H

Breaker	IC at 480VAC	Rating	Magnetic trip	2 pole, 600VAC/500VDC catalog number	List price	3 pole, 600VAC/DC catalog number	List price	
S3H	50kA	15A	500A	S3H015TW-2	\$ 527	S3H015TW	\$ 619	
		20A	500A	S3H020TW-2		S3H020TW		
		25A	500A	S3H025TW-2		S3H025TW		
		30A	500A	S3H030TW-2		S3H030TW		
		35A	500A	S3H035TW-2		S3H035TW		
		40A	500A	S3H040TW-2		S3H040TW		
		50A	500A	S3H050TW-2	S3H050TW			
		60A	600A	S3H060TW-2	S3H060TW			
		70A	700A	S3H070TW-2	S3H070TW	617	S3H070TW	702
		80A	800A	S3H080TW-2	S3H080TW			
		90A	900A	S3H090TW-2	S3H090TW			
		100A	1000A	S3H100TW-2	S3H100TW			
		125A	1250A	S3H125TW-2	S3H125TW	1376	S3H125TW	1586
		150A	1500A	S3H150TW-2	S3H150TW			
		175A ^①	1750A	S3H175TW-2	S3H175TW			
200A ^①	2000A	S3H200TW-2	S3H200TW					
225A ^①	2250A	S3H225TW-2	S3H225TW					

S3L

Breaker	IC at 480VAC	Rating	Magnetic trip	2 pole, 600VAC/500VDC catalog number	List price	3 pole, 600VAC/DC catalog number	List price
S3L	65k	15A	500A	S3L015TW-2	\$ 634	S3L015TW	\$ 824
		20A	500A	S3L020TW-2		S3L020TW	
		25A	500A	S3L025TW-2		S3L025TW	
		30A	500A	S3L030TW-2		S3L030TW	
	85kA	35A	500A	S3L035TW-2	634	S3L035TW	824
		40A	500A	S3L040TW-2		S3L040TW	
		50A	500A	S3L050TW-2		S3L050TW	
		60A	600A	S3L060TW-2		S3L060TW	
	65kA	70A	700A	S3L070TW-2	816	S3L070TW	1010
		80A	800A	S3L080TW-2		S3L080TW	
		90A	900A	S3L090TW-2		S3L090TW	
		100A	1000A	S3L100TW-2		S3L100TW	
	65kA	125A	1250A	S3L125TW-2	1818	S3L125TW	2260
		150A	1500A	S3L150TW-2		S3L150TW	
		175A ^①	1750A	S3L175TW-2		S3L175TW	
65kA	200A ^①	2000A	S3L200TW-2	1818	S3L200TW	2260	
	225A ^①	2250A	S3L225TW-2		S3L225TW		

① 480VAC maximum



S3
150/225A
100% UL rated

S3NQ

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole 600VAC/DC catalog number	List price
S3NQ	25kA	15A	500A	S3NQ015TW	\$ 459
		20A	500A	S3NQ020TW	
		25A	500A	S3NQ025TW	
		30A	500A	S3NQ030TW	
		35A	500A	S3NQ035TW	
		40A	500A	S3NQ040TW	
		50A	500A	S3NQ050TW	560
		60A	600A	S3NQ060TW	
		70A	700A	S3NQ070TW	
		80A	800A	S3NQ080TW	1257
		90A	900A	S3NQ090TW	
		100A	1000A	S3NQ100TW	
		125A	1250A	S3NQ125TW	
		150A	1500A	S3NQ150TW	
		175A ^①	1750A	S3NQ175TW	
200A ^①	2000A	S3NQ200TW	1257		
225A ^①	2250A	S3NQ225TW			

S3HQ

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole catalog number	List price
S3HQ	50kA	15A	500A	S3HQ015TW	\$ 688
		20A	500A	S3HQ020TW	
		25A	500A	S3HQ025TW	
		30A	500A	S3HQ030TW	
		35A	500A	S3HQ035TW	
		40A	500A	S3HQ040TW	
		50A	500A	S3HQ050TW	780
		60A	600A	S3HQ060TW	
		70A	700A	S3HQ070TW	
		80A	800A	S3HQ080TW	1762
		90A	900A	S3HQ090TW	
		100A	1000A	S3HQ100TW	
		125A	1250A	S3HQ125TW	
		150A	1500A	S3HQ150TW	
		175A ^①	1750A	S3HQ175TW	
200A ^①	2000A	S3HQ200TW	1762		
225A ^①	2250A	S3HQ225TW			

15

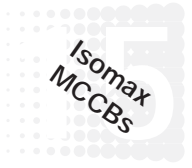
S3LQ

Breaker	IC at 480VAC	Rating	Magnetic trip	3 pole catalog number	List price
S3LQ	65kA	15A	500A	S3LQ015TW	\$ 916
		20A	500A	S3LQ020TW	
		25A	500A	S3LQ025TW	
		30A	500A	S3LQ030TW	
	85kA	35A	500A	S3LQ035TW	1123
		40A	500A	S3LQ040TW	
		50A	500A	S3LQ050TW	
		60A	600A	S3LQ060TW	
		70A	700A	S3LQ070TW	2511
		80A	800A	S3LQ080TW	
		90A	900A	S3LQ090TW	
		100A	1000A	S3LQ100TW	
		125A	1250A	S3LQ125TW	2511
		150A	1500A	S3LQ150TW	
		175A ^①	1750A	S3LQ175TW	
200A ^①	2000A	S3LQ200TW			
225A ^①	2250A	S3LQ225TW			

Note: When applied correctly, UL tested 100% equipment rated breakers may be applied at full rating rather than on the sizing rules of the NEC where breakers and cable are sized based on actual continuous load current divided by 80%. This 100% rating can save the user the cost of larger cable or bus bar. Please consult the NEC for details and other design factors needed for this application.

① 480VAC maximum

S3 150/225A, 600VAC



Magnetic only (MCP)

Magnetic only circuit breakers are instantaneous trip only devices which are Underwriters Laboratories Recognized. MCPs must be used with some other device that will provide overload protection.

Type	Interruption capacity		Amps	Magnetic trip	3 pole catalog number	List price
S3N	240VAC	35kA	3	12 – 36	S3N003MW	\$ 568
	480VAC	18kA	5	20 – 60	S3N005MW	
	600VAC	10kA	10	40 – 120	S3N010MW	
	240VAC	35kA	25	100 – 300	S3N025MW	\$ 568
	480VAC	18kA				
	600VAC	10kA				
S3N	240VAC	75kA	50	200 – 600	S3N050MW	633
	480VAC	35kA	100	400 – 1200	S3N100MW	763
	600VAC	14kA	125	500 – 1500	S3N125MW	929
			150	600 – 1500	S3N150MW	929

Type	Interruption capacity		Amps	Magnetic trip	3 pole catalog number	List price
S3L	240VAC	50kA	3	12 – 36	S3L003MW	\$ 710
	480VAC	25kA	5	20 – 60	S3L005MW	
	600VAC	10kA	10	40 – 120	S3L010MW	
	240VAC	50kA	25	100 – 300	S3L025MW	\$ 710
	480VAC	25kA				
	600VAC	10kA				
	240VAC	150kA	50	200 – 600	S3L050MW	710
	480VAC	85kA	100	400 – 1200	S3L100MW	843
	600VAC	25kA	125	500 – 1500	S3L125MW	1910
			150	600 – 1500	S3L150MW	1910
	480VAC	65kA	200 ②	800 – 2400	S3L200MW	1910

Molded case switches

Type	Interruption capacity ①		Amps	Magnetic trip	3 pole catalog number	List price			
S3B-D	240VAC	150kA	225	2250A	S3B225DW	\$ 410			
S3H-D	240VAC	100kA	150	1500A	S3H150DW	892			
	480VAC	50kA							
	600VAC	14kA							
	500VDC	65kA							
Non-UL switches without overcurrent protection	Withstand rating		100	none	S3D100W	531			
	600VAC	6.5kA					160	S3D160W	892
							250	S3D250W	1393

Connection options

Type	Wire range	Amps①	Set of 2 catalog number	List price	Set of 3 catalog number	List price
CU/AL front lugs	14AWG – 2AWG	60	K3TA-2	\$ 4	K3TA	\$ 6
CU/AL front lugs	14AWG – 1/0	100	K4TB-2	4	K4TB	6
CU/AL front lugs	2AWG – 4/0	150	K4TC-2	4	K4TC	6
CU/AL front lugs	4AWG – 300kcmil	225	K4TD-2	10	K4TD	15
CU front lugs (saddle) CU rear lugs	14AWG – 250kcmil	250	—	—	Set of 6 catalog number K4TES K4TER	30
	6AWG – 250kcmil	250	—	—		
Extended front bar	—	250	—	—	K4ET-250	46

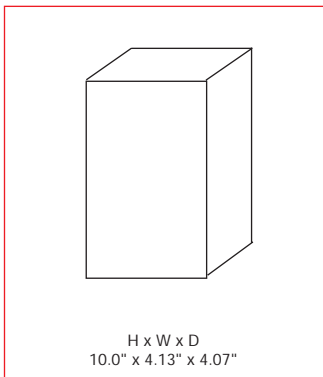
① Suggested lugs for circuit breaker up to amps shown. Cable size and type determine maximum amperage.

② 480VAC maximum.

③ With fuse or MCCB protected circuit.

Discount schedule SM – S3 MCPs only
Discount schedule S3 – Circuit breakers
Discount schedule SA – Lugs

S4 250A, 600VAC Electronic trip type



Standard S4 package includes complete circuit breaker and mounting hardware. Order cable lugs or other connection scheme as a separate item.

General

The S4 breaker family is a 250A frame utilizing a microprocessor based overcurrent protective trip system. In the 250A version, the trip unit is adjustable from 100A up to 250A without the addition of any parts or rating plugs. As standard, the S4 includes adjustable long time function for overload protection and adjustable instantaneous function for short circuit protection.

Versions

To meet all application needs, the S4 is available in various versions:

- B = Adjustment LI
- C = Adjustment LSI
- E = Adjustment LSI G
- O = 100% UL rated
- D = Molded case switch
- M = Magnetic only (MCP)

Trip functions

These tripping functions are available:

- L = Long time
- I = Instantaneous
- S = Short time
- G = Ground fault

Performance level

Each version is also available in different maximum fault interrupting levels:

- N = Normal
- H = High
- L = Extra high

15 Number of poles

In UL/CSA form, the S4 is available in two pole or three pole versions, both with the same dimensions. A four pole version is also available in UL/IEC form. For price estimate, add 35% to list price of selected version three pole breaker, contact ABB Control for details.

Accessory mounting

Internal accessories are UL/CSA approved for both factory or field installation. Accessories require control cable connectors. Shunt trips or UVR's mount in the left cavity. Auxiliary or bell alarm switches mount in the right cavity.

Reverse feeding

All versions of the S4 family are suitable for reverse feed applications.

Molded case switches

UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection.

UL/CSA Interrupting capacity (kA RMS) UL489 / CSA C22.2

Voltage	N	H	L
240VAC	65	150	200
480VAC	25	65	100
600VAC	18	22	35

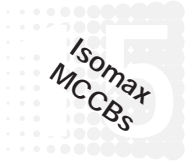
IEC-947 Interrupting capacity (kA RMS)

Voltage	N	H	L
230VAC	65	150	200
380/400/415VAC	35	65	100
440VAC	30	50	80
500VAC	25	40	65
690VAC	18	22	30

S4

250A, 600VAC

Electronic trip type



The S4 breaker family uses two available microprocessor based internal trip units. The standard **PR211** trip unit includes adjustments for long time current pick-up and instantaneous current trip point.

The optional **PR212** trip unit includes adjustments for long time current pick-up/delay, short time pick-up/delay I²t (on/off), instantaneous current trip point and further optional ground fault protection.

100A Frame (40 – 100A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	2 pole catalog number	List price	3 pole catalog number	List price
S4N	25kA	PR211	LI	S4N100BW-2	\$ 1073	S4N100BW	\$ 1347
		PR212	LSI	S4N100CW-2	1679	S4N100CW	1913
		PR212	LSIG	—	—	S4N100EW	2813
S4H	65kA	PR211	LI	S4H100BW-2	2572	S4H100BW	3030
		PR212	LSI	S4H100CW-2	3138	S4H100CW	3596
		PR212	LSIG	—	—	S4H100EW	4496
S4L	100kA	PR211	LI	S4L100BW-2	3159	S4L100BW	3950
		PR212	LSI	S4L100CW-2	3725	S4L100CW	4516
		PR212	LSIG	—	—	S4L100EW	5416

250A Frame (100 – 250A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	2 pole catalog number	List price	3 pole catalog number	List price
S4N	25kA	PR211	LI	S4N250BW-2	\$ 1073	S4N250BW	\$ 1347
		PR212	LSI	S4N250CW-2	1679	S4N250CW	1913
		PR212	LSIG	—	—	S4N250EW	2813
S4H	65kA	PR211	LI	S4H250BW-2	2572	S4H250BW	3030
		PR212	LSI	S4H250CW-2	3138	S4H250CW	3596
		PR212	LSIG	—	—	S4H250EW	4496
S4L	100kA	PR211	LI	S4L250BW-2	3159	S4L250BW	3950
		PR212	LSI	S4L250CW-2	3725	S4L250CW	4516
		PR212	LSIG	—	—	S4L250EW	5416

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating PR212 A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating A - B - C - D

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Continuous amperage settings (long time adjustment) – PR211

Frame	Set points								Setting
	0.4	0.5	0.6	0.7	0.8	0.9	0.95	1.0	
100A	40	50	60	70	80	90	95	100	Amps
250A	100	125	150	175	200	225	237	250	Amps



S4

250A, 600 VAC

100% UL rated

When applied correctly, UL tested 100% equipment rated breakers may be applied at full rating rather than on the sizing rules of the NEC where breakers and cable are sized based on actual continuous load current divided by 80%. This

100% rating can save the user the cost of larger cable or bus bar. Please consult the NEC for details and other design factors needed for this application.

100A Frame (40 – 100A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	3 pole catalog number	List price
S4N	25kA	PR211	LI	S4NQ100BW	\$ 1482
		PR212	LSI	S4NQ100CW	2104
		PR212	LSIG	S4NQ100EW	3094
S4H	65kA	PR211	LI	S4HQ100BW	3333
		PR212	LSI	S4HQ100CW	3956
		PR212	LSIG	S4HQ100EW	4946
S4L	100kA	PR211	LI	S4LQ100BW	4345
		PR212	LSI	S4LQ100CW	4968
		PR212	LSIG	S4LQ100EW	5958

250A Frame (100 – 250A adjustable continuous range)

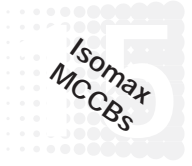
Breaker	IC at 480VAC	Trip type	Adjustment	3 pole catalog number	List price
S4N	25kA	PR211	LI	S4NQ250BW	\$ 1482
		PR212	LSI	S4NQ250CW	2104
		PR212	LSIG	S4NQ250EW	3094
S4H	65kA	PR211	LI	S4HQ250BW	3333
		PR212	LSI	S4HQ250CW	3956
		PR212	LSIG	S4HQ250EW	4946
S4L	100kA	PR211	LI	S4LQ250BW	4345
		PR212	LSI	S4LQ250CW	4968
		PR212	LSIG	S4LQ250EW	5958

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating PR212 A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating A - B - C - D

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S4 250A, 600VAC



Magnetic only (MCP)

All S4 magnetic only breakers utilize the electronic PR211 trip unit with an adjustable range of 1.5 to 12 times frame rating. Both two and three pole MCPs are 600VAC rated.

Type	Amps	Interruption capacity	Adjustment range	2 pole 600VAC catalog number	List price	3 pole 600VAC catalog number	List price
S4N	100 250	240VAC 65kA 480VAC 25kA 600VAC 18kA	150 – 1200A 375 – 3000A	S4N100MW-2 S4N250MW-2	\$ 1073	S4N100MW S4N250MW	\$ 1347
S4H	100 250	240VAC 150kA 480VAC 65kA 600VAC 22kA	150 – 1200A 375 – 3000A	S4H100MW-2 S4H250MW-2	2572	S4H100MW S4H250MW	3030
S4L	100 250	240VAC 200kA 480VAC 100kA 600VAC 35kA	150 – 1200A 375 – 3000A	S4L100MW-2 S4L250MW-2	3159	S4L100MW S4L250MW	3950

Molded case switch

Type	Interruption capacity ②	Amps	Magnetic trip	3 pole catalog number	List price
S4H-D	240VAC 150kA 480VAC 65kA 600VAC 22kA	250	3000A	S4H250DW	\$ 1215

Neutral GF current transformer (required for 4 wire GF systems)

Amps	Catalog number	List price
100	K4NCT-100	\$ 250
250	K4NCT-250	

Connection options

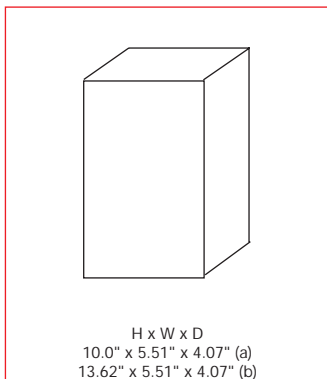
Type	Wire range	Amps ①	Set of 2 catalog number	List price	Set of 3 catalog number	List price
CU/AL front lugs	14AWG – 1/0	100	K4TB-2	\$ 4	K4TB	\$ 6
CU/AL front lugs	2AWG – 4/0	150	K4TC-2	4	K4TC	6
CU/AL front lugs	4AWG – 300kcmil	225	K4TD-2	10	K4TD	15
CU/AL front lugs	6AWG – 350kcmil	250	K4TE-2	20	K4TE	30
CU front lugs (saddle) CU rear lugs	14AWG – 250kcmil	250	—	—	Set of 6 catalog number	30
	6AWG – 250kcmil	250	—	—	K4TES K4TER	
Extended front bar	—	250	—	—	K4ET-250	46

① Suggested lugs for a circuit breaker up to the amps shown. Cable size and type determine maximum amperage.
② With fuse or MCCB protected circuit.

S5 400A, 600V Electronic and thermal-magnetic trip types



S5



H x W x D
10.0" x 5.51" x 4.07" (a)
13.62" x 5.51" x 4.07" (b)

Standard S5 package includes complete circuit breaker and mounting hardware. Order cable lugs or other connection scheme as a separate item.

- (a) With K5TF cable lugs, breaker is 10.0" tall.
- (b) With K5TG cable lugs, terminal covers are provided and breaker is 13.62" tall.

General

The S5 breaker family is a 400A frame utilizing a microprocessor-based overcurrent protective trip system. In the 400A version, the trip unit is adjustable from 160A up to 400A without the addition of any parts or rating plugs. As standard the S5 includes adjustable long time function for overload protection and adjustable instantaneous function for short circuit protection.

Versions

To meet all application needs, the S5 is available in various versions:

- B = Adjustment LI
- C = Adjustment LSI
- E = Adjustment LSIG
- Q = 100% UL rated
- D = Molded case switch
- M = Magnetic only (MCP)
- T = Thermal magnetic
- G = 2.5 Mag (3-pole only)

Trip functions

These tripping functions are available:

- L = Long time
- S = Short time
- I = Instantaneous
- G = Ground fault

Performance level

Each version is also available in different maximum fault interrupting levels

- N = Normal
- H = High
- L = Extra high

Number of poles

In UL/CSA version, the S5 is available in two pole or three pole version, both with the same dimensions. A four pole version is also available in UL/IEC form. For price estimate, add 35% to list price of selected version three pole breaker, contact ABB Control for details.

Accessory mounting

Internal accessories are UL/CSA approved for both factory or field installation. Accessories require control cable connectors. Shunt trips or UVR's mount in the left cavity. Auxiliary or bell alarm switches mount in the right cavity.

Reverse feeding

All versions of the S5 family are suitable for reverse feed applications.

Molded case switches

UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection.

UL/CSA Interrupting capacity (kA RMS) UL489 / CSA C22.2

Voltage	N	H	L
240VAC	65	150	200
480VAC	35	65	100
600VAC	22	22	35
500VDC [Ⓞ]	35	50	65
600VDC [Ⓞ]	20	35	50

IEC-947 Interrupting capacity (kA RMS)

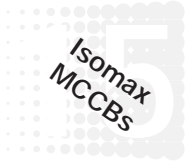
Voltage	N	H	L
230VAC	65	100	200
380/400/415VAC	35	65	100
440VAC	30	50	80
500VAC	25	40	65
690VAC	20	25	30

[Ⓞ] Thermal magnetic only.

S5

400A, 600 VAC

Electronic and thermal-magnetic trip types



The S5 breaker family uses two available microprocessor based internal trip units. The standard **PR211** trip unit includes adjustments for long time current pick-up and instantaneous current trip point.

The optional **PR212** trip unit includes adjustments for long time current pick-up/delay, short time pick-up/delay, I²t (on/off), instantaneous current trip point and further optional ground fault protection.

400A Frame (160 – 400A adjustable continuous range)

Breaker	IC at 480VAC	Trip	Adjustment	2 pole, 600VAC catalog number	List price	3 pole, 600VAC catalog number	List price
S5N	35kA	PR211	LI	S5N400BW-2	\$ 1798	S5N400BW	\$ 2151
		PR212	LSI	S5N400CW-2	2464	S5N400CW	2817
		PR212	LSIG	—	—	S5N400EW	3717
S5H	65kA	PR211	LI	S5H400BW-2	3285	S5H400BW	3654
		PR212	LSI	S5H400CW-2	3951	S5H400CW	4320
		PR212	LSIG	—	—	S5H400EW	5220
S5L	100kA	PR211	LI	S5L400BW-2	3945	S5L400BW	4733
		PR212	LSI	S5L400CW-2	4611	S5L400CW	5399
		PR212	LSIG	—	—	S5L400EW	6299

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating A - B - C - D

Continuous amperage settings (long time adjustment) – PR211

Frame	Set points								Setting
	0.4	0.5	0.6	0.7	0.8	0.9	0.95	1.0	
400A	160	200	240	280	320	360	380	400	Amps

S5 thermal-magnetic breakers, for AC and DC applications

Breaker	IC at 500VDC	Rating	Magnetic trip	2 pole, 600VAC/500VDC catalog number	List price	3 pole, 600VAC/DC catalog number	List price
S5N	35kA	300A (210 – 300A)	3000A	S5N300TW-2	\$ 1798	S5N300TW	\$ 2151
		400A (280 – 400A)	4000A	S5N400TW-2		S5N400TW	
S5H	50kA	300A (210 – 300A)	3000A	S5H300TW-2	3285	S5H300TW	3654
		400A (280 – 400A)	4000A	S5H400TW-2		S5H400TW	
S5L	65kA	300A (210 – 300A)	3000A	S5L300TW-2	3945	S5L300TW	4733
		400A (280 – 400A)	4000A	S5L400TW-2		S5L400TW	



S5

400A, 600 VAC

100% UL rated, electronic trip type

When applied correctly, UL tested 100% equipment rated breakers may be applied at full rating rather than on the sizing rules of the NEC where breakers and cable are sized based on actual continuous load current divided by 80%. This

100% rating can save the user the cost of larger cable or bus bar. Please consult the NEC for details and other design factors needed for this application.

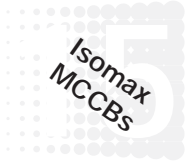
400A Frame (160 – 400A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	3 pole, 600VAC catalog number	List price
S5N	35kA	PR211	LI	S5NQ400BW	\$ 2366
		PR212	LSI	S5NQ400CW	3099
		PR212	LSIG	S5NQ400EW	4089
S5H	65kA	PR211	LI	S5HQ400BW	4019
		PR212	LSI	S5HQ400CW	4752
		PR212	LSIG	S5HQ400EW	5742
S5L	100kA	PR211	LI	S5LQ400BW	5206
		PR212	LSI	S5LQ400CW	5939
		PR212	LSIG	S5LQ400EW	6929

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (1/2 On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating A - B - C - D

S5 400A, 600VAC



Magnetic only (MCP)

All S5 magnetic only breakers utilize the electronic PR211 trip unit with an adjustable range of 1.5 to 12 times frame rating. Both two and three pole MCP's are 600VAC rated.

Type	Amps	Interruption capacity		Adjustment range	2 pole 600VAC catalog number	List price	3 pole 600VAC catalog number	List price
S5N	400	240 VAC 480VAC 600VAC	65kA 35kA 22kA	600 – 4800A	S5N400MW-2	\$ 1798	S5N400MW	\$ 2151
S5H	400	240VAC 480VAC 600VAC	150kA 65kA 22kA	600 – 4800A	S5H400MW-2	3285	S5H400MW	3654
S5L	400	240VAC 480VAC 600VAC	200kA 100kA 35kA	600 – 4800A	S5L400MW-2	3945	S5L400MW	4733

Molded case switch

Switch	Interruption capacity ③		Amps	Magnetic trip	3 pole catalog number	List price
S5H-D	240VAC 480VAC 600VAC 600VDC	150kA 65kA 22kA 50kA	400A	5000A	S5H400DW	\$ 1994

Neutral GF current transformer (required for 4 wire GF systems)

Amps	Catalog number	List price
400	K5NCT-400	\$ 250

Connection options

Type	Wire range	Amps ②	Set of 2 catalog number	List price	Set of 3 catalog number	List price
CU/AL front lugs	250kcmil – 500kcmil	300	K5TF-2	\$ 30	K5TF K5TG ①	\$ 45
CU/AL front lugs	(2) 3/0 – 250kcmil	400	K5TG-2 ③			
CU front lugs (saddle)	250kcmil – 500kcmil	400	—	—	Set of 6 catalog number	90
CU rear lugs	250kcmil – 500kcmil	400	—	—	K5TGS K5TGR	
Extended front bar	—	400	—	—	K5ET-400	

① Including lug cover.

② Suggested lugs for a circuit breaker up to amps shown. Cable size and type determine maximum amperage.

③ With fuse or MCCB protected circuit.

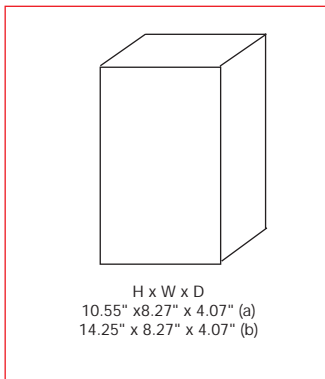
S6

600A / 800A, 600V

Electronic and thermal-magnetic trip type



S6



H x W x D
10.55" x 8.27" x 4.07" (a)
14.25" x 8.27" x 4.07" (b)

Standard S6 package includes complete circuit breaker and mounting hardware. Order cable lugs or other connection scheme as a separate item.

- (a) With K6TH cable lugs breaker is 10.55" tall.
- (b) With K6TJ cable lugs, terminal covers are provided and breaker is 14.25" tall.

General

The S6 breaker family is an 800A frame with a 600A and 800A version, both utilizing a microprocessor based overcurrent protective trip system. Both versions are adjustable from 40% to 100% of rating without the addition of any parts or rating plugs. As standard, the S6 includes adjustable long time function for overload protection and adjustable instantaneous function for short circuit protection.

Versions

To meet all application needs, the S6 is available in various versions:

- B = Adjustment LI
- C = Adjustment LSI
- E = Adjustment LSIG
- Q = 100% UL rated
- D = Molded case switch
- M = Magnetic only (MCP)
- T = Thermal magnetic
- G = 2.5 Mag (3-pole only)

Trip functions

These tripping functions are available:

- L = Long time
- S = Short time
- I = Instantaneous
- G = Ground fault

Performance level

Each version is also available in different maximum fault interrupting levels

- N = Normal
- H = High
- L = Extra high

Number of poles

In UL/CSA version, the S6 is available as in two pole or three pole version, both with the same dimensions. A four pole version is also available in UL/IEC form. For price estimate, add 35% to list price of selected version three pole breaker, contact ABB Control for details.

Accessory mounting

Internal accessories are UL/CSA approved for both factory or field installation. Accessories require control cable connectors. Shunt trips or UVR's mount in the left cavity. Auxiliary or bell alarm switches mount in the right cavity.

Reverse feeding

All versions of the S6 family are suitable for reverse feed applications.

Molded case switches

UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection. IEC type molded case switches with no trip protection are also available.

UL/CSA Interrupting capacity (kA RMS) UL489 / CSA C22.2

Voltage	N	H	L
240VAC	65	150	200
480VAC	50	65	100
600VAC	25	35	42
500VDC [Ⓞ]	35	50	65
600VDC [Ⓞ]	20	25	50

IEC-947 Interrupting capacity (kA RMS)

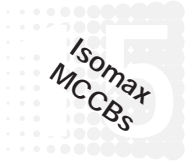
Voltage	N	H	L
230VAC	65	100	200
380/400/415VAC	35	65	100
440VAC	30	50	80
500VAC	25	40	65
690VAC	20	25	35

Catalog Number number	Rating	Magnetic trip
S6N600GW	3 pole, 600 Amp thermal magnetic, Im=2.5 x Ith	1500A
S6N800GW	3 pole, 800 Amp thermal magnetic, Im=2.5 x Ith	2000A

S6

600A / 800A, 600 VAC

Electronic and thermal magnetic trip type



The S6 breaker family uses two available microprocessor based internal trip units. The standard **PR211** trip unit includes adjustments for long time current pick-up and instantaneous current trip point.

The optional **PR212** trip unit includes adjustments for long time current pick-up/delay, short time pick-up/delay, I²t (on/off), instantaneous current trip point and further optional ground fault protection.

600A Frame (240 – 600A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	2 pole, 600VAC catalog number	List price	3 pole, 600VAC catalog number	List price
S6N	50kA	PR211	LI	S6N600BW-2	\$ 2847	S6N600BW	\$ 3608
		PR212	LSI	S6N600CW-2	4237	S6N600CW	4998
		PR212	LSIG	—	—	S6N600EW	6998
S6H	65kA	PR211	LI	S6H600BW-2	4275	S6H600BW	5271
		PR212	LSI	S6H600CW-2	5665	S6H600CW	6661
		PR212	LSIG	—	—	S6H600EW	8661
S6L	100kA	PR211	LI	S6L600BW-2	5481	S6L600BW	6482
		PR212	LSI	S6L600CW-2	6871	S6L600CW	7872
		PR212	LSIG	—	—	S6L600EW	8972

800A Frame (320 – 800A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	2 pole, 600VAC catalog number	List price	3 pole, 600VAC catalog number	List price
S6N	50kA	PR211	LI	S6N800BW-2	\$ 3842	S6N800BW	\$ 4802
		PR212	LSI	S6N800CW-2	5232	S6N800CW	6192
		PR212	LSIG	—	—	S6N800EW	8192
S6H	65kA	PR211	LI	S6H800BW-2	5275	S6H800BW	6465
		PR212	LSI	S6H800CW-2	6665	S6H800CW	7855
		PR212	LSIG	—	—	S6H800EW	9855
S6L	100kA	PR211	LI	S6L800BW-2	6476	S6L800BW	7676
		PR212	LSI	S6L800CW-2	7866	S6L800CW	9066
		PR212	LSIG	—	—	S6L800EW	11,066

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating PR212 A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating PR212 A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating PR212 A - B - C - D

Continuous amperage settings (long time adjustment) — PR211

Frame	Set points									Setting
	0.4	0.5	0.6	0.7	0.8	0.9	0.95	1.0		
600A	240	300	360	420	480	540	570	600		Amps
800A	320	400	480	560	640	720	760	800		Amps

S6 thermal-magnetic breakers, for AC and DC applications

Breaker	IC at 500VDC	Rating	Magnetic trip	2 pole, 600VAC /500DC catalog number	List price	3 pole, 600VAC/DC catalog number	List price
S6N	35kA	600A (420 – 600A)	6000A	S6N600TW-2	\$ 2847	S6N600TW	\$ 3608
		800A (560 – 800A)	8000A	S6N800TW-2	3842	S6N800TW	4802
S6H	50kA	600A (420 – 600A)	6000A	S6H600TW-2	4275	S6H600TW	5271
		800A (560 – 800A)	8000A	S6H800TW-2	5275	S6H800TW	6465
S6L	65kA	600A (420 – 600A)	6000A	S6L600TW-2	5481	S6L600TW	6482
		800A (560 – 800A)	8000A	S6L800TW-2	6476	S6L800TW	7676



S6

600A / 800A, 600 VAC

100% UL rated, electronic trip type

When applied correctly, UL tested 100% equipment rated breakers may be applied at full rating rather than on the sizing rules of the NEC where breakers and cable are sized based on actual continuous load current divided by 80%. This

100% rating can save the user the cost of larger cable or bus bar. Please consult the NEC for details and other design factors needed for this application.

600A Frame (240 – 600A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	3 pole 600VAC catalog number	List price
S6N	50kA	PR211	LI	S6NQ600BW	\$ 3969
		PR212	LSI	S6NQ600CW	5498
		PR212	LSIG	S6NQ600EW	7698
S6H	65kA	PR211	LI	S6HQ600BW	5798
		PR212	LSI	S6HQ600CW	7327
		PR212	LSIG	S6HQ600EW	9527
S6L	100kA	PR211	LI	S6LQ600BW	7130
		PR212	LSI	S6LQ600CW	8659
		PR212	LSIG	S6LQ600EW	9869

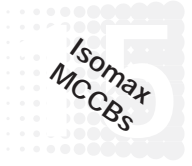
800A Frame (320 – 800A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	3 pole 600VAC catalog number	List price
S6N	50kA	PR211	LI	S6NQ800BW	\$ 5282
		PR212	LSI	S6NQ800CW	6811
		PR212	LSIG	S6NQ800EW	9011
S6H	65kA	PR211	LI	S6HQ800BW	7112
		PR212	LSI	S6HQ800CW	8641
		PR212	LSIG	S6HQ800EW	10,841
S6L	100kA	PR211	LI	S6LQ800BW	8444
		PR212	LSI	S6LQ800CW	9973
		PR212	LSIG	S6LQ800EW	12,173

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating PR212 A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating A - B - C - D

S6 600A / 800A



Magnetic only (MCP)

All S6 magnetic only breakers utilize the electronic PR211 trip unit with an adjustable range of 1.5 to 12 times frame rating. Both two and three pole MCPs are 600VAC rated.

Type	Amps	Interruption capacity	Adjustment range	2 pole 600VAC catalog number	List price	3 pole 600VAC catalog number	List price
S6N	600	240VAC	65kA	900 – 7200A	S6N600MW-2 S6N800MW-2	S6N600MW S6N800MW	\$ 2847 3842
	800	480VAC 600VAC	50kA 25kA	1200 – 9600A			
S6H	600	240VAC	150kA	900 – 7200A	S6H600MW-2 S6H800MW-2	S6H600MW S6H800MW	4275 5270
	800	480VAC 600VAC	65kA 35kA	1200 – 9600A			
S6L	600	240VAC	200kA	900 – 7200A	S6L600MW-2 S6L800MW-2	S6L600MW S6L800MW	5481 6476
	800	480VAC 600VAC	100kA 42kA	1200 – 9600A			

Molded case switches

Type	Interruption capacity ②	Amps	Magnetic trip	3 pole catalog number	List price	
S6H-D	240VAC	200kA	---	---	---	
	480VAC	100kA	600	S6H600DW	\$ 3275	
	600VAC	42kA	800	S6H800DW	4248	
	600VDC	50kA	---	---	---	
Non-UL, switches without overcurrent protection	Withstand rating		400	none	S6D400W	3275
	600VAC	15kA	630	none	S6D630W	3275
			800	none	S6D800W	4248

Neutral current transformer (required for 4 wire GF systems)

Amps	Catalog number	List price
600	K6NCT-600	\$ 250
800	K6NCT-800	

Connection options

Type	Wire range	Amps ②	Set of 2 catalog number	List price	Set of 3 catalog number	List price
CU/AL front lugs	(2) 250kcmil – 500kcmil	600	K6TH-2	\$ 50	K6TH ① K6TJ ①	\$ 75 135
	(3) 2/0 – 400kcmil	800	K6TJ-2 ①	90		
CU rear lugs	(2) 250kcmil – 350kcmil (3) 250 – 350kcmil	600	---	---	Set of 6 catalog number K6THR K6TJR	150 170
		800	---	---		
Extended front bar	---	600	---	---	K6ET-600 K6ET-800	150 170
Extended front bar	---	800	---	---		

① Includes lug cover.
 ② Suggested lugs for a circuit breaker up to amps shown. Cable size and type determine maximum amperage.
 ③ With fuse or MCCB protected circuit.



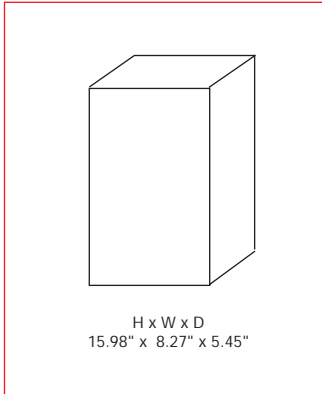
S7

1200A, 600 VAC

Electronic trip type



S7



H x W x D
15.98" x 8.27" x 5.45"

Standard S7 package includes complete circuit breaker and mounting hardware. Order cable lugs or other connection scheme as a separate item.

General

The S7 breaker family is a 1200A frame utilizing a microprocessor based overcurrent protective trip system. In the 1200A version, the trip unit is adjustable from 480A up to 1200A without the addition of any parts or rating plugs. As standard, the S7 includes adjustable long time function for overload protection and adjustable instantaneous function for short circuit protection.

Versions

To meet all application needs, the S7 is available in various versions:

- B = Adjustment LI
- C = Adjustment LSI
- E = Adjustment LSIG
- Q = 100% UL rated
- D = Molded case switch
- M = Magnetic only (MCP)

Trip functions

These tripping functions are available:

- L = Long time
- S = Short time
- I = Instantaneous
- G = Ground fault

Performance level

Each version is also available in different maximum fault interrupting levels

- H = High
- L = Extra high (IEC only)

UL/CSA Interrupting capacity (kA RMS) UL489 / CSA C22.2

Voltage	H	
240VAC	100	
480VAC	65	
600VAC	50	

IEC-947 Interrupting capacity (kA RMS)

Voltage	H	L
230VAC	100	200
380/400/415VAC	65	100
440VAC	55	80
500VAC	45	70
690VAC	25	35

15 Number of poles

In UL/CSA version, the S7 is available as in two pole or three pole version, both with the same dimensions. A four pole version is also available in a UL/IEC form. For price estimate, add 35% to list price of selected three pole, contact ABB Control.

Accessory mounting

Internal accessories are UL/CSA approved for both factory or field installation. Accessories require control cable connectors. Shunt trips or UVR's mount in the left cavity. Auxiliary or bell alarm switches mount in the right cavity.

Reverse feeding

All versions of the S7 family are suitable for reverse feed applications.

Molded case switches

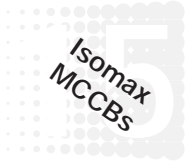
UL489 switches include no overcurrent protection except for a high instantaneous trip mechanism for self protection. IEC type molded case switches with no trip protection are also available.

① Consult factory

S7

1200A, 600 VAC

Electronic trip type



The S7 breaker family uses two available microprocessor based internal trip units. The standard **PR211** trip unit includes adjustments for long time current pick-up and instantaneous current trip point.

The optional **PR212** trip unit includes adjustments for long time current pick-up/delay, short time pick-up/delay, I²t (on/off), instantaneous current trip point and further optional ground fault protection.

1000A Frame (400 – 1000A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	2 pole, 600VAC catalog number	List price	3 pole, 600VAC catalog number	List price
S7H	65kA	PR211	LI	S7H1000BW-2	\$ 6959	S7H1000BW	\$ 7724
		PR212	LSI	S7H1000CW-2	8039	S7H1000CW	8804
		PR212	LSIG	—	—	S7H1000EW	10,604

1200A Frame (480 – 1200A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	2 pole, 600VAC catalog number	List price	3 pole, 600VAC catalog number	List price
S7H	65kA	PR211	LI	S7H1200BW-2	\$ 6959	S7H1200BW	\$ 7724
		PR212	LSI	S7H1200CW-2	8039	S7H1200CW	8804
		PR212	LSIG	—	—	S7H1200EW	10,604

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating PR212 A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating A - B - C - D

Continuous amperage settings (long time adjustment) – PR211

Frame	Set points									Setting
	0.4	0.5	0.6	0.7	0.8	0.9	0.95	1.0		
1000A	400	500	600	700	800	900	950	1000	Amps	
1200A	480	600	720	840	960	1080	1140	1200	Amps	

① Consult factory.



S7

1200A, 600VAC

UL 100% rated

When applied correctly, UL tested 100% equipment rated breakers may be applied at full rating rather than on the sizing rules of the NEC where breakers and cable are sized based on actual continuous load current divided by 80%. This

100% rating can save the user the cost of larger cable or bus bar. Please consult the NEC for details and other design factors needed for this application.

1000A Frame (400 – 1000A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	3 pole catalog number	List price
S7H	65kA	PR211	LI	S7HQ1000BW	\$ 8495
		PR212	LSI	S7HQ1000CW	9684
		PR212	LSIG	S7HQ1000EW	11,664

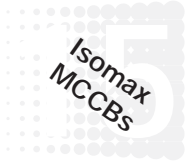
1200A Frame (480 – 1200A adjustable continuous range)

Breaker	IC at 480VAC	Trip type	Adjustment	3 pole catalog number	List price
S7H	65kA	PR211	LI	S7HQ1200BW	\$ 8495
		PR212	LSI	S7HQ1200CW	9684
		PR212	LSIG	S7HQ1200EW	11,664

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 – 1.0 3.0 – 18 sec.	0.4-0.5-0.55-0.6-0.65-0.7-0.75-0.8-0.85-0.875-0.9-0.925-0.95-0.975-1.0 x Frame rating PR212 A - B - C - D
S	Short time pick-up Short time delay	1.0 – 10.0 0.05 – 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 – 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 – 1.0 0.1 – 0.8 sec.	Off-0.2-0.3-0.4-0.6-0.8-0.9-1.0 x Frame rating A - B - C - D

S7 1200A, 600V



Magnetic only (MCP)

All S7 magnetic only breakers utilize the electronic PR211 trip unit with an adjustable range of 1.5 to 12 times frame rating. Both two and three pole MCPs are 600VAC rated.

Type	Amps	Interruption capacity	Adjustment range	2 pole catalog number	List price	3 pole catalog number	List price
S7H	1000 1200	240VAC 100kA 480VAC 65kA 600VAC 50kA	1500 – 12,000A 1800 – 14,400A	S7H1000MW-2 S7H1200MW-2	\$ 6959	S7H1000MW S7H1200MW	\$ 7724

Molded case switches

Type	Interruption capacity ②	Amps	Magnetic trip	3 pole catalog number	List price
S7H-D	240VAC 100kA 480VAC 65kA 600VAC 50kA 600VDC 12kA	1000 1200	20,000A 20,000A	S7H1000DW S7H1200DW	\$ 7300
Non-UL, switches without overcurrent protection	Withstand rating 600VAC 25kA	1000 1250	— —	S7D1000W S7D1250W	

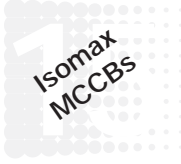
Neutral current transformer (required for 4 wire GF systems)

Amps	Catalog number	List price
1000	K7NCT-1000	\$ 250
1200	K7NCT-1200	

Connection options

Type	Wire range	Amps ①	Set of 2 catalog number	List price	Set of 3 catalog number	List price
CU/AL front lugs	(4) 4/0 – 500kcmil	1200	K7TK-2	\$ 120	K7TK	\$ 180
Extended front bar	—	1200	—	—	Set of 6 catalog number	240
					K7ET-1250	

① Suggested lugs for a circuit breaker up to amps shown. Cable size and type determine maximum amperage.
② With fuse or MCCB protected circuit.



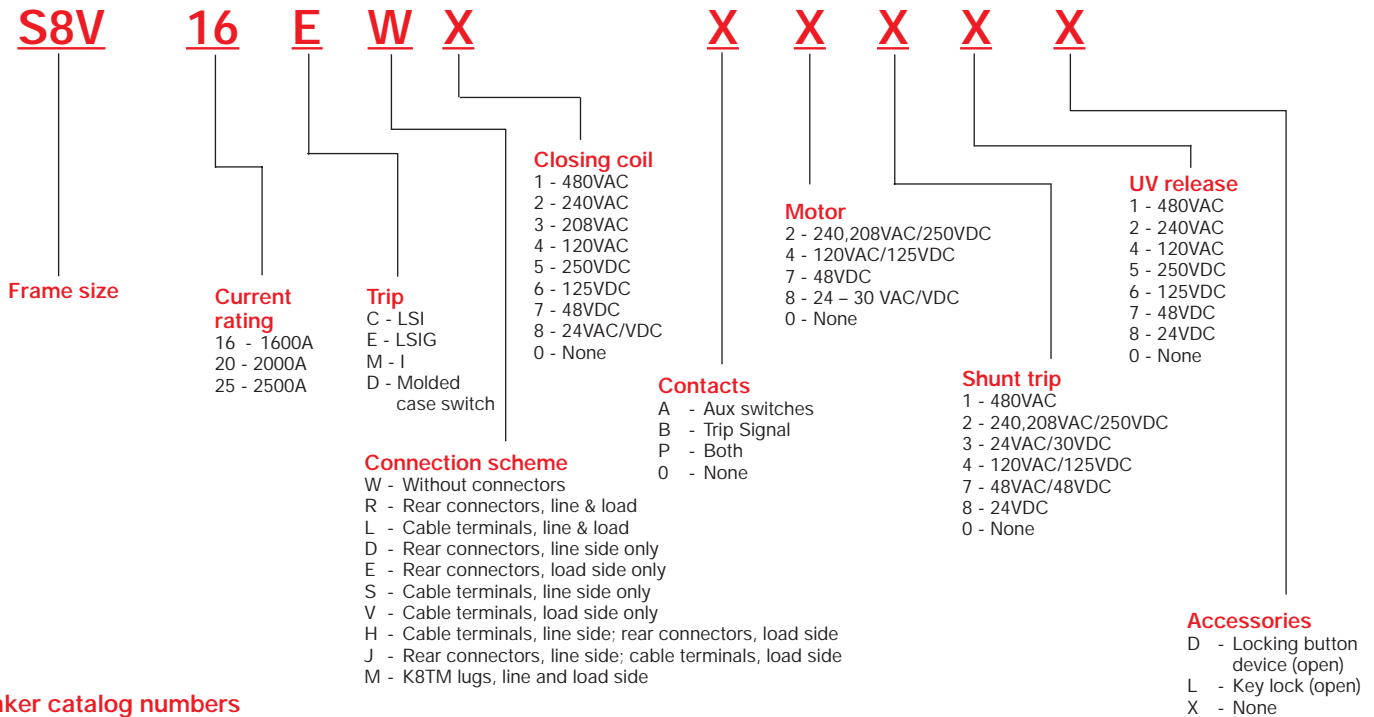
S8 1600 / 2000 / 2500A Insulated case circuit breaker

Description

- Insulated case type molded case circuit breaker with manually operated stored energy mechanism. Optional electric charging motor available
- Three cycle closing time for use in generator synchronizing applications.
- Electric spring charging mechanism rated for over 5,000 operations
- Three different frame ratings, 1600, 2000 and 2500 amperes. All are same compact physical size.
- Solid state trip units are available in four different configurations including adjustments for long time, short time, instantaneous and ground fault.
- Standard interrupting rating of 100kA at 480VAC.
- Short time withstand rating of 35kA at 600VAC for one second when breaker ordered with adjustable short time trip.
- Breaker includes charging handle for manual energizing of closing/opening springs
- Built-in ground fault (LSIG) for use with four-wire systems requires neutral GF sensor. Meets NEC ground fault requirements for service entrance applications.
- Internal accessories include electric charging motor, shunt trips, a combination auxiliary/bell alarm switch, and an undervoltage release.
- Breakers are suitable for use in reverse feed applications.
- Wide range of adjustments on trip settings, trip unit includes cover to prevent tampering.
- Front indicators for contact position.
- Uses convenient mounting pads for ease of installation in enclosures.
- Internal accessories are wired to terminal block mounted on right side of breaker.
- Trip signal contact option indicates when breaker has tripped due to overcurrent.
- Canadian Standards Association certification under C22.2 No. 5 under File LR90467 for both breakers and internal accessories.
- In compliance with IEC947 including 690VAC. Breakers are labeled with both UL/CSA and IEC ratings.
- Breakers are Underwriters Laboratories listed under Standard UL 489 for molded case circuit breakers per File E93565, internal accessories are per File E116596.



Catalog number information



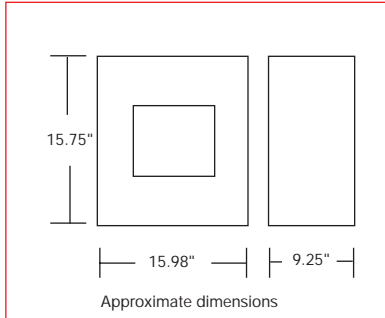
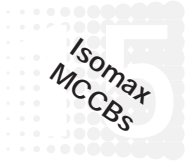
Breaker catalog numbers

The breaker catalog number must be completed. Please note that variations can affect price.

S8

1600 / 2000 / 2500A

Insulated case circuit breaker



Description

Breaker is shipped complete with installed trip unit and accessories. Cable terminals or rear T connectors can be included if desired. For four-wire systems an external neutral ground fault sensor must be ordered separately.

Trip functions

- L - Long time pick-up and delay
- S - Short time pick-up and delay
- I - Instantaneous trip
- G - Ground fault pick-up and delay

3 pole, 600VAC maximum ①

Maximum continuous rating				1600A	2000A	2500A			
Breaker	IC at 480VAC	Trip type	Adjustment	Catalog number	List price	Catalog number	List price	Catalog number	List price
S8V	100kA	PR212	LSI	S8V16CW	\$ 12,540	S8V20CW	\$ 14,427	S8V25CW	\$ 21,561
			LSIG	S8V16EW	14,505	S8V20EW	16,561	S8V25EW	24,487
			I	S8V16MW	11,267	S8V20MW	12,988	S8V25MW	20,916
			MCS	S8V16DW	9620	S8V20DW	10,999	S8V25DW	16,267

UL/CSA Interrupting capacity (kA RMS)

UL489 / CSA C22.2

Voltage	V
240VAC	125
480VAC	100
600VAC	85
600VDC ②	25

IEC-947 Interrupting capacity (kA RMS)

Voltage	V
230VAC	120
300/400/415VAC	120
440VAC	100
500VAC	70
690VAC	50

Trip settings

Adjustment	Trip function	Range	Individual settings
L	Long time pick-up Long time delay	0.4 - 1.0 3.0 - 18 sec.	0.4-0.5-0.6-0.7-0.8-0.9-0.95-1.0 x Frame rating A - B - C - D
S	Short time pick-up Short time delay	1.0 - 10.0 0.05 - 0.5 sec.	Off-1.0-2.0-3.0-4.0-6.0-8.0-10.0 x Frame rating A - B - C - D (I ² t On-Off)
I	Instantaneous trip	1.5 - 12.0	1.5-2.0-4.0-6.0-8.0-10.0-12.0 x Frame rating
G	Ground fault Ground fault delay	0.2 - 1.0 0.1 - 0.8 sec.	Off-0.2-0.3-0.4 x Frame rating A - B - C - D

15

Continuous amperage settings (long time adjustment)

Frame	Set points								Setting
	0.4	0.5	0.6	0.7	0.8	0.9	0.95	1.0	
1600A	640	800	960	1120	1280	1440	1520	1600	Amps
2000A	800	1000	1200	1400	1600	1800	1900	2000	Amps
2500A	1000	1250	1500	1750	2000	2250	2375	2500	Amps

UL 100% equipment rated circuit breakers

Circuit breakers and cable are sized per the National Electric Code on a basis of actual continuous load current divided by 80%. For example, a 360 ampere load should be connected by cable capable of handling 450 amperes (360A / 0.80 = 450A) and therefore be protected by a 450 ampere rated circuit breaker. Other factors may need to be considered when sizing breakers in special applications.

When applied correctly, UL-tested 100% equipment rated breakers may be applied at full rating, therefore saving the user the cost of larger cable or bus. Using the example above, the 360 ampere load could be used with cable capable of handling 360 amperes (360A / 1.00 = 360A) and only a 400 ampere rated circuit breaker (400A is next available size CB).

1600A, S8 Frame 100% rated

Catalog number	List price
S8VQ16CW	\$ 13,168
S8VQ16EW	15,231

2000A, S8 Frame 100% rated

Catalog number	List price
S8VQ20CW	\$ 15,148
S8VQ20EW	17,390

① Three pole breakers are listed and approved for use in two pole applications with center-pole not connected.
② Applies to MCS only.



S8

1600A, 2000A & 2500A

Accessories

Internal accessories

(Must be factory mounted for UL/CSA)

Item	Type	Factory installed catalog number suffix	List price
Closing coil	480VAC	1	\$ 575
	240VAC	2	
	208VAC	3	
	120VAC	4	
	250VDC	5	
	125VDC	6	
	48VDC	7	
	24VAC/VDC	8	
Electric motor (inc. spring charged signal contact)	240,208VAC & 250VDC	2	3217
	120VAC/125VDC	4	
	48VDC	7	
	24 - 30VAC/VDC	8	
Shunt trip	480VAC	1	518
	240,208VAC & 250VDC	2	
	24VAC/30VDC	3	
	120VAC/125VDC	4	
	48VAC/48VDC	7	
	24VDC	8	
Undervoltage release	480VAC	1	518
	240VAC	2	
	120VAC	4	
	250VDC	5	
	125VDC	6	
	48VDC	7	
	24VDC	8	
	Aux. contacts	2A/1B	
Trip signal	1A/1B	B	192
Combo. aux. & trip contacts	2A/1B Aux & 1A/1B Trip	P	588
Padlockable button cover (open)	—	D	144
Key lock (open)	—	L	155

Closing coil

Required for closing breaker electrically, the coil voltage must be specified at the time of order entry.

Internal accessory ratings

Accessory type	Voltage	Rating
Shunt trip	All	100VA/120Watts
Undervoltage releases	AC/DC	30VA (12 Watts/ 10VA (4 Watts))
Auxiliary contacts	240VAC 125VDC 250VDC	10A Max. 0.3A Max. 0.15A Max
Closing coil	AC/DC	30VA / 40VA

Stored energy electric motor operators

E.O.	Type	Inrush (VA)	Normal (watts)	Closing time	Opening time	Resetting time
MS8	Stored energy	1000	230	0.05s	0.035s	9.0s

Mechanical life of 10,000 cycles at 20 operations per hour.

Connection accessories (includes sets of 3)

Item	Type	Catalog number	List price
Cable terminals	1600A Max.	K8TL	\$ 274
	2500A Max.	K8TM	315
	Rear T conn.	K8RT2500	855

Neutral ground fault current transformer

Item	Type	Catalog number	List price
Ground Fault Neutral CT	1600A	K8NCT-1600	\$ 888
	2000A	K8NCT-2000	
	2500A	K8NCT-2500	

Note: Neutral GF CT required for proper GF operation.

Door flange

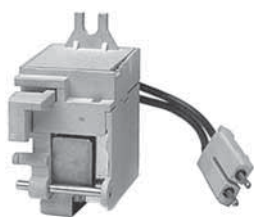
Item	Catalog number	List price
Face plate	K8FP	\$ 25

Electrical accessories

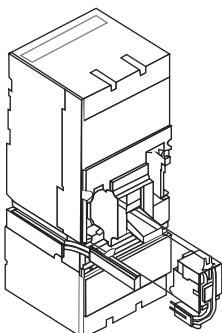
Shunt trip, undervoltage release

S3 – S7

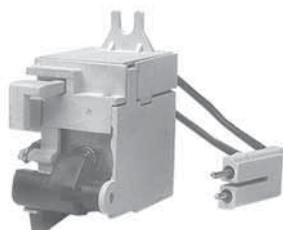
Isomax
MCCBs



K5S1



S5 with K5S2



K5U1



K6C-SUP

Shunt trips

Voltage	Factory installation		Field installation		List price
	Catalog number suffix ①	List price adder	Catalog numbers		
			S3 – S4 – S5	S6 – S7	
480VAC/250VDC	S1	\$ 430	K5S1	K7S1	\$ 415
240VAC	S2		K5S2	K7S2	
120VAC/125VDC	S4		K5S4	K7S4	
48VDC	S7		K5S7	K7S7	
24VAC/VDC	S8		K5S8	K7S8	
12VDC	S9		K5S9	K7S9	

Low power shunt trips

Voltage	Factory installation		Field installation		List price
	Catalog number suffix ①	List price adder	Catalog numbers		
			S3 – S4 – S5	S6 – S7	
24VDC	SA	\$ 430	K5SA	K7SA	\$ 415
120VAC	SB		K5SB	K7SB	

For remote opening of circuit breaker and includes internal cut-off switch to protect solenoid. All shunt trips are left pole mounted and can not be used with UVRs. Except for 12VDC, all shunt trips are approved for use in GF systems. Shunt trips must be ordered with correct connector.

Shunt trip connectors (required)

Type circuit breaker	Voltage	Factory installation ①	Field kit catalog number		List price
			S3 – S4 – S5 – S6	S7	
Fixed mounted	All	included	K6C-SU	K7C-SU	\$ 15
Plug-in/Draw-out	All	included	K6C-SUP	K7C-SUP	

Electrical specifications – shunt trips (standard)

V	24, 120, 240, 480VAC ~ 50/60 Hz 12, 24, 48, 125, 250 VDC –
For S3-S5 P	100 VA-/120W- Instantaneous duty
For S6-S7	150 VA-/150W-

Undervoltage releases

Voltage	Factory installation		Field installation		List price
	Catalog number suffix ①	List price adder	Catalog numbers		
			S3 – S4 – S5	S6 – S7	
480VAC	U1	\$ 430	K5U1	K7U1	\$ 415
240VAC	U2		K5U2	K7U2	
120VAC	U4		K5U4	K7U4	
24VAC	U3		K5U3	K7U3	
250VDC	U5		K5U5	K7U5	
125VDC	U6		K5U6	K7U6	
48VDC	U7		K5U7	K7U7	
24VDC	U8		K5U8	K7U8	

Will trip CB when connected voltage drops to 35-70% of UVR voltage rating. Will allow CB to close (ON) when voltage is approximately 85% of rated voltage. All UVRs are left pole mounted and can not be used with shunt trips. UVRs must be ordered with correct connector.

Undervoltage release connectors (required)

Type circuit breaker	Voltage	Factory installation ①	Field kit catalog number		List price
			S3 – S4 – S5 – S6	S7	
Fixed mounted	All	included	K6C-SU	K7C-SU	\$ 15
Plug-in/Draw-out	All	included	K6C-SUP	K7C-SUP	

Electrical specifications – UVR & low power shunt trips

V	24, 120, 240, 480 VAC ~ 50/60 Hz 24, 48, 125, 250 VDC –
For S3-S5 P	6 VA-/3W- Continuous duty
For S6-S7	10 VA-/4W-

① For factory installation add suffix given to end of circuit breaker catalog number per accessory format.

Electrical accessories

Auxiliary contacts

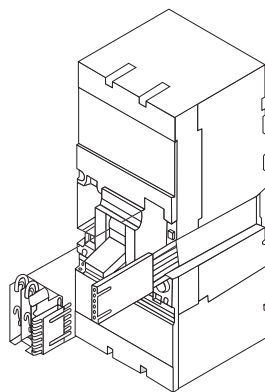
S3 – S7



K5AS



K6C-ABP



S5 with K6C-AB

Auxiliary contacts — S3 – S7

Contacts	Factory installation		Field installation		
	Catalog number suffix ^①	List price adder	Catalog numbers		List price
2 Form Cs	A	\$ 275	S3 – S4 – S5 K5AS	S6 – S7 K7AS	\$ 260
1 BA & 1 C	BA	365	K5BA	K7BA	350
1 B BA & 1A + 1B	BA3		—	K7BA-3	

The auxiliary contacts are accessory contacts for the indication of circuit breaker open-closed or tripped. Bell alarm contacts (B.A.) can be used to indicate circuit breaker tripping. All contacts are right pole mounted.

Auxiliary contact connectors (required) — S3 – S7

Type circuit breaker	Voltage	Factory installation ^①	Field kit catalog number		List price
			S3 – S4 -- S5 – S6	S7	
Fixed mounted	All	included	K6C-AB	K7C-AB	\$ 15
Plug-in/Draw-out	All	included	K6C-ABP	K7C-ABP	

Electrical specifications

Voltage	Maximum contact amperage rating
125 VDC	0.3 A
250 VDC	0.15 A
250 VAC	6 A

N.O. = contact is open as circuit breaker is open
 N.C. = contact is closed when circuit breaker is open
 B.A. = will open/close only when circuit breaker trips

^① For factory installation add suffix given to end of circuit breaker catalog number per accessory format.
^② Not UL approved for field installation.

Electrical accessories

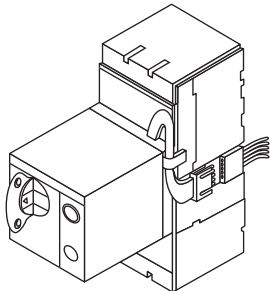
Motor operators, stored energy motor operators

S3 – S7

Isomax
MCCBs



K5M2



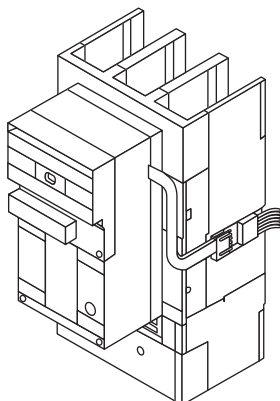
S4 with K5M2



K6C-M



K6M2



S7 with K7M4

Motor operator

Voltage	Catalog number S3 – S4 – S5	List price
240VAC/250VDC 120VAC/125VDC 48VDC 24VDC	K5M2 K5M4 K5M7 K5M8	\$ 678

For remote control of circuit breaker opening and closing.
Complete with manual operating lever, padlock device and emergency opening push-button.
When ordering the connector always specify type and version of the circuit-breaker.

The following options are also available:

- key lock for open position
- key lock for open position of two or more circuit breakers (using the same key for groups of circuit breakers)

Motor operator connectors (required)

Type circuit breaker	Voltage	Field kit catalog number S3 – S4 – S5	List price
Fixed mounted Plug-in/Draw-out	All All	K6C-M K6C-MP	\$ 15

Electrical specifications

V	120, 240VAC ~ 50/60 Hz 24, 48, 125, 250 VDC –
P inrush	500 VA~/500W-
P normal	350 VA~/500W-
Close time	0.1 s
Open time	0.1 s

Stored-energy motor operator

Voltage	Catalog number		List price
	S6	S7	
240VAC/250VDC 120VAC/125VDC 48VDC 24VDC	K6M2 K6M4 K6M7 K6M8	K7M2 K7M4 K7M7 K7M8	\$ 2407

- Stored-energy motor operator with springs automatically pre-loaded by motor.
- Complete with shunt opening and closing release, and compartment door flange.
- When ordering the connector always specify type and version of the circuit-breaker.
- The following options are also available:
 - key lock for open position
 - key lock for open position of two or more circuit-breakers (using the same key for groups of circuit-breakers).

Stored-energy motor operator connectors (required)

Type circuit breaker	Voltage	Field kit catalog number		List price
		S6	S7	
Fixed mounted Plug-in/Draw-out	All All	K6C-M K6C-MP	K7C-M K7C-MP	\$ 15

Electrical specifications

V	120, 240 VAC ~ 50/60 Hz 24, 48, 125, 250 VDC –
P inrush	660 VA~/600W-
P normal	180 VA~/180W-
Close time	0.09 s
Open time	1.2 s
Reset time	2.0 s

External accessories

Lugs and termination kits

S3 – S7



K4TB



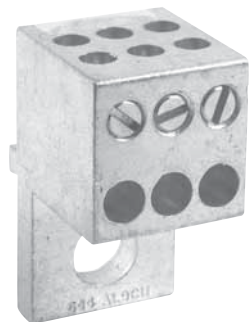
K4ET-250



K4TES



K4TER



K4TN

Standard cable lug kits

For breakers	Amps ^①	Wire range	Set of 2 catalog number	List price	Set of 3 catalog number	List price
S3	60	14AWG – 2AWG	K3TA-2	\$ 4	K3TA	\$ 6
S3 – S4	100	14AWG – 1/0	K4TB-2	4	K4TB	6
S3 – S4	150	2AWG – 4/0	K4TC-2	4	K4TC	6
S3 – S4 – S5	225	4AWG – 300kcmil	K4TD-2	10	K4TD	15
S4	250	6AWG – 350kcmil	K4TE-2	20	K4TE	30
S5	300	250kcmil – 500kcmil	K5TF-2	30	K5TF	45
S5	400	(2) 3/0 – 250kcmil	K5TG-2 ^②	30	K5TG ^②	45
S6	600	(2) 250kcmil – 500kcmil	K6TH-2	50	K6TH	75
S6	800	(3) 2/0 – 400kcmil	K6TJ-2 ^②	90	K6TJ ^②	135
S7	1200	(4) 4/0 – 500kcmil	K7TK-2	120	K7TK	180

Standard cable lugs, for use on line and load side of circuit breaker. Suitable for use with Cu or Al. Special versions available with taps and screws for control wire connection. Note: S6 and S7 lugs are Al9Cu (90°C); all others Al7Cu (75°C).

Standard cable lug kits with control power taps

For breakers	Amps ^①	Wire range	Set of 2 catalog number	List price	Set of 3 catalog number	List price
S3 – S4	100	14AWG – 1/0	K4TB-2C	\$ 8	K4TBC	\$ 12
S3 – S4	150	2AWG – 4/0	K4TC-2C	8	K4TCC	12
S3 – S4 – S5	225	4AWG – 300kcmil	K4TD-2C	14	K4TDC	21
S4	250	6AWG – 350kcmil	K4TE-2C	24	K4TEC	36
S5	300	250kcmil – 500kcmil	K5TF-2C	34	K5TFC	51
S5	400	(2) 3/0 – 250kcmil	K5TG-2C ^②	34	K5TGC ^②	51
S6	600	(2) 250kcmil – 500kcmil	K6TH-2C	54	K6THC	81
S6	800	(3) 2/0 – 400kcmil	K6TJ-2C ^②	94	K6TJC ^②	141
S7	1200	(4) 4/0 – 500kcmil	K7TK-2C	124	K7TKC	186

Extended front termination kits

Suitable for use with	Maximum amps	Set of 6 catalog number	List price
S3 – S4	250	K4ET-250	\$ 46
S5	400	K5ET-400	114
S6	630	K6ET-600	150
S6	800	K6ET-800	170
S7	1250	K7ET-1250	240

For adding onto standard circuit breaker front terminals, extending available connection area for user termination. Suitable for spaded cable or bus connection. S3 – S5 include terminal covers.

Saddle cable lug kits (Cu cable only)

Suitable for use with	Max amps	Wire range	Set of 6 catalog number	List price
S3 – S4	250	14AWG – 250kcmil	K4TES	\$ 30
S5	400	250kcmil – 500kcmil	K5TGS	90

These special non-aluminum cable lugs are for use with copper cable. Lugs are intended for use with copper cable or where non-aluminum connectors are required (marine, salt or corrosive environments).

Rear cable lug kits (Cu cable only)

Suitable for use with	Max amps	Wire range	Set of 6 catalog number	List price
S3 – S4	250	6AWG – 250kcmil	K4TER	\$ 30
S5	400	250kcmil – 500kcmil	K5TGR	90
S6	600	(2) 2/0 – 350kcmil	K6THR	150
S6	800	(3) 250kcmil – 350kcmil	K6TJR	170

For use where cable connection from the back-rear of the breaker is desired.

Distribution cable lug kit

Suitable for use with	Max amps	Wire range	Set of 3 catalog number	List price
S3 – S4	250	(6) #14 - 6	K4TN	\$ 125
S5	400	(6) #14 - 1/0	K5TGD	240

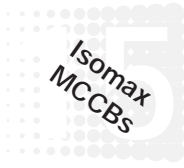
① Suggested lugs for circuit breaker up to amps shown. Cable size and type determine maximum amperes.

② Includes required lug covers.

External accessories

Rotary and variable depth handle operators

S3- S7



K5RH



OHB65J10



OHB95J10



OHB125J10



K5VD-M, K5VD-S12,
K5VD-H

Rotary handle operating mechanism

Frame	Catalog number	List price
S3 - S4 - S5	K5RH	\$ 108
S6	K6RH	124
S7	K7RH	145

Mounts directly onto breaker. Includes door interlock to prevent CB door opening while CB is in ON position. Padlock provision included to padlock CB in open position. Can also be key locked with optional cylinder lock assembly. Door interlock bracket must be ordered separately, if required. See page 15.62.

Variable depth rotary handles

New pistol type 1, 3R, 12

Frame	Catalog number mechanism	List price	Shaft catalog number (length in inches)	List price	Handle catalog number (length in inches)	List price
S3-S4-S5	K5VD-M	49	OXF10X148 (5.8)	\$ 24 26 32	OHB95J10 (3.7)	80
			OXF10X225 (8.9)		OHG95J10 (3.7)	
S6	K6VD-M	80	OXF10X500 (19.7)		OHB125J10 (4.9)	90
S7	K7VD-M	80			OHG125J10 (4.9)	
					OHB175J10 (6.9)	100
					OHG175J10 (6.9)	

Pistol type 4, 4X

Frame	Catalog number mechanism	List price	Shaft catalog number (length in inches)	List price	Handle catalog number (length in inches)	List price
S3-S4-S5	K5VD-M	49	OXF10X148 (5.8)	\$ 24 26 32	OHB95L10 (3.7)	120
			OXF10X225 (8.9)		OHG95L10 (3.7)	
S6	K6VD-M	80	OXF10X500 (19.7)		OHB125L10 (4.9)	130
S7	K7VD-M	80			OHG125L10 (4.9)	
					OHB175L10 (6.9)	140
					OHG175L10 (6.9)	

Square type 1

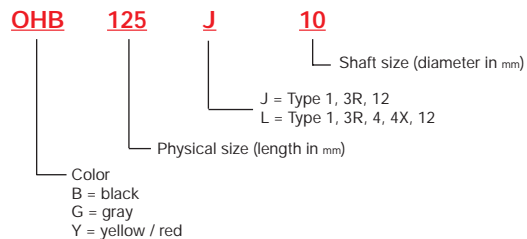
Frame	Catalog number mechanism	List price	Shaft catalog number	List price	Handle catalog number	List price
S3-S4-S5	K5VD-M	49	K5VD-S12	\$ 24	K5VD-H	\$ 25
S6	K6VD-M	80	K7VD-S20	27	K7VD-H	28
S7	K7VD-M	80			K7VD-H	28

NOTE: Complete assembly requires a mechanism, shaft and handle.

Variable depth shaft support

For frames	Catalog number	List price
S3 - S4 - S5	K5VD-LSS	\$ 25

New pistol handle catalog number explanation



External accessories

Flange handle operators

S3 – S6



K7FHD-HS12

Flange handle

Solid shaft linkage

Breaker	NEMA type	Complete handle kit	List price	Mechanism only	List price	Shaft only	Shaft length	List price	Handle only	List price
S3	1,3R,12	K3FHD-12S12	240	K3FHD-M	128	K7FHD-S12	12	19	K7FHD-HS12	93
		K3FHD-17S12	248			K7FHD-S17	17	27		
		K3FHD-22S12	255			K7FHD-S22	22.5	34		
S4	1,3R,12	K4FHD-12S12	240	K4FHD-M	128	K7FHD-S12	12	19	K7FHD-HS12	93
		K4FHD-17S12	248			K7FHD-S17	17	27		
		K4FHD-22S12	255			K7FHD-S22	22.5	34		
S5	1,3R,12	K5FHD-12S12	240	K5FHD-M	128	K7FHD-S12	12	19	K7FHD-HS12	93
		K5FHD-17S12	248			K7FHD-S17	17	27		
		K5FHD-22S12	255			K7FHD-S22	22.5	34		
S6	1,3R,12	K6FHD-12S12	523	K6FHD-M	411	K7FHD-S12	12	19	K7FHD-HS12	93
		K6FHD-17S12	531			K7FHD-S17	17	27		
		K6FHD-22S12	538			K7FHD-S22	22.5	34		
S6	4, 4X	K6FHD-12S4	563	K6FHD-M	411	K7FHD-S12	12	19	K7FHD-HS4	133
		K6FHD-17S4	571			K7FHD-S17	17	27		
		K6FHD-22S4	578			K7FHD-S22	22.5	34		

Available as complete kits including flange handle, shaft and breaker operating mechanism. Mechanism mounts directly onto breaker and shaft can be cut to the desired length for the breaker enclosure. Door is interlocked with the handle when the breaker is in the closed (ON) position; handles include interlock defeater for emergency override. Handle can be padlocked in the open (OFF) position. Can be field converted for left hand mounting.

Door hardware kits — Solid shaft linkage & cable operated

Item	Catalog number	List price
Door hardware kit, right hand, 2 point latch for enclosures less than 40 inches high	FH-DHK	\$ 150
Roller for 3 point latch, add to FH-DHK	FH-3RL	30

Enclosure depths

Minimum

Breaker	Depth (inches)
S3 - S5	10
S6	11

Maximum

For maximum depth, add 4 inches to the shaft length

① Cable not included.

External accessories

Flange handle operators

S3 – S7



K7FCH

Flange handle Cable linkage

Breaker	NEMA type	Mechanism only	List price	Cable only	Cable length	List price	Handle only	List price
S3-S4	1,3R,12	K4FPM	110	K5C036	36" (91cm)	114	K5FCH	213
	4, 4X	K4FPM	110	K5C048	48" (122cm)	146	K5FCH4	243
				K5C060	60" (152cm)	160		
S5	1,3R,12	K5FPM	128	K5C072	72" (183cm)	175	K5FCH	213
				K5C084	84" (213cm)	204		
	4, 4X	K5FPM	128	K5C096	96" (244cm)	221	K5FCH4	243
				K5C108	108" (274cm)	238		
				K5C120	120" (305cm)	256		
S6	1,3R,12	K6FPM	220	K7C048	48" (122cm)	190	K7FCH	310
	4, 4X	K6FPM	220	K7C060	60" (152cm)	220	K7FCH4	415
				K7C072	72" (183cm)	256		
S7	1,3R,12	K7FPM	220	K7C084	84" (213cm)	270	K7FCH	310
				K7C096	96" (244cm)	320		
	4, 4X	K7FPM	220	K7C120	120" (305cm)	350	K7FCH4	415

Notes: For complete assembly; mechanism, cable and handle are required.
All cables mount onto the right side of the breaker.
Handle can be mounted on the right or left side.

Door hardware kits — S3 - S7 Cable operated

Item	Catalog number	List price
Door hardware kit, right hand, 2 point latch for enclosures less than 40 inches high	KDH2R	\$ 200
Door hardware kit, right hand, 3 point latch for enclosures 40 inches high or greater	KDH3R	225

Enclosure depths

Minimum

Breaker	Depth (inches)
S3 - S6	8
S7	10

Maximum

Maximum depth is determined by cable length.

External accessories S3 – S7



K5LD



K7KL



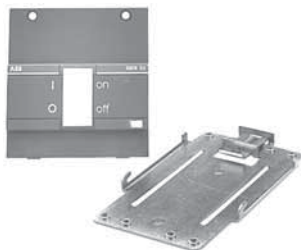
K6LC



K6LCH



K6LC-S



K3DMB

Front locking device

Item	Catalog number	List price
S3 – S4 – S5	K5LD	\$ 14
S6	K6LD	16
S7	K7LD	20
S3 – S4 – S5	K5LDW ①	14
S6	K6LDW ①	16
S7	K7LDW ①	20

Mounts directly onto front of CB. Includes padlock device for locking CB in open position. Can be used as a manual handle block, with padlock or with optional key lock accessory. Optional door interlock kit that will prevent CB door from opening while CB is in the closed (ON) position.

Door interlock bracket

Item	Catalog number S3 – S7	List price
Bracket	K7DB	\$ 5

Key locks

Accessory	Keys	Catalog number		List price
		S3 – S4 – S5	S6 – S7	
Electric operator	different same	K5KL-EO	K7KL-EO	\$ 25
		K5KL-EO-2	K7KL-EO-2	
Rotary HM & locking device	different same	K7KL	K7KL	
		K7KL-2	K7KL-2	

Keyed cylinder locks are available for mounting onto Isomax electric operators, rotary handle mechanisms and front locking devices. Key locks can be for one individual circuit breaker (different keys in each order) or for two circuit breakers using the same key.

Terminal covers for fixed circuit breakers

Frame	Low profile catalog number	List price	High profile catalog number	List price
S3 – S4	K4LC	8	K4LCH	\$ 16
S5	K5LC	12	K5LCH	24
S6	K6LC	18	K6LCH	32
S7	K7LC	40	---	---

Both high and low types are available for fixed circuit-breakers. Covers provide IP40 degree of protection for fixed mounted circuit breakers. Lug covers are required and included as standard with S5 400A and S6 800A cable lug kits. Covers up to S6 can be sealed with lug cover seal shown in next section.

Terminal cover seals

Suitable for use with breakers	Used with LC covers	List price
S3 – S4 – S5 – S6	K6LC-S	\$ 5

These screws prevent the terminal covers from being removed.

DIN rail mounting kits

Suitable for use with breakers	Catalog number	List price
S3	K3DMB	\$ 24
S4	K4DMB	26
S5	K5DMB	38

Kit consists of mounting bracket to fix S3-S5 breakers onto 75mm DIN rail (EN 50023 rail) and includes 45mm high front face plate to match up with miniature circuit breakers and manual motor starters. S1 breaker mounts on 35mm DIN rail.

Mechanical interlock plate

Frame	Horizontal catalog number	List price	Vertical catalog number	List price
S3	K3MI-H	\$ 570	K3MI-V	\$ 570
S4	K4MI-H	570	K4MI-V	570
S5	K5MI-H	590	K5MI-V	590
S6	K6MI-H	620	K6MI-V	620
S7	K7MI-H	630	K7MI-V	630

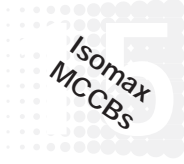
Provides for mounting of two similar breakers on a single mounting plate. CBs are interlocked via a "walking beam" type interlock, preventing breakers from being ON or closed at the same type. Both breakers can be OFF or tripped. MIP is available in two versions, one with breakers mounted horizontally and then also a version for vertical mounting of breakers.

① Required for drawout breakers.

Accessories

S3 – S7

IEC



Rear connected stud kits^①

For breakers	Max. amps	Set of 6 catalog number	List price
S3 – S4	250	K4RC	\$ 87
S5	400	K5RC	225
S6	800	K6RC	280
S7	1200	K7RC	340

Provides means to connect breakers directly onto rear bus bars.

Rear plug-in and draw-out circuit breakers

Isomax breakers are available in both rear plug-in and complete draw-out configurations. Plug-in breakers can be rear bus, front bus or front cable connected and are available up to the S5 400A size. The draw-out configuration uses a unique racking system and is available for all breakers from S3 through S7.

Plug-in (3 pole)^①

Frame	Movable kit		Separate kits fixed and movable				Complete plug-in kits			
	Movable	List price	Fixed base kit		Rear conn.		Includes both fixed and movable portion			
			Front bus	List price	Rear conn.	List price	Front bus	List price	Rear conn.	List price
S3	K4PMK	203	K3PFF	190	K3PFR	230	K3PF	393	K3PR	\$ 433
S4	K4PMK	203	K4PFF	203	K4PFR	243	K4PF	406	K4PR	446
S5	K5PMK	238	K5PFF	278	K5PFR	278	K5PF	516	K5PR	516

Draw-out (3 pole)^{①②③}

Frame	Movable kit		Separate kits fixed and movable				Complete draw-out kits			
	Movable	List price	Fixed base kit		Rear conn.		Includes both fixed and movable portion			
			Front bus	List price	Rear conn.	List price	Front bus	List price	Rear conn.	List price
S3	K4WMK	\$ 203	K3WFF	\$ 230	K3WFR	\$ 270	K3WF	\$ 433	K3WR	\$ 473
S4	K4WMK	203	K4WFF	283	K4WFR	323	K4WF	486	K4WR	526
S5	K5WMK	278	K5WFF	318	K5WFR	318	K5WF	596	K5WR	596
S6 Horiz	K6WMK	523	K6WFF	1346	K6WFR-H	1346	K6WF	1869	K6WR-H	1869
S6 Vert	K6WMK	523	K6WFF	1346	K6WFR-V	1346	K6WF	1869	K6WR-V	1869
S7 Horiz	K7WMK	821	K7WFF	2111	K7WFR-H	2111	K7WF	2932	K7WR-H	2932
S7 Vert	K7WMK	821	K7WFF	2111	K7WFR-V	2111	K7WF	2932	K7WR-V	2932

Movable kit = parts needed to modify standard CB to movable type.

Fixed base kit = fix mount onto panel.

Ext Fr bus = fixed base with line and load side extended front bus connectors. (FF)

Rear Conn. = fixed base with line and load side rear bus connectors. (FR)

Complete kit = includes all parts required for plug-in or draw-out connection; does not include CB.

Plug-in = open breaker can be physically removed from fixed base without disconnecting cable or bus from fixed base. (P)

Draw-out = also known as withdrawable, breaker can be removed from fixed base via a through the door crank. Includes ON, TEST and OFF position. (W)

Four pole versions (plug-in and/or draw-out)

Take the above list prices times 1.35 for four (4) pole versions and add "-4" to the end of the catalog number.

Draw-out crank

Isomax frames	Catalog number	List price
S3 – S7	K7WCR	\$ 20

Cable termination kits (3 pole only)^①

Compression type cable lug kit used to modify extended front bus connectors for direct cable connection.

Frame	Set of 6	List price
S3	K4FCT	\$ 72
S4	K4FCT	72
S5	K5FCT	86

Hand-held test kit (for all electronic trip types)

Isomax frames	Catalog number	List price
S4 – S5 – S6 – S7	K7TUT	\$ 210

Isomax hand-held test kit is used to both test and exercise microprocessor trip units in breakers S4 through S7. Unit includes test forks that insert into the test plugs on all Isomax microprocessor trip units. Tester generates 15VDC signal that performs diagnostic on electronic trip functions and will confirm test by tripping the CB. Will not test S3 nor any molded case switch versions.

① IEC ratings only.

② Front cable connection.

③ Requires front locking device to prevent drawout while breaker is closed.

Enclosures Type 1 & 3R/12

Description

Type 1

- General purpose indoor enclosure intended for use in normal environments to provide a degree of protection against contact with enclosed equipment.
- Sheet steel, surface mount.
- Breaker is front-operable and can be padlocked via front hasp.
- Available through 2500A, 600VAC
- UL Listed for use as service entrance equipment (SUSE), per UL file E116374.

Type 3R/12

- Type 3R is intended for outdoor use providing protection against rain, sleet or snow.
- Type 12 is for use in indoor atmospheres to provide a degree of protection against circulating dust, lint, sawdust, falling dirt and dripping non-corrosive liquids.
- Surface-mounted, sheet steel enclosure.
- Breaker can be operated via **separately ordered** handle mechanism; door is interlocked with mechanism.
- Available through 2500A, 600VAC.
- UL Listed for use as service entrance equipment (SUSE), per UL file E116374.



Type 7/9

- Cast from copper-free aluminum (max. 0.025 copper content)
- Stainless steel shotblasted or sandblasted natural finish
- Standard conduit openings in top and bottom
- Breaker is operated from front handle and can be padlocked
- NEC Class I Groups D, Div. 1 & 2
- NEC Class II Groups E, F & G, Div 1 & 2
- NEC Class III
- External machined flange joint design
- Integral cast mounting feet
- Machined flange for ease of hinge installation
- Ground lug
- Cast mounting pan bosses
- All enclosures suitable for drilling & tapping
- UL panel listed per UL File # E183868

Enclosures Type 1 & 3R/12

Isomax
MCCBs



S3E-1



S4E-3R12 ③

Enclosures (Price does not include circuit breaker; order as a separate item.) ④

NEMA designation	Breaker type	Enclosure maximum rating		Approximate dimensions① H x W x D (inches)	Catalog number	List price	
		AL cables	CU cables				
Type 1	S3	150A	225A	22 x 12 x 4.5	S3E-1	235	
	S4	225A	250A	30 x 17.5 x 4.5	S4E-1	305	
	S5	400A	400A	30 x 17.5 x 4.5	S5E-1	305	
	S6	800A	800A	44 x 22 x 6	S6E-1	685	
	S7	1000A	1200A	44 x 22 x 6	S7E-1	685	
	S8	2500A	2500A	88 x 36 x 24	S8ES250-1	5285	
	Type 3R/12②	S1	100A	100A	14 x 10 x 8.8	S1E-3R12	305
		S2 ②	125A	125A	16 x 11 x 8	S2E-3R12	305
S3		150A	225A	22 x 12 x 9	S3E-3R12	395	
S4		225A	250A	30 x 17.5 x 9	S4E-3R12	575	
S5		400A	400A	30 x 17.5 x 9	S5E-3R12	575	
S6		800A	800A	44 x 22 x 11	S6E-3R12	905	
S7		1000A	1200A	44 x 22 x 11	S7E-3R12	905	
S8		2500A	2500A	88 x 36 x 24	S8ES250-3R12	5285	

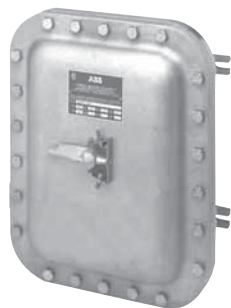
Neutral kits

Breaker type	Neutral cable capacity and wire range	Neutral kit catalog number	List price
S3	Neutral #6-250 kcmil Bonding Lug #14-1/0	S3NK225	135
S4	Neutral #6-250 kcmil Bonding Lug #14-1/0 kcmil	S4NK250	155
S5	Neutral (2) #6-250 kcmil Bonding Lug #14-1/0 kcmil	S5NK400	260
S6	Neutral (2) #2-600 kcmil Bonding Lug #6-250 kcmil	S6NK800	350
S7	Neutral (4) #2-600 kcmil Bonding Lug #6-250 kcmil	S7NK1200	535
S8	Neutral (6) #1/0-750 kcmil Bonding Lug (2) #2-600 kcmil	—	included

NOTE: The list price adder for factory installation of an enclosed circuit breaker is 50% of the enclosure list price.

① Enclosures may not meet size requirement for UL 100% rated breakers.
 ② Not UL approved.
 ③ Variable depth rotary handle must be ordered separately (S1 - S7).
 ④ Consult ABB for breakers installed in enclosures.

Enclosures Type 7/9



S5N400BW7

Explosion-proof enclosures

(Price does not include circuit breaker; order as a separate item for factory assembly.)

NEMA designation	Breaker type	Enclosure max. rating	Approximate dimensions H x W x D (inches)	Catalog number suffix	List price adder
Type 7/9	S3	Cu only 100A	17 x 10 x 8.65	7	\$ 2100
	S3	Cu only 225A	22.5 x 11.5 x 8.77	7	2850
	S4	Cu only 250A	25 x 18 x 9.92	7	4700
	S5	Cu only 400A	30 x 17 x 9.25	7	6600
	S6	Cu only 600A	35 x 17 x 11	7	8600
	S6	Cu only 800A	41 x 17 x 11	7	10,450
	S7	Cu only 1200A	51 x 17 x 13	7	22,450

To order a breaker in an explosion-proof enclosure, add the suffix "7" to the end of the catalog number and add the list price adder to the list price of the breaker.

Example: **S5N400BW7**
 S5N400BW breaker..... \$ 2151
 Explosion proof enclosure..... **6600**
 Total..... \$ 8751

Additional options

NEMA 4X Stainless steel bolts Captive bolts Drain

NEMA designation	Breaker type	Enclosure max. rating	Cat. no. adder	List price adder	Cat. no. adder	List price adder	Cat. no. adder	List price adder	Cat. no. adder	List price adder
Type 7/9	S3	Cu only 100A	-X	\$ 130	-S	\$ 20	-B	\$ 145	-D	\$ 110
	S3	Cu only 225A	-X	145	-S	25	-B	170	-D	
	S4	Cu only 250A	-X	145	-S	45	-B	355	-D	
	S5	Cu only 400A	-X	175	-S	60	-B	415	-D	
	S6	Cu only 600A	-X	250	-S	60	-B	465	-D	
	S6	Cu only 800A	-X	315	-S	60	-B	535	-D	
	S7	Cu only 1200A	-X	430	-S	80	-B	600	-D	

To add additional options, simply add the suffix to the end of the catalog number.

Example: **S5N400BW7XSD**
 S5N400BW breaker..... \$ 2151
 Explosion proof enclosure..... 6600
 NEMA 4X 175
 Stainless steel bolts..... 60
 Drain **110**
 Total..... \$ 9096

Catalog number information — Type 7/9

15

S4 N 250 B W 7 - 2 xxx

● **Frame size**

- S3 = 150 / 225A
- S4 = 250A
- S5 = 400A
- S6 = 600 / 800A
- S7 = 1200A

● **Interrupting rating class**

- B = Basic (240VAC)
- N = Normal
- H = High
- L = Extra high
- D = Special molded case switch

● **Current rating**

- 015 = 15A
- 250 = 250A
- 400 = 400A
- 600 = 600A
- 800 = 800A
- 1200 = 1200A

● **Trip unit function**

- B = LI
- C = LSI
- D = Molded case switch (MCS)
- E = LSIg
- T = Thermal-magnetic
- F = LSIg/K
- H = LSIg/D
- J = LSIg/DT
- K = LSIg/DTK
- M = Magnetic only (MCP)

● **Accessories (added in alpha-numeric order)**

- A = Auxiliary switch
- B = Captive bolts
- BA = Bell alarm
- BA3 = Bell alarm (S6/S7 only)
- D = Breather/drain
- H = Fixed rotary handle mounted on CB
- S_ = Shunt trip with voltage code
- S = Stainless steel bolts
- U_ = Undervoltage release with voltage code
- X = NEMA 7/9/4X

● **Number of poles**

- 2 = 2 pole
- 4 = 4 pole
- None = 3 pole

● **NEMA enclosure 7/9**

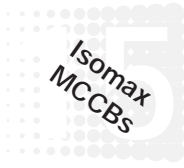
● **Type connectors**

- W = None
- L = Lugs

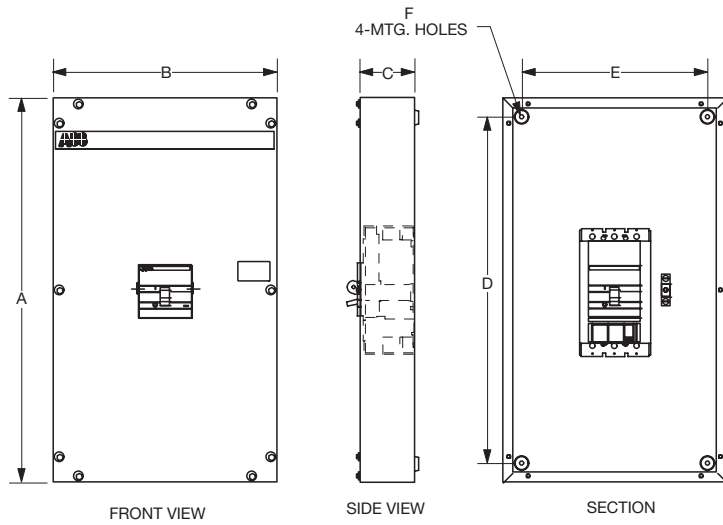
Enclosures

Approximate dimensions

S3 – S7, NEMA 1, 3R & 12

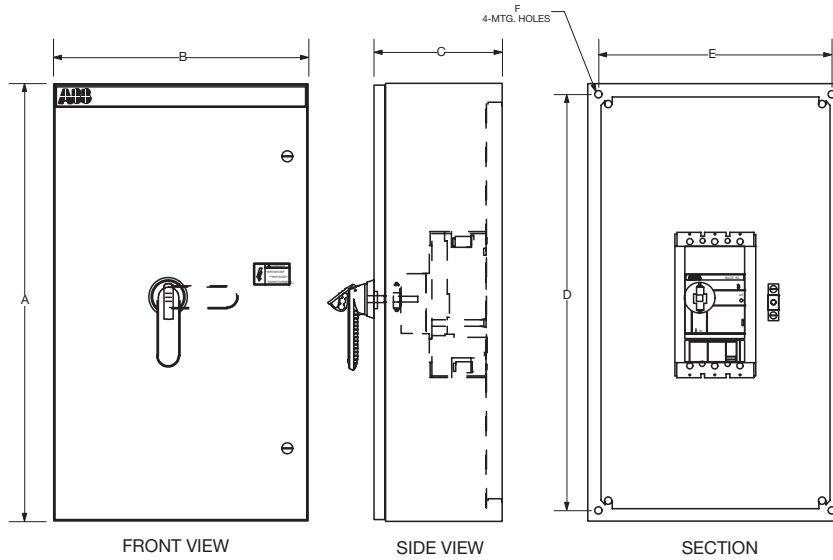


NEMA 1



Cat. #	A	B	C	D	E	F
S3E-1	22.0 559.0	12.0 305.0	4.25 108.0	19.0 482.0	9.0 229.0	0.312 7.93
S4E-1	30.0 762.0	17.5 444.5	4.25 108.0	27.0 686.0	14.5 368.5	0.312 7.93
S5E-1	30.0 762.0	17.5 444.5	4.25 108.0	27.0 686.0	14.5 368.5	0.312 7.93
S6E-1	44.0 1118.0	22.0 559.0	5.75 146.0	41.0 1041.5	19.0 483.0	0.312 7.93
S7E-1	44.0 1118.0	22.0 559.0	5.75 146.0	41.0 1041.5	19.0 483.0	0.312 7.93

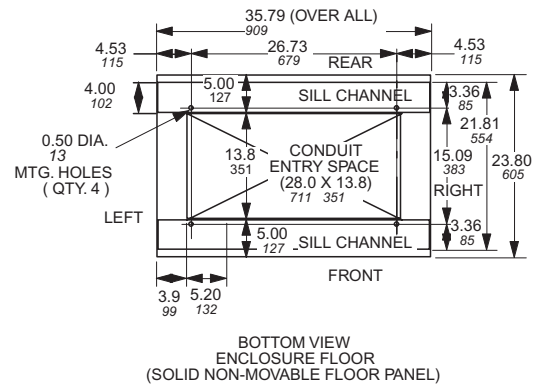
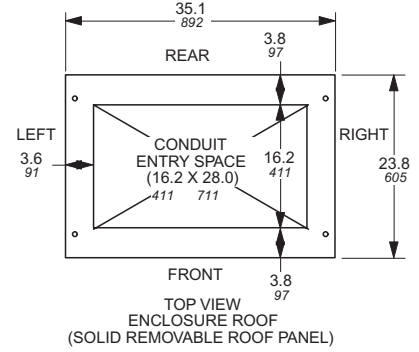
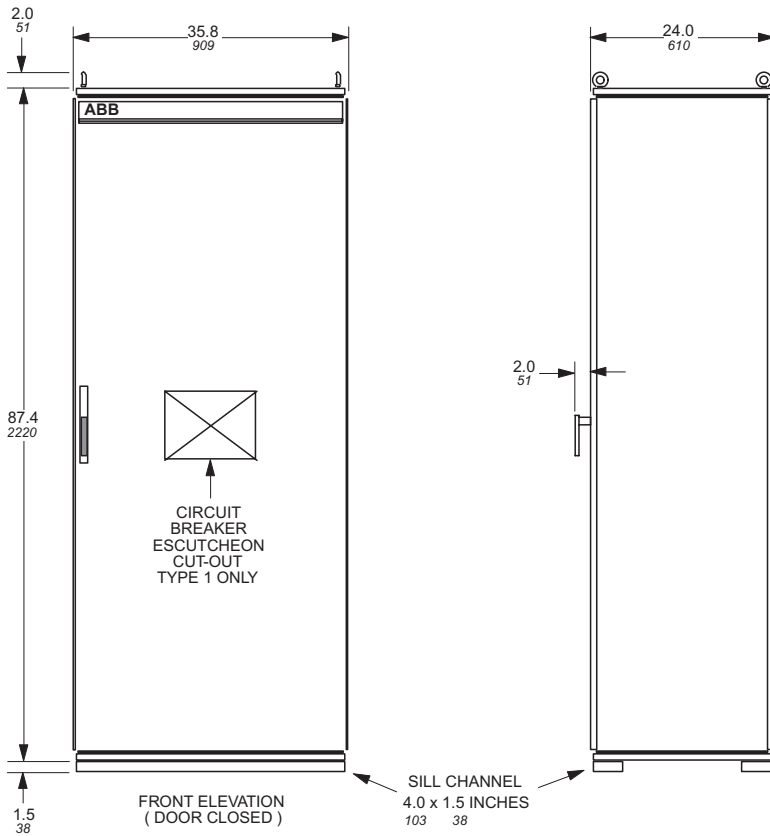
NEMA 3R, 12



Cat. #	A	B	C	D	E	F
S3E-3R12	22.0 559.0	12.0 305.0	8.8 224.0	20.5 520.5	10.5 267.0	0.50 13.7
S4E-3R12	30.0 762.0	17.5 444.5	8.8 224.0	28.5 724.0	16.0 406.5	0.50 13.7
S5E-3R12	30.0 762.0	17.5 444.5	8.8 224.0	28.5 724.0	16.0 406.5	0.50 13.7
S6E-3R12	44.0 1118.0	22.0 559.0	10.8 274.5	42.5 1080.0	20.5 521.0	0.50 13.7
S7E-3R12	44.0 1118.0	22.0 559.0	10.8 274.5	42.5 1080.0	20.5 521.0	0.50 13.7

Enclosures

Approximate dimensions
S8, NEMA 1, 3R & 12



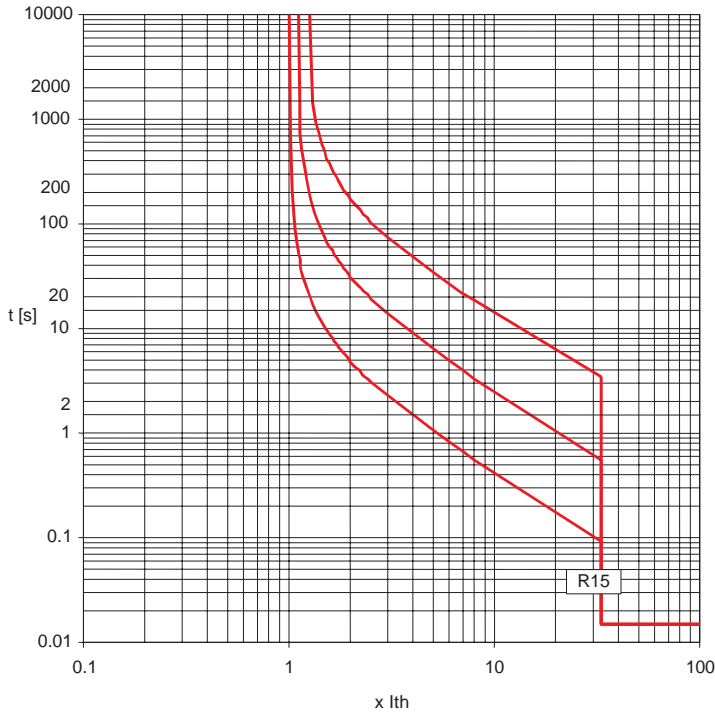
Protective releases

Thermal-magnetic overcurrent release

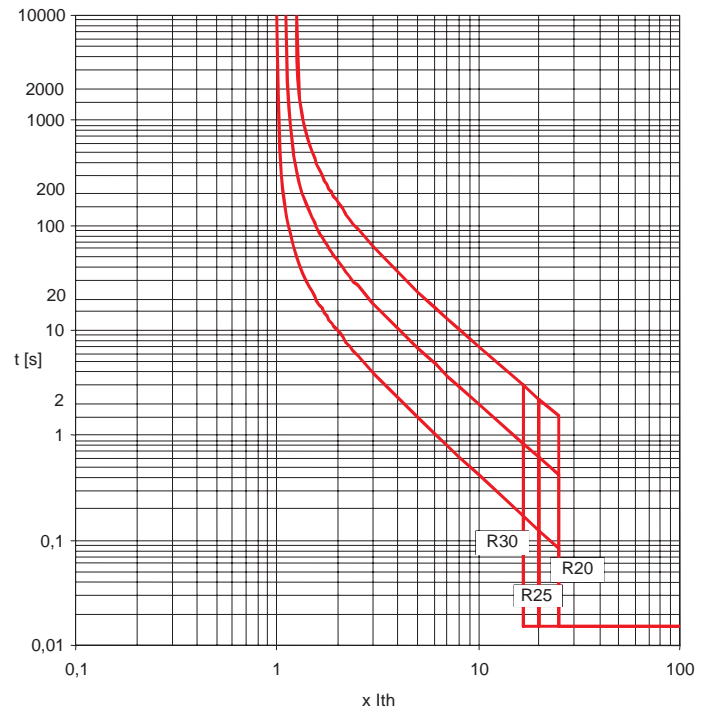
Time-current curves, S3



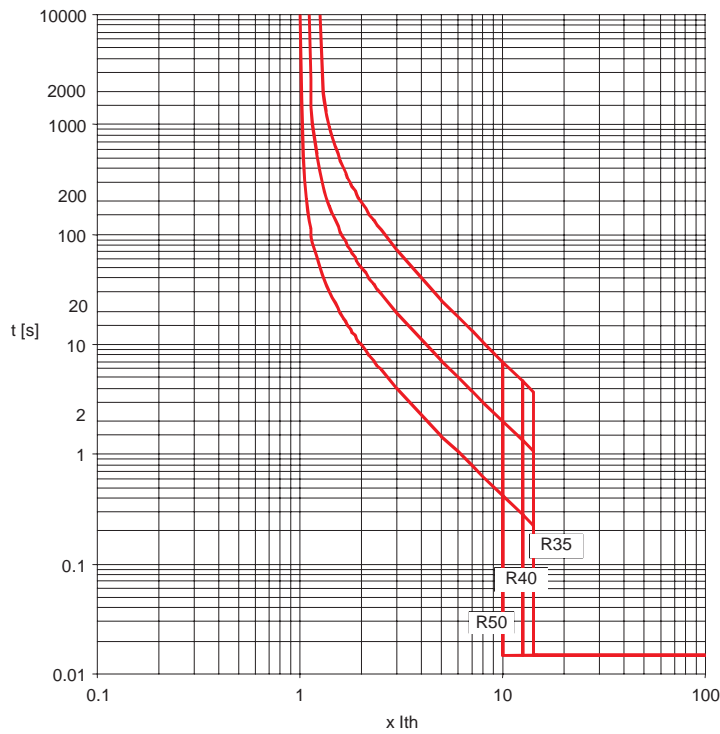
S3, R15



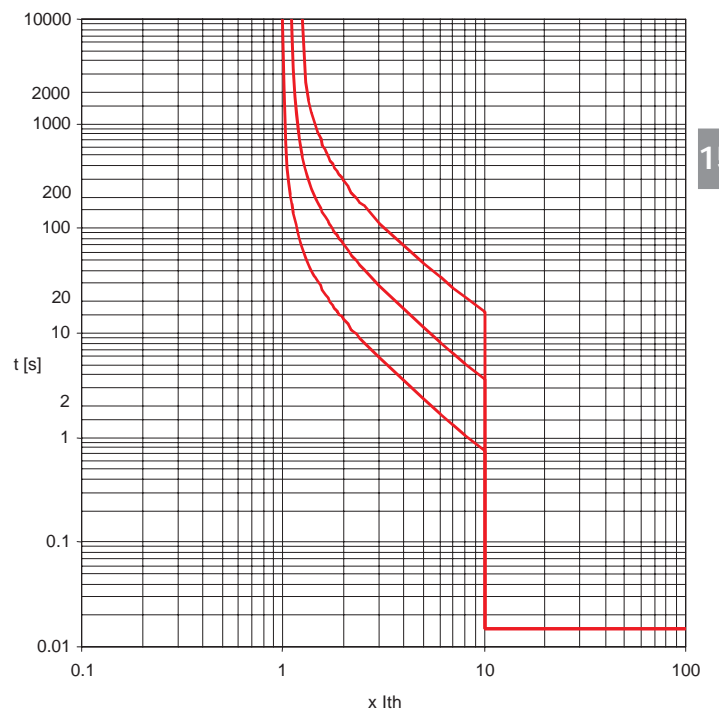
S3, R20-R30



S3, R35-R50



S3, R50-R100



Ⓞ Direct current may shift tripping characteristic. Consult ABB.

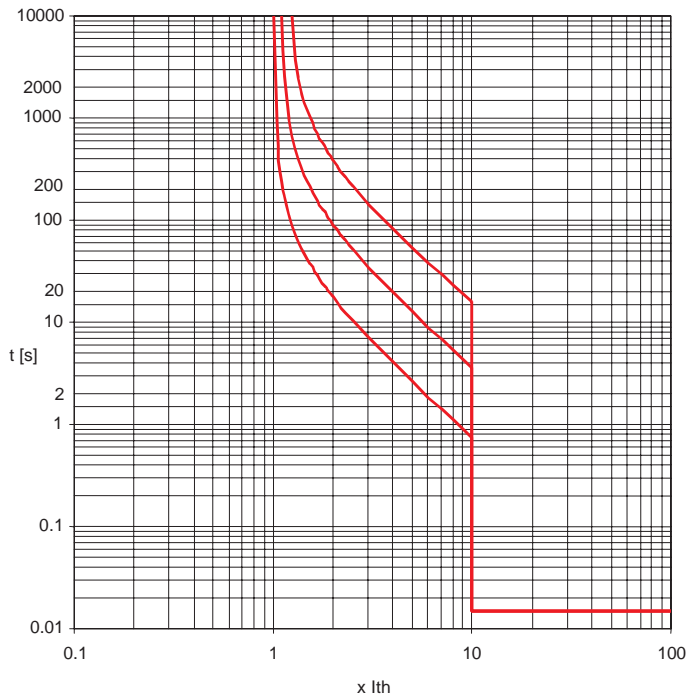


Protective releases

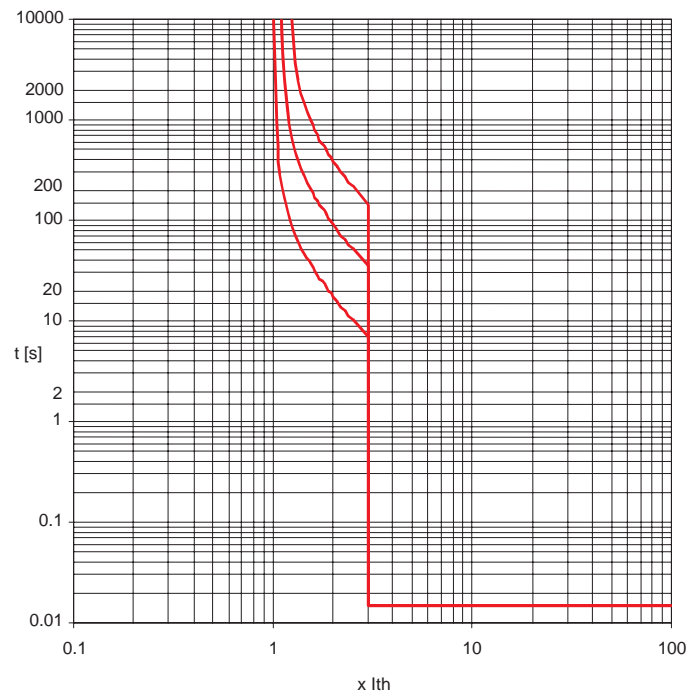
Thermal-magnetic overcurrent release

Time-current curves, S3

S3, R125-R225 – 10X I_m

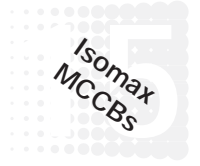


S3, R150-R225 – 3X I_m



Trip curves for distribution

Circuit breakers w/thermomagnetic trip units
Isomax S5 & S6



S5 400 TMD

$I_n = 300 - 400 \text{ A}$
 $I_3 = 2.5 I_n$

Consult factory

S5 400 TMD

$I_n = 300 - 400 \text{ A}$
 $I_3 = 5 \div 10 I_n$

Consult factory



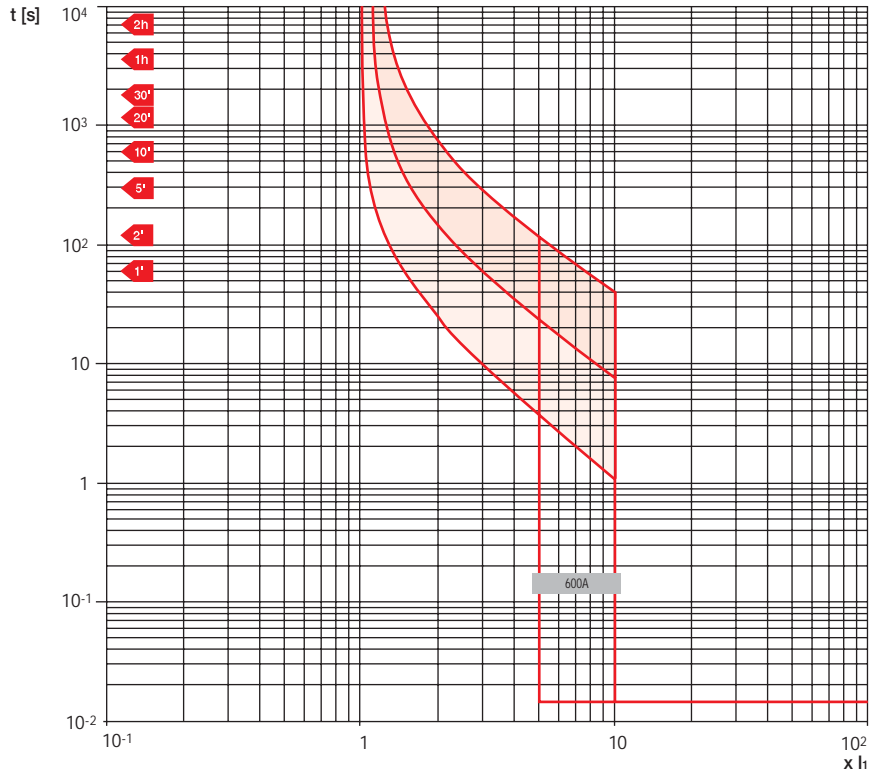
Trip curves for distribution

Circuit breakers w/thermomagnetic trip units

Isomax S6

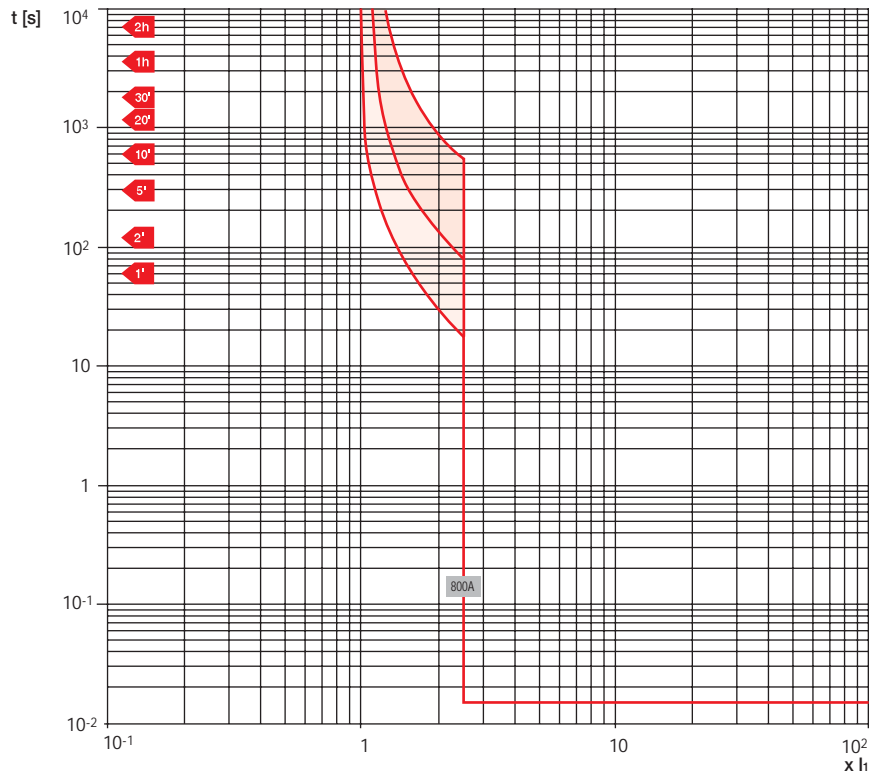
S6 600 TMD

$I_n = 800 \text{ A}$
 $I_3 = 5 \div 10 I_n$



S6 800 TMD

15 $I_n = 800 \text{ A}$
 $I_3 = 2.5 I_n$



Trip curves for distribution

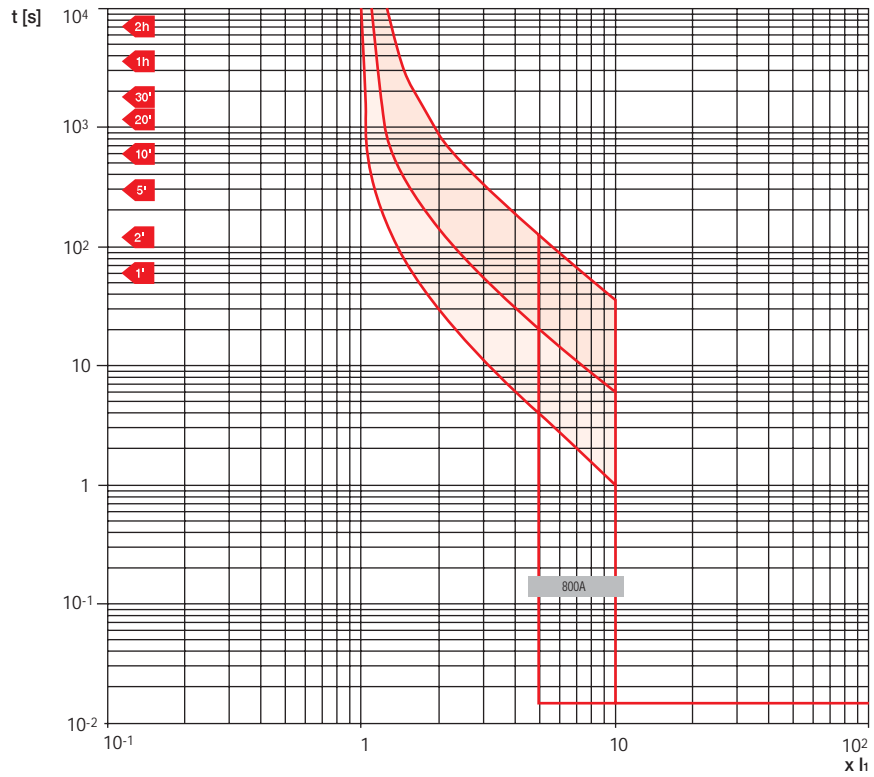
Circuit breakers w/thermomagnetic trip units

Isomax S6



S6 800 TMD

$I_n = 800 \text{ A}$
 $I_3 = 5 \div 10 I_n$





Protective releases

Microprocessor trip release

S4, S5, S6, S7, S8

Microprocessor based overcurrent relays for alternating current for S4, S5, S6 and S7 circuit-breakers

The microprocessor based overcurrent relays (actual RMS) for Isomax S circuit-breakers offer a wide range of current and trip time settings.

They are available in two versions:

PR211/P with overcurrent protection «L» and instant short circuit protection «I». Available with functions «L», «I», or «L+I». L function includes adjustable long-time pick-up and long-time delay.

PR212/P with overcurrent protection «L», selective short circuit protection «S», instant short circuit protection «I» and ground fault protection «G». Available with functions «L+S+I» or «L+S+I+G». Functions «S», «I» and «G» can be excluded manually by means of the trip current threshold selector (OFF position). In its most complete configuration, i.e. with functions «L+S+I+G», the PR212/P relay can be combined, on request, with the following units:

PR212/D — dialog unit

Essential for two-way communication with electrical plant management systems. When the unit is present, it is possible to choose between the manually set parameters (LOC), and the parameters set by the electrical plant control system (REM) by means of the appropriate selector. The dialog unit must be supplied with an auxiliary voltage of 24 V d.c.

The following information is made available through the dialog unit on the field bus:

- protection parameters
- current values of phases, neutral and ground
- circuit-breaker state
- number of operations of circuit-breaker
- interrupted currents
- state of the overcurrent relay with indication of:
 - normal operation
 - pre-alarm (0.9 x I1)
 - overcurrent function «L»
 - trip function «S»
 - trip function «I»
 - trip function «G».

It is possible to provide and/or modify the protection parameters and the circuit-breaker opening/closing controls. In the event of a serial communication error, the overcurrent relay operates in accordance with the last parameters set and in any event always in accordance with the manually programmed setting. The same occurs in the event of a dialog unit fault, and in the absence of auxiliary supply.

15 The dialog unit is external for circuit breakers S4 and S5 and is located inside the relay box for circuit breakers S6 and S7.

The external dialog unit is connected by means of a cable for supply and communication with the PR212/P protection relay.

The standard version of the dialog interface has the following specifications:

- hardware: EIA RS485 serial transmission line
- communication protocol: ABB Modbus
- transmission speed: 150 – 19200 baud (bit/s).

PR212/K — signalling unit

Can be connected directly to the PR212/P protection relay and provides contacts for the protection unit trip and alarm signals: pre-alarm, overcurrent function «L», trip functions «S», «I» and «G», trip by relay and internal communication error with PR212/P.

PR212/T — actuator unit

Can be installed only if the dialog unit is present, and by means of suitable relays, controls the opening and closing of the circuit-breaker. In order that opening and closing can be actuated, the circuit-breaker must be equipped with a motor operator (direct-acting for S4 and S5; stored energy type for S6 and S7).

Note

The K and T units are always external.

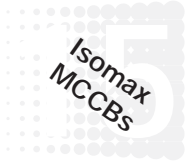
Other important features of the microprocessor based relays are as follows:

- protection of neutral with programmable automatic adjustment, executed by the manufacturer, to 50% (standard) or 100% (on request) of the current value selected for the phases. The optional version has no code in this catalog;
- reliable operation also when one phase only is live;
- individual and simultaneous adjustment on the three phases and neutral;
- no need for auxiliary supply;
- trip specifications not affected by the ambient temperature;
- consistency of specifications and reliability including in contaminated environments;
- signalling of tripped relay (available for all versions) by means of voltage-free contact for 24 V d.c. or a.c. circuits maximum 3 W.

Circuit-breaker rated current change according to ambient temperature. The tripping characteristics of Isomax S4 – S8 with electronic trip units are unaffected by ambient temperatures from -25°C to +70°C.

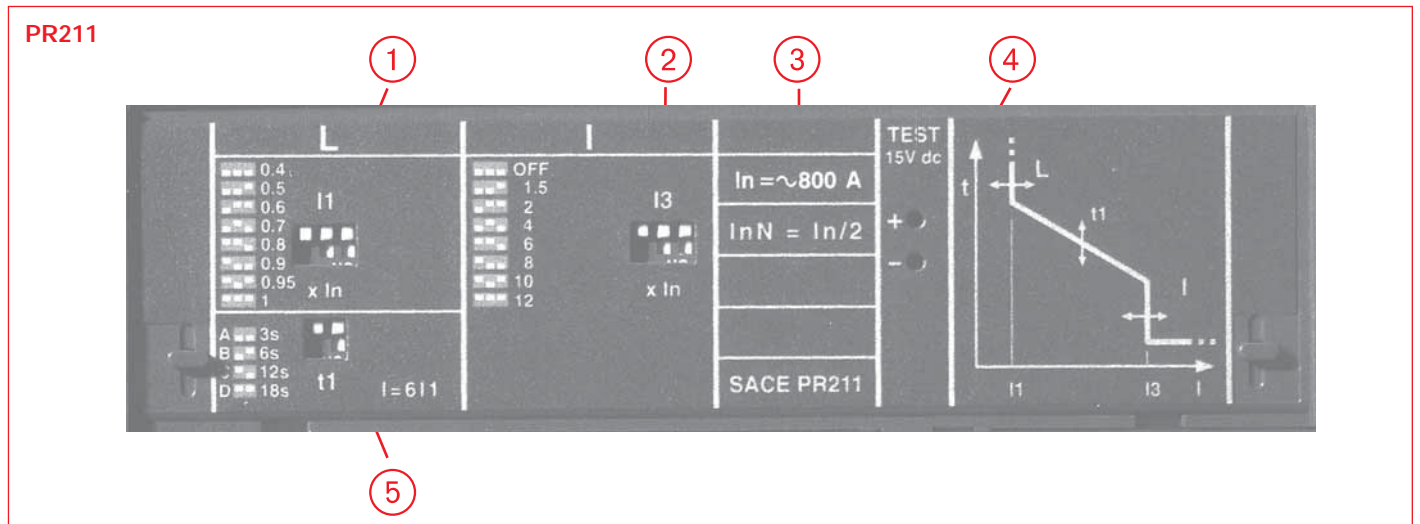
Protective releases

Microprocessor based overcurrent relays, PR211 for S4, S5, S6 & S7 breakers



Protective functions and set values

Protection against	Trip	Symbol	Set values (manual adjustment in steps)
Overload	Long delay	L	$I1 = 0.4-0.5-0.6-0.7-0.8-0.9-0.95-1 \times I_n$ $t1 = 4 \text{ curves A,B,C,D}$
Short-circuit	Instantaneous adjustment	I	$I3 = 1.5-2-4-6-8-10-12 \times I_n$

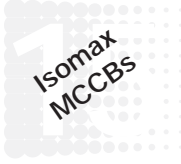


Key

- 1 Dip-switch for function L setting (I1)
- 2 Dip-switch for function I setting (I3)
- 3 Rated current of current transformers
- 4 15 V d.c. input for release functioning check
- 5 Function L trip time setting dip switch (T1)

Rated and setting currents

Circuit-breaker	Current transformer	Functions	
		L (I1) A (0.4 – 1 x In)	I (I3) A (1.5 – 12 x In)
S4	250	100	150 – 1200
		250	375 – 3000
S5	400	300	450 – 3600
		400	600 – 4800
S6	600/800	600	900 – 7200
		800	1200 – 9600
S7	1200	1000	1000 – 12,000
		1200	1800 – 14,400

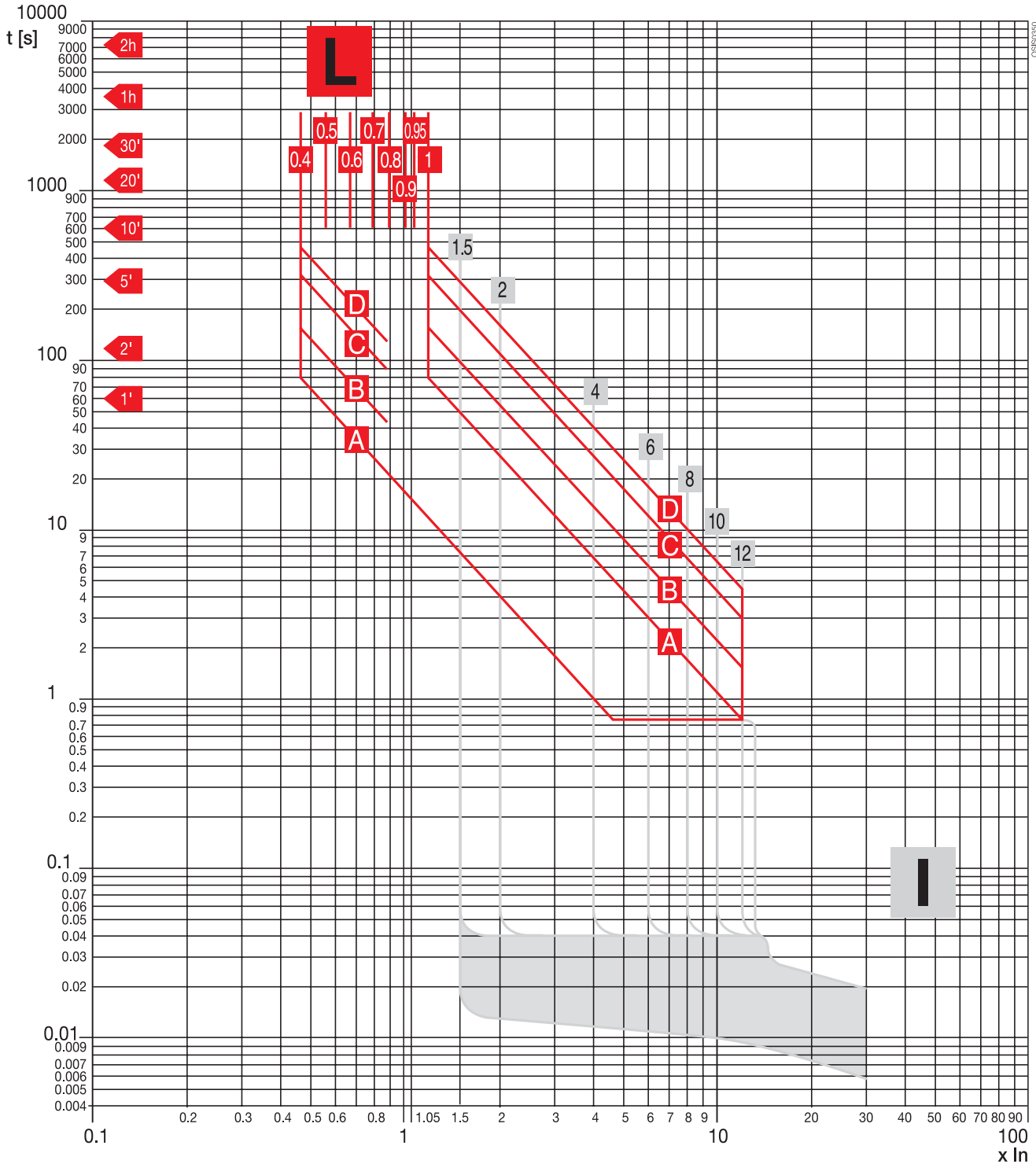


Protective releases

Microprocessor based overcurrent relays, PR211

Time-current curves, S4 – S7

Function L - I



15

Key

I_n = Rated current of current transformers
 t = Tripping time

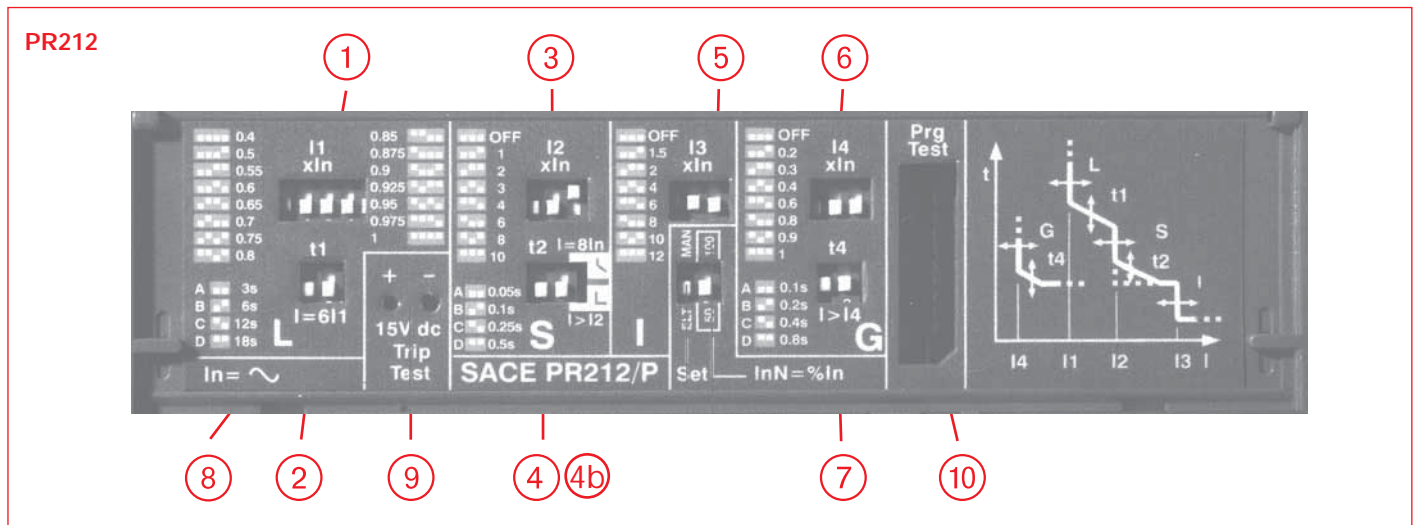
Protective releases

Microprocessor based overcurrent relays, PR212

Protection functions and set values, S4 – S8

Protection functions and set values

Protection against	Overload	Short-circuit	Short circuit	Earth fault
Trip	Long delay	Inverse or definite short delay	Instantaneous adjustable	Inverse short delay
Symbol	L	S	I	G ⊙
Set values (manual adjustment in steps)	$I1 = 0.4-0.5-0.55-0.6-0.65-0.7-0.75$ $0.8-0.85-0.875-0.9-0.925-0.95-0.975-1 \times I_n$ $t1 = 4 \text{ curves A - D}$	$I2 = 1-2-3-4-6-8-10$ $\text{OFF} \times I_n$ $t2 = 4 \text{ curves A - D}$	$I3 = 1.5-2-4-6-8-10-12$	$I4 = 0.2-0.3-0.4-0.7-0.8-0.9-1$ $t4 = 4 \text{ curves A - D}$
Set values (electronic adjustment)	$I1 = 0.4 - 1 \times I_n$ $t1 = 3 - 18\text{s}$	$I2 = 1 \dots 10 \text{ OFF} \times I_n$ $t2 = 0.05 - 0.5$	$I3 = 1.5-12 \text{ OFF} \times I_n$	$I4 = 0.2 - 1 \text{ OFF} \times I_n$ $t4 = 0.1 - 0.8\text{s}$



Key

- 1 Function L setting dip-switch (I1)
- 2 Function L trip time setting dip-switch (t1)
- 3 Function S setting dip-switch (I2)
- 4 Function S trip time setting dip-switch (t2)
- 4b Fixed/variable trip time selection dip-switch
- 5 Function I setting dip-switch (I3)
- 6 Function G setting dip-switch (I4)
- 7 Function G trip time setting dip-switch (t4)
- 8 Rated current of current transformers
- 9 15 V d.c. input for release functioning check
- 10 Socket for connecting SACE PR010/T test unit

⊙ S8 It = 0.2 - 0.4



Protective releases

Rated and setting currents, PR212

S4 – S8

Rated and setting currents

Circuit breaker	Current transformer	Functions			
		L (I1) A (0.4 – 1.0 x In)	S (I1) A (1 – 10 x In)	I (I3) A (1.5 – 12 x In)	G (I4) A (0.2 – 1 x In) / S8 (0.2 – 0.4)
S4 250	100	40 – 100	100 – .1000	150 – 1200	20 – 100
	250	100 – 250	250 – .2500	375 – 3000	50 – 250
S5 400	300	120 – 300	300 – .3000	450 – 3600	60 – 300
	400	160 – 400	400 – .4000	600 – 4800	80 – 400
S6 600	600	240 – 600	600 – .6000	900 – 7200	120 – 600
	800	320 – 800	800 – .8000	1200 – 9600	160 – 800
S7 1200	1000	400 – 1000	1000 – .10,000	1500 – 12,000	200 – 1000
	1200	480 – 1200	1200 – .12,000	1800 – 14,400	240 – 1200
	1600	640 – 1600	1600 – .16,000	2400 – 19,200	320 – 640
S8 1600 – 2500	2000	800 – 2000	2000 – .20,000	3000 – 24,000	400 – 800
	2500	1000 – 2500	2500 – .25,000	3750 – 30,000	500 – 1000

Key

- Iu** = Rated uninterrupted current of circuit-breaker
- In** = Rated current of current transformers
- I1** = Current setting value for relay overload protection
- I2** = Current setting value for relay short-circuit selective protection
- I3** = Current setting value for relay instantaneous short-circuit protection
- I4** = Current setting value for earth fault protection

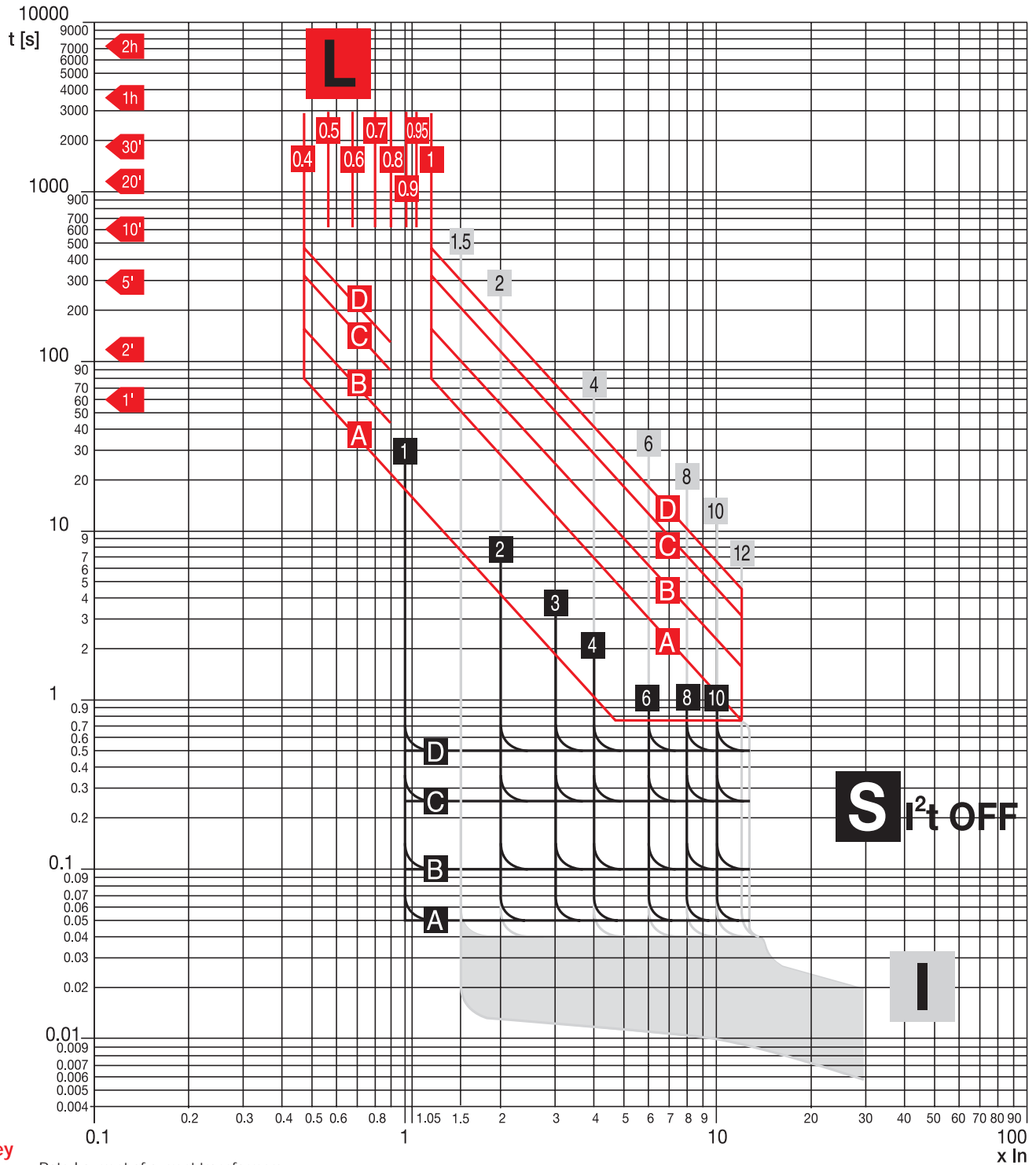
Protective releases

Microprocessor based overcurrent relays, PR212

Time-current curves, S4 – S8



Function L - S - I



Key
In = Rated current of current transformers
t = Tripping time

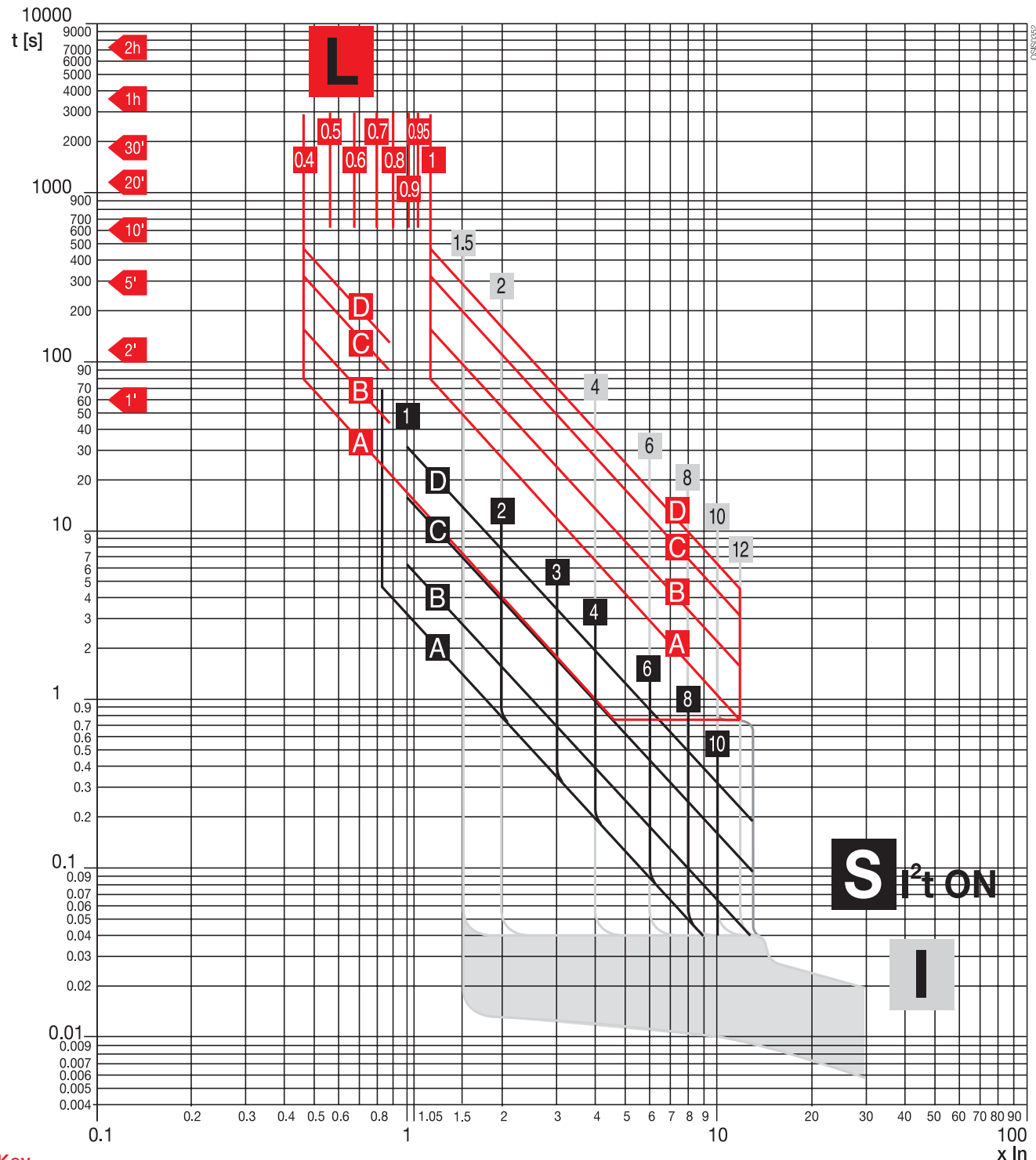


Protective releases

Microprocessor based overcurrent relays, PR212

Time-current curves, S4 – S8

Function L - S - I



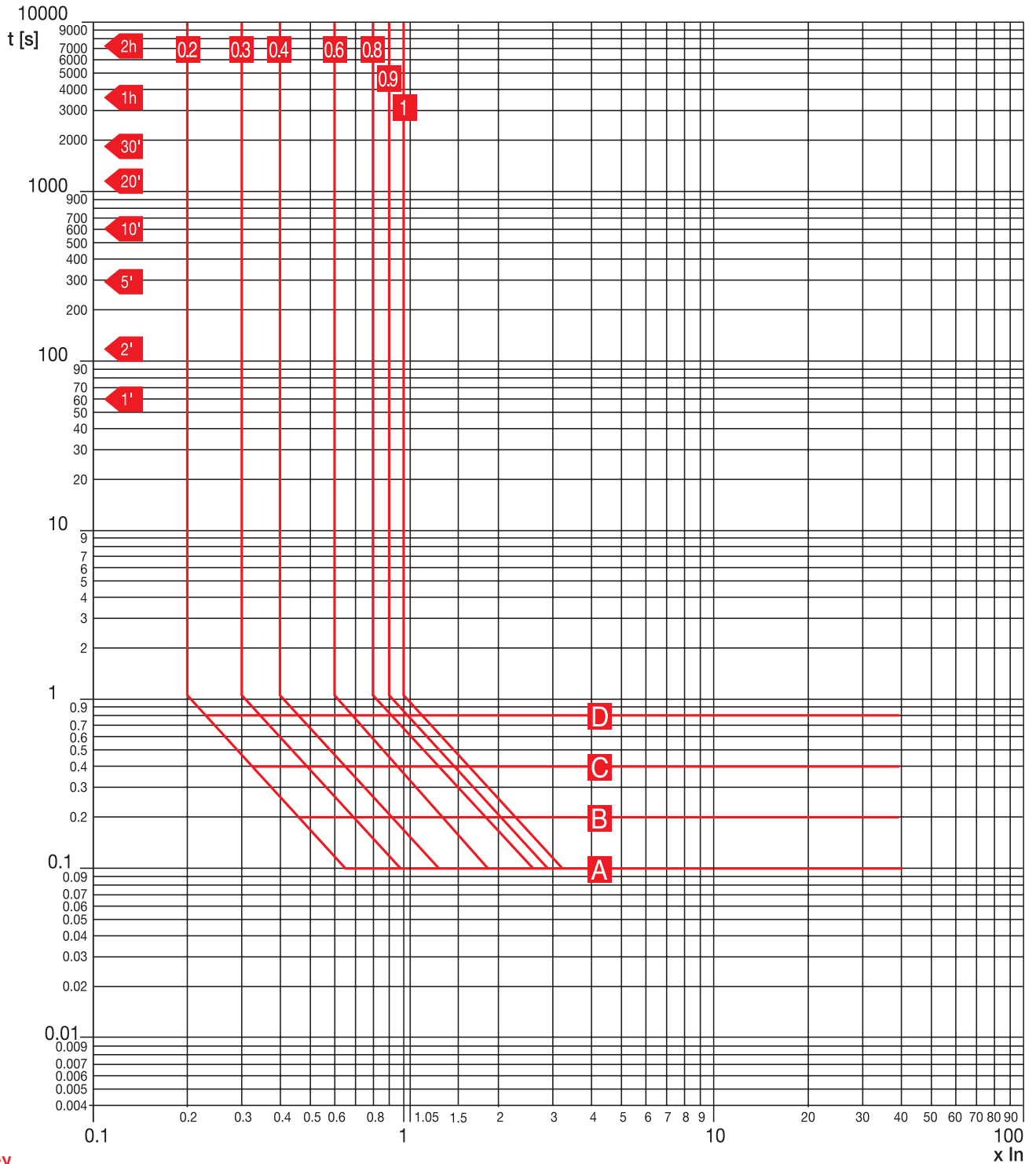
Protective releases

Microprocessor based overcurrent relays, PR212

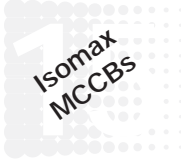
Time-current curves, S4 – S8



Function G[®]



① S8 maximum setting is 0.4 per NEC guidelines.



Motor horsepower ratings

Magnetic trip

1/2HP @ 575V to 100HP @ 575V

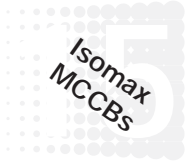
Horsepower per NEC 430-50				Motor full Load amps	Isomax Type	MCP Rating	Approximate trip setting % of MFLA						
208V	230V	460V	575V				1.5X	2X	4X	6X	8X	10X	12X
Magnetic trip						%	%	%	%	%	%	%	
			1/2	0.9	S3	3	—	—	1300	2000	2700	3400	4000
		1/2		1.1	S3	3	—	—	1100	1600	2200	3700	3300
			3/4	1.3	S3	3	—	—	900	1400	1800	2300	2800
		3/4		1.6	S3	3	—	—	800	1100	1500	1900	2300
			1	1.7	S3	3	—	—	700	1100	1400	1800	2100
		1		2.1	S3	5	—	—	1000	1400	1900	2400	2900
	1/2			2.2	S3	5	—	—	900	1400	1800	2300	2700
1/2			1 1/2	2.4	S3	5	—	—	800	1300	1700	2100	2500
			2	2.7	S3	5	—	—	700	1100	1500	1900	2200
		1 1/2		3	S3	5	—	—	700	1000	1300	1700	2000
	3/4			3.2	S3	5	—	—	600	900	1300	1600	1900
		2		3.4	S3	5	—	—	600	900	1200	1500	1800
3/4				3.5	S3	10	—	—	1100	1700	2300	2900	3400
			3	3.9	S3	10	—	—	1000	1500	2100	2600	3100
	1			4.2	S3	10	—	—	1000	1400	1900	2400	2900
1				4.6	S3	10	—	—	900	1300	1700	2200	2600
		3		4.8	S3	10	—	—	800	1300	1700	2100	2500
	1 1/2			6	S3	10	—	—	700	1000	1300	1700	2000
			5	6.1	S3	10	—	—	700	1000	1300	1600	2000
1 1/2				6.6	S3	10	—	—	600	900	1200	1500	1800
	2			6.8	S3	10	—	—	600	900	1200	1500	1800
				7.5	S3	25	—	—	1300	2000	2700	3300	4000
2		5		7.6	S3	25	—	—	1300	2000	2600	3300	3900
			7 1/2	9	S3	25	—	—	1100	1700	2200	2800	3300
	3			9.6	S3	25	—	—	1000	1600	2100	2600	3100
3				10.6	S3	25	—	—	900	1400	1900	2400	2800
		7 1/2	10	11	S3	25	—	—	900	1400	1800	2300	2700
		10		14	S3	25	—	—	700	1000	1400	1800	2100
	5			15.2	S3	25	—	—	700	1000	1300	1600	2000
5				16.7	S3	25	—	—	600	900	1200	1500	1800
			15	17	S3	25	—	—	600	900	1200	1500	1800
		15		21	S3	50	—	—	1000	1400	1900	2400	2800
7 1/2	7 1/2		20	22	S3	50	—	—	900	1400	1800	2300	2700
			25	27	S3	50	—	—	800	1200	1700	2100	2500
		20		27	S3	50	—	—	700	1100	1500	1900	2200
	10			28	S3	50	—	—	700	1100	1400	1800	2100
10				30.8	S3	50	—	—	600	1000	1300	1600	1900
			30	32	S3	50	—	—	600	900	1300	1600	1900
		25		34	S3	50	—	—	600	900	1200	1500	1800
		30		40	S3	100	—	—	1000	1500	2000	2500	3000
			40	41	S3	100	—	—	1000	1500	2000	2400	2900
	15			42	S3	100	—	—	1000	1400	1900	2400	2900
15				46.2	S3	100	—	—	900	1300	1700	2200	2600
		40	50	52	S3	100	—	—	800	1200	1500	1200	2300
	20			54	S3	100	—	—	700	1100	1500	1900	2200
20				59.4	S3	100	—	—	700	1000	1300	1700	2000
			60	62	S3	100	—	—	600	1000	1300	1600	1900
		50		65	S3	100	—	—	600	900	1200	1500	1800
	25			68	S3	100	—	—	600	900	1200	1500	1800
25				74.8	S3	150	—	—	800	1200	1600	2000	—
		60	75	77	S3	150	—	—	800	1200	1600	1900	—
	30			80	S3	150	—	—	800	1100	1500	1900	—
30				88	S3	150	—	—	700	1000	1400	1700	—
		75		96	S3	150	—	—	600	900	1300	1600	—
			100	99	S3	150	—	—	600	900	1200	1500	—

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Motor horsepower ratings

Electronic trip

40HP @ 230V to 500HP @ 460V



Horsepower per NEC 430-50				Motor full Load amps	Isomax Type	MCP Rating	Approximate trip setting % of MFLA						
208V	230V	460V	575V				1.5X	2X	4X	6X	8X	10X	12X
							Electronic trip						
							%	%	%	%	%	%	%
	40			104	S4	250	350	500	1000	1400	1900	2400	2900
40				114	S4	250	350	450	900	1300	1800	2200	2600
		100		124	S4	250	300	400	800	1200	1600	2000	2400
			125	125	S4	250	300	400	800	1200	1600	2000	2400
	50			130	S4	250	300	400	800	1200	1500	1900	2300
50				143	S4	250	250	350	700	1000	1400	1700	2100
			150	144	S4	250	250	350	700	1000	1400	1700	2100
	60			154	S4	250	250	300	600	1000	1300	1600	1900
		125		156	S4	250	250	300	600	1000	1300	1600	1900
60				169	S4	250	200	300	600	900	1200	1500	1800
		150		180	S5	400	350	450	900	1300	1800	2200	2700
	75			192	S5	400	300	400	800	1300	1700	2100	2500
75				211	S5	400	300	400	800	1100	1500	1900	2300
		200		240	S5	400	250	350	700	1000	1300	1700	2000
			250	242	S5	400	250	350	700	1000	1300	1700	2000
	100			248	S5	400	250	300	600	1000	1300	1600	1900
100				273	S6	600	350	450	900	1300	1800	2200	2600
			300	289	S6	600	300	400	800	1200	1700	2100	2500
		250		302	S6	600	300	400	800	1200	1600	2000	2400
	125			312	S6	600	300	400	800	1200	1500	1900	2300
			350	336	S6	600	250	350	700	1100	1400	1800	2100
125				343	S6	600	250	350	700	1100	1400	1700	2100
	150			360	S6	600	250	350	700	1000	1300	1700	2000
		300		361	S6	600	250	350	700	1000	1300	1700	2000
			400	362	S6	600	250	300	600	900	1300	1600	1900
150				396	S6	600	250	300	600	900	1200	1500	1800
			450	412	S6	800	300	400	800	1200	1600	1900	2300
		350		414	S6	800	300	400	800	1200	1600	1900	2300
			500	472	S6	800	250	350	700	1000	1400	1700	2000
		400		477	S6	800	250	350	700	1000	1300	1700	2000
	200			480	S6	800	250	350	700	1000	1300	1700	2000
		450		515	S6	800	250	300	600	900	1200	1600	1900
200				528	S6	800	250	300	600	900	1200	1500	1800
		500		590	S7	1000	250	350	700	1000	1400	1700	2000



Notes

Emax power breakers 16.1 - 16.64

Accessories 16.29 - 16.31

Air circuit breakers 16.26 - 16.28

Current transformers 16.29

Electronic time delay 16.31

Emax breakers, IEC 16.18 - 16.25

Emax breakers, UL 16.6 - 16.13

General information, IEC 16.14 - 16.17

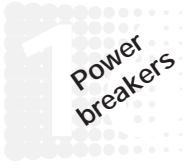
General information, UL 16.1 - 16.5

Mechanical interlocks 16.30

Spare parts 16.31

Test kits 16.31

Transparent front cover 16.31



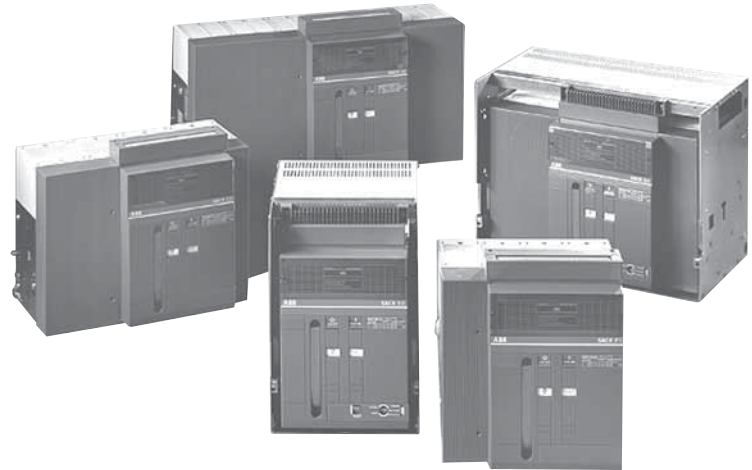
Notes

Emax

Power breakers



Emax power breakers



ABB's Emax series of low voltage power circuit breakers embodies over half a century's experience and technological development in power circuit breakers. The Emax offers a series of breakers that is totally innovative in its technological design, ease of installation and use, making it the ideal solution for the growing requirements of designers, switchboard and switchgear manufacturers, installers, OEMs and users.

The Emax power circuit breakers are UL Listed and meet the ANSI Standard for low voltage power circuit breakers.

ABB Emax power circuit breakers are available in five different models (four sizes) with rated continuous current from 800A to 5000A and rated short-circuit current range from 42kA to 125kA (480V).

Technical catalog 1SDC200003 D0201 is available upon request.

General information

UL general ratings and specifications



E1



E2



E3

Circuit breaker type			E1	E2		E3			
Performance level			B-A	B-A	N-A	N-A	S-A	H-A	V-A
Rated continuous current, UL1066	A		800	1600	1200	2000	1200	1200	1200
File # E194191	A		1200	—	1600	2500	1600	1600	1600
	A		—	—	—	—	2000	2000	2000
	A		—	—	—	—	2500	2500	2500
Rated short circuit current	240VAC	kA	42	42	65	65	85	85	100
	480VAC	kA	42	42	50	50	65	85	100
	600VAC	kA	35	42	50	50	65	65	85
Rated short time current		kA	35	42	50	50	65	65	65
Trip units									
PR111/P-A			•	•	•	•	•	•	•
PR112/P-A			•	•	•	•	•	•	•
Operation times									
Make time (max)	ms		80	80	80	80	80	80	80
Break time (<ST current)(max)	ms		70	70	70	70	70	70	70
Break time (>ST current)(max)	ms		30	30	30	30	30	30	30
Overall dimensions, 3 pole									
Fixed:	H=418mm / 16.46in D=302mm / 11.89in W (3 poles)	mm/in	296/11.65	296/11.65		404/15.91			
Drawout:	H=461mm / 18.15in D=396.5mm / 15.61in W (3 poles)	mm/in	324/12.76	324/12.76		432/17.01			
Weights (CB with releases, RH terminals and CTs, accessories excluded)									
Fixed 3 pole	Kg/lbs		42/93	46/101		68/150			
Drawout 3 pole	Kg/lbs		65/143	72/159		100/220			
Overall dimensions, 4 pole									
Fixed:	H=418mm / 16.46in D=302mm / 11.89in W (4 poles)	mm/in	386/15.20	386/15.20		530/20.87			
Drawout:	H=461mm / 18.15in D=396.5mm / 15.61in W (4 poles)	mm/in	414/16.30	414/16.30		558/21.97			
Weights (CB with releases, RH terminals and CTs, accessories excluded)									
Fixed 4 pole	Kg/lbs		50/110	55/121		80/176			
Drawout 4 pole	Kg/lbs		80/176	89/196		125/275			

Specifications common to the entire range

Rated max voltage	635VAC
Rated voltage	600VAC
Test voltage (1min 50/60Hz)	2.2kV
Frequency	50-60Hz
Service temperature	-5... +70°C
Storage temperature	-40... +70°C
Number of poles	3/4
Versions	Fixed/Drawout

General information

UL general ratings and specifications



E4



E6

Circuit breaker type			E4			E6	
Performance level			S-A	H-A	V-A	H-A	V-A
Rated continuous current, UL 1066 File # E194191	A		3200	3200	3200	4000	4000
	A		3600	3600	3600	5000	5000
	A		—	—	—	—	—
	A		—	—	—	—	—
Rated short circuit current	240VAC	kA	85	100	100	125	125
	480VAC	kA	65	85	100	85	125
	600VAC	kA	65	85	85	85	85
Rated short time current		kA	65	85	85	100	100
Trip units							
PR111/P-A			•	•	•	•	•
PR112/P-A			•	•	•	•	•
Operation times							
Make time (max)		ms	80	80	80	80	80
Break time (I<ST current)(max)		ms	70	70	70	70	70
Break time (I>ST current)(max)		ms	30	30	30	30	30
Overall dimensions, 3 pole							
Fixed:	H=418mm / 16.46in	mm/in	566/22.28			782/30.79	
	D=302mm / 11.89in						
	W (3 poles)						
Drawout:	H=461mm / 18.15in	mm/in	594/23.39			810/31.89	
	D=396.5 / 15.61in						
	W (3 poles)						
Weights (CB with releases, RH terminals and CTs, accessories excluded)							
Fixed 3 poles		Kg/lbs	95/209			140/309	
Drawout 3 poles		Kg/lbs	147/324			210/463	
Overall dimensions, 4 pole							
Fixed:	H=418mm / 16.46in	mm/in	656/25.83			908/35.75	
	D=302mm / 11.89in						
	W (4 poles)						
Drawout:	H=461mm / 18.15in	mm/in	684/26.93			936/36.85	
	D=396.5 / 15.61in						
	W (4 poles)						
Weights (CB with releases, RH terminals and CTs, accessories excluded)							
Fixed 4 pole		Kg/lbs	115/253			170/374	
Drawout 4 pole		Kg/lbs	190/418			260/573	

Specifications common to the entire range

Rated max voltage	635VAC
Rated voltage	600VAC
Test voltage (1min 50/60Hz)	2.2kV
Frequency	50-60Hz
Number of poles	3/4
Versions	Fixed/Drawout

General information

Catalog number information

Emax breaker, UL

E 1 S 16 X X X X X X X X X X

Accessories: X = none
 A = mechanical counter
 B = button guard
 F = A & B

Accessories: X = none
 A = mechanical trip indicator
 B = mechanical trip indicator & bell alarm
 C = padlock provision (open)
 D = keylock (open)
 E = position lock
 F = access pos. lock
 G = A & C
 H = A & D
 J = A & E
 K = A & F
 L = A, C & E
 M = A, C & F
 N = B & C
 P = B & D
 Q = B & E
 R = B & F
 S = B, C & E
 T = B, C & F
 U = C & E
 V = C & F
 W = D & E
 Y = D & F

Undervoltage trip: 0 = none
 50/60Hz & VDC: A = 24VDC, B = 30V, C = 48V, D = 60V, E = 110 - 120V, F = 125 - 127V, G = 220 - 240V, H = 250V, J = 380 - 400VAC, K = 440 - 480VAC
 Second shunt trip: L = 24VDC, M = 30V, N = 48V, P = 60V, Q = 110 - 120V, R = 125 - 127V, S = 220 - 240V, T = 250V, U = 380 - 400VAC, V = 440 - 480VAC

Shunt trip: 0 = none
 50/60Hz & VDC: A = 24VDC, B = 30V, C = 48V, D = 60V, E = 110 - 120V, F = 125 - 127V, G = 220 - 240V, H = 250V, J = 380 - 400VAC, K = 440 - 480VAC

Spring charging motor: (includes spring charged signal, P/N does not show)
 0 = none, A = 24 - 30VAC/VDC, B = 48 - 60VAC/VDC, C = 110-130VAC/VDC, D = 220 - 250VAC/VDC, E = spring charged signal only

Contacts:
 A = 4 aux, B = 10 aux, C = 15 aux, D = UV energ. N.O.
 E = UV energ. NC, F = A & D, G = A & E, H = B & D
 J = B & E, K = C & D, L = C & E

Closing coil: 0 = none
 50/60Hz & VDC: A = 24VDC, B = 30, C = 48, D = 60, E = 110 - 120, F = 125 - 127, G = 220 - 240, H = 250, J = 380 - 400VAC, K = 440 - 480VAC

Terminal types: (1st letter is upper terminal, 2nd letter is lower terminal)
 H = rear horz ②, V = rear vert. ①
 H = HH, V = VV
 A = HV, B = VH

Trip unit: A = PR111/P, LI, B = PR111/P, LSI, C = PR111/P, LSI G
 D = non-automatic, E = PR112/P, LSI, F = PR112/P, LSI
 G = PR112/PD, LSI, H = PR112/PD, LSI G, N = PR113/P
 P = PR113/PD

Version: B = fixed breaker, UL; D = withdrawable breaker, UL, less cradle

Max. ampere rating: 02 = 250, 04 = 400, 08 = 800, 10 = 1000, 12 = 1200, 16 = 1600, 20 = 2000, 25 = 2500, 32 = 3200, 36 = 3600, 40 = 4000, 50 = 5000

Breaking capacity: B = basic, N = normal, S = standard, H = high, V = very high

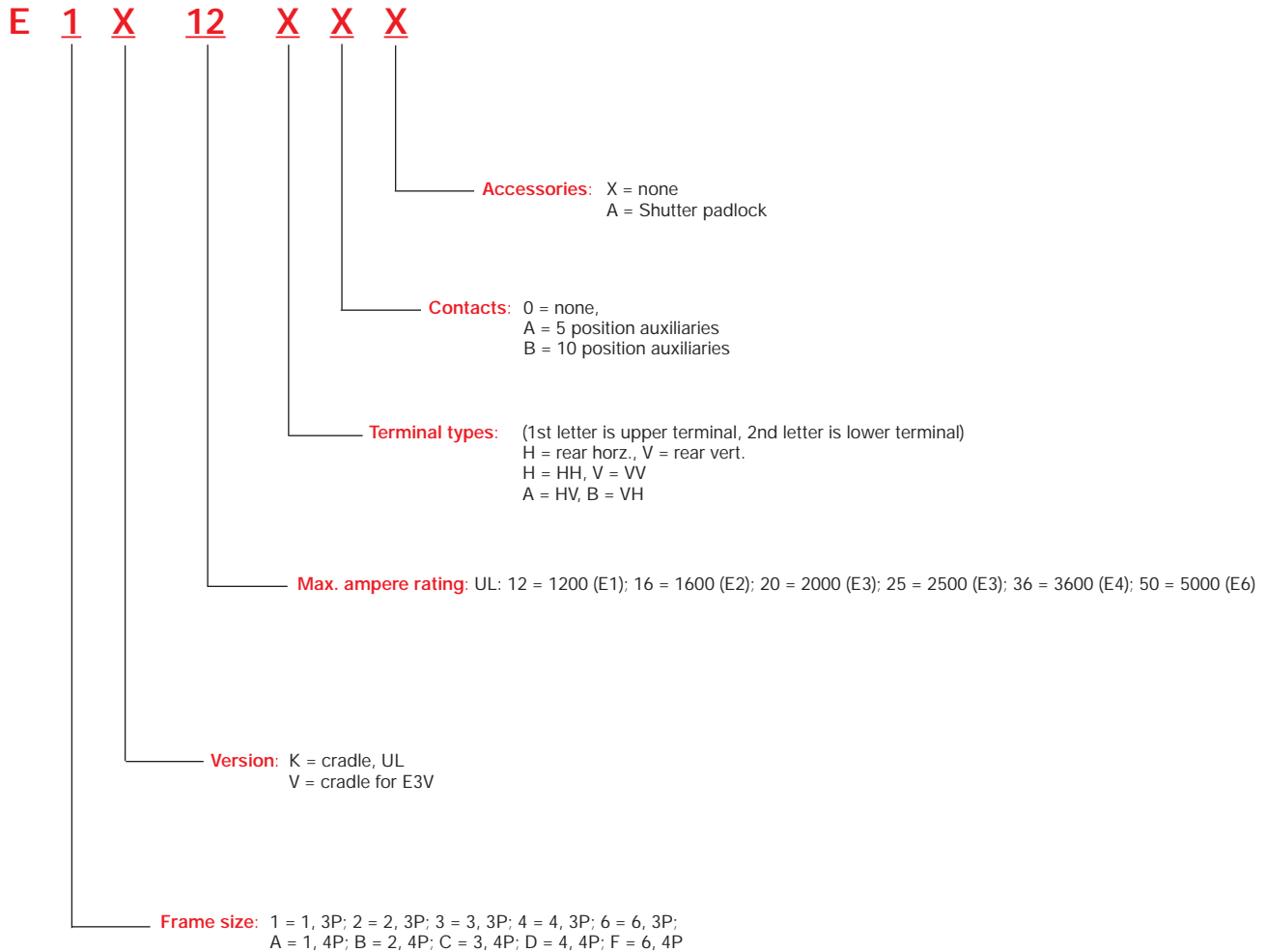
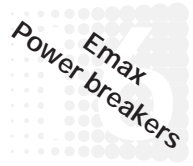
Frame size: 1 = 1, 3P; 2 = 2, 3P; 3 = 3, 3P; 4 = 4, 3P; 6 = 6, 3P; A = 1, 4P; B = 2, 4P; C = 3, 4P; D = 4, 4P; F = 6, 4P

① Will be shipped separately.
 ② For withdrawable breakers, use "H".
 ③ Not available with PR112 trip units. External 15A auxiliary kit can be used.

General information

Catalog number information

Emax, cradle (fixed part) UL



General information

Standard features

Fixed breaker		Drawout breaker	
Manual operated	Electrically operated	Manual operated	Electrically operated
T.U. — PR111/P, LI Aux. SW., 4 Spring charged indicator Flange Accessory support Terminal block Lifting plate	T.U — PR111/P, LI Motor operator Closing coil Shunt trip Aux. SW., 4 Spring charged indicator Flange Accessory support Terminal block Lifting plate	T.U. — PR111/P, LI Aux. SW., 4 Spring charged indicator Flange Crank Accessory support Sliding contacts Anti-insertion lock Lifting plate	T.U. — PR111/P, LI Motor operator Closing coil Shunt trip Aux. SW., 4 Spring charged indicator Flange Crank Accessory support Sliding contacts Anti-insertion lock Lifting plate

NOTE: Switches provided standard without 4 auxiliary contacts.

Fixed breakers, 3 pole UL

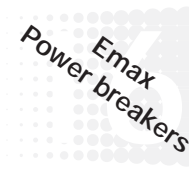
Fixed breakers

Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Manually operated	Electrically operated	Set of three vertical terminals
E1B-A08	800	42	\$ 6815	\$ 9176	\$ 644
E1B-A12	1200	42	7321	9682	644
E2N-A12	1200	50	7819	10,180	690
E3S-A12	1200	65	8780	11,141	790
E3H-A12	1200	85	9048	11,409	790
E3V-A12	1200	100	9953	12,314	790
E2B-A16	1600	42	7871	10,232	690
E2N-A16	1600	50	9082	11,443	690
E3S-A16	1600	65	9797	12,158	790
E3H-A16	1600	85	10,352	12,713	790
E3V-A16	1600	100	11,387	13,748	790
E3N-A20	2000	50	10,032	12,393	790
E3S-A20	2000	65	11,053	13,414	790
E3H-A20	2000	85	13,602	15,963	790
E3V-A20	2000	100	14,962	17,323	790
E3N-A25	2500	50	14,778	17,139	790
E3S-A25	2500	65	16,451	18,812	790
E3H-A25	2500	85	17,708	20,069	790
E3V-A25	2500	100	19,479	21,840	790
E4S-A32	3200	65	21,102	23,463	1664
E4H-A32	3200	85	21,566	23,927	1664
E4V-A32	3200	100	24,047	26,408	1664
E4S-A36	3600	65	23,939	26,300	1664
E4H-A36	3600	85	27,302	29,663	1664
E4V-A36	3600	100	28,666	31,027	1664
E6H-A40	4000	85	31,528	33,889	2783
E6V-A40	4000	125	43,932	46,293	2783
E6H-A50	5000	85	43,221	45,582	2783
E6V-A50	5000	125	51,684	54,045	2783

Standard features – manually operated UL breaker

- Rear horizontal terminals
- PR111 trip unit with LI protection functions
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open/closed position indication
- Lifting plates
- Current transformers
- Terminal box

Fixed breakers, 4 pole UL



Fixed breakers

Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Manually operated	Electrically operated	Set of four vertical terminals
E1B-A08	800	42	\$ 9200	\$ 11,561	\$ 837
E1B-A12	1200	42	9883	12,244	837
E2N-A12	1200	50	10,556	12,917	897
E3S-A12	1200	65	11,853	14,214	1027
E3H-A12	1200	85	12,215	14,576	1027
E3V-A12	1200	100	13,436	15,797	1027
E2B-A16	1600	42	10,626	12,987	897
E2N-A16	1600	50	12,261	14,622	897
E3S-A16	1600	65	13,226	15,587	1027
E3H-A16	1600	85	13,975	16,336	1027
E3V-A16	1600	100	15,373	17,734	1027
E3N-A20	2000	50	13,543	15,904	1027
E3S-A20	2000	65	14,922	17,283	1027
E3H-A20	2000	85	18,363	20,724	1027
E3V-A20	2000	100	20,199	22,560	1027
E3N-A25	2500	50	19,950	22,311	1027
E3S-A25	2500	65	22,209	24,570	1027
E3H-A25	2500	85	23,906	26,267	1027
E3V-A25	2500	100	26,296	28,657	1027
E4S-A32	3200	65	28,488	30,849	2163
E4H-A32	3200	85	29,114	31,475	2163
E4V-A32	3200	100	32,463	34,824	2163
E4S-A36	3600	65	32,318	34,679	2163
E4H-A36	3600	85	36,858	39,219	2163
E4V-A36	3600	100	38,699	41,060	2163
E6H-A40	4000	85	42,563	44,924	3618
E6V-A40	4000	125	59,308	61,669	3618
E6H-A50	5000	85	58,348	60,709	3618
E6V-A50	5000	125	69,773	72,134	3618

Standard features – manually operated UL breaker

- Rear horizontal terminals
- PR111 trip unit with LI protection functions
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open/closed position indication
- Lifting plates
- Current transformers
- Terminal box

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating

Withdrawable breakers, 3 pole UL

Withdrawable breakers

Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Moving part only		Fixed part only	
			Manually operated	Electrically operated	RH terminals	Set of three vertical terminals
E1B-A08	800	42	\$ 7383	\$ 9744	\$ 2281	\$ 644
E1B-A12	1200	42	8375	10,736	2281	644
E2N-A12	1200	50	8814	11,175	2400	690
E3S-A12	1200	65	9220	11,581	2925	790
E3H-A12	1200	85	9633	11,994	2925	790
E3V-A12	1200	100	10,596	12,957	2925	790
E2B-A16	1600	42	9320	11,681	2400	690
E2N-A16	1600	50	10,483	12,844	2400	690
E3S-A16	1600	65	10,931	13,292	2925	790
E3H-A16	1600	85	11,445	13,806	2925	790
E3V-A16	1600	100	12,590	14,951	2925	790
E3N-A20	2000	50	11,386	13,747	2925	790
E3S-A20	2000	65	12,700	15,061	2925	790
E3H-A20	2000	85	14,262	16,623	2925	790
E3V-A20	2000	100	15,688	18,049	2925	790
E3N-A25	2500	50	17,767	20,128	2925	790
E3S-A25	2500	65	20,315	22,676	2925	790
E3H-A25	2500	85	22,622	24,983	2925	790
E3V-A25	2500	100	24,884	27,245	2925	790
E4S-A32	3200	65	23,800	26,161	6259	1664
E4H-A32	3200	85	24,447	26,808	6259	1664
E4V-A32	3200	100	25,863	28,224	6259	1664
E4S-A36	3600	65	26,863	29,224	6259	1664
E4H-A36	3600	85	30,865	33,226	6259	1664
E4V-A36	3600	100	31,948	34,309	6259	1664
E6H-A40	4000	85	34,676	37,037	7398	2783
E6V-A40	4000	125	46,570	48,931	7398	2783
E6H-A50	5000	85	46,402	48,763	7398	2783
E6V-A50	5000	125	57,078	59,439	7398	2783

Standard features – electrically operated breaker

Moving part

- PR111 trip unit with LI protection feature
- Spring charging motor
- Shunt trip
- Closing coil
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open-closed position indication
- Lifting plates
- Current transformers
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts
- Fail safe device (not available with YU)

Standard features – electrically operated breaker

Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Withdrawable breakers, 4 pole UL



Withdrawable breakers

Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Moving part only		Fixed part only	
			Manually operated	Electrically operated	RH terminals	Set of four vertical terminals
E1B-A08	800	42	\$ 9967	\$ 12,328	\$ 3079	\$ 837
E1B-A12	1200	42	11,306	13,667	3079	837
E2N-A12	1200	50	11,899	14,260	3240	897
E3S-A12	1200	65	12,447	14,808	3949	1027
E3H-A12	1200	85	13,005	15,366	3949	1027
E3V-A12	1200	100	14,305	16,666	3949	1027
E2B-A16	1600	42	12,582	14,943	3240	897
E2N-A16	1600	50	14,152	16,513	3240	897
E3S-A16	1600	65	14,757	17,118	3949	1027
E3H-A16	1600	85	15,451	17,812	3949	1027
E3V-A16	1600	100	16,996	19,357	3949	1027
E3N-A20	2000	50	15,371	17,732	3949	1027
E3S-A20	2000	65	17,145	19,506	3949	1027
E3H-A20	2000	85	19,254	21,615	3949	1027
E3V-A20	2000	100	21,179	23,540	3949	1027
E3N-A25	2500	50	23,985	26,346	3949	1027
E3S-A25	2500	65	27,425	29,786	3949	1027
E3H-A25	2500	85	30,540	32,901	3949	1027
E3V-A25	2500	100	33,594	35,955	3949	1027
E4S-A32	3200	65	32,130	34,491	8450	2163
E4H-A32	3200	85	33,003	35,364	8450	2163
E4V-A32	3200	100	34,915	37,276	8450	2163
E4S-A36	3600	65	36,265	38,626	8450	2163
E4H-A36	3600	85	41,668	44,029	8450	2163
E4V-A36	3600	100	43,130	45,491	8450	2163
E6H-A40	4000	85	46,813	49,174	9987	3618
E6V-A40	4000	125	62,870	65,231	9987	3618
E6H-A50	5000	85	62,643	65,004	9987	3618
E6V-A50	5000	125	77,055	79,416	9987	3618

Standard features – electrically operated breaker Moving part

- PR111 trip unit with LI protection feature
- Spring charging motor
- Shunt trip
- Closing coil
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open-closed position indication
- Lifting plates
- Current transformers
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts
- Fail safe device (not available with YU)

Standard features – electrically operated breaker Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating

Non-automatic air circuit breakers

Fixed switches (without trip unit & c.t.s.), 3 pole UL

Fixed switches

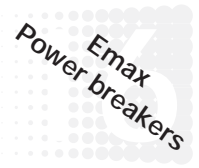
Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Manually operated	Electrically operated	Set of three vertical terminals
E1B-A/MS08	800	42	\$ 5086	\$ 7447	\$ 644
E1B-A/MS12	1200	42	5592	7953	644
E2N-A/MS12	1200	50	6090	8451	690
E3S-A/MS12	1200	65	6944	9305	790
E2B-A/MS16	1600	42	6142	8503	690
E2N-A/MS16	1600	50	7353	9714	690
E3S-A/MS16	1600	65	7961	10,322	790
E3N-A/MS20	2000	50	8196	10,557	790
E3S-A/MS20	2000	65	9217	11,578	790
E3N-A/MS25	2500	50	12,942	15,303	790
E3S-A/MS25	2500	65	14,615	16,976	790
E4S-A/MS32	3200	65	18,733	21,094	1664
E4H-A/MS32	3200	85	19,197	21,558	1664
E4S-A/MS36	3600	65	21,570	23,931	1664
E4H-A/MS36	3600	85	24,933	27,294	1664
E6H-A/MS40	4000	85	28,946	31,307	2783
E6H-A/MS50	5000	85	40,639	43,000	2783

Standard features – manually operated UL switch

- Rear horizontal terminals
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Terminal box

Non-automatic air circuit breakers

Fixed switches (without trip unit & c.t.s.), 4 pole UL



Fixed switches

Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Manually operated	Electrically operated	Set of four vertical terminals
E1B-A/MS08	800	42	\$ 6866	\$ 9227	\$ 644
E1B-A/MS12	1200	42	7549	9910	644
E2N-A/MS12	1200	50	8222	10,583	690
E3S-A/MS12	1200	65	9374	11,735	790
E2B-A/MS16	1600	42	8292	10,653	690
E2N-A/MS16	1600	50	9927	12,288	690
E3S-A/MS16	1600	65	10,747	13,108	790
E3N-A/MS20	2000	50	11,065	13,426	790
E3S-A/MS20	2000	65	12,443	14,804	790
E3N-A/MS25	2500	50	17,472	19,833	790
E3S-A/MS25	2500	65	19,730	22,091	790
E4S-A/MS32	3200	65	25,290	27,651	1664
E4H-A/MS32	3200	85	25,916	28,277	1664
E4S-A/MS36	3600	65	29,120	31,481	1664
E4H-A/MS36	3600	85	33,660	36,021	1664
E6H-A/MS40	4000	85	39,077	41,438	2783
E6H-A/MS50	5000	85	54,863	57,224	2783

Standard features – manually operated UL switch

- Rear horizontal terminals
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Terminal box

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating

Non-automatic air circuit breakers

Withdrawable switches (without trip unit & c.t.s.), 3 pole UL

Withdrawable switches

Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Moving part only		Fixed part only	
			Manually operated	Electrically operated	RH terminals	Set of three vertical terminals
E1B-A/MS08	800	42	\$ 5654	\$ 8015	\$ 2281	\$ 644
E1B-A/MS12	1200	42	6646	9007	2281	644
E2N-A/MS12	1200	50	7085	9446	2400	690
E3S-A/MS12	1200	65	7384	9745	2925	790
E2B-A/MS16	1600	42	7591	9952	2400	690
E2N-A/MS16	1600	50	8754	11,115	2400	690
E3S-A/MS16	1600	65	9095	11,456	2925	790
E3N-A/MS20	2000	50	9550	11,911	2925	790
E3S-A/MS20	2000	65	10,864	13,225	2925	790
E3N-A/MS25	2500	50	15,931	18,292	2925	790
E3S-A/MS25	2500	65	18,479	20,840	2925	790
E4S-A/MS32	3200	65	21,431	23,792	6259	1664
E4H-A/MS32	3200	85	22,078	24,439	6259	1664
E4S-A/MS36	3600	65	24,494	26,855	6259	1664
E4H-A/MS36	3600	85	28,496	30,857	6259	1664
E6H-A/MS40	4000	85	32,094	34,455	7398	2783
E6H-A/MS50	5000	85	43,820	46,181	7398	2783

Standard features – manually operated switch

Moving part

- Manual mechanical close and open pushbuttons
- Circuit breaker open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts
- Fail-safe device (not available with YU)

Standard features – manually operated switch

Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Non-automatic air circuit breakers

Withdrawable switches (without trip unit & c.t.s.), 4 pole

UL



Withdrawable switches

Circuit breaker type	Frame amps	Interrupting ratings kA, 480V	Moving part only		Fixed part only	
			Manually operated	Electrically operated	RH terminals	Set of four vertical terminals
E1B-A/MS08	800	42	\$ 7633	\$ 9994	\$ 3079	\$ 837
E1B-A/MS12	1200	42	8972	11,333	3079	837
E2N-A/MS12	1200	50	9565	11,926	3240	897
E3S-A/MS12	1200	65	9968	12,329	3949	1027
E2B-A/MS16	1600	42	10,248	12,609	3240	897
E2N-A/MS16	1600	50	11,818	14,179	3240	897
E3S-A/MS16	1600	65	12,278	14,639	3949	1027
E3N-A/MS20	2000	50	12,893	15,254	3949	1027
E3S-A/MS20	2000	65	14,666	17,027	3949	1027
E3N-A/MS25	2500	50	21,507	23,868	3949	1027
E3S-A/MS25	2500	65	24,947	27,308	3949	1027
E4S-A/MS32	3200	65	28,932	31,293	8450	2163
E4H-A/MS32	3200	85	29,805	32,166	8450	2163
E4S-A/MS36	3600	65	33,067	35,428	8450	2163
E4H-A/MS36	3600	85	38,470	40,831	8450	2163
E6H-A/MS40	4000	85	43,327	45,688	9987	3618
E6H-A/MS50	5000	85	59,157	61,518	9987	3618

Standard features – manually operated switch

Moving part

- Manual mechanical close and open pushbuttons
- Circuit breaker open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts
- Fail-safe device (not available with YU)

Standard features – manually operated switches

Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating

General information

IEC general ratings and specifications ②



E1



E2



E3



E4

Circuit breaker type		E1			E2			E3				
		B			B	N	L	N	S	H	L	
Performance level		B			B	N	L	N	S	H	L	
Rated uninterrupted current (at 40°C) I_u breaking capacity	A	800	1600	1250	1250	2500	1250	1250	2000			
	A	1250	2000	1600	1600	3200	1600	1600	2500			
	A	—	—	2000	—	—	—	2000	2000	—	—	
	A	—	—	—	—	—	—	2500	2500	—	—	
	A	—	—	—	—	—	—	3200	3200	—	—	
Capacity of neutral pole on four-pole circuit breakers	% I_u	100	100	100	100	100	100	100	100	100	100	
Rated ultimate short-circuit breaking capacity	I_{cu} 220/230/380/400/415V- 440V-	kA	40	40	65	130	65	75	100	130		
	500/660/690V-	kA	40	40	65	110	65	75	100	110		
	600V-	kA	36	40	55	85	65	75	85	85		
	250V— (switches)	kA	—	—	—	—	—	—	100	—	—	
	250V— (switches)	kA	36	40	55	—	65	75	75	—	—	
Rated duty short-circuit breaking capacity	I_{cs} 220/230/380/400/415V- 440V-	kA	40	40	65	130	65	75	85	130		
	500/660/690V-	kA	40	40	65	110	65	75	85	110		
	600V-	kA	36	40	55	85	65	75	85	65		
	250V— (switches)	kA	—	—	—	—	—	—	—	—	—	
	250V— (switches)	kA	36	40	55	—	65	75	75	—	—	
Rated short-time withstand current	I_{cw} (1S) kA	36	40	55	10	65	75	75	75	15		
Rated short-circuit making capacity (peak value)	I_{cm} 220/230//380/400/415V- 440V-	kA	84	84	143	286	143	165	220	286		
	500/660/690V-	kA	84	84	143	242	143	165	220	242		
	500/660/690V-	kA	75.6	84	121	187	143	165	187	187		
Utilization category (in accordance with CEI EN 60947-2)		B			B	B	A	B	B	B	A	
Isolation behavior (in accordance with CEI EN 60947-2)		•			•	•	•	•	•	•	•	
Overcurrent protection		•			•	•	•	•	•	•	•	
Microprocessor-based releases for a.c. applications		•			•	•	•	•	•	•	•	
Operating time												
Closing time (max) Break time for $I < I_{cw}$ (max) ① Break time for $I > I_{cw}$ (max)	ms	80	80	80	80	80	80	80	80	80		
	ms	70	70	70	70	70	70	70	70	70		
	ms	30	30	30	12	30	30	30	30	12		
Dimensions												
Fixed:	H=418mm D=302mm L(3/4 poli)=	mm	296/386			296/386			404/530			
Withdrawable:	H=461mm D=396.5mm L(3/4 poli)=	mm	324/414			324/414			432/558			
Weights												
(circuit-breaker complete with releases and CT, excluding accessories)												
Fixed 3/4 pole	kg	42/50	46/55	46/55	45/53	68/80	68/80	68/80	67/79			
Withdrawable 3/4 pole (including fixed part)	kg	65/80	72/89	72/89	70/87	100/125	100/125	100/125	100/120			

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Circuit-breaker type		E1B		E2 B-N			E2L		E3 N-S-H				
Rated uninterrupted current (at 40°C)	I_u A	800	1250	1250	1600	2000	1250	1600	1250	1600	2000	2500	3200
Mechanical life with regular routine maintenance	No. operations x 1000	25	25	25	25	25	20	20	20	20	20	20	20
	Frequency f Operations per hour	60	60	60	60	60	60	60	60	60	60	60	60
Electrical life (440V-)	No. operations x 1000	10	10	15	12	10	4	3	12	10	9	8	6
	Frequency f Operations per hour	30	30	30	30	30	20	20	20	20	20	20	20

① Without intentional delays.
② Consult factory for drawings.

General information

IEC general ratings and specifications



E6

Specifications common to the entire range

Voltages		
Rated service voltage	Ue	690~ / 250- V
Rated insulation voltage	Ui	1000 V
Rated impulse withstand voltage	Uimp	12 kV
Service temperature		-5 ... +70 °C
Storage temperature		-40 ... +70 °C
Frequency	f	50-60 Hz
Number of poles		3-4
Versions		Fixed / Withdrawable

Circuit breaker type			E4		E6	
Performance level			S	H	H	V
Rated uninterrupted current (at 40°C) I _u	A		4000	3200	5000	3200
	A		—	4000	6300	4000
	A		—	—	—	5000
	A		—	—	—	6300
	A		—	—	—	—
Capacity of neutral poles on four-pole circuit breakers	%I _u		50	50	50	50
Rated ultimate short-circuit breaking capacity	I _{cu} 220/230/380/400/415V-	kA	75	100	100	150
	440V-	kA	75	100	100	150
	500/660/690V-	kA	75	85	75	85
	600V-	kA	—	100	—	—
	250V— (switches)	kA	75	100	100	100
Rated duty short-circuit breaking capacity	I _{cs} 220/230/380/400/415V-	kA	75	100	100	125
	440V-	kA	75	100	100	125
	500/660/690V-	kA	75	85	100	100
	250V— (switches)	kA	75	100	100	100
Rated short-time withstand current	I _{cw}	(1S)kA	75	100	100	100
Rated short-circuit making capacity (peak value)	I _{cm} 220/230/380/400/415V-	kA	165	220	220	330
	440V-	kA	165	220	220	330
	500/660/690V-	kA	165	187	165	187
Utilization category (in accordance with CEI EN 60947-2)			B	B	B	B
Isolation behavior (in accordance with CEI EN 60947-2)			•	•	•	•
Overcurrent protection						
Microprocessor-based releases for a.c. applications			•	•	•	•
Operating time						
Closing time (max)		ms	80	80	80	80
Break time for I < I _{cw} (max) ^①		ms	70	70	70	70
Break time for I > I _{cw} (max)		ms	30	30	30	30
Dimensions						
Fixed:	H=418mm D=302mm L(3/4 poli)=	mm	566/656		782/908	
Withdrawable:	H=461mm D=396.5mm L(3/4 poli)=	mm	594/684		810/936	
Weights						
(circuit-breaker complete with releases and CT, excluding accessories)						
Fixed 3/4 pole		kg	95/115	95/115	140/170	140/170
Withdrawable 3/4 pole (including fixed part)		kg	147/190	147/190	210/260	210/260

Circuit-breaker type			E3L		E4 S-H		E6 H-V			
Rated uninterrupted current (at 40°C)	I _u	(A)	2000	2500	3200	4000	3200	4000	5000	6300
Mechanical life with regular routine maintenance		(No. operations x 1000)	15	15	15	15	12	12	12	12
	Frequency	f (Operations per hour)	60	60	60	60	60	60	60	60
Electrical life (440V-)		(Operations x 1000)	2	1.8	7	5	5	4	3	2
	Frequency	f (Operations per hour)	20	20	10	10	10	10	10	10

① Without intentional delays.
② Consult factory for drawings.

General information

Catalog number information

IEC

E 1 S 16 X X X X X X X X X X

Accessories: X = none
A = mechanical counter
B = button guard
F = A & B

Accessories: X = none
A = mechanical trip indicator
B = mechanical trip indicator & bell alarm
C = padlock provision (open)
D = keylock (open)
E = position lock
F = access pos. lock
G = A & C
H = A & D
J = A & E
K = A & F
L = A, C & E
M = A, C & F
N = B & C
P = B & D
Q = B & E
R = B & F
S = B, C & E
T = B, C & F
U = C & E
V = C & F
W = D & E
Y = D & F

Undervoltage trip: 0 = none
50/60Hz & VDC: A = 24VDC, B = 30V, C = 48V, D = 60V, E = 110 - 120V, F = 125 - 127V, G = 220 - 240V, H = 250V, J = 380 - 400VAC, K = 440 - 480VAC
Second shunt trip: L = 24VDC, M = 30V, N = 48V, P = 60V, Q = 110 - 120V, R = 125 - 127V, S = 220 - 240V, T = 250V, U = 380 - 400VAC, V = 440 - 480VAC

Shunt trip: 0 = none
50/60Hz & VDC: A = 24VDC, B = 30, C = 48, D = 60, E = 110 - 120, F = 120 - 127, G = 220 - 240, H = 240 - 250, J = 380 - 400VAC, K = 440 - 480VAC

Spring charging motor: (includes spring charged signal, P/N does not show)
0 = none, A = 24 - 30VAC/VDC, B = 48 - 60VAC/VDC, C = 110-130VAC/VDC, D = 220 - 250VAC/VDC, E = spring charged signal only

Contacts:
A = 4 aux
E = UV energ. NC
J = B & E
B = 10 aux
F = A & D
K = C & D
C = 15 aux
G = A & E
L = C & E
D = UV energ. N.O.
H = B & D

Closing coil: 0 = none
50/60Hz & VDC: A = 24VDC, B = 30, C = 48, D = 60, E = 110 - 120, F = 120 - 127, G = 220 - 240, H = 240 - 250, J = 380 - 400VAC, K = 440 - 480VAC

Terminal types: (1st letter is upper terminal, 2nd letter is lower terminal) ①
H = rear horz., V = rear vert., F = front, L = rear flat
H = HH, V = VV, F = FF, L = LL,
A = HV, B = VH, C = HF, D = FH, E = HL, G = LH, J = VF, K = FV, M = VL, N = LV, P = FL, Q = LF

Trip unit: A = PR111/P, LI
D = non-automatic
G = PR112/PD, LSI
P = PR113/PD
B = PR111/P, LSI
E = PR112/P, LSI
H = PR112/PD, LSI
C = PR111/P, LSI
F = PR112/P, LSI
N = PR113/P

Version: F = fixed breaker, IEC; W = withdrawable breaker, IEC, less cradle

Max. ampere rating: 02 = 250, 04 = 400, 08 = 800, 10 = 1000, 12 = 1250, 16 = 1600, 20 = 2000, 25 = 2500, 32 = 3200, 40 = 4000, 50 = 5000, 63 = 6300

Breaking capacity: B = basic, N = normal, S = standard, H = high, V = very high, L = limiting

Frame size: 1 = 1, 3P; 2 = 2, 3P; 3 = 3, 3P; 4 = 4, 3P; 6 = 6, 3P; A = 1, 4P; B = 2, 4P; C = 3, 4P; D = 4, 4P; F = 6, 4P

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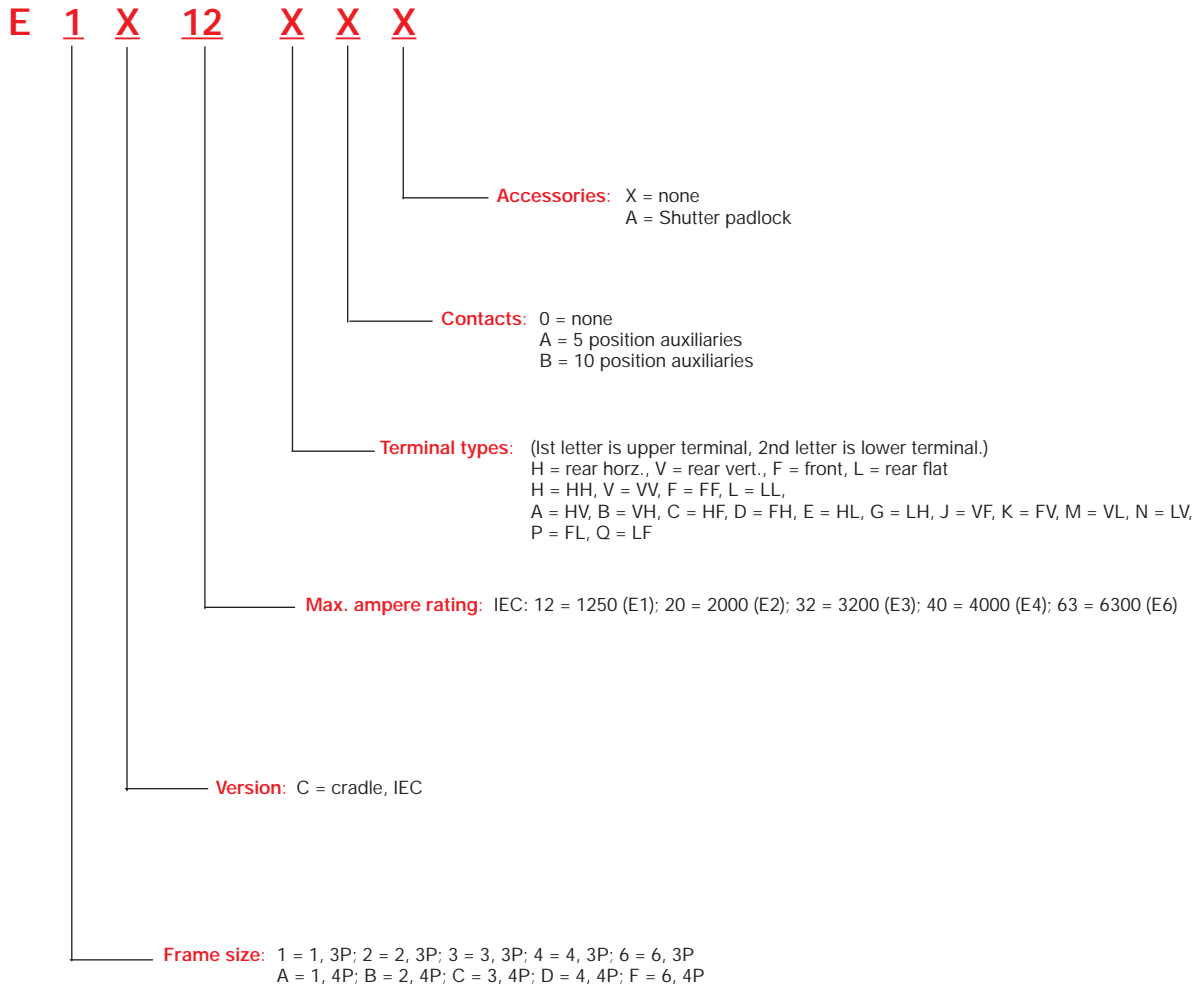
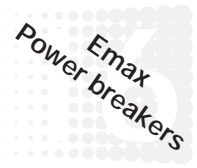
① For withdrawable breakers, use "H".

② Not available with PR112 trip units; use external 15 auxiliary kit.

General information

Catalog number information

Cradle (fixed part), IEC



General information

Standard features

Fixed breaker		Drawout breaker	
Manual operated	Electrically operated	Manual operated	Electrically operated
T.U. — PR111/P, LI Aux. SW., 4 Spring charged indicator Flange Accessory support Terminal block Lifting plate	T.U. — PR111/P, LI Motor operator Closing coil Shunt trip Aux. SW., 4 Spring charged indicator Flange Accessory support Terminal block Lifting plate	T.U. — PR111/P, LI Aux. SW., 4 Spring charged indicator Flange Crank Accessory support Sliding contacts Anti-insertion lock Lifting plate	T.U. — PR111/P, LI Motor operator Closing coil Shunt trip Aux. SW., 4 Spring charged indicator Flange Crank Accessory support Sliding contacts Anti-insertion lock Lifting plate

NOTE: Switches provided standard without 4 auxiliary contacts.

Fixed breakers, 3 poles IEC

Fixed breakers

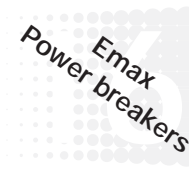
Circuit breaker type	Frame amps	Interrupting ratings kA, 415V	Manually operated	Electrically operated	Set of three vertical terminals	Set of three front terminals
E1B08	800	40	\$ 6027	\$ 8388	\$ 644	\$ 367
E1B12	1250	40	6656	9017	644	367
E2N12	1250	65	7314	9675	690	888
E3S12	1250	75	7808	10,169	790	1232
E3H12	1250	100	8036	10,397	790	1232
E2L12	1250	130	10,066	12,427	690	888
E2B16	1600	40	7293	9654	690	888
E2N16	1600	65	8014	10,375	690	888
E3S16	1600	75	8700	11,061	790	1232
E3H16	1600	100	9232	11,593	790	1232
E2L16	1600	130	11,422	13,783	690	888
E2B20	2000	40	8509	10,870	690	888
E2N20	2000	65	9024	11,385	690	888
E3S20	2000	75	9817	12,178	790	1232
E3H20	2000	100	11,762	14,123	790	1232
E3L20	2000	130	13,425	15,786	790	1232
E3N25	2500	65	13,870	16,231	790	1232
E3S25	2500	75	15,242	17,603	790	1232
E3H25	2500	100	16,948	19,309	790	1232
E3L25	2500	130	19,454	21,815	790	1232
E3N32	3200	65	17,963	20,324	790	1232
E3S32	3200	75	18,662	21,023	790	1232
E3H32	3200	100	20,217	22,578	790	1232
E4H32	3200	100	22,085	24,446	1664	1696
E6V32	3200	150	36,328	38,689	2783	2464
E4S40	4000	75	26,873	29,234	1664	1696
E4H40	4000	100	30,645	33,006	1664	1696
E6V40	4000	150	42,739	45,100	2783	2464
E6H50	5000	100	42,047	44,408	2783	2464
E6V50	5000	150	50,281	52,642	2783	2464
E6H63	6300	100	50,456	52,817	2783	2464
E6V63	6300	150	60,337	62,698	2783	2464

Standard features – manually operated breaker

Fixed breaker

- Rear horizontal terminals
- PR111 trip unit with LI protection functions
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open-closed position indication
- Lifting plates
- Current transformers
- Terminal box

Fixed breakers, 4 poles IEC



Fixed breakers

Circuit breaker type	Frame amps	Interrupting ratings kA, 415V	Manually operated	Electrically operated	Set of four vertical terminals	Set of four front terminals
E1B08	800	40	\$ 7475	\$ 9836	\$ 837	\$ 489
E1B12	1250	40	8293	10,654	837	489
E2N12	1250	65	9148	11,509	897	1183
E3S12	1250	75	9306	11,667	1027	1643
E3H12	1250	100	9591	11,952	1027	1643
E2L12	1250	130	12,725	15,086	897	1183
E2B16	1600	40	9121	11,482	897	1183
E2N16	1600	65	10,059	12,420	897	1183
E3S16	1600	75	10,413	12,774	1027	1643
E3H16	1600	100	10,550	12,911	1027	1643
E2L16	1600	130	14,488	16,849	897	1183
E2B20	2000	40	10,701	13,062	897	1183
E2N20	2000	65	11,371	13,732	897	1183
E3S20	2000	75	11,795	14,156	1027	1643
E3H20	2000	100	13,621	15,982	1027	1643
E3L20	2000	130	17,093	19,454	1027	1643
E3N25	2500	65	17,671	20,032	1027	1643
E3S25	2500	75	19,454	21,815	1027	1643
E3H25	2500	100	21,672	24,033	1027	1643
E3L25	2500	130	24,930	27,291	1027	1643
E3N32	3200	65	22,992	25,353	1027	1643
E3S32	3200	75	23,900	26,261	1027	1643
E3H32	3200	100	27,307	29,668	1027	1643
E4H32	3200	100	28,351	30,712	2163	2260
E6V32	3200	150	45,410	47,771	3618	3286
E4S40	4000	75	34,610	36,971	2163	2260
E4H40	4000	100	39,516	41,877	2163	2260
E6V40	4000	150	53,424	55,785	3618	3286
E6H50	5000	100	52,558	54,919	3618	3286
E6V50	5000	150	62,852	65,213	3618	3286
E6H63	6300	100	63,070	65,431	3618	3286
E6V63	6300	150	75,422	77,783	3618	3286

Standard features – manually operated breaker

Fixed breaker

- Rear horizontal terminals
- PR111 trip unit with LI protection functions
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open-closed position indication
- Lifting plates
- Current transformers
- Terminal box

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating ①

① Consult factory for special 100% neutral pole rating.

Withdrawable breakers, 3 poles IEC

Withdrawable breakers

Circuit breaker type	Frame amps	Interrupting ratings kA, 415V	Moving part only		Fixed part		
			Manually operated	Electrically operated	RH terminals	Set of three vertical terminals	Set of three front terminals
E1B08	800	40	\$ 6501	\$ 8862	\$ 2281	\$ 644	\$ 367
E1B12	1250	40	7757	10,118	2281	644	367
E2N12	1250	65	8626	10,987	2400	690	888
E3S12	1250	75	8760	11,121	2925	790	1232
E3H12	1250	100	8897	11,258	2925	790	1232
E2L12	1250	130	12,180	14,541	2400	690	888
E2B16	1600	40	9097	11,458	2400	690	888
E2N16	1600	65	10,234	12,595	2400	690	888
E3S16	1600	75	10,674	13,035	2925	790	1232
E3H16	1600	100	11,100	13,461	2925	790	1232
E2L16	1600	130	15,920	18,281	2400	690	888
E2B20	2000	40	10,987	13,348	2400	690	888
E2N20	2000	65	11,182	13,543	2400	690	888
E3S20	2000	75	11,361	13,722	2925	790	1232
E3H20	2000	100	13,256	15,617	2925	790	1232
E3L20	2000	130	17,817	20,178	2925	790	888
E3N25	2500	65	15,220	17,581	2925	790	1232
E3S25	2500	75	17,896	20,257	2925	790	1232
E3H25	2500	100	19,528	21,889	2925	790	1232
E3L25	2500	130	22,892	25,253	2925	790	1232
E3N32	3200	65	22,337	24,698	2925	790	1232
E3S32	3200	75	23,340	25,701	2925	790	1232
E3H32	3200	100	23,724	26,085	2925	790	1232
E4H32	3200	100	23,842	26,203	6259	1664	1696
E6V32	3200	150	38,539	40,900	7398	2783	2464
E4S40	4000	75	30,399	32,760	6259	1664	1696
E4H40	4000	100	34,540	36,901	6259	1664	1696
E6V40	4000	150	45,340	47,701	7398	2783	2464
E6H50	5000	100	45,541	47,902	7398	2783	2464
E6V50	5000	150	53,341	55,702	7398	2783	2464
E6H63	6300	100	64,163	66,524	7398	2783	2464
E6V63	6300	150	78,427	80,788	7398	2783	2464

Standard features – electrically operated breaker

Moving part

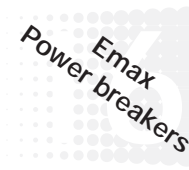
- PR111 trip unit with LI protection functions
- Spring charging motor
- Shunt trip
- Closing coil
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open-closed position indication
- Lifting plates
- Current transformers
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts

Standard features – electrically operated breaker

Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Withdrawable breakers, 4 poles IEC



Withdrawable breakers

Circuit breaker type	Frame amps	Interrupting ratings kA, 415V	Moving part only		Fixed part		
			Manually operated	Electrically operated	RH terminals	Set of four vertical terminals	Set of four front terminals
E1B08	800	40	\$ 7717	\$ 10,078	\$ 2572	\$ 837	\$ 489
E1B12	1250	40	10,649	13,010	2572	837	489
E2N12	1250	65	11,372	13,733	3192	897	1183
E3S12	1250	75	11,906	14,267	3890	1027	1643
E3H12	1250	100	12,229	14,590	3890	1027	1643
E2L12	1250	130	15,402	17,763	3192	897	1183
E2B16	1600	40	11,395	13,756	3192	897	1183
E2N16	1600	65	12,873	15,234	3192	897	1183
E3S16	1600	75	12,472	14,833	3890	1027	1643
E3H16	1600	100	13,304	15,665	3890	1027	1643
E2L16	1600	130	20,264	22,625	3192	897	1183
E2B20	2000	40	13,851	16,212	3192	897	1183
E2N20	2000	65	15,661	18,022	3192	897	1183
E3S20	2000	75	14,873	17,234	3890	1027	1643
E3H20	2000	100	16,784	19,145	3890	1027	1643
E3L20	2000	130	22,714	25,075	3890	1027	1643
E3N25	2500	65	20,380	22,741	3890	1027	1643
E3S25	2500	75	22,816	25,177	3890	1027	1643
E3H25	2500	100	24,938	27,299	3890	1027	1643
E3L25	2500	130	29,312	31,673	3890	1027	1643
E3N32	3200	65	29,555	31,916	3890	1027	1643
E3S32	3200	75	29,893	32,254	3890	1027	1643
E3H32	3200	100	32,017	34,378	3890	1027	1643
E4H32	3200	100	32,589	34,950	8324	2163	2260
E6V32	3200	150	49,722	52,083	9839	3618	3286
E4S40	4000	75	41,350	43,711	8324	2163	2260
E4H40	4000	100	44,409	46,770	8324	2163	2260
E6V40	4000	150	58,496	60,857	9839	3618	3286
E6H50	5000	100	58,680	61,041	9839	3618	3286
E6V50	5000	150	68,820	71,181	9839	3618	3286
E6H63	6300	100	82,888	85,249	9839	3618	3286
E6V63	6300	150	101,432	103,793	9839	3618	3286

Standard features – electrically operated breaker

Moving part

- PR111 trip unit with LI protection functions
- Spring charging motor
- Shunt trip
- Closing coil
- Manual mechanical close and open pushbuttons
- CB open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- 2NO & 2NC auxiliary contacts for open-closed position indication
- Lifting plates
- Current transformers
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts

Standard features – electrically operated breaker

Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating ①

① Consult factory for special 100% neutral pole rating.

Non-automatic air circuit breaker

Fixed switches (Without trip unit & c.t.s.), 3 pole IEC

Fixed switches, 3 pole

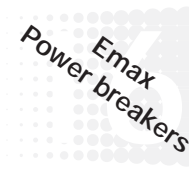
Circuit breaker type	Frame amps	Manually operated	Electrically operated	Set of three vertical terminals	Set of three front terminals
E1B/MS08	800	\$ 4298	\$ 6659	\$ 644	\$ 367
E1B/MS12	1250	4927	7288	644	367
E2N/MS12	1250	5585	7946	690	888
E3S/MS12	1250	5972	8333	790	1232
E2B/MS16	1600	5564	7925	690	888
E2N/MS16	1600	6285	8646	690	888
E3S/MS16	1600	6864	9225	790	1232
E2B/MS20	2000	6780	9141	690	888
E2N/MS20	2000	7295	9656	690	888
E3S/MS20	2000	7981	10,342	790	1232
E3N/MS25	2500	12,034	14,395	790	1232
E3S/MS25	2500	13,406	15,767	790	1232
E3N/MS32	3200	16,127	18,488	790	1232
E3S/MS32	3200	16,826	19,187	790	1232
E4S/MS40	4000	24,504	26,865	1664	1696
E4H/MS40	4000	28,276	30,637	1664	1696
E6H/MS50	5000	39,465	41,826	2783	2464
E6H/MS63	6300	47,874	50,235	2783	2464

Standard features – manually operated switch

- Rear horizontal terminals
- Manual mechanical close and open pushbuttons
- Circuit breaker open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Terminal box

Non-automatic air circuit breaker

Fixed switches (Without trip unit & c.t.s.), 4 pole IEC



Fixed switches, 4 pole

Circuit breaker type	Frame amps	Manually operated	Electrically operated	Set of four vertical terminals	Set of four front terminals
E1B/MS08	800	\$ 5533	\$ 7894	\$ 837	\$ 489
E1B/MS12	1250	6351	8712	837	489
E2N/MS12	1250	7206	9567	897	1183
E3S/MS12	1250	7221	9582	1027	1643
E2B/MS16	1600	7179	9540	897	1183
E2N/MS16	1600	8117	10,478	897	1183
E3S/MS16	1600	8328	10,689	1027	1643
E2B/MS20	2000	8759	11,120	897	1183
E2N/MS20	2000	9429	11,790	897	1183
E3S/MS20	2000	9710	12,071	1027	1643
E3N/MS25	2500	15,586	17,947	1027	1643
E3S/MS25	2500	17,369	19,730	1027	1643
E3N/MS32	3200	20,907	23,268	1027	1643
E3S/MS32	3200	21,815	24,176	1027	1643
E4S/MS40	4000	31,815	34,176	2163	2260
E4H/MS40	4000	36,721	39,082	2163	2260
E6H/MS50	5000	49,479	51,480	3618	3286
E6H/MS63	6300	59,991	62,352	3618	3286

Standard features – manually operated switch

- Rear horizontal terminals
- Manual mechanical close and open pushbuttons
- Circuit breaker open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Terminal box

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating ①

① Consult factory for special 100% neutral pole rating.

Non-automatic air circuit breaker

Withdrawable switches (Without trip unit & c.t.s.), 3 pole IEC

Withdrawable switches, 3 pole

Circuit breaker type	Ampere frame amps	Moving part only		Fixed part RH terminals	Set of 3 vertical terminals	Set of 3 front terminals
		Manually operated	Electrically operated			
E1B/MS08	800	\$ 4772	\$ 7133	\$ 2281	\$ 644	\$ 367
E1B/MS12	1250	6028	8389	2281	644	367
E2N/MS12	1250	6897	9258	2400	690	888
E3S/MS12	1250	6924	9285	2925	790	1232
E2B/MS16	1600	7368	9729	2400	690	888
E2N/MS16	1600	8505	10,866	2400	690	888
E3S/MS16	1600	8838	11,199	2925	790	1232
E2B/MS20	2000	9258	11,619	2400	690	888
E2N/MS20	2000	9453	11,814	2400	690	888
E3S/MS20	2000	9525	11,886	2925	790	1232
E3N/MS25	2500	13,384	15,745	2925	790	1232
E3S/MS25	2500	16,060	18,421	2925	790	1232
E3N/MS32	3200	20,501	22,862	2925	790	1232
E3S/MS32	3200	21,540	23,865	2925	790	1232
E4S/MS40	4000	28,030	30,391	6259	1664	1696
E4H/MS40	4000	32,171	34,532	6259	1664	1696
E6H/MS50	5000	42,959	45,320	7398	2783	2464
E6H/MS63	6300	61,581	63,942	7398	2783	2464

Standard features – manually operated switch

Moving part

- Manual mechanical close and open pushbuttons
- Circuit breaker open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts

Standard features – manually operated switch

Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Non-automatic air circuit breaker

Withdrawable switches (Without trip unit & c.t.s.), 4 pole

IEC



Withdrawable switches, 4 pole

Circuit breaker type	Ampere frame amps	Moving part only		Fixed part RH terminals	Set of 4 vertical terminals	Set of 4 front terminals
		Manually operated	Electrically operated			
E1B/MS08	800	\$ 5775	\$ 8136	\$ 2572	\$ 837	\$ 489
E1B/MS12	1250	8707	11,068	2572	837	489
E2N/MS12	1250	9430	11,791	3192	897	1183
E3S/MS12	1250	9821	12,182	3890	1027	1643
E2B/MS16	1600	9453	11,814	3192	837	1183
E2N/MS16	1600	10,931	13,292	3192	897	1183
E3S/MS16	1600	10,387	12,748	3890	1027	1643
E2B/MS20	2000	11,909	14,270	3192	837	1183
E2N/MS20	2000	13,719	16,080	3192	897	1183
E3S/MS20	2000	12,788	15,149	3890	1027	1643
E3N/MS25	2500	18,295	20,656	3890	1027	1643
E3S/MS25	2500	20,731	23,092	3890	1027	1643
E3N/MS32	3200	27,470	29,831	3890	1027	1643
E3S/MS32	3200	27,808	30,169	3890	1027	1643
E4S/MS40	4000	38,555	40,916	8324	2163	2260
E4H/MS40	4000	41,614	43,975	8324	2163	2260
E6H/MS50	5000	55,601	57,962	9839	3618	3286
E6H/MS63	6300	79,809	82,170	9839	3618	3286

Standard features – manually operated switch

Moving part

- Manual mechanical close and open pushbuttons
- Circuit breaker open/closed mechanical indicator
- Spring charged/discharged mechanical indicator
- Lifting plates
- Racking device with closed door
- Circuit breaker racking position indicator
- Sliding contacts

Standard features – manually operated switch

Fixed part

- Safety shutters
- Rear horizontal terminals
- Sliding contacts
- Anti-insertion lock
- Ground connection

Neutral pole rating

- E1 – E3 = 100% rating
- E4 – E6 = 50% rating ①

① Consult factory for special 100% neutral pole rating.

Air circuit breakers

Installed optional features

UL & IEC

1. – 20. Options for trip units

Item	Factory installation list price adder	Field installation catalog number	Field install. list price
1. Trip unit PR111/P-A LI (UL version)	—	PR111/P-A-LI	\$ 1089
2. Trip unit PR111/P-A LSI (UL version)	\$ 515	PR111/P-A-LSI	1604
3. Trip unit PR111/P-A LSIG (UL version)	1208	PR111/P-A-LSIG	2297
4. Trip unit PR112/P-A LSI (UL version)	2210	PR112/P-A-LSI	3299
5. Trip unit PR112/P-A LSIG (UL version)	2904	PR112/P-A-LSIG	3993
6. Trip unit PR112/PD-A LSI (UL version)	6890	PR112/PD-A-LSI	7979
7. Trip unit PR112/PD-A LSIG (UL version)	7583	PR112/PD-A-LSIG	8672
8. Trip unit PR113/P-A-LSIG (UL version)	7323	PR113/P-A-LSIG	8412
9. Trip unit PR113/PD-A-LSIG (UL version)	12,002	PR113/PD-A-LSIG	13,091
10. Trip unit PR111/P LI (IEC version)	—	PR111/P-LI	1089
11. Trip unit PR111/P LSI (IEC version)	515	PR111/P-LSI	1604
12. Trip unit PR111/P LSIG (IEC version)	1208	PR111/P-LSIG	2297
13. Trip unit PR112/P LSI (IEC version)	2210	PR112/P-LSI	3299
14. Trip unit PR112/P LSIG (IEC version)	2904	PR112/P-LSIG	3993
15. Trip unit PR112/PD LSI (IEC version)	6890	PR112/PD-LSI	7979
16. Trip unit PR112/PD LSIG (IEC version)	7583	PR112/PD-LSIG	8672
17. Trip unit PR113/PLSIG (IEC version)	7323	PR113/P-LSIG	8412
18. Trip unit PR113/PDLSIG (IEC version)	12,002	PR113/PD-LSIG	13,091
19. Mechanical trip indication (manual reset)	188	KE6TSM	188
20. Mechanical trip indication and bell alarm	348	KE6TBA	348

21. – 27. Electrical and mechanical accessories

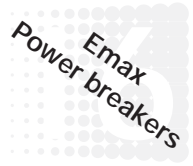
Item	Factory installation list price adder	Field installation catalog number	Field installation list price
21a. Shunt trip coil (included in the electrically operated breaker) Rated voltage 24V 30V 48V 60V 110/120V 125/127V 220/240V 250V 380/400V 440/480V	\$ 374	KE6S0 KE6S9 KE6S8 KE6S7 KE6S6 KE6S5 KE6S4 KE6S3 KE6S2 KE6S1	\$ 374
21b. Second shunt trip coil (includes accessory support) ① 24V 30V 48V 60V 110/120V 125/127V 220/240V 250V 380/400V 440/480V	456	KE6S0-2 KE6S9-2 KE6S8-2 KE6S7-2 KE6S6-2 KE6S5-2 KE6S4-2 KE6S3-2 KE6S2-2 KE6S1-2	456
22. Closing coil (included in the electrically operated breaker) Rated voltage 24V 30V 48V 60V 110/120V 125/127V 220/240V 250V 380/400V 440/480V	374	KE6C0 KE6C9 KE6C8 KE6C7 KE6C6 KE6C5 KE6C4 KE6C3 KE6C2 KE6C1	374
23. Spring charging motor with limit switch and electrical indication charged spring (included in the electrically operated breaker) Rated voltage 24/30V 48/60V 100/130V 220/250V Spring charged signal only	1613 73	KE6M9 KE6M7 KE6M5 KE6M3 KE6SC	1613 73

① Order as alternative to UV trip.

Air circuit breakers

Installed optional features

UL & IEC



Item	Factory installation list price adder	Field installation catalog number	Field installation list price
24. Instantaneous under voltage trip release Rated voltage 24V 30V 48V 60V 110/120V 125/127V 220/240V 250V 380/400V 440/480V	\$ 456	KE6U0 KE6U9 KE6U8 KE6U7 KE6U6 KE6U5 KE6U4 KE6U3 KE6U2 KE6U1	\$ 456
25. Energized undervoltage release signalling contact Auxiliary contact normally open Auxiliary contact normally closed	82	KE6UE10 KE6UE01	82
26. Auxiliary contacts for breakers Rated 5A-250VAC / 0.3A -125VDC 26a. 2NO +2NC 26b. 5NO + 5NC (not available with PR112) 26c. 15 additional auxiliary contacts for field installation on fixed breakers (connected to breaker with flexible cable) ① 26d. 15 additional auxiliary contacts for field installation on withdrawable breakers (connected to breaker with flexible cable) ①	– 753 1507 1507	KE6A4 KE6A10 KE6A15 KE6A15-W	297 1050 1507 1507
27. Auxiliary contacts for switches 27a. 2NO + 2NC 27b. 5NO + 5NC	297 1050	KE6A4 KE6A10	297 1050

28. – 29. Electrical and mechanical accessories

Item	Factory installation list price adder	Field installation catalog number	Field installation list price
28. Auxiliary contacts for service/test/disconnected position indication Cradle mounted 28a. 5 auxiliary contacts 28b. 10 auxiliary contacts for E1/2 3 pole 28c. 10 auxiliary contacts for E1/2 4 pole 28d. 10 auxiliary contacts for E3 3 pole 28e. 10 auxiliary contacts for E3 4 pole 28f. 10 auxiliary contacts for E4/6 3/4 pole	377 753 753 753 753 753	KE6PS1 KE2PS3 KE2PS4 KE3PS3 KE3PS4 KE6PS2	377 753 753 753 753 753
29. Mechanical operation counter	418	KE6MC	418

① Order as alternative to various types of interlock and kirk key lock. For mounting on fixed breaker, also requires accessory 32 (KE6MLP).

Air circuit breakers

Installed optional features

UL & IEC

30. – 35. Locks and interlocks

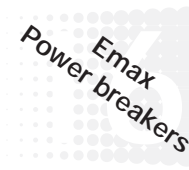
Item	Factory installation list price adder	Field installation catalog number	Field installation list price
30. Button guard	\$ 48	KE6PG	\$ 48
31. Key lock in open position 31a. Key lock N. 3004222 ① 31b. Key lock N. 0025431 31c. Key lock N. 0233424 31d. Key lock N. 0335452 31e. Key lock different keys	202	KE6KL2 KE6KL3 KE6KL4 KE6KL5 KE6KL1	202
32. Padlocking button cover (padlocks not supplied)	162	KE6PD1	162
33. Key and padlocking device to lock the breaker in disconnected, test or connected position (position lock) 33a. Key + padlocking N3004222 ① 33b. Key + padlocking N0025451 33c. Key + padlocking N0233424 33d. Key + padlocking N0335452 33e. Key + padlocking different keys	202	KE6PL2 KE6PL3 KE6PL4 KE6PL5 KE6PL1	202
34. Accessory to lock the breaker in test or disconnected position only ② Position lock	212	KE6PLA	212
35. Padlocking device for the safety shutters on the cradle Cradle padlock	43	KE6SP	43

① Keylock number when factory installed is N3004222.

② Also requires position lock (accessory 29).

External accessories

Current transformers, UL & IEC



36a. Neutral current transformer (required for 4 wire ground fault systems)

For breaker	Amps	Catalog number	List price
E1 – E2	250A	KE2NCT-250	\$ 406
	400A	KE2NCT-400	
	800A	KE2NCT-800	
	1000A	KE2NCT-1000	
	1200A	KE2NCT-1200	
	1250A	KE2NCT-1200 ^①	
	1600A	KE2NCT-1600	
E3	250A	KE3NCT-250	414
	400A	KE3NCT-400	
	800A	KE3NCT-800	
	1000A	KE3NCT-1000	
	1200A	KE3NCT-1200	
	1250A	KE3NCT-1250 ^①	
	1600A	KE3NCT-1600	
	2000A	KE3NCT-2000	
	2500A	KE3NCT-2500	
	E4	1600A	
2000A		KE4NCT-2000	
2500A		KE4NCT-2500	
3200A		KE4NCT-3200	
4000A		KE4NCT-4000 ^①	
E6	3200A	KE6NCT-3200 ^①	414
	4000A	KE6NCT-4000	
	5000A	KE6NCT-5000	
	6300A	KE6NCT-6300 ^①	

36b. Current transformer sets (sets of three)

For breaker	Amps	Catalog number	List price
E1 – E2	250A	KE2CT250	\$ 840
	400A	KE2CT400	
	800A	KE2CT800	
	1000A	KE2CT1000	
	1200A	KE2CT1200	
	1250A	KE2CT1250 ^①	
	1600A	KE2CT1600	
E3	250A	KE3CT250	1090
	400A	KE3CT400	
	800A	KE3CT800	
	1000A	KE3CT1000	
	1200A	KE3CT1200	
	1250A	KE3CT1250 ^①	
	1600A	KE3CT1600	
	2000A	KE3CT2000	
	2500A	KE3CT2500	
E4	1600A	KE4CT1600	1640
	2000A	KE4CT2000	
	2500A	KE4CT2500	
	3200A	KE4CT3200	
	4000A	KE4CT4000 ^①	
E6	3200A	KE6CT3200	2188
	4000A	KE6CT4000	
	5000A	KE6CT5000	
	6300A	KE6CT6300 ^①	

^① IEC only.

External accessories Mechanical interlocks^①

37. Mechanical interlocks (base plate for fixed circuit breaker)

For breaker	Interlock type	Catalog number	List price
E1 – E6	All	KE6MLP	\$ 241

NOTE: order for fixed circuit breaker only; order one accessory for each fixed breaker.

38. Interlock for fixed circuit breaker/fixed part of withdrawable circuit breaker (cable attachment plate)

For breaker	Interlock type	Catalog number	List price
E1 – E6	A, B, D C	KE6MLA KE6MLC	\$ 628

NOTE: order one accessory for each fixed circuit breaker/fixed part of withdrawable circuit breaker

39. Interlock for fixed circuit breaker/moving part of withdrawable circuit breaker (internal interlocking shaft)

For breaker	Interlock type	Catalog number	List price
E1 – E2 E3 E4, 3 pole E4, 4 pole/ E6, 3 pole E6, 4 pole	All	KE2ML KE3ML KE4ML-3 KE6ML-3 KE6ML-4	\$ 145

NOTE: order one accessory for each fixed circuit breaker/mobile part of withdrawable circuit breaker

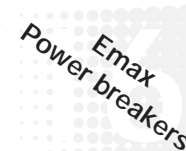
40. Interlock cables

For breaker	Interlock type	Horizontal Catalog number	Vertical Catalog number	List price
E1 – E6	A	KE6MLC-HA	KE6MLC-VA	\$ 97
	B	KE6MLC-HB	KE6MLC-VB	193
	C	KE6MLC-HC	KE6MLC-VC	193
	D	KE6MLC-HD	KE6MLC-VD	193

NOTE: order one type of cable for each interlock

^① Order as an alternative to the Accessory number 15 auxiliary contact (see page 16.27) and Kirk key lock.

External accessories Other items



41. Electronic time delay for undervoltage release ①

Item	Delay	Field installation catalog number	List price
41. Time delay Voltage 24/30V 48V 60V 110/125V 220/250V	0.5-1-1.5-2-3.5 s	KE6TL9 KE6TL8 KE6TL7 KE6TL5 KE6TL3	\$ 428

42. Transparent front cover (IP54)

For breaker	Catalog number	List price
42. Cover E1 – E6	KE6DC	\$ 557

43. Kirk key lock adaptor plate (in open position) ②

For breaker	Catalog number	List price
43. Kirk key lock adaptor plate		
43a. E1 – E2 fixed breaker, 3-4 pole	KE6KKB-E2F	\$ 1436
43b. E1 – E2 withdrawable breaker, 3-4 pole	KE6KKB-E2W	1195
43c. E3 fixed breaker, 3-4 pole	KE6KKB-E3F	1436
43d. E3 withdrawable breaker, 3-4 pole	KE6KKB-E3W	1195
43e. E4 fixed breaker, 3 pole	KE6KKB-E4F	1436
43f. E4 withdrawable breaker, 3 pole	KE6KKB-E4W	1195
43g. E6 fixed breaker, 3 pole	KE6KKB-E6F	1436
43h. E6 withdrawable breaker, 3 pole	KE6KKB-E6W	1195
43i. E4 fixed breaker, 4 pole	KE6KKB-E4F-F	1436
43j. E4 withdrawable breaker, 4 pole	KE6KKB-E4W-4	1195
43k. E6 fixed breaker, 4 pole	KE6KKB-E6F-4	1436
43l. E6 withdrawable breaker, 4 pole	KE6KKB-E6W-4	1195

NOTE: Provision for kirk lock (kirk key lock not included; use lock Type F – 1 inch bolt projection in withdrawn position).

44. Kit for converting fixed breaker with rear horizontal terminals to rear vertical (set of three terminals)

Item	Catalog number	List price
44. Conversion kit		
44a. 1/2 3p F HR > F VR E1-A	KE1FHRVR	\$ 644
44b. 1/2 3p F HR > F VR E2-A	KE2FHRVR	690
44c. 1/2 3p F HR > F VR E3-A (12, 16, 20)	KE3FHRVR	790
44d. 1/2 3p F HR > F VR E3-A (25)	KE3F25HRVR	790
44e. 1/2 3p F HR > F VR E4-A	KE4FHRVR	1664
44f. 1/2 3p F HR > F VR E6-A	KE6FHRVR	2783

45. – 47. Test kits

Item	Catalog number	List price
45. Hand-held test kit (for PR111 only)	K7TUT	\$ 210
46. Hand-held battery unit for PR112	PR120/B	275
47. Test and configuration unit SACE PR010/T	PR010/T	12,500

48. – 55. Spare parts

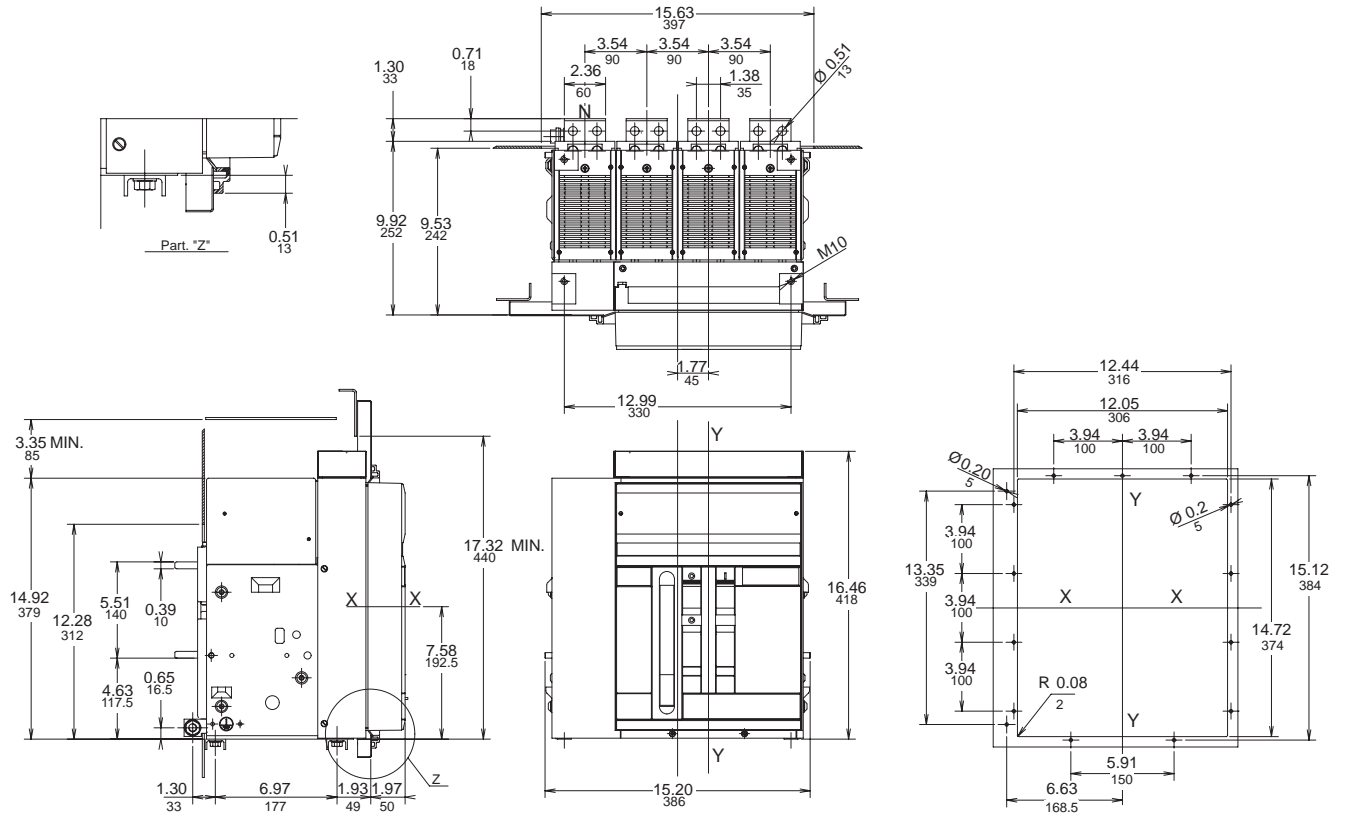
Item	Catalog number	List price
48. Racking crank	1SDA038092R1	\$ 122
49. Door escutcheon	1SDA038096R1	153
50. Terminal board for fixed circuit breaker	1SDA038342R1	722
51. Support plate for auxiliary releases	1SDA038339R1	244
52. Sliding contacts for the moving part	1SDA038328R1	946
53. Sliding contacts for the fixed part	1SDA038362R1	793
54. Lifting plates	1SDA038093R1	224
55. Transparent cover for the trip unit	1SDA045724R1	61

① IEC only.

② Kirk key not provided. Order as an alternative to the various types of interlocks and auxiliary contacts (see Accessory 26c and 26d on page 16.27).

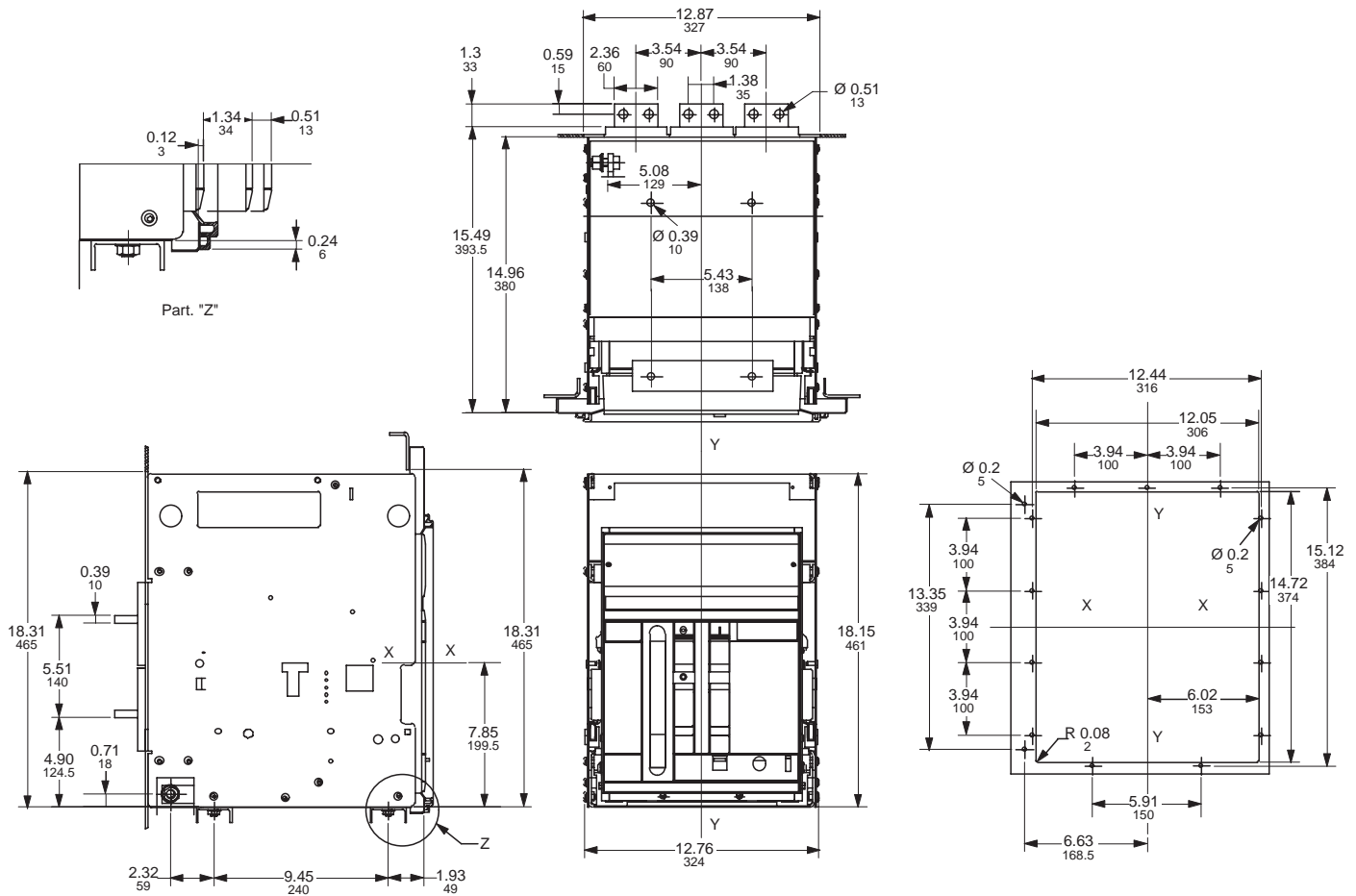
Approximate dimensions (for UL version)
E1, fixed with horizontal rear terminals
4 pole

00.00 Inches
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Approximate dimensions (for UL version)
E1, withdrawable with horizontal rear terminals
3 pole

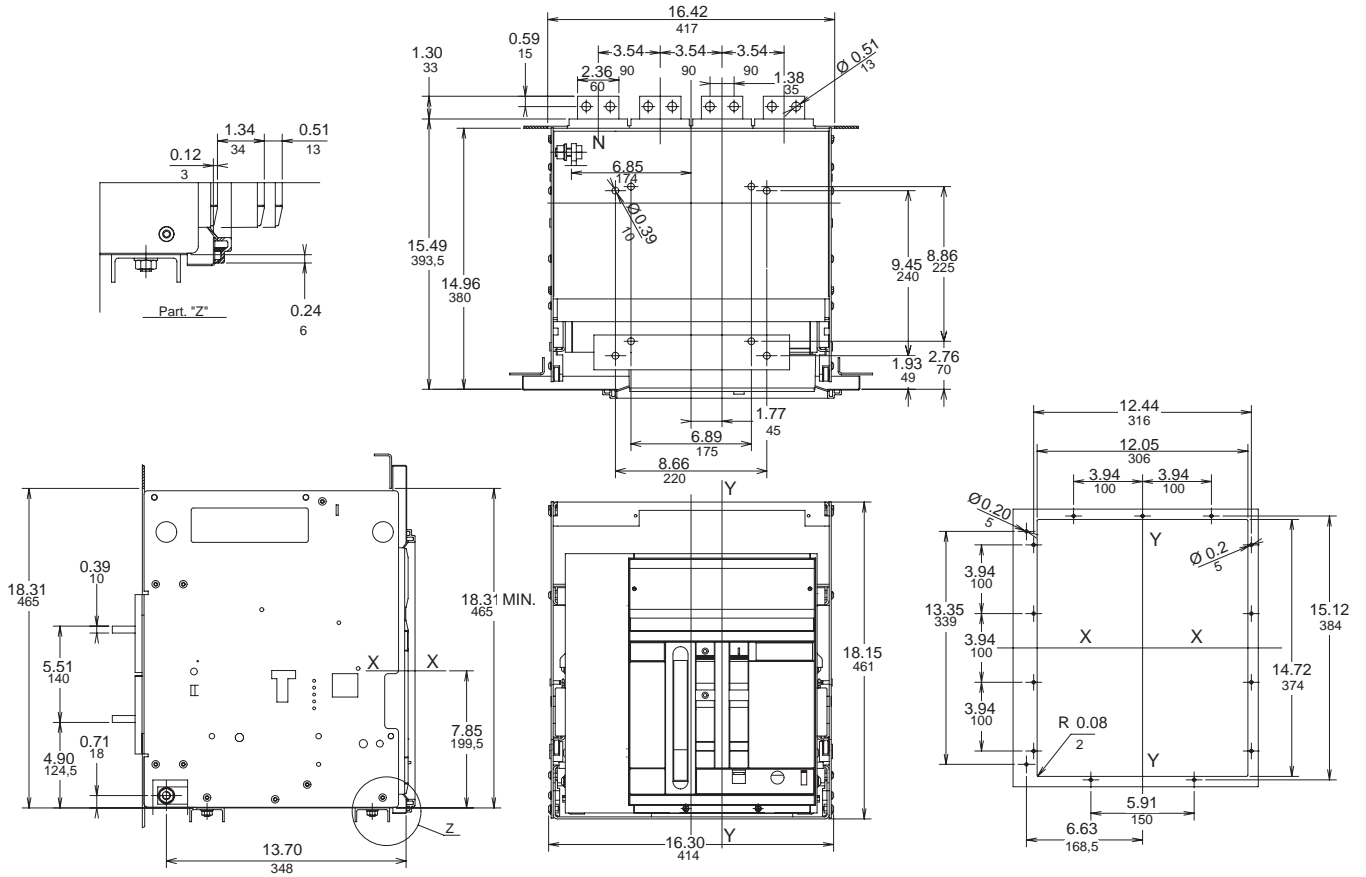
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Approximate dimensions (for UL version)
E1, withdrawable with horizontal rear terminals
4 pole

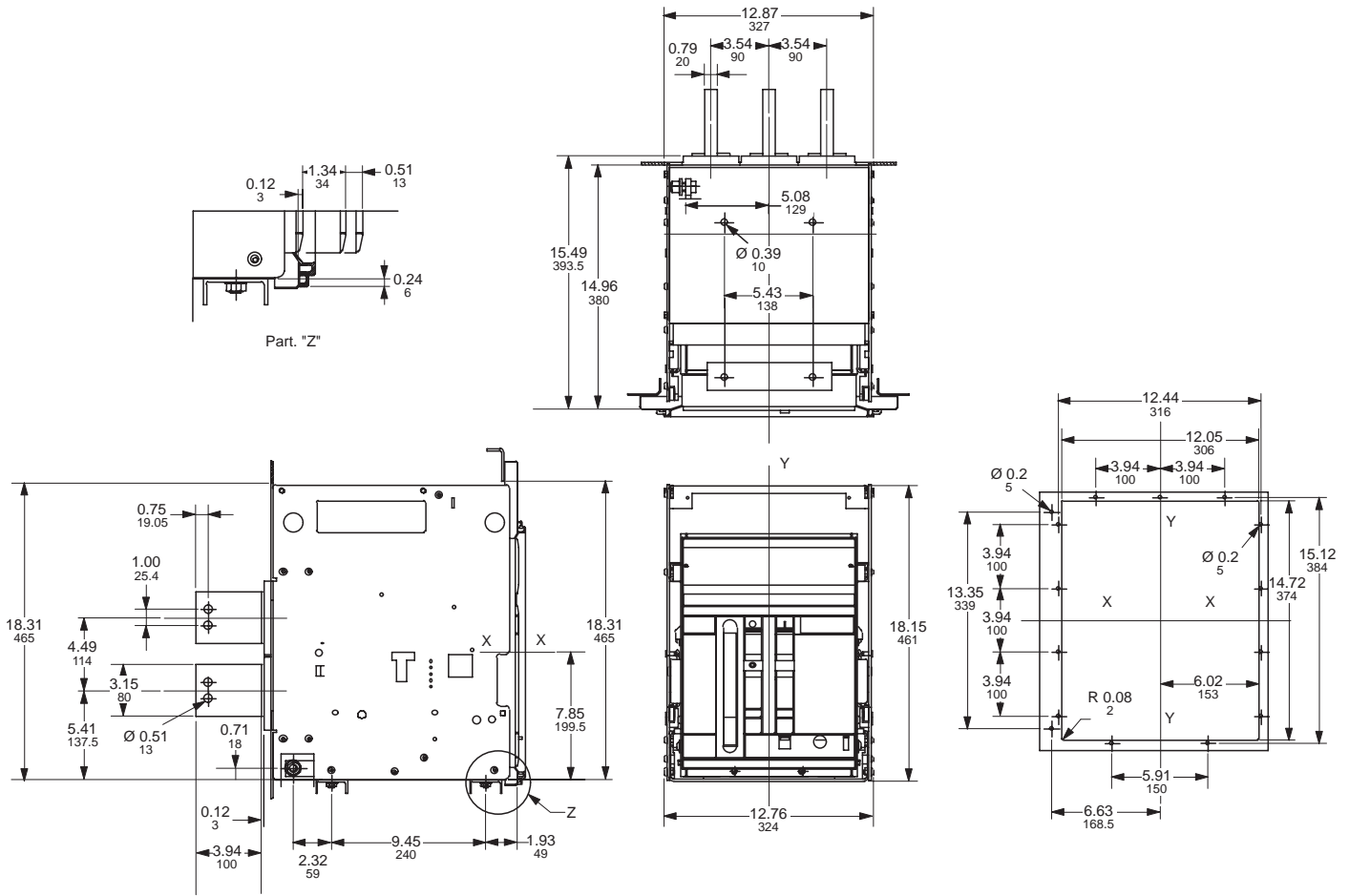


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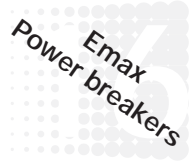


Approximate dimensions (for UL version)
E1 - E2, withdrawable with vertical rear terminals
3 pole

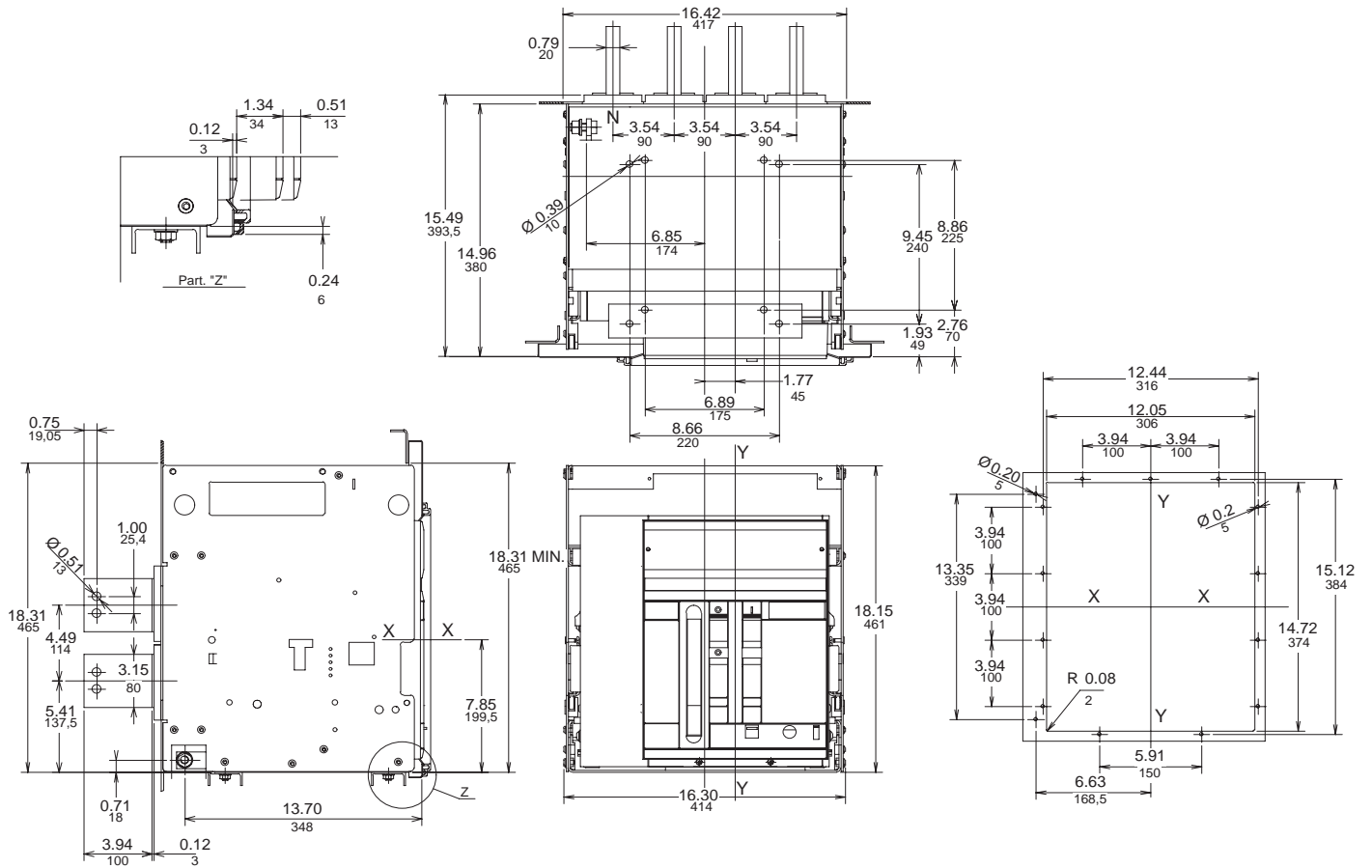
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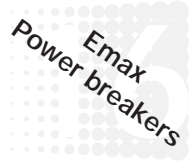
Approximate dimensions (for UL version)
E1 - E2, withdrawable with vertical rear terminals
4 pole



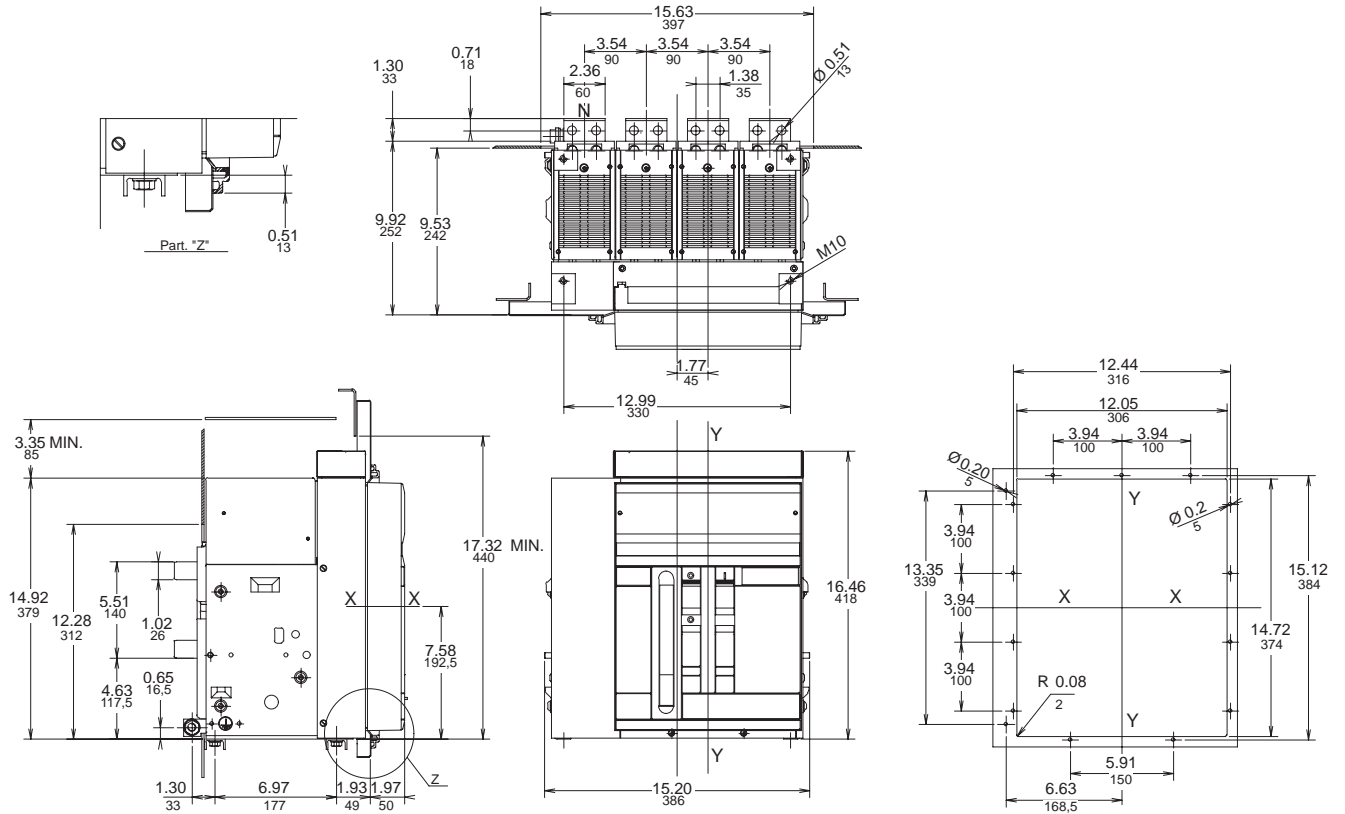
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Approximate dimensions (for UL version)
E2, fixed with horizontal rear terminals
4 pole

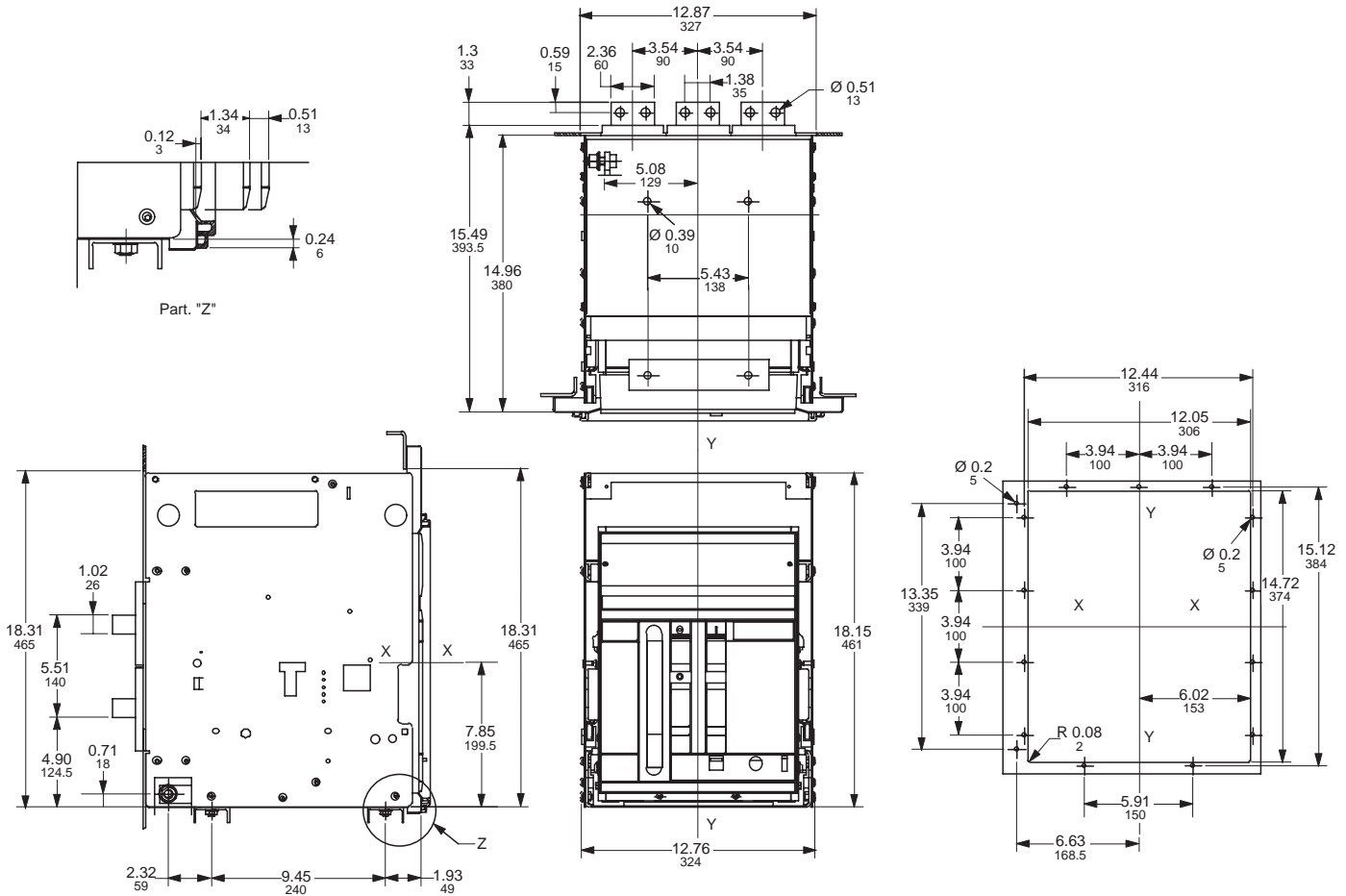


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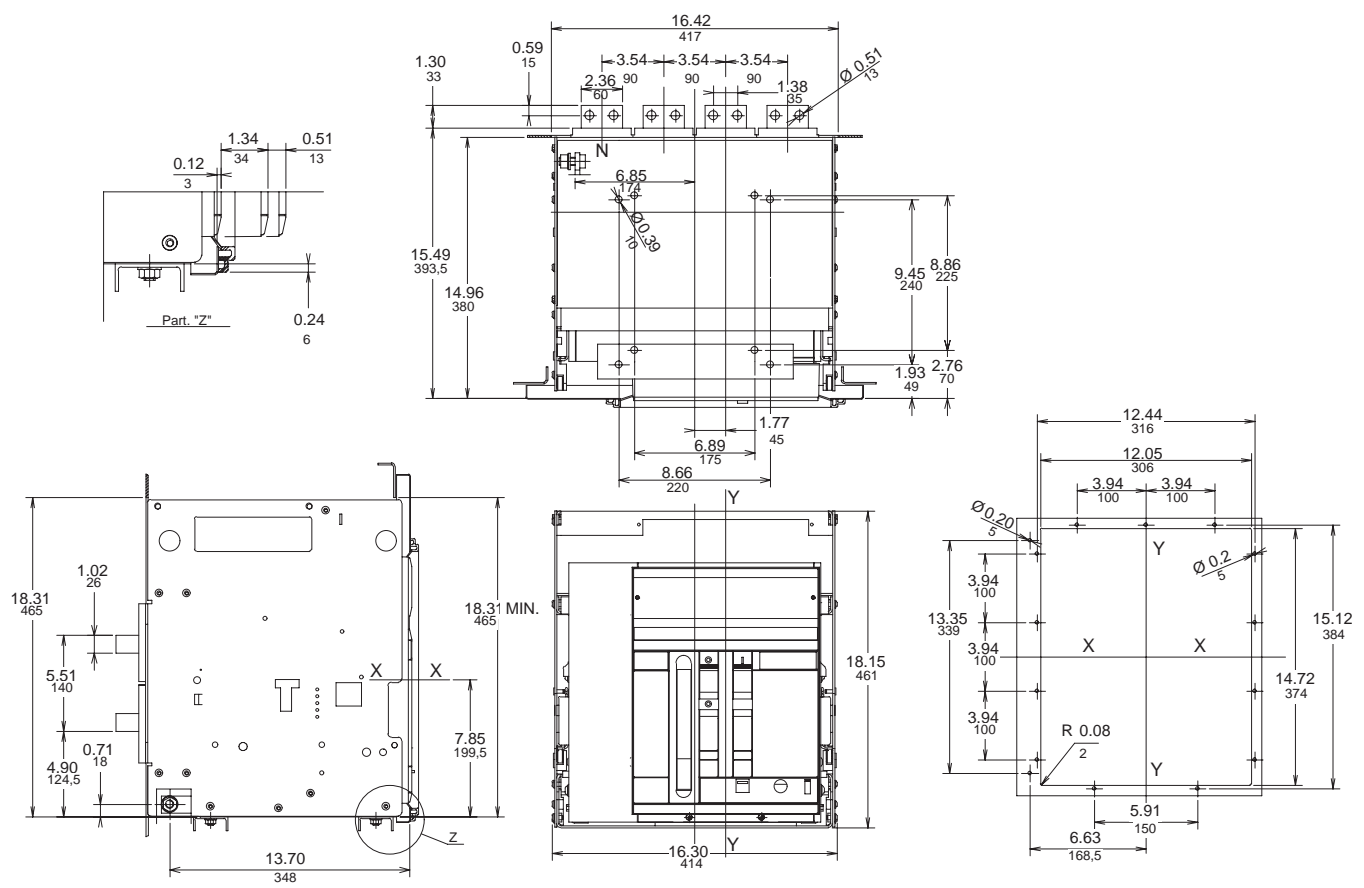
Approximate dimensions (for UL version)
E2, withdrawable with horizontal rear terminals
3 pole

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00.00 [Millimeters]



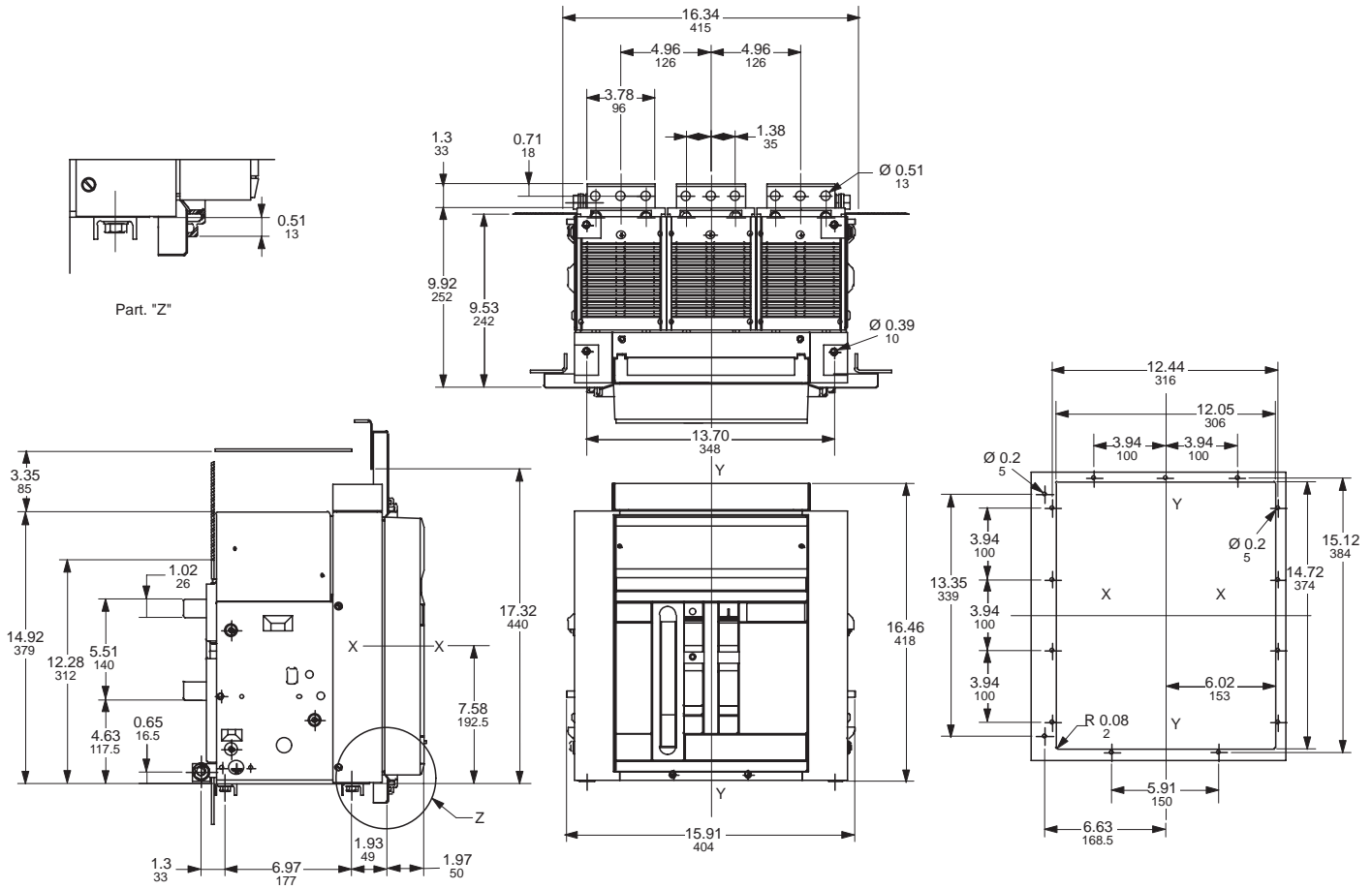
Approximate dimensions (for UL version)
E2, withdrawable with horizontal rear terminals
4 pole

00.00 Inches
00.00 [Millimeters]



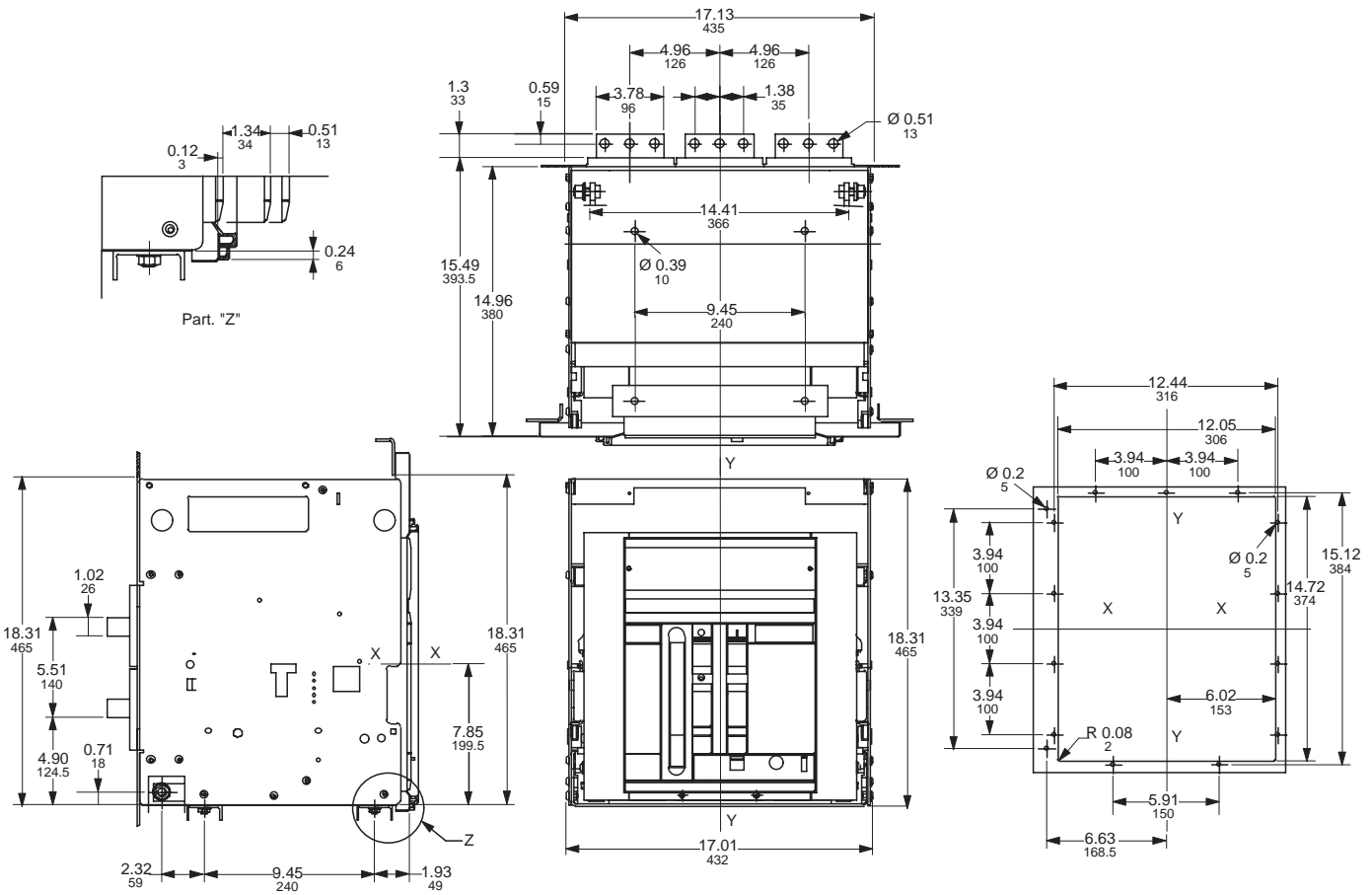
Approximate dimensions (for UL version)
E3, fixed with horizontal rear terminals
3 pole

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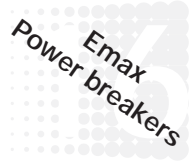


Approximate dimensions (for UL version)
E3, withdrawable with horizontal rear terminals
3 pole

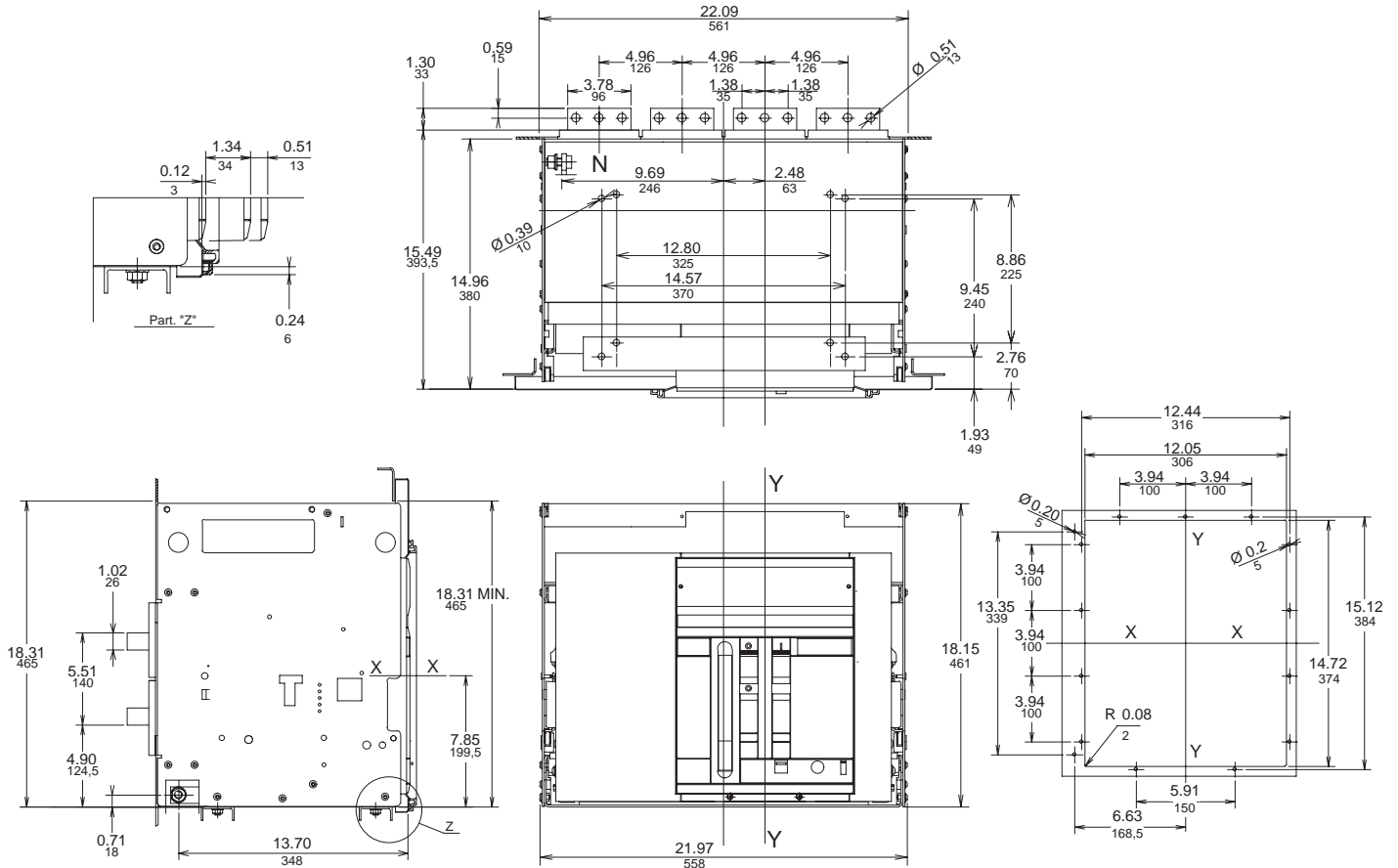
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Approximate dimensions (for UL version) E3, withdrawable with horizontal rear terminals 4 pole

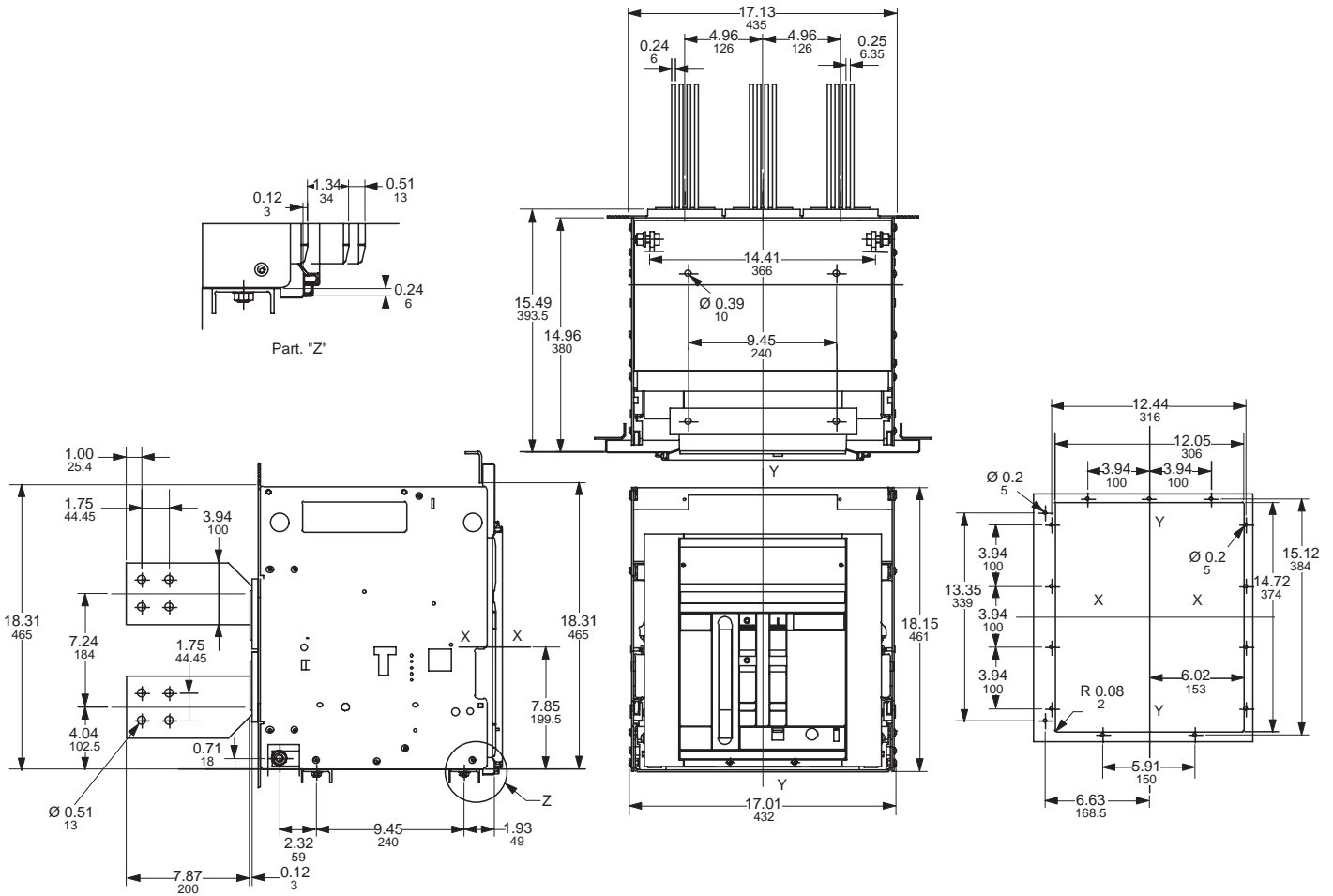


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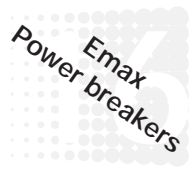


Approximate dimensions (for UL version)
E3 (2500A), withdrawable with vertical rear terminals
3 pole

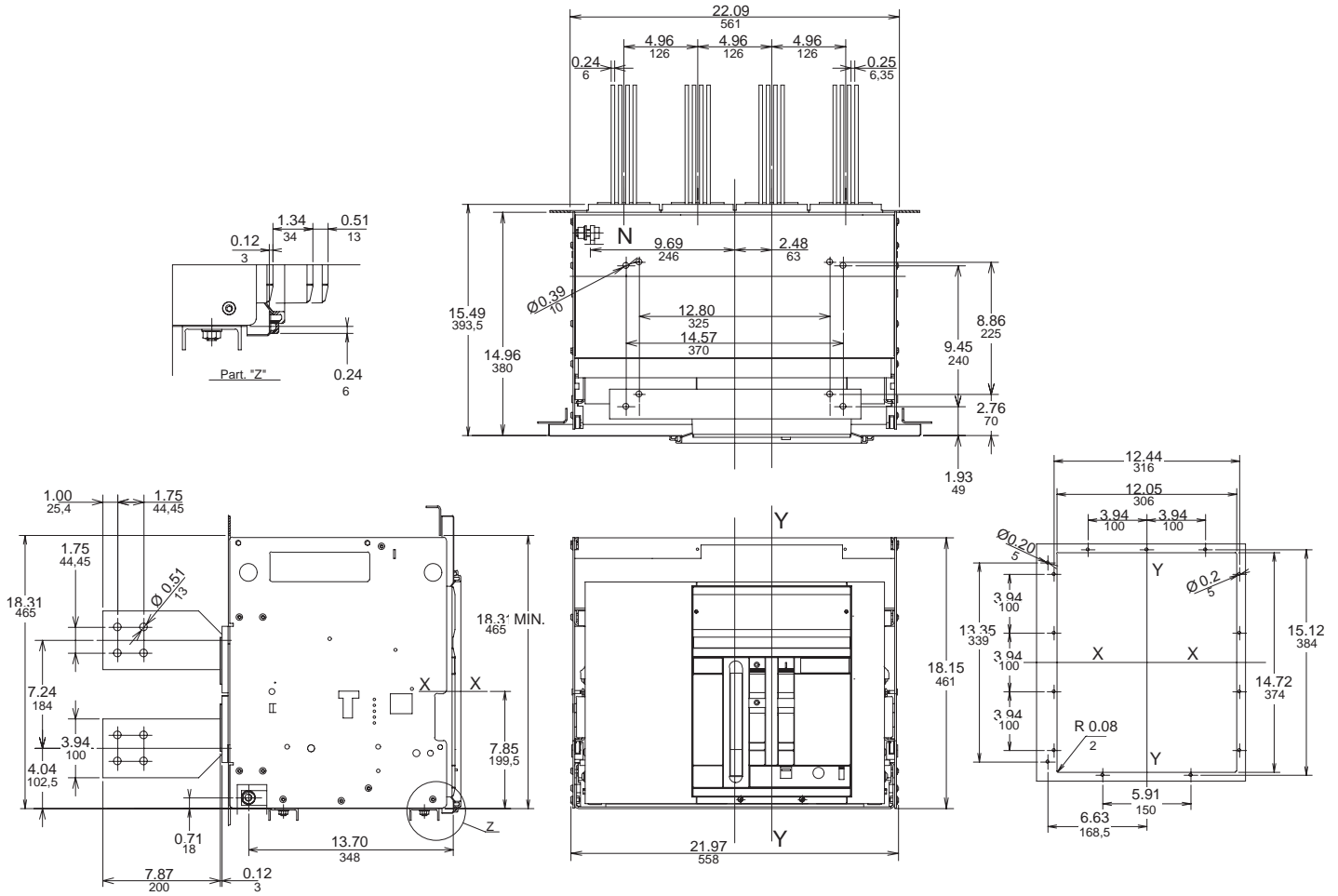
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Approximate dimensions (for UL version) E3 (2500A), withdrawable with vertical rear terminals 4 pole

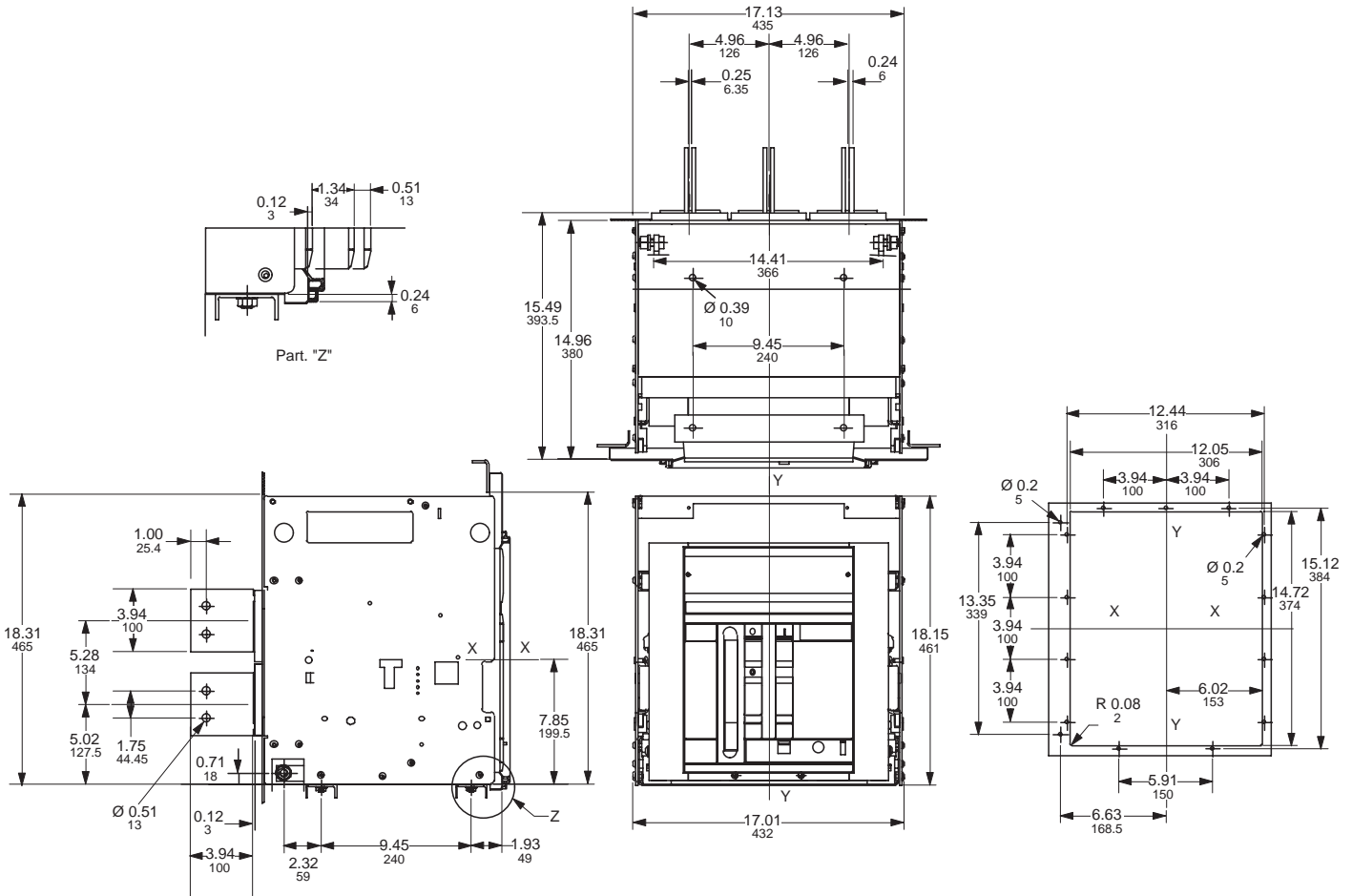


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00.00 [Millimeters]



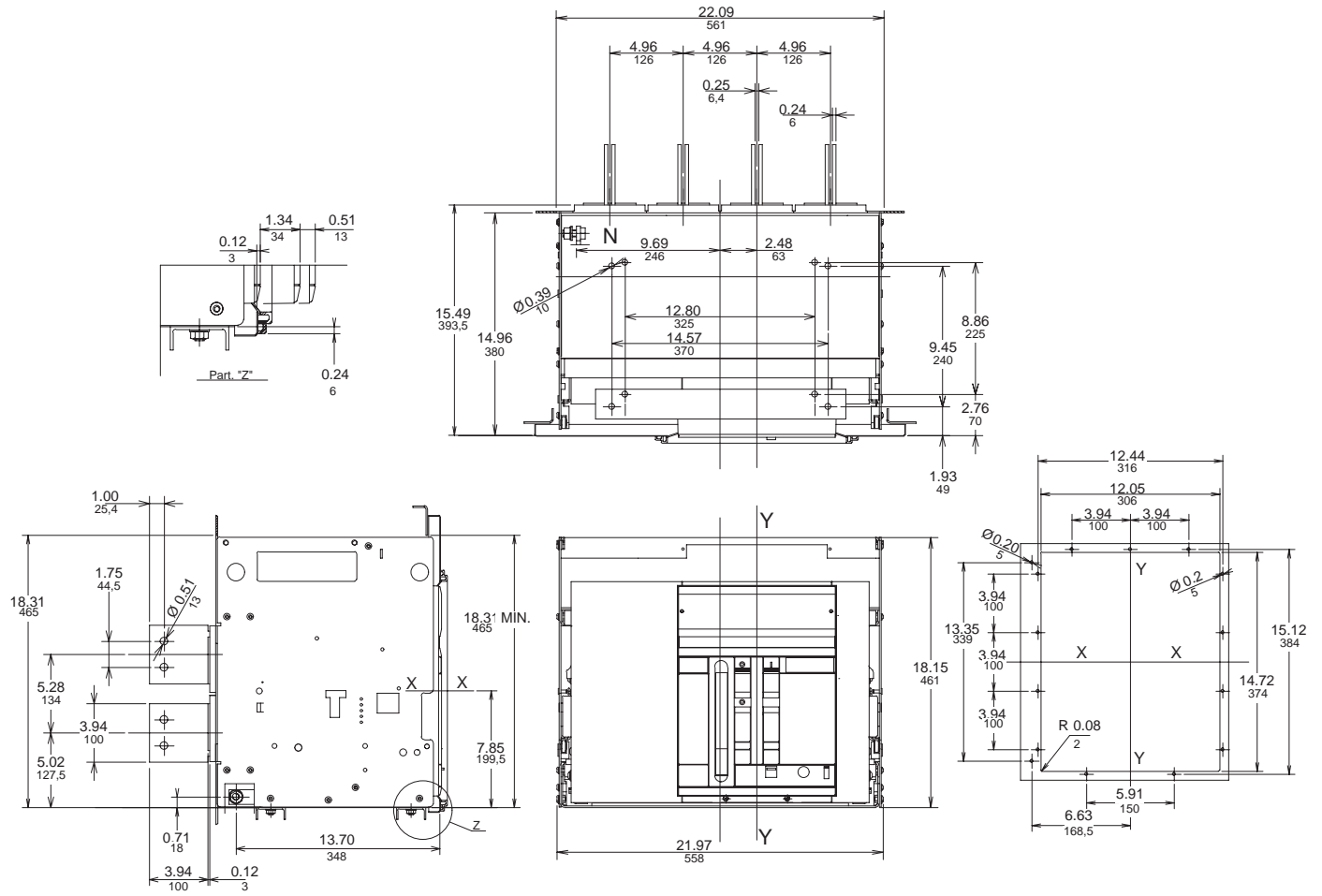
Approximate dimensions (for UL version)
E3 (1200A/1600A/2000A), withdrawable with
Vertical rear terminals, 3 pole

00.00 Inches
00.00 [Millimeters]



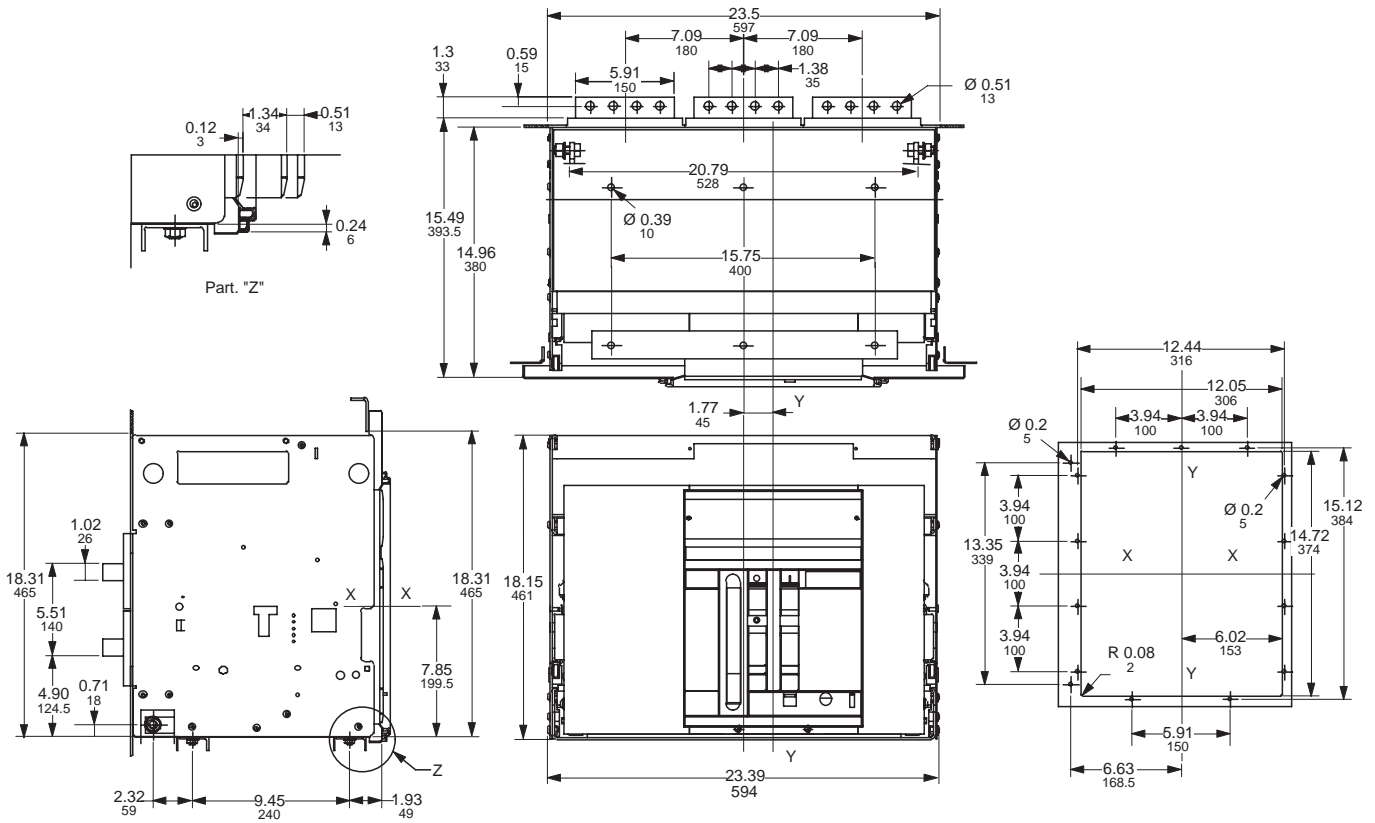
Approximate dimensions (for UL version)
E3 (1200A/1600A/2000A), withdrawable with
Vertical rear terminals, 4 pole

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[Millimeters]

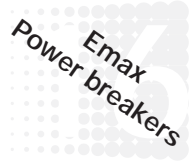


Approximate dimensions (for UL version)
E4, withdrawable with horizontal rear terminals
3 pole

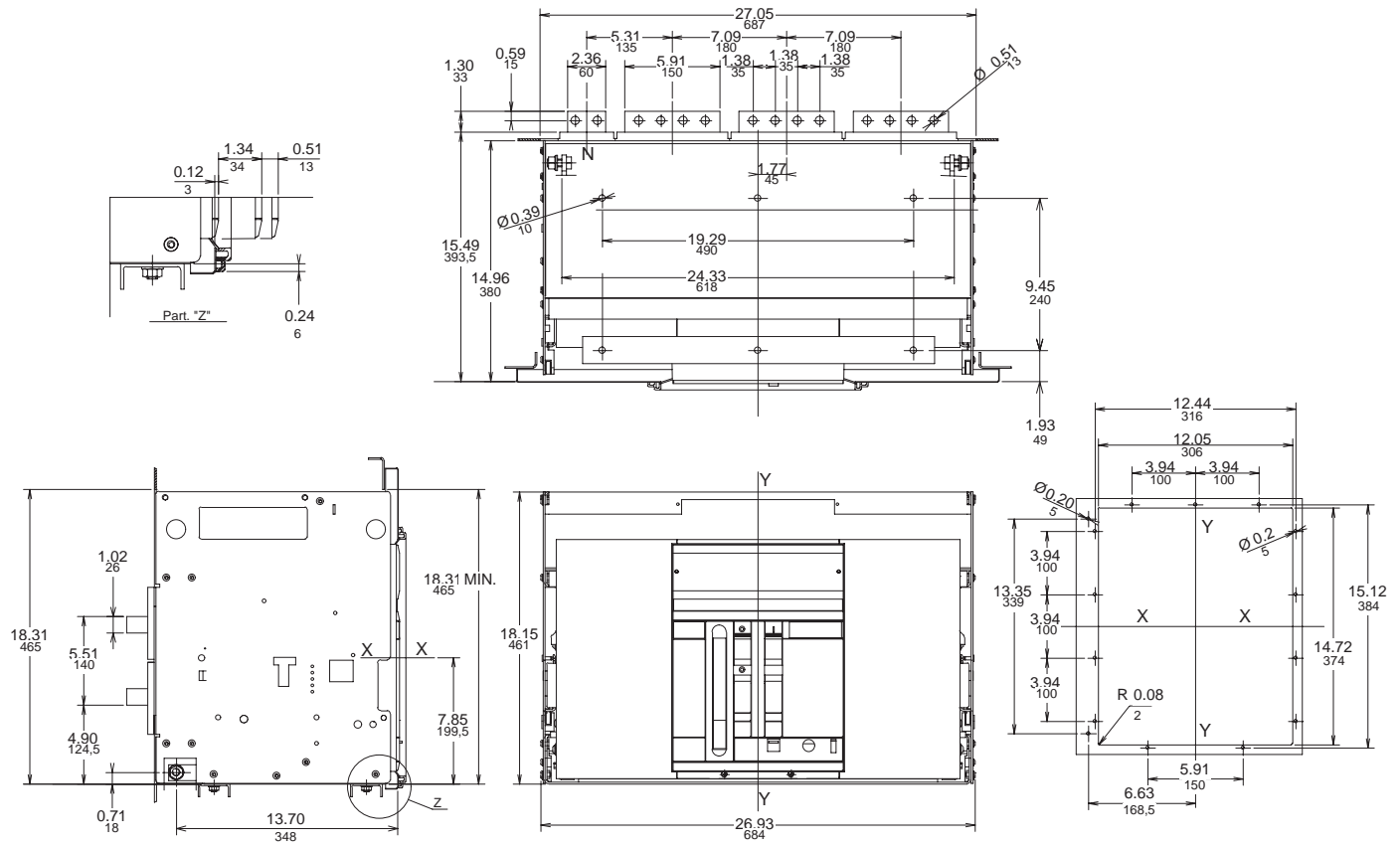
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Approximate dimensions (for UL version) E4, withdrawable with horizontal rear terminals 4 pole

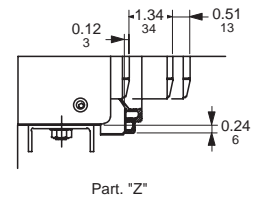
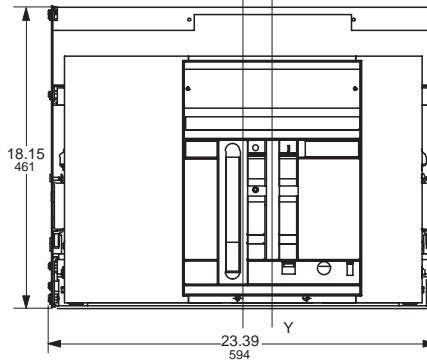
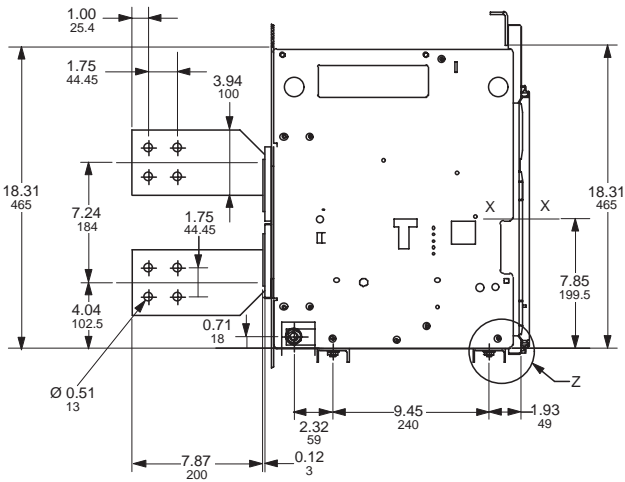
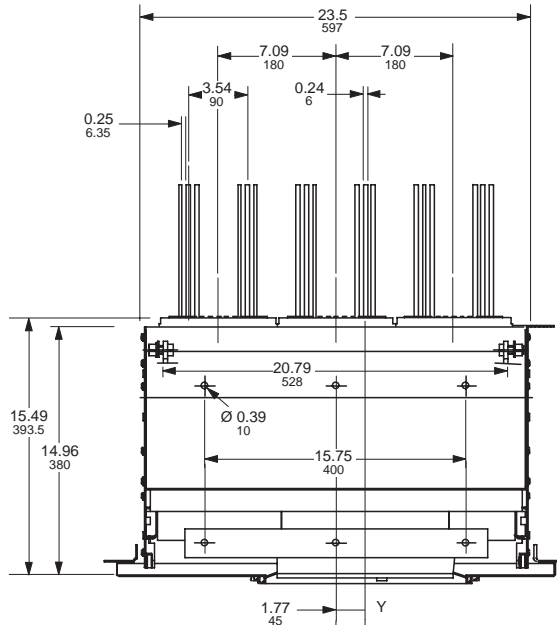
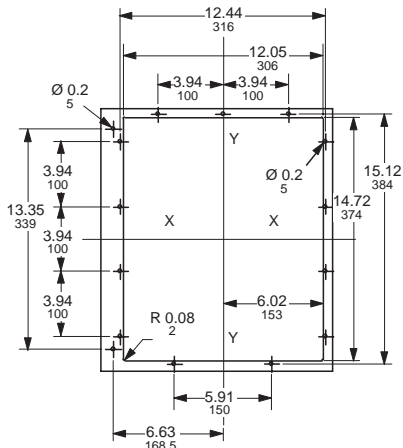


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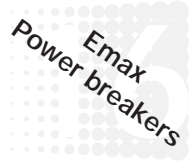


Approximate dimensions (for UL version) E4, withdrawable with vertical rear terminals 3 pole

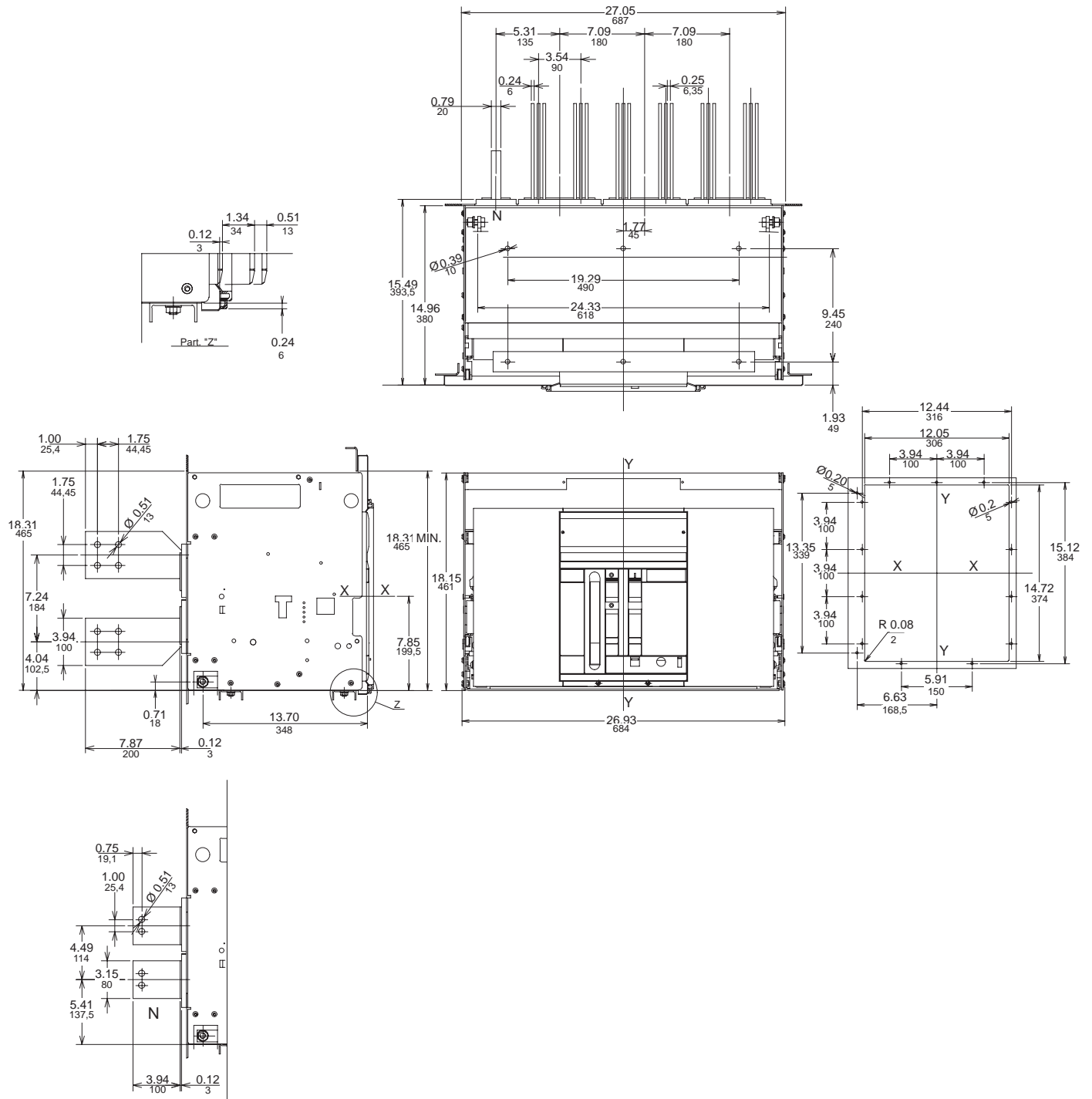
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Approximate dimensions (for UL version) E4, withdrawable with vertical rear terminals 4 pole

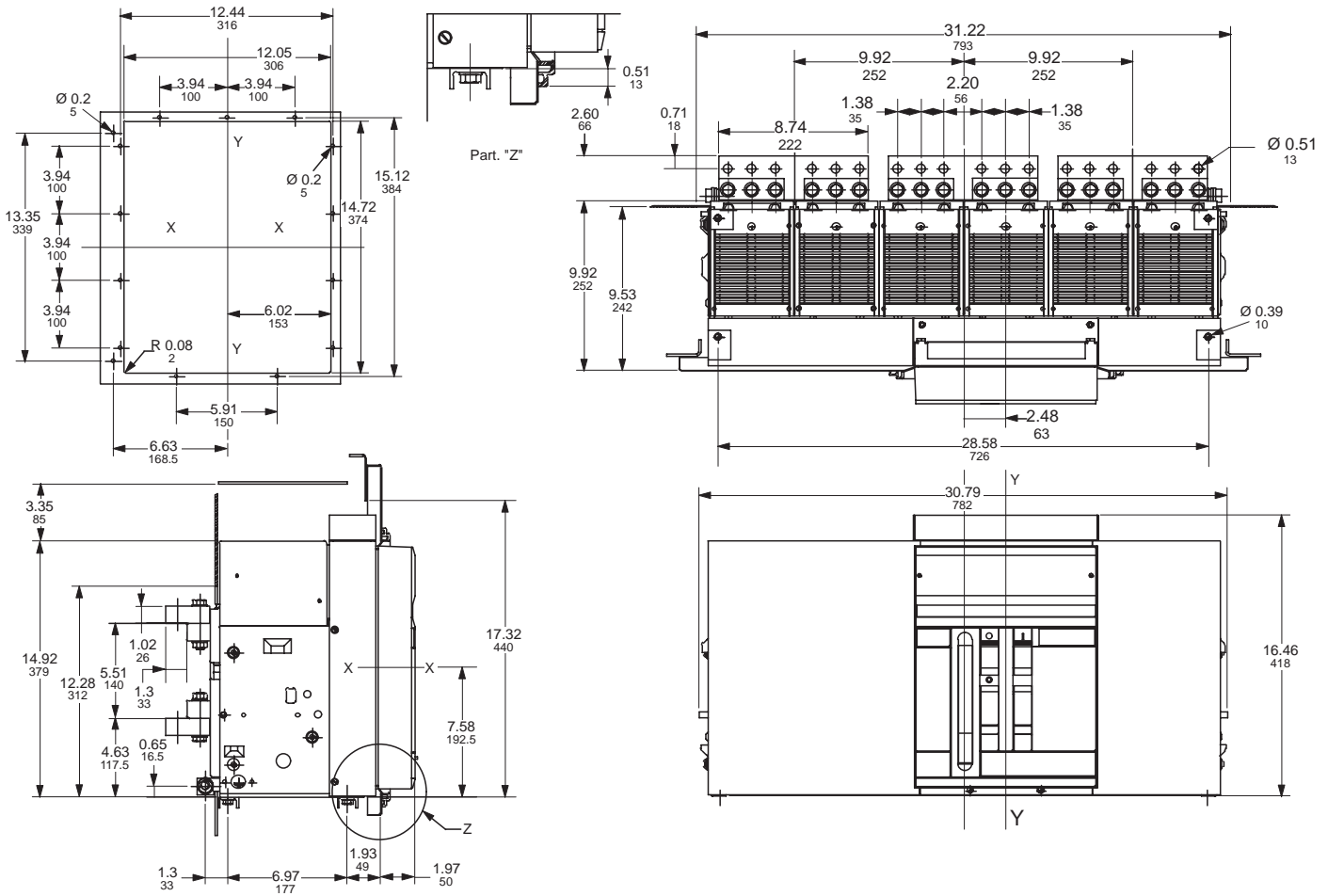


00.00 Inches
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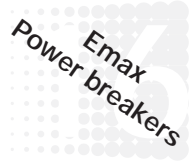


Approximate dimensions (for UL version)
E6, fixed with horizontal rear terminals
3 pole

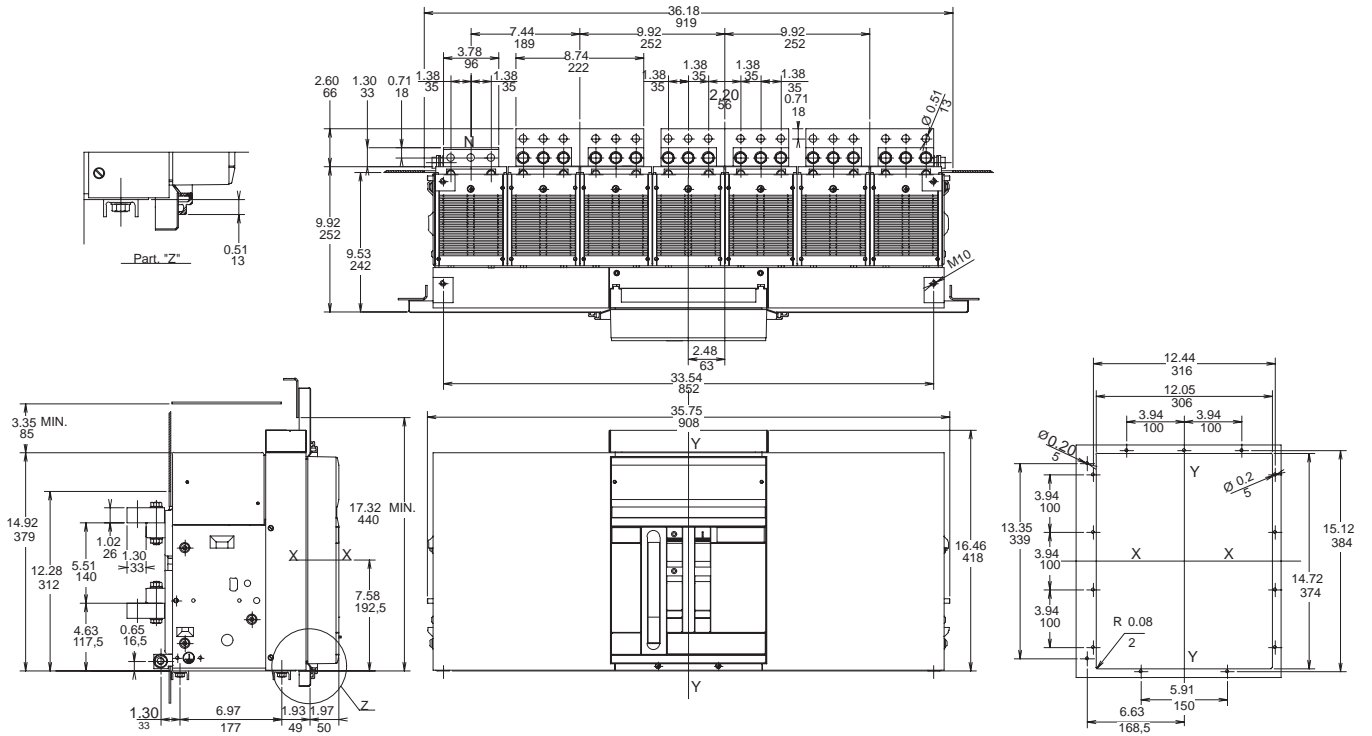
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00.00 [Millimeters]



Approximate dimensions (for UL version) E6, fixed with horizontal rear terminals 4 pole

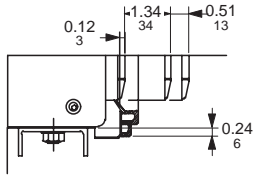


00.00 Inches
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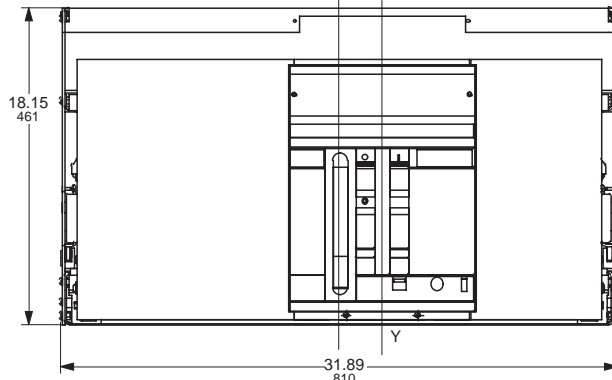
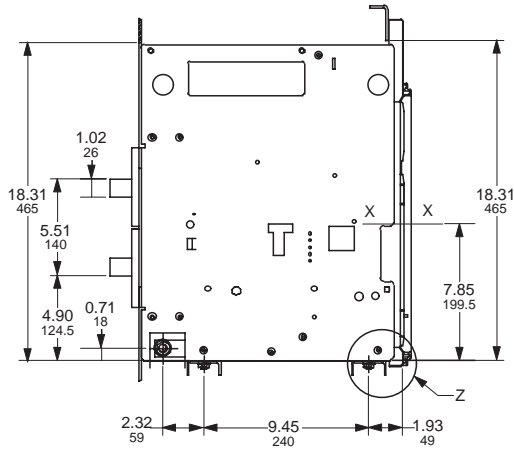
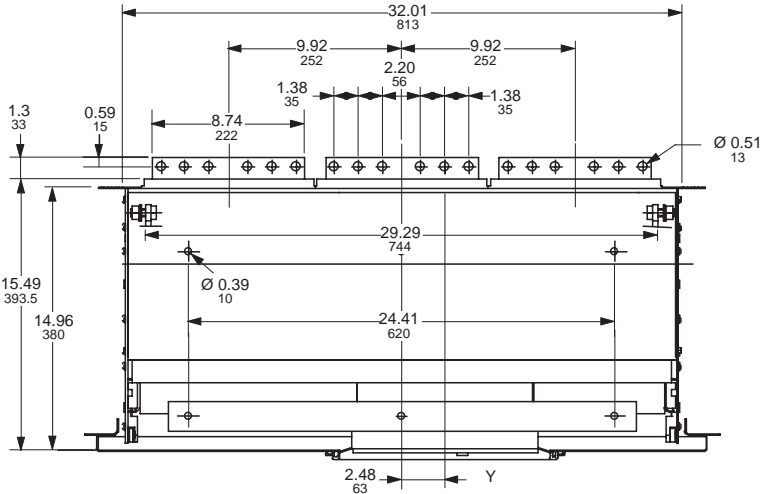
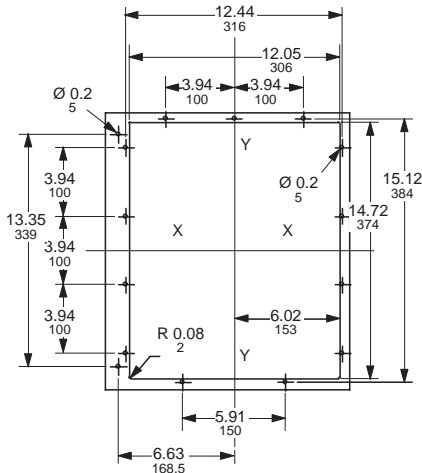


Approximate dimensions (for UL version)
E6, withdrawable with horizontal rear terminals
3 pole

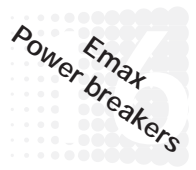
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00.00 [Millimeters]



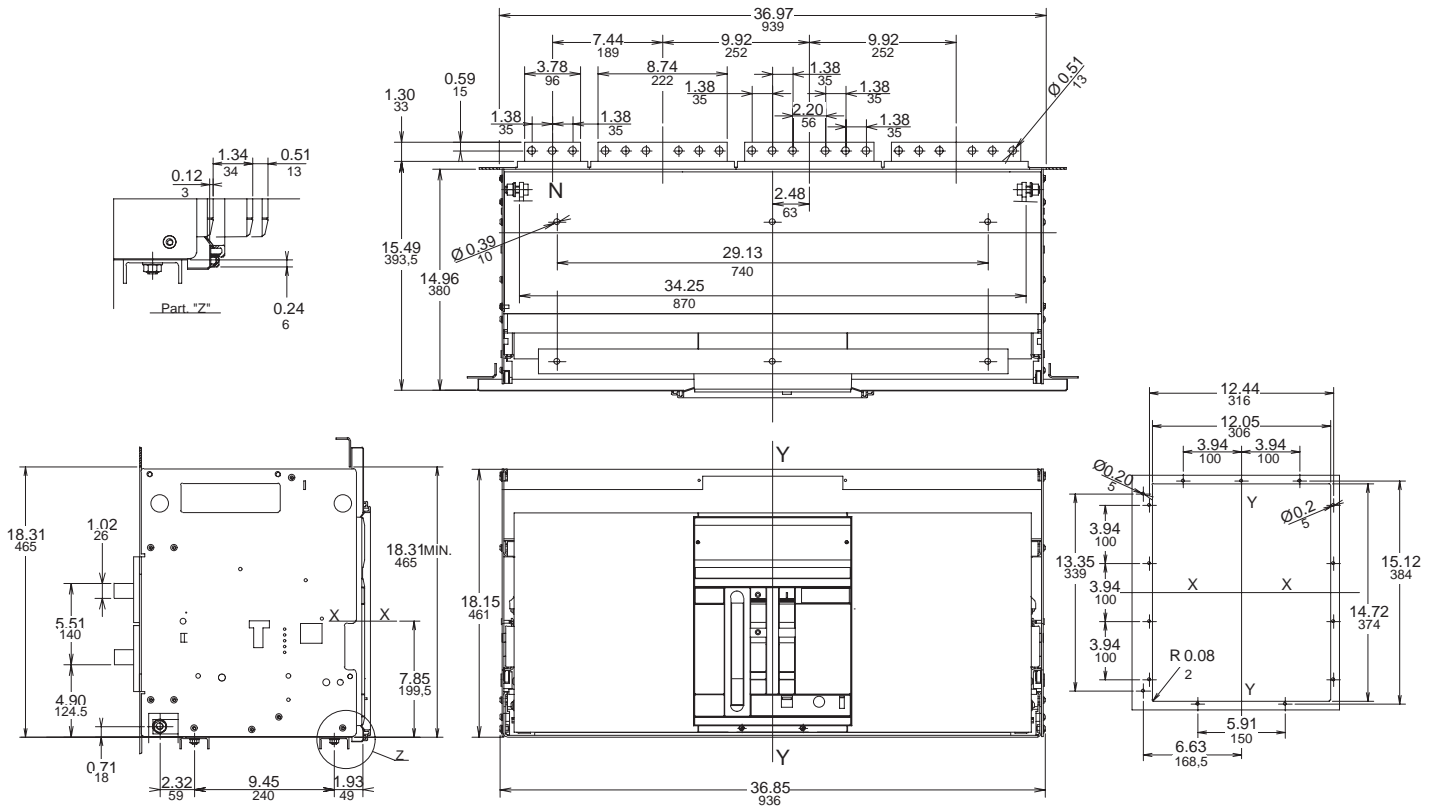
Part. "Z"



Approximate dimensions (for UL version) E6, withdrawable with horizontal rear terminals 4 pole

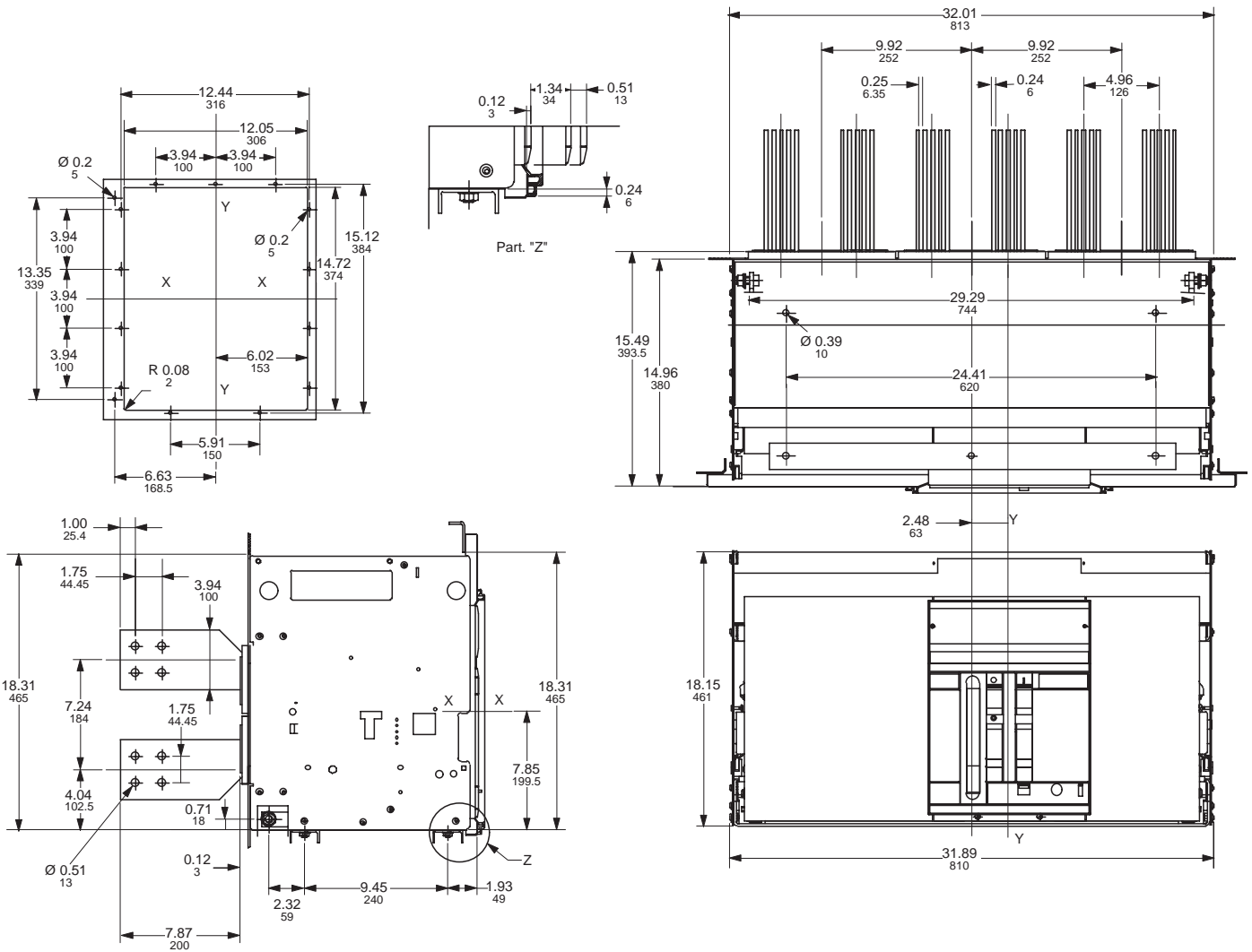


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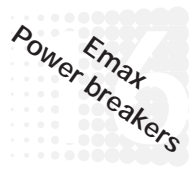


Approximate dimensions (for UL version)
E6, withdrawable with vertical rear terminals
3 pole

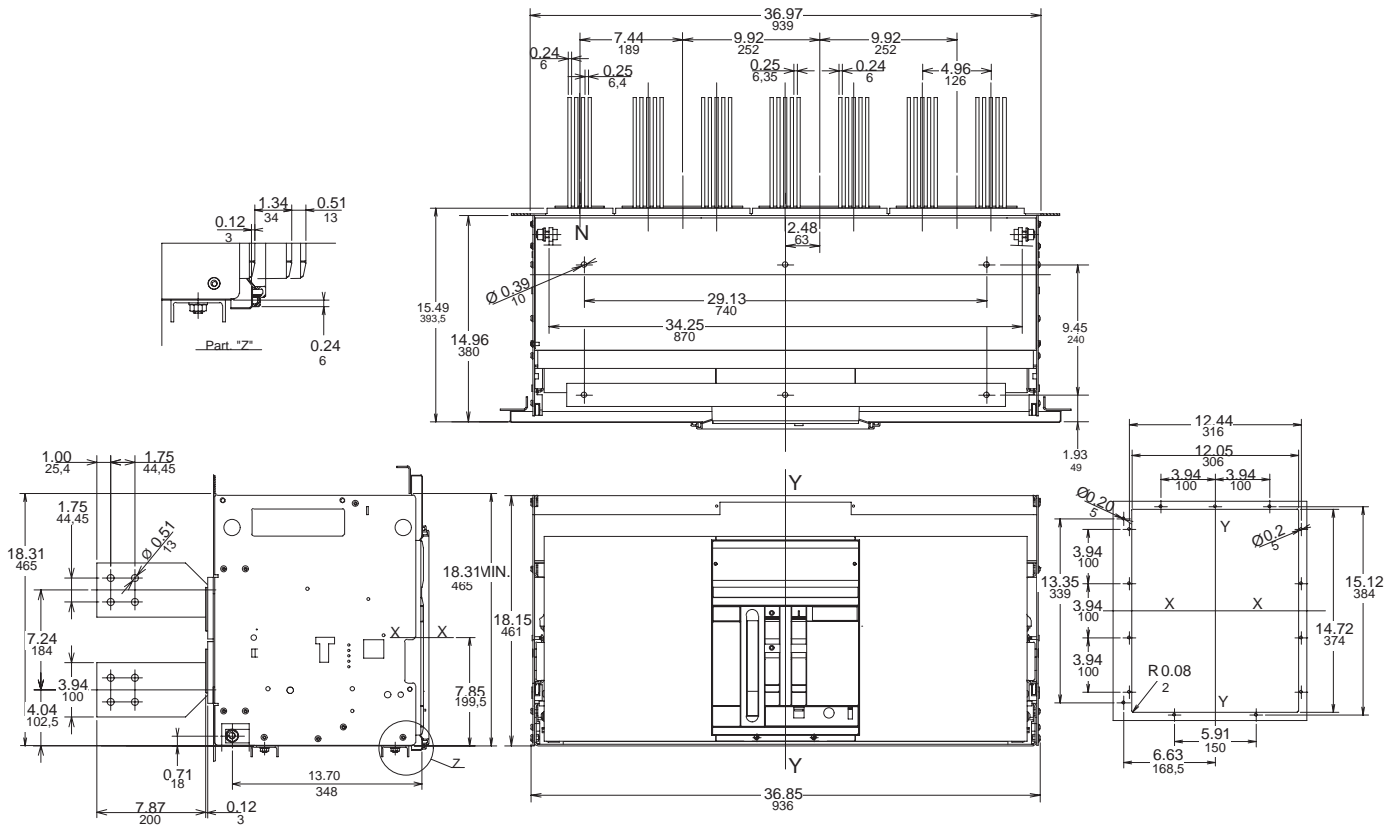
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00.00 [Millimeters]



Approximate dimensions (for UL version) E6, withdrawable with vertical rear terminals 4 pole



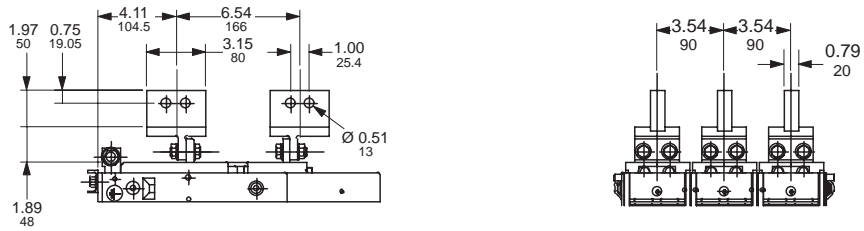
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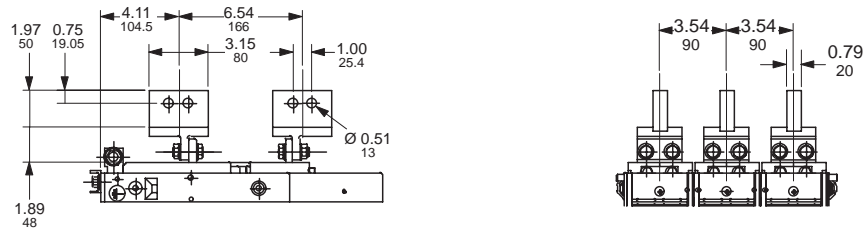
Approximate dimensions (for UL version)
E1 - E6, fixed with vertical rear terminals
3 pole

00.00 Inches
00.00 [Millimeters]

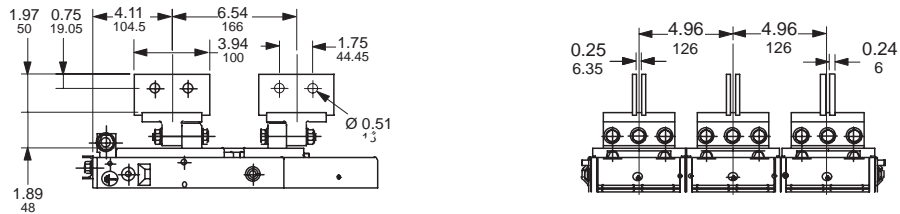
E1



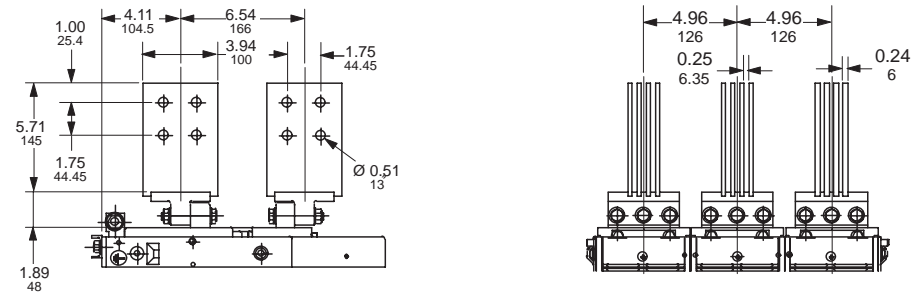
E2



E3 (1200A - 2000A)

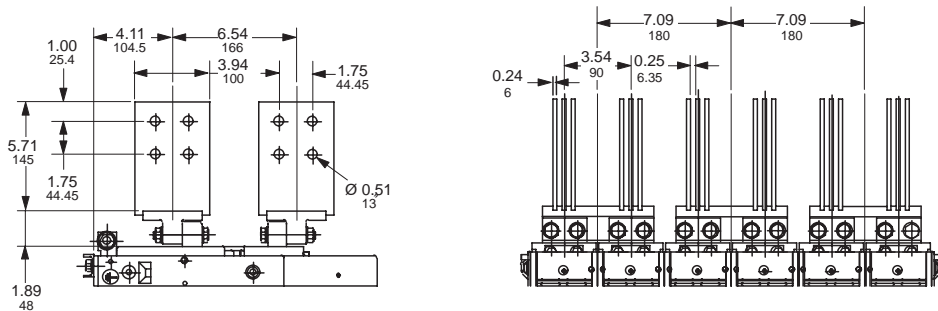


E3 (2500A)

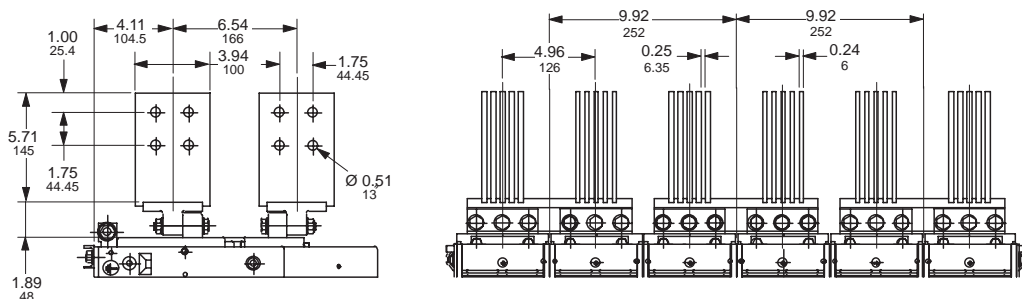


16

E4



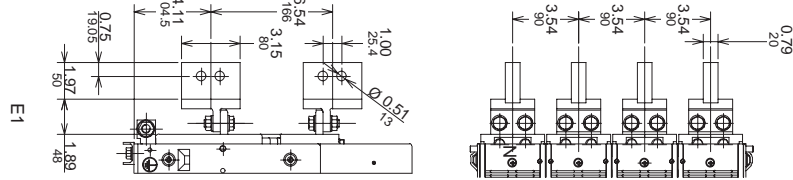
E6



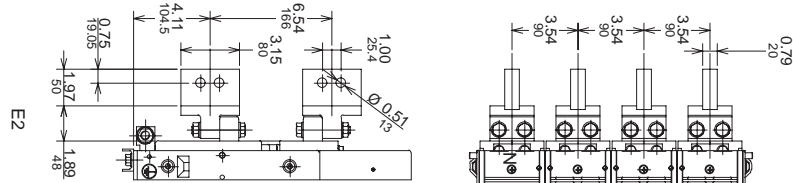
Approximate dimensions (for UL version)
E1 - E6, fixed with vertical rear terminals
4 pole

00.00 Inches
00.00 [Millimeters]

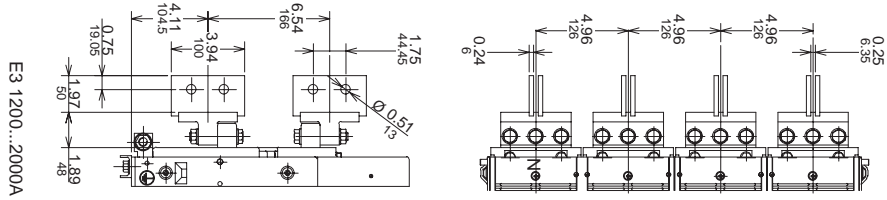
E1



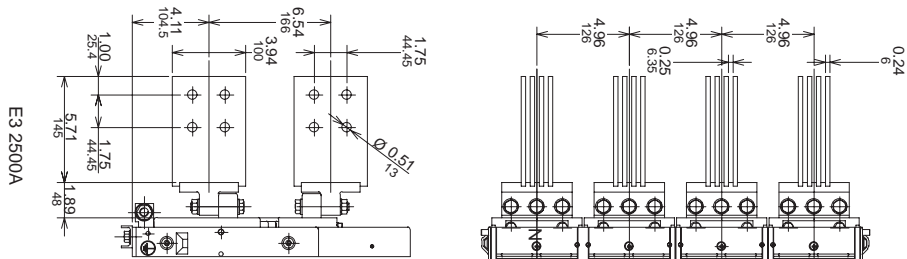
E2



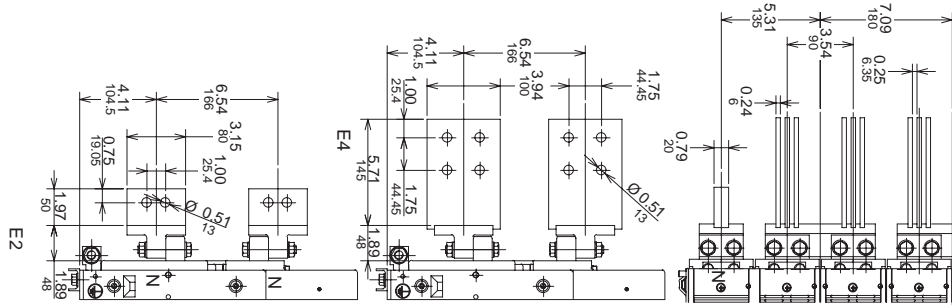
E3 (1200A - 2000A)



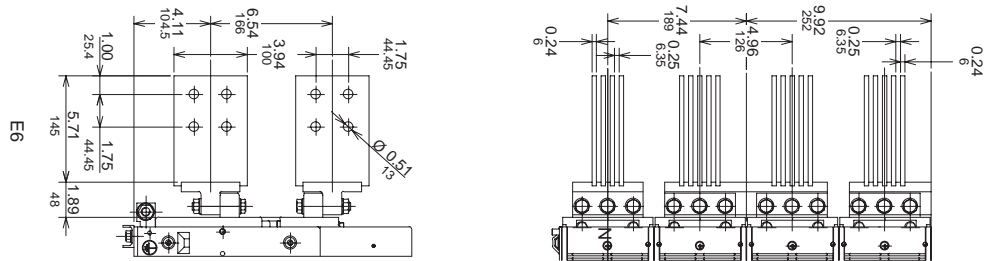
E3 (2500A)



E4



E6





Switchboard MaxSB	17.1 - 17.8
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Switchboard MaxSB Low Voltage Products and Systems



Switchboard MaxSB

New / Experienced

Building on years of experience in supplying low voltage distribution equipment all over the world ABB opens a new approach to what a switchboard can be and how it can better serve the user, the design engineer and the contractor.

Fresh / Familiar

ABB builds on the familiar look of a switchboard with group mounted molded case circuit breakers and fixed or draw out main breakers. Fresh ideas are incorporated with features such as a slotted vertical bus design, a full hinged door that incorporates the breaker cover plates, and a modular frame enclosure system.

Unique / Reliable

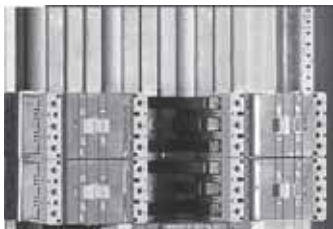
Unique design features such as the slotted bus, and hinged door make this switchboard new. Plated copper bus, bolted bus connections, a frame enclosure structure, and ABB's proven breaker technology make this ABB switchboard highly reliable. Quality is a standard feature in ABB switchboards. A list of expensive options is not needed to ensure the highest quality standards are met.

Features

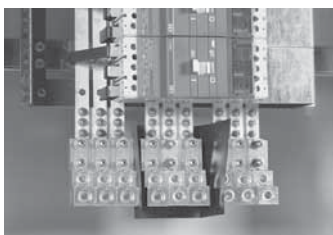
- Hinged door and large wire ways save time and money in field wiring.
- Unique bus layout delivers the freedom to locate feeder breakers independent of any hole pattern.
- Plated copper bus used in all three phases and neutral.
- Copper ground bus extends full width of switchboard.
- Horizontal bus up to 5000 Amps
- Vertical bus up to 3000 Amps
- Group mounted feeder breakers ranging from 15 amps to 1200 Amps
- Main breakers up to 5000 Amps
- Strong frame construction isolates bus and breaker assemblies from enclosure "skin". Durable dry paint finish. Four inch base and lifting eyes are standard.

17

Switchboard MaxSB General information



Unique hole-less bus bar arrangement allows you to install feeder breakers in any location vertically. Less time less hassle.



Easy access to incoming terminals. Less time less hassle



5000 amp Mains and 3000 amp vertical bus designs enable this switchboard to distribute power in the largest low voltage applications. A multi-layered bus design and modular enclosure system provide the flexibility to provide an 800 amp free-standing switchboard that has an extremely small foot print.

Precise / Flexible

ABB's switchboard uses a frame-based enclosure system. Unlike self-supporting enclosures the frame supports the bus bar and breaker assemblies. Front panels, sidewalls, and rear panels are also supported by the frame structure. This design offers a number of advantages over self-supporting enclosure systems. Damaged walls and panels can be easily replaced without the need to disassemble interior bus or breaker assemblies. The modular nature of ABB's frame enclosure system makes it easy to expand the switchboard by adding sections as system requirements change. Simply remove a side wall and butt the new section against the old. Overlapping horizontal bus design makes for a simple and accurate splice connection.

Custom / Standard

Wouldn't it be nice to have the freedom to layout a switchboard in such a way that it compliments the application and site requirements? Would you benefit from the freedom to locate breakers as you choose? Wouldn't you like to add custom features like a dust-proof enclosure, or a full glass door for added security and an enhanced appearance in high visibility sites? ABB's standard switchboard design makes these and other custom like features affordable.

Industrial / Commercial

The Operations Manager wants reliability, the specifying engineer wants a product he can believe in, the service department demands maintainability, the CFO wants value and the contractor wants a supplier and product that is easy to work with and on time delivery. One company can match all of these requirements; ABB.

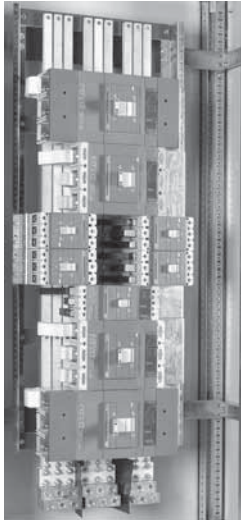
The Operations Manager and specifying engineer appreciate features such as plated copper bus and bolted bus connections. A frame-based enclosure system delivers strength, expandability and simplifies repairs. The complete system is designed and tested to meet or exceed UL requirements.

The maintenance department enjoys a hinged door that makes it easy for qualified personnel to access the cabinet to maintain and service ABB's switchboards. Connections are located so that you can actually get to them. A framed enclosure construction and bus design make this switchboard easy to expand as requirements change.

Contractors save on installation time with easy to access terminals, increased cable area and a design that makes it easy to add breakers and accessories in the field.

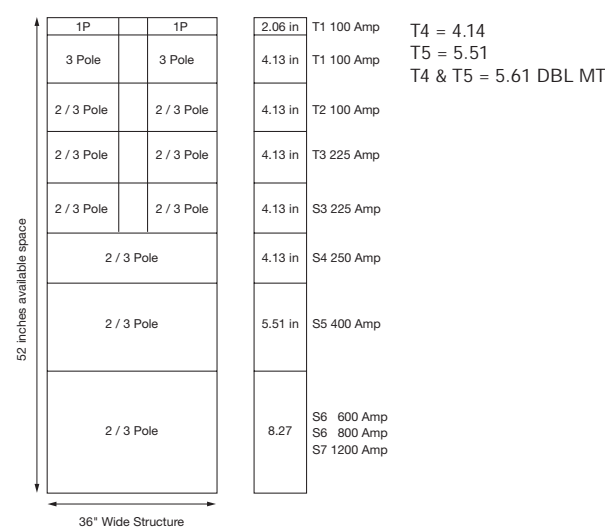
Switchboard MaxSB

Low Voltage Products and Systems



Feeder Breakers

Frame	Poles	Space Inches	KAIC			Trip Frame Rating Amps							
			277	240	480	15	20	25	30	35	40	50	60
T1B	1	1.0	18 ^②										
T1N	3	3.0		50	22 ^③								
T2S	2/3	3.54		65	35								
T2H	2/3	3.54		100	65								
T3N	2/3	4.13		50	25								
T3S	2/3	4.13		65	35								
S3N	2/3	4.13		65	25								
S3H	2/3	4.13		100	50								
S3L	2/3	4.13		150	85 ^①								
						70	80	90	100				
T1B	1	1.0	18										
T1N	3	3.0		50	22								
T2S	2/3	3.54		65	35								
T2H	2/3	3.54		100	65								
T3N	2/3	4.13		50	25								
T3S	2/3	4.13		65	35								
S3N	2/3	4.13		65	25								
S3H	2/3	4.13		100	50								
S3L	2/3	4.13		150	85								
						125	150	175	200	225			
T3N	2/3	4.13		50	25								
T3S	2/3	4.13		65	35								
S3N	2/3	4.13		65	25								
S3H	2/3	4.13		100	50								
S3L	2/3	4.13		150	85								
						250 Electronic - adjustable 40 - 250							
S4N	2/3	4.13		65	25								
S4H	2/3	4.13		150	65								
S4L	2/3	4.13		200	100								
						400 Electronic - adjustable 160 - 400							
S5N	2/3	5.51		65	35								
S5H	2/3	5.51		150	65								
S5L	2/3	5.51		200	100								
						600 Electronic - adjustable 240 - 600							
S6N	2/3	8.27		65	50								
S6H	2/3	8.27		150	65								
S6L	2/3	8.27		200	100								
						800 Electronic - adjustable 320 - 800							
S6N	2/3	8.27		65	50								
S6H	2/3	8.27		150	65								
S6L	2/3	8.27		200	100								
						1200 Electronic - adjustable 480 - 1200							
S7H	2/3	8.27		100	65								



① S3L	15-30A	65kA@480V
② T1B	15A	10kA@277V
③ T1N	15A	35kA@240V 14kA@480V

Maximum switchboard rating = 100kA

Molded case circuit breakers

Tmax

T1 100 A - T2 100A - T3 225 A



T1 100A



T2 100A



T3 225A



Tmax T2 can be fitted with the latest generation in electronic trip units. This is the first time that a circuit-breaker of this size can benefit from electronic protection, and the setting flexibility it provides.

UL 489 CSA 22.2

Circuit breakers		Tmax T1 1p	Tmax T1	Tmax T2	Tmax T3	
Maximum frame continuous current 40°C I _u	[A]	100	100	100	225	
Number of poles	[Nr]	1	3/4	2/3/4	2/3/4	
Rated operational voltage (AC) 50-80Hz U _e	[V]	277	480	480	480	
Short circuit interrupting capacity, I _{cu}	AC 240V	[kA]	B	N	S H	N S
		[kA]	50	65	100	50 65
	277V	[kA]	18 ^①			
	480V	[kA]		22 ^②	35 65	25 35
	DC 250V 2 poles in series	[kA]		25		25 35
500V 3 poles in series	[kA]		25		25 35	
Relays	TM	-	-	-	-	
	PR22 1DS			-	-	
	MA			-	-	
Versions	MCCB	-	-	-	-	
	MCS		-		-	
	MCP			-	-	

IEC 60047-2

Circuit breakers		Tmax T1 1p	Tmax T1	Tmax T2	Tmax T3		
Rated uninterrupted current I _u	[A]	160	160	160	250		
Number of poles	[Nr]	1	3/4	3/4	3/4		
Rated service voltage, U _e	AC 50-60Hz	240	690	690	690		
	DC	125	500	500	500		
Rated ultimate short circuit breaking capacity, I _{cu}	AC	220/230V	[kA]	B	B C N	N S H L	N S
		[kA]	25	25 40 50	65 85 100 120	50 85	
		380/415	[kA]		16 25 36	36 50 70 85	36 50
		440V	[kA]		10 15 22	30 45 55 75	25 40
	500V	[kA]		8 10 15	25 30 36 50	20 30	
	690V	[kA]		3 4 6	6 7 8 10	5 8	
	DC	250V 2 poles in series	[kA]		16 25 36	35 50 70 85	36 50
		250V 2 poles in series	[kA]		20 30 40	40 55 85 100	40 55
500V 2 poles in series		[kA]		16 25 36	36 50 70 85	36 50	
Trip units	Fixed thermal magnetic	-					
	Fixed thermal magnetic PR221/DS			-	-		
	Fixed magnetic			-	-		
	Adjustable magnetic			-	-		
Dimensions	H [in/mm]	5.12/130	5.12/130	5.12/130	5.9/150		
	W 1p or 3p [in/mm]	1/25.4	3/76	3.54/90	4.13/105		
	W 4p [in/mm]		4/102	4.72/122	5.5/140		
Mechanical life	D [in/mm]	2.76/70	2.76/70	2.76/70	2.76/70		
	[No operations]	25000	25000	25000	25000		
	[No hourly operations]	240	240	240	120		
Electrical life	[No operations]	8000	8000	8000	8000		
	[No hourly operations]	120	120	120	120		

① 15A : 10kA@277Vac

② 15A : 35kA@240Vac; 14kA@480Vac

Molded case circuit breakers

Isomax

S3B - S3 - S4



S3B

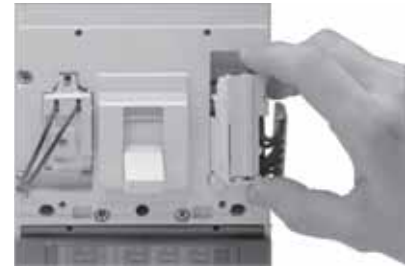


S3



S4

Isolation of control accessories and power poles allows for the safe addition / replacement of shunt trips, auxiliaries, bell alarm and under voltage relays.

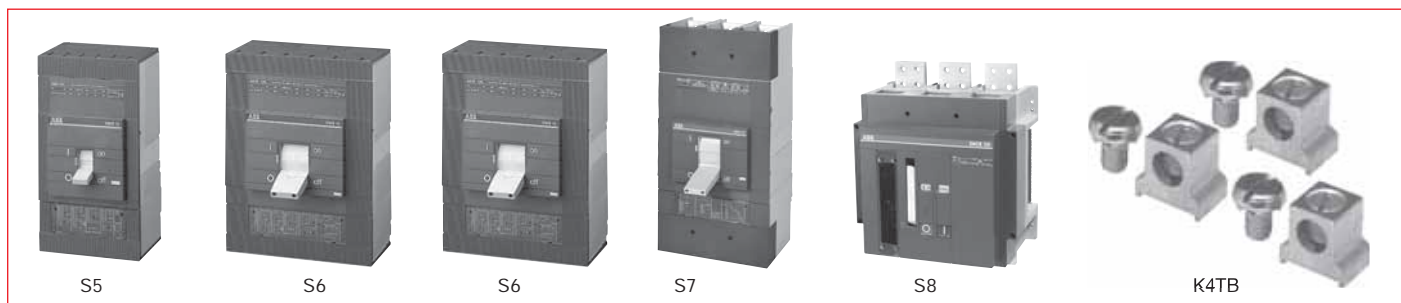


Circuit breaker type

			S3B	S3			S4					
Maximum frame continuous rated current	40° C	A	225	150	225	250						
Rated operational voltage	50/60Hz	V	240	600	480	600						
Test voltage	1 min. 50/60 Hz	V	3000	3000	3000	3000						
Rated impulse withstand voltage		kV	6	6	6	8						
Poles		No.	2/3	2/3/4	2/3/4	2/3/4						
Performance level			B	N	H	L	N	H	L			
UL/CSA short-circuit Interrupting capacity UL 489, File #E93565 CSA, File #LR90467	240VAC	kA RMS	150	65	100	150	65	100	150	65	100	150
	480VAC		–	25	50	85 ^②	25	50	65	65	150	200
	600VAC		–	14	14	25	–	–	–	18	32	35
	500VDC		50	35	50	65	25	35	50	–	–	–
	600VDC	①	–	20	35	50	–	–	–	–	–	–
IEC-947 rated ultimate Short-circuit Breaking capacity	202/230VAC	kA RMS	150	65	100	170	65	100	170	65	100	200
	380/400/415VAC		–	35	65	85	35	65	85	35	65	100
	440VAC		–	30	50	65	30	50	65	30	50	80
	500VAC		–	25	40	50	25	40	50	25	40	65
	660/690VAC	–	14	18	20	14	18	20	18	22	30	
Overcurrent trip unit/relay			•	•	•	•	•	•	•	•	•	
Thermal-magnetic			–	–	–	–	–	–	–	–	–	
Microprocessor-based			–	–	–	–	–	–	–	–	–	
Dialogue unit			–	–	–	–	–	–	–	–	–	
Interchangeability			–	–	–	–	–	–	–	–	–	
Version — Terminals			•	•	•	•	•	•	•	•	•	
Fixed — front or rear			•	•	•	•	•	•	•	•	•	
Plug-in — front or rear			•	•	•	•	•	•	•	•	•	
Withdrawable — front or rear			•	•	•	•	•	•	•	•	•	
Dimensions (fixed circuit-breaker)												
2P & 3P (H x W x D)		in	6.70 x 4.13 x 4.07	6.70 x 4.13 x 4.07	6.70 x 4.13 x 4.07	6.70 x 4.13 x 4.07	10.0 x 4.13 x 4.07	10.0 x 4.13 x 4.07	10.0 x 4.13 x 4.07	10.0 x 4.13 x 4.07	10.0 x 4.13 x 4.07	
4P (H x W x D)		in	6.70 x 5.51 x 4.07	6.70 x 5.51 x 4.07	6.70 x 5.51 x 4.07	6.70 x 5.51 x 4.07	10.0 x 5.51 x 4.07	10.0 x 5.51 x 4.07	10.0 x 5.51 x 4.07	10.0 x 5.51 x 4.07	10.0 x 5.51 x 4.07	
Mechanical duration		No.	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	
operations frequency		ops./hour	240	120	120	120	120	120	120	120	120	
Weights (fixed 3P)		lbs.	6.75	6.75	6.75	6.75	8.8	8.8	8.8	8.8	8.8	

① For use with thermal - magnetic trip only:
500 VDC, 2 poles in series
600 VDC, 3 poles in series
② 15-30A units are 65kA at 480VAC

Molded case circuit breakers Isomax S3B - S3 - S4



Circuit breaker type		S5	S6			S7	S8			
Maximum frame continuous rated current	40° C	A	400	600	800	1200	1600/2000/2500			
Rated operational voltage	50/60Hz	V	600	600	600	600	600			
Test voltage	1 min. 50/60 Hz	V	3000	3000	3000	3000	3000			
Rated impulse withstand voltage		kV	8	8	8	8	8			
Poles		No.	2/3/4	2/3/4	2/3/4	2/3/4	3			
Performance level			N H L	N H L	N H L	H	V			
UL/CSA short-circuit Interrupting capacity UL 489, File #E93565 CSA, File #LR90467	240VAC	kA RMS	65	150	200	65	150	200	100	120
	480VAC		35	65	100	50	65	100	65	100
	600VAC		22	22	35	25	35	42	50	85
	500VDC		35	50	65	35	50	65	–	–
	600VDC	①	20	35	50	20	35	50	–	–
IEC-947 rated ultimate Short-circuit Breaking capacity	202/230VAC	kA RMS	65	100	200	65	100	200	100	120
	380/400/415VAC		35	65	100	35	65	100	65	120
	Icu 440VAC		30	50	80	30	50	680	55	100
	500VAC		25	40	65	25	40	65	45	70
	660/690VAC	②	20	25	30	20	25	35	25	50
Overcurrent trip unit/relay										
Thermal-magnetic			•	•	•	•	•	•	•	
Microprocessor-based			•	•	•	•	•	•	•	
Dialogue unit			•	•	•	•	•	•	•	
Interchangeability			•	•	•	•	•	•	•	
Version — Terminals										
Fixed — front or rear			•	•	•	•	•	•	•	
Plug-in — front or rear			•	•	•	•	•	•	•	
Withdrawable — front or rear			•	•	•	•	•	•	•	
Dimensions (fixed circuit-breaker)										
2P & 3P (H x W x D)	in		10.0 x 5.51 x 4.07	10.55 x 8.27 x 4.07	14.25 x 8.27 x 4.07	15.98 x 8.27 x 5.45	15.75 x 15.98 x 9.25			
4P (H x W x D)	in		10.0 x 7.24 x 4.07	10.55 x 11.0 x 4.07	14.25 x 11.0 x 4.07	15.98 x 11.0 x 5.45				
Mechanical duration operations frequency	No. ops./hour		20,000 120	20,000 120	20,000 120	10,000 120	10,00 20			
Weights (fixed 3P)	lbs.		11.0	21.0	22.0	37.5	135			

Standard cable lug kits

For breakers	Amps	Wire range	Catalog number
S3	60	14AWG - 2AWG	K3TA
S3 - S4	100	14AWG - 1/0	K4TB
S3 - S4	150	14AWG - 4/0	K4TC
S3 - S4 - S5	225	4AWG - 300kcmil	K4TD
S4	250	6AWG - 350kcmil	K4TE
S5	300	250kcmil - 500kcmil	K5TF
S5	400	(2) 3/0 - 250kcmil	K5TG
S6	600	(2) 250kcmil - 250Kcmil	K5TH
S6	800	(3) 2/0 - 400kcmil	K6TJ
S7	1200	(4) 4/0 - 400kcmil	K7TK
S8	1600	(4) 1/0 - 750kcmil	K8TL
S8	2500	(6) 1/0 - 750kcmil	K8TM

Standard cable lugs, for use on load side of circuit breaker. Suitable for use with Cu or Al. Special versions available with taps and screw for control wire connection. Note: S6 and S7 lugs are Al9Cu (90°); all others AL7Cu (75°C). Must use wire based on 75°C ampacity.

Air circuit breakers

Emax

E1 - E2 - E3 - E4 - E6



Circuit breaker type

		E1		E2		E3				E4			E6	
		B-A	B-A	N-A	N-A	S-A	H-A	V-A	S-A	H-A	V-A	H-A	V-A	
Performance level														
Rated continuous current File #E194191	A	800	1600	1200	2000	1200	1200	1200	3200	3200	3200	4000	4000	
	A	1200	-	1600	2500	1600	1600	1600	3600	3600	3600	5000	5000	
	A	-	-	-	-	2000	2000	2000	-	-	-	-	-	
	A	-	-	-	-	2500	2500	2500	-	-	-	-	-	
Rated short circuit current	240VAC	kA	42	42	65	65	85	85	100	85	100	100	125	125
	480VAC	kA	42	42	50	50	65	85	100	65	85	100	85	125
	600VAC	kA	35	42	50	50	65	65	85	65	85	85	85	85
Rated short time current	kA	35	42	50	50	65	65	65	65	85	85	100	100	
Trip units														
PR111/P-A		•	•	•	•	•	•	•	•	•	•	•	•	
PR112/P-A		•	•	•	•	•	•	•	•	•	•	•	•	
PR113/P-A		•	•	•	•	•	•	•	•	•	•	•	•	
Operation times														
Make time (max)	ms	80	80	80	80	80	80	80	80	80	80	80	80	
Break time (I<ST current)(max)	ms	70	70	70	70	70	70	70	70	70	70	70	70	
Break time (I>ST current)(max)	ms	30	30	30	30	30	30	30	30	30	30	30	30	
Overall dimensions, 3 pole														
Fixed: H=418mm / 16.46in D=302mm / 11.89in W (3 poles)	mm/in	296/11.65	296/11.65			404/15.91			566/22.28			782/30.79		
Drawout: H=461mm / 18.15in D=396.5mm / 15.61 in W (3 poles)	mm/in	324/12.76	324/12.76			432/17.01			594/23.39			810/31.89		
Weights (CB with releases, RH terminals and CTs, accessories excluded)														
Fixed 3 poles	Kg/lbs	452/93	46/101			68/150			95/209			140/309		
Drawout 3 poles	Kg/lbs	65/143	72/159			100/220			147/324			210/463		
Overall dimensions, 4 pole														
Fixed: H=418mm / 16.46in D=302mm / 11.89in W (4 poles)	mm/in	386/15.20	386/15.20			530/20.87			656/25.83			908/35.75		
Drawout: H=461mm / 18.15in D=396.5mm / 15.61in W (4 poles)	mm/in	414/16.30	414/16.30			558/21.97			684/26.93			936/36.85		
Weights (CB with releases, RH terminals and CTs, accessories excluded)														
Fixed 4 poles	Kg/lbs	50/110	55/121			80/176			115/253			170/374		
Drawout 4 poles	Kg/lbs	80/176	89/196			125/275			190/418			260/573		

Specifications common to the entire range

Rated max voltage	635 VAC
Rated voltage	600VAC
Test voltage (1 min 50/60Hz)	2.2k
Frequency	50/60Hz
Number of poles	3/4
Versions	Fixed/Drawout

Lugs: Main Breakers and Main Lugs Only

Frames	Lug size	Wire size	Catalog number
E1	(4)	#2-600kcmil	KE1CLK 4600
E2	(4)	#2-600kcmil	KE2CLK 4600
E3	(6)	#2-600kcmil	KE3CLK 6600
E4	(10)	#2-600kcmil	KE4CLK 10600
E5	(12)	#2-600kcmil	KE6CLK 12600



ABB's Emax air circuit breaker is available with three trip units models. From the PR111 that offers only the basic protection functions to the PR113 that offers protection, multi-meter capability, and communication capability there is a trip unit for every application.

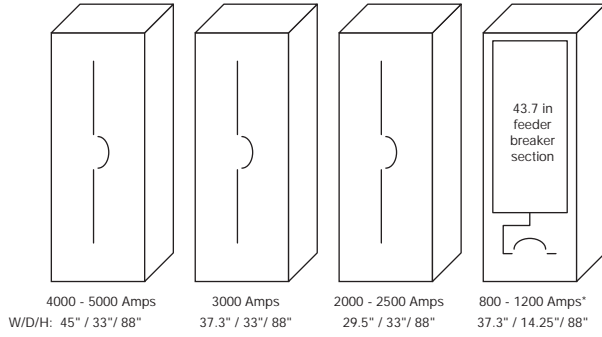
Air circuit breakers

Emax

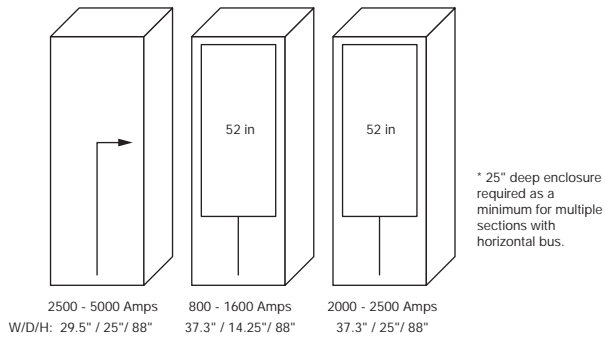
E1 - E2 - E3 - E4 - E6

Typical layouts

Mains



Mains Lugs Only and Feeder Breaker Sections





ATLV MaxSG Low Voltage Metal Enclosed Switchgear



Standard Line-Up of MaxSG Metal Enclosed Low Voltage switchgear with instrumentation and Emax Power Circuit Breakers.

MaxSG Switchgear

ABB MaxSG switchgear is a further continuation in the development of innovative products from ABB, a world-wide leader in development and production of low voltage switchgear. MaxSG is industrial duty equipment built to ANSI standards. MaxSG is designed to use 100% rated Emax circuit breakers and follows the vision of ABB products in providing customers with advanced solutions to meet the needs associated with the mechanical, electrical and thermal stress of today's manufacturing environment.

The MaxSG Metal-Enclosed Low Voltage Switchgear offers many advantages that include:

- Modular frame arrangements
- Optional barriers for increased personnel protection
- Efficient and flexible designs
- Standard connections to a full range of ABB products

MaxSG is available with the following nominal ratings:

- 600Vac max
- 5000Aac max
- 50/60 Hz
- 2200Vac RMS Dielectric
- 125kA Symmetrical Short Circuit Withstand Rating
- Seismic Qualification Zones 1 - 4

MaxSG can accommodate four Emax Power Circuit Breaker frame types:

- E2 1200-1600A: B-A N-A
- E3 1200-2500A: N-A, S-A, H-A, V-A
- E4 3200-3600A: S-A, H-A, V-A
- E6 4000-5000A : H-A, V-A

ABB MaxSG switchgear and the use of these breakers will allow a full range of selectivity, coordination, and short circuit withstand capability.

MaxSG vertical sections are offered in 23.6" (600mm), 31.5" (800mm), and 39.4" (1000mm) widths and will allow four 2000A circuit breakers to be placed in one vertical section maximizing power supply capability and minimizing floor space. In addition MaxSG offers depths of 65" (1650mm) and 75" (1900mm) to provide maximum available cable area.

ABB MaxSG switchgear and Emax circuit breakers have been designed and conformance tested to meet and exceed the industry requirements of ANSI C37.13, C37.16, C37.17 and UL 1066 for the breaker elements and ANSI C37.20.1, C37.51 and UL1558 for the switchgear assembly.

MaxSG and ABB will fill the customer's needs from general application through a full range of special applications including electrical protection, transfer/coordination, and extreme environmental applications.

ATLV MaxSG

ATLV MaxSG Features

Closed-Door Draw out Capability (standard)

MaxSG offers the ability to rack the breaker from the "CONNECT" position through the "TEST" position and to the "DISCONNECT" position while the breaker compartment door remains stationary and closed providing maximum convenience and personnel safety.



True Closed Door Draw out Capability

Draw out Padlock Provision

Allows the Emax breaker to be padlocked in the "CONNECT", "TEST" or "DISCONNECT" position providing an added degree of safety.

Breaker Rejection Feature (standard)

Prevents breakers with lower short circuit/continuous current ratings from being inserted into the breaker compartment.



Emax breaker rejection feature.

Safety Shutters (standard)

Safety shutters to prevent accidental contact with live bus are a standard on all breakers. In addition a padlock feature is available to lock the shutters in the closed position for an added degree of safety.

Breaker Insertion / Withdrawal Interlock (standard)

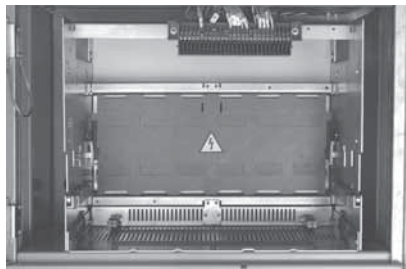
Interlocks prevent racking of the breaker while the main contacts are closed.

Kirk Key Interlocks

Allows the breaker to be locked open when in the connected position. Typical mechanical breaker interlocking can be achieved with this feature. Single and double barrel locks are available in the breaker compartment.

Overhead Lift Device

A rail mounted hoist is installed on top of the equipment for lifting the breakers into and out of the breaker cubicles.



Safety shutters standard in every Breaker cubicle.



MaxSG overhead lift device.

ATLV MaxSG Bus design

Bus Design

All horizontal and vertical bus are rated for ANSI and UL standard temperature rise requirements of maximum 65°C rise over an ambient temperature of 40°C.

Bus Insulation Systems

Bare bus is provided as standard in all MaxSG switchgear. The configuration provides horizontal isolation barriers at all tiebreakers for added protection in the event of a fault. An insulated bus system that completely insulates the bus with thermo-contractile flame resistant tubing is also available. At connection joints an adhesive coated low voltage tape or optional flexible boots are supplied for customer inspection and maintenance.

Bus Bracing

Steel supported polyester type fingerplates provide bus bracing. Bus bracing is available from 50kA to 125kA symmetrical ratings.

Rear Barriers

Steel main bus barriers are available to completely isolate the rear cable compartment area from the main bus for added personnel safety. Steel inter-compartment barriers are also available to isolate each vertical section.

Silver Plated Bus (Standard)

All bus is copper with a silver plated surface. Tin plated bus is offered as an option.

Ground Bus

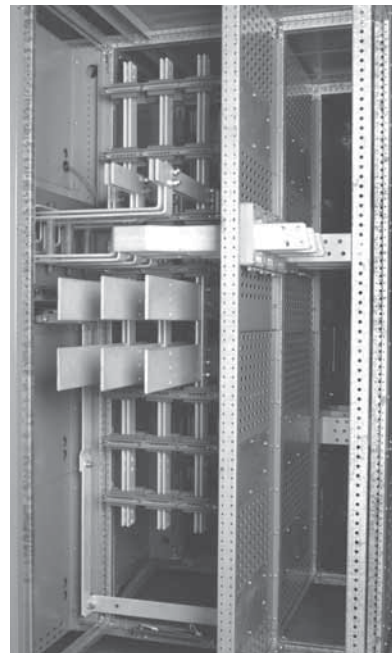
A ground bus is supplied over the entire length of the switchgear and is conveniently located for customer connections.



MaxSG main bus designed with the end user in mind.



Optional rear main bus barriers, providing a completely isolated cable compartment.



ATLV MaxSG Structural design



Basic Structure

The basic structure of the switchgear is a rigid platform constructed of 12gA steel. Lifting is available through floor jacks.

Hinges

Doors are attached with semi-concealed hinges allowing rugged support for equipment mounting and providing protection against non-authorized removal of doors with the use of tamper resistant hardware.



Standard bolted rear cover and optional hinged rear door.

Rear Covers/ Doors

Rear bolted covers with tap type screws provide easy removal and installation in the field. Optional full height hinged doors are also available on request.

Rear Cable Space

Conduit entries meet and exceed all applicable NEC requirements. Extended rear compartment space is available as an option to allow extra space if desired.

Paint and Finish

MaxSG uses an electro-static powder coat finish that meets and exceeds IEEE C37.20.1 coating qualification requirements. ANSI 61 light gray is offered as a standard.



Rear cable area.

ATLV MaxSG Wiring / Instrumentation

Secondary Terminations

Customer secondary terminations are located above the circuit breaker providing ample room for customer connection routing and termination. Spare terminal points can be located in the front of the gear in an instrument compartment.

Instrument compartments

When additional devices are required separate instrument compartments are supplied. Voltage transformers, when specified, are also mounted in the instrument compartments with their primary and secondary fuse protection.

Intercubicle Wiring

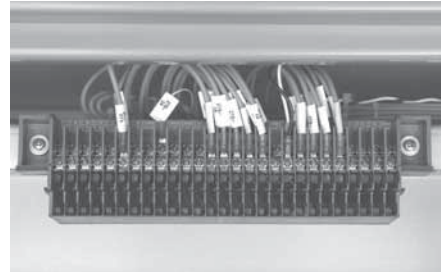
Intercubicle wiring is done on terminal strips located in a wire way on top of the equipment. This allows for quick and easy access when installing or expanding the MaxSG switchgear.

Wire Designation

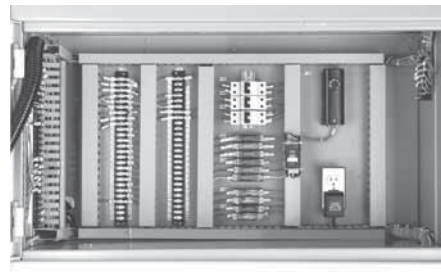
Heat shrink permanent marking origin destination wire tags are offered as a standard on all MaxSG switchgear.

Control Wiring

#14 gA SIS wiring is standard. Wiring is offered with the standard insulated locking fork and optional ring type terminals.



Customer secondary terminal locations.



Instrument compartment



ATLV MaxSG Dimensional data

Section sizing

The basic MaxSG switchgear is 87" (2200mm) in height, 90.2" (2290mm) to the top of the wiring and 98.9" (2511mm) over the top of the overhead lifting device, and 65" (1650mm) deep. The width of the vertical section is determined by the breaker type and frame size.

Table: Section Sizing

Breaker Frame Size	Breaker Cubicle Height	Min. Section Width	Minimum Equipment Depth	Optional Equipment Depth
1200-2000A	20.7" 525mm	23.6" 600mm	65" 1650mm	75" 1900mm
2500A-3600A	20.7" 525mm	31.5" 800mm	65" 1650mm	75" 1900mm
4000A-5000A	20.7" 525mm	39.4" 1000mm	65" 1650mm	75" 1900mm

MaxSG weights

The process for determining the cumulative weight for MaxSG switchgear is to add the weights for each vertical section of equipment and add the total weight of the breakers to be installed.

Table: MaxSG Switchgear Section Weights

Section Width	Weight (lbs.)
23.6"	971
31.5"	1155
39.4"	1381

* 257lbs to be added for end panels

Table: Emax Breaker Weights

Breaker type	Weight (lbs.)
E2	159
E3	220
E4	324
E6	463

MaxSG rules for layouts and sizing

- Main and tie breakers must be placed in the "C" compartment.
- One breaker can be placed below a main breaker.
- One breaker can be placed below a tie breaker.
- Instrument compartments are 20.7" (525mm) or 41.4" (1050mm) in height.
- Miniature control switches, miniature volt/ammeters, and indicating lights can be mounted on breaker compartment doors.
- Liquid cooled transformers require a 15" transition section.
- A maximum of four breakers can be placed in a vertical section.
- The factory should be consulted to determine if cabling arrangements will allow UL service entrance.
- The factory should be consulted for special applications such as fire pump breakers.

ATLV MaxSG Air circuit breakers



Circuit breaker type

		E2		E3				E4			E6	
		B-A	N-A	N-A	S-A	H-A	V-A	S-A	H-A	V-A	H-A	V-A
Performance level												
Rated continuous current	A	1600	1200	2000	1200	1200	1200	3200	3200	3200	4000	4000
File #E194191	A	-	1600	2500	1600	1600	1600	3600	3600	3600	5000	5000
	A	-	-	-	2000	2000	2000	-	-	-	-	-
	A	-	-	-	2500	2500	2500	-	-	-	-	-
Rated short circuit current	240VAC	kA	42 65	65	85	85	100	85	100	100	125	125
	480VAC	kA	42 50	50	65	85	100	65	85	100	85	125
	600VAC	kA	42 50	50	65	65	85	65	85	85	85	85
Rated short time current		kA	42 50	50	65	65	65	85	85	85	100	100
Trip units												
PR111/P-A			• •	• •	• •	• •	• •	• •	• •	• •	• •	• •
PR112/P-A			• •	• •	• •	• •	• •	• •	• •	• •	• •	• •
PR113/P-A			• •	• •	• •	• •	• •	• •	• •	• •	• •	• •
Operation times												
Make time (max)	ms		80 80	80	80	80	80	80	80	80	80	80
Break time (I<ST current)(max)	ms		70 70	70	70	70	70	70	70	70	70	70
Break time (I>ST current)(max)	ms		30 30	30	30	30	30	30	30	30	30	30
Overall dimensions, 3 pole												
W (3 poles)	mm/in		296/11.65		404/15.91			566/22.28			782/30.79	
Drawout: H=461mm / 18.15in												
D=396.5mm / 15.61in												
W (3 poles)	mm/in		324/12.76		432/17.01			594/23.39			810/31.89	
Weights (CB with releases, RH terminals and CTs, accessories excluded)												
Drawout 3 poles	Kg/lbs		72/159		100/220			147/324			210/463	

Specifications common to the entire range

Rated max voltage	635 VAC
Rated voltage	600VAC
Test voltage (1 min 50/60Hz)	2.2kV
Frequency	50/60Hz
Number of poles	3
Versions	Drawout

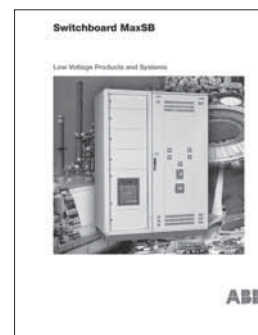
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ABB's Emax air circuit breaker is available with three trip units models. From the PR111 that offers only the basic protection functions to the PR113 that offers protection, multi-meter capability, and communication capability there is a trip unit for every application.

* For additional information on Emax circuit breakers and related products see catalogs listed below:

* Emax Catalog: 1SDC200003D0201

* MaxSB Catalog: AC1800





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SwitchLine Non-fusible Disconnect switches



SwitchLine
Non-fusible disconnect switches
16A – 3150A, 600V

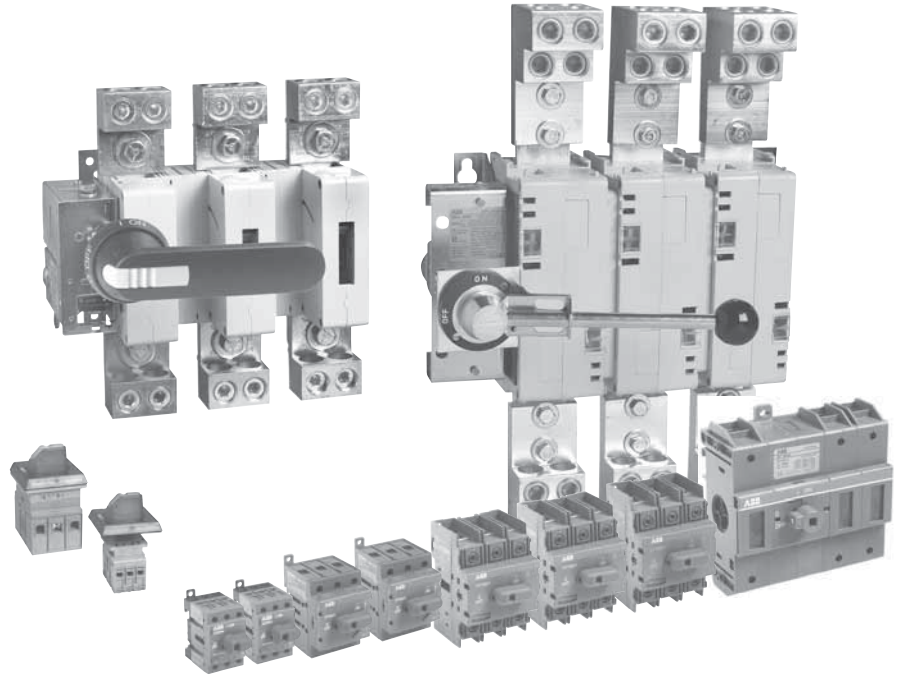


ABB SwitchLine includes 16 different amperage sizes from 16A to 3150A. The basic construction provides flexibility, safety, and high performance in an extremely compact size. ABB SwitchLine is a perfect choice for all switching applications from industrial motor control to construction safety switches.

Disconnect
switches
Non-fusible

General information

Selection guide

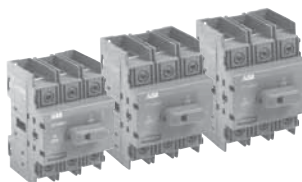
OT16E3 – OT160E3



OT16E3 OT25E3 OT32E3



OT45E3 OT63E3



OT30E3 OT60E3 OT100E3



OT160E3

Catalog number	3 pole	OT16E3	OT25E3	OT32E3	OT45E3	OT63E3	OT30E3	OT60E3	OT100E3	OT160E3
General purpose amp rating	A	16	25	40	60	80	30	60	100	125
Catalog reference	Page #	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.20
Approvals ①										
	2 pole	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	UL98
	3 pole	UL508	UL508	UL508	UL508	UL508	UL98	UL98	UL98	UL98
	4 pole	UL508	UL508	UL508	UL508	UL508	UL98	UL98	UL98	UL98
Technical ratings – UL, CSA ②										
Max operating voltage	V	600	600	600	600	600	600	600	600	600
Max horsepower rating										
Three phase										
200 – 208V	HP	3	7.5	10	15	20	10	20	25	30
240V	HP	5	7.5	10	15	20	10	20	30	40
480V	HP	10	15	20	30	40	20	40	50	75
600V	HP	10	20	25	30	40	30	40	50	100
Single phase										
120V	HP	1	1.5	2	2	2	2	3	5	7.5
240V	HP	2	3	5	5	5	5	7.5	15	20
Technical ratings – IEC ③										
Rated insulation and operational voltage, AC20 and DC20	V	750	750	750	750	750	750	750	750	750
Rated thermal current, I _{th}										
AC 20/DC 20 open	A	25	32	40	63	80	40	63	115	200
AC 20/DC 20 enclosed	A	25	32	40	63	80	40	63	115	160
AC 21A ≤500V	A	16	25	32	63	80	40	63	100	160
AC 21A ≤690V	A	16	25	32	63	80	40	63	100	160
Rated operational power AC23										
400/415V	kW	7.5	9	11	22	37	15	18.5	37	75
690V	kW	7.5	9	11	15	18.5	15	15	37	75
Physical characteristics										
Weight ③	3 pole lb	0.24	0.24	0.24	0.59	0.59	0.79	0.79	0.79	2.42
Dimension	3 pole H in	2.68	2.68	2.68	3.60	3.60	3.94	3.94	3.94	5.00
	W in	1.38	1.38	1.38	2.07	2.07	2.76	2.76	2.76	4.96
	D in	2.20	2.20	2.20	2.85	2.85	2.95	2.95	2.95	2.93
Accessories										
Terminal lug kit		Integral	Integral	Integral	Integral	Integral	Integral	Integral	Integral	Integral
Terminal shroud		•	•	•	•	•	•	•	•	—
Auxiliary contact		•	•	•	•	•	•	•	•	•
Handle UL/NEMA type										
Type 1, 3R, 12		•	•	•	•	•	•	•	•	•
Type 1, 3R, 4, 4X, 12		•	•	•	•	•	•	•	•	•
Handle type										
Selector		•	•	•	•	•	•	•	•	—
Pistol		•	•	•	•	•	•	•	•	•
Conversion kits										
6 pole		•	•	•	•	•	•	•	•	•
Transfer		•	•	•	•	•	•	•	•	•
Bypass		•	•	•	•	•	•	•	•	•
Mechanical interlock		•	•	•	•	•	•	•	•	•
Electrical interlock		—	—	—	—	—	—	—	—	—

• = Available
— = Not available

UL listed, CSA approved, IEC rated, CE marked

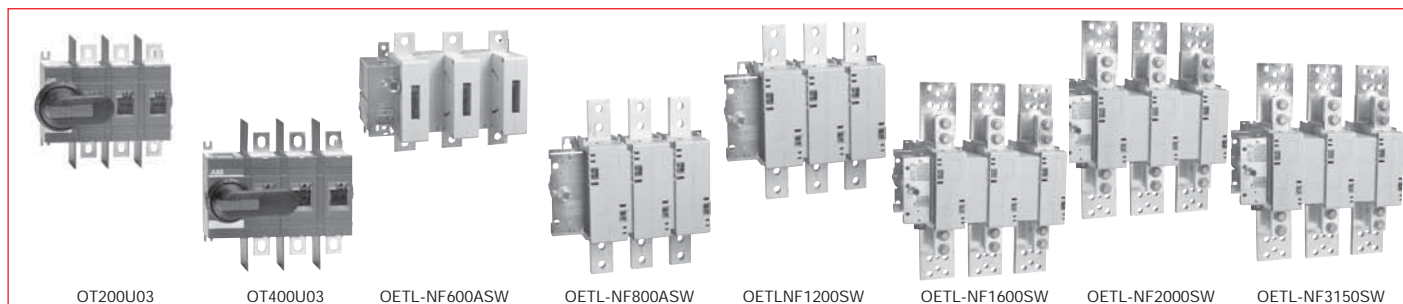
① UL listed switches are also CSA approved.
② For complete technical information please see page 18.43 – 18.74.
③ Switch only.

General information

Selection guide

OT200 – OT400 & OETL-NF600A – OETL-NF3150

Disconnect
switches
Non-fusible



Catalog number	3 pole	OT200U03	OT400U03	OETL-NF600A	OETL-NF800A	OETL-NF1200	OETL-NF1600	OETL-NF2000	OETL-NF3150
General purpose amp rating	A	200	400	600	800	1200	1600	2000	3150
Catalog reference	Page #	18.23	18.26	18.26	18.26	18.30	18.30	18.30	18.30
Approvals ^①	2 pole 3 pole 4 pole	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC IEC	IEC IEC IEC
Technical ratings – UL, CSA ②									
Max operating voltage	V	600	600	600	600	600	600	600	600
Max horsepower rating									
Three phase									
200 – 208V	HP	60	100	150	200	—	—	—	—
240V	HP	75	125	200	250	—	—	—	—
480V	HP	150	250	400	500	—	—	—	—
600V	HP	200	350	500	600	—	—	—	—
Single phase									
120V	HP	—	—	—	—	—	—	—	—
240V	HP	—	—	—	—	—	—	—	—
Technical ratings – IEC ②									
Rated insulation and operational voltage, AC20 and DC20	V	1000	1000	1000	1000	1000	1000	1000	1000
Rated thermal current, I _n									
AC 20/DC 20 open	A	250	400	800	1250	1600	2500	2500	3150
AC 20/DC 20 enclosed	A	250	400	720	1250	1600	2300	2300	2600
AC 21A ≤500V	A	250	400	800	1250	1600	2500 ^③	2500 ^③	3150 ^③
≤690V	A	250	400	800	1250	1600	2500 ^③	2500 ^③	3150 ^③
Rated operational power AC23									
400/415V	kW	132	220	355	400	400	400	400	400
690V	kW	240	355	355	—	—	—	—	—
Physical characteristics									
Weight ③	3 pole lb	2.9	5.7	13.66	35.9	38.55	127.7	127.7	127.7
Dimension	3 pole H in	6.69	8.66	11.77	19.09	19.09	25.04	25.04	25.04
	W in	6.67	8.7	11.93	14.29	14.29	18.43	18.43	18.43
	D in	3.30	3.35	5.12	4.92	4.92	10.67	10.67	10.67
Accessories									
Terminal lug kit		OZXA-200	OZXA-400	OZXA-27	OZXA-30	OZXA-28	OZXA-28	OZXA-28/2	OZXA-28/2
Terminal shroud		•	•	•	•	•	—	—	—
Auxiliary contact		•	•	•	•	•	•	•	•
Handle UL/NEMA type									
Type 1, 3R, 12		•	•	•	•	•	•	•	•
Type 1, 3R, 4, 4X, 12		•	•	•	•	•	•	•	•
Handle type									
Selector		—	—	—	—	—	—	—	—
Pistol		•	•	•	•	•	•	•	•
Conversion kits									
6 pole		•	•	•	•	•	—	—	—
Transfer		•	•	•	•	•	—	—	—
Bypass		•	•	•	•	•	—	—	—
Mechanical interlock		•	•	•	•	•	•	•	•
Electrical interlock		•	•	•	•	•	•	•	•

S = Standard feature
• = Available
— = Not available

UL listed, CSA approved, IEC rated, CE marked

① UL listed switches are also CSA approved.
② For complete technical information please see page 18.43 – 18.74.
③ Switch only
④ IEC 947-3 Utilization Category B, Infrequent operation

General information



Versatility

ABB SwitchLine non-fusible disconnect switches are designed to offer maximum versatility in many ways.

Broad range

SwitchLine is seventeen amperage sizes from 16A – 3150A. All sizes are compact, heavy duty, 600V disconnect switches. Many sizes are available in 2, 3, 4, 6, and 8 pole configurations.

Compact size

The SwitchLine's compact dimensions allow panel size reduction in new applications or easily retrofit into space-sensitive existing installations.

International acceptance

UL listed, CSA approved, IEC rated, CE marked, and most other international standards.

UL98 (CSA 22.2 No.4) — UL File # E101914, CSA File #LR58077

For OT30, OT60, OT100, OT160, OT200, OT400, OETL-NF600 – OETL-NF2000 switches, OH_ pistol grip handles

Suitable for use as motor disconnects or industrial control panel disconnects on service entrance equipment, panelboards, switchboards, industrial control equipment, motor control centers, etc. and are horsepower rated and ampere rated.

UL508 (CSA 22.2 No. 14) — UL File # E63822, CSA File #LR58247

For OT16 – OT63 switches, OH_ selector handles

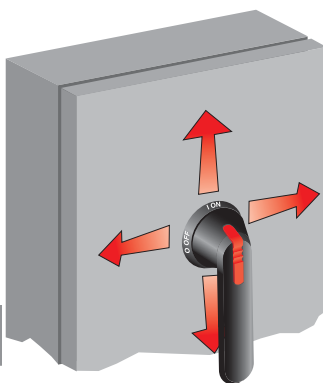
Suitable for use in equipment or machinery as motor controllers & motor disconnects and are horsepower and ampere rated.

IEC

Tested in accordance to IEC 947-1 and 3, IEC 664, IEC 269, and IEC 204

CE

Compliance with the European Machine Directive IEC 204 (EN 60204)



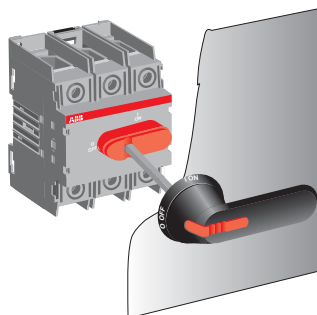
Installation options

Rotary through the door: available in all sizes, 16A – 3150A

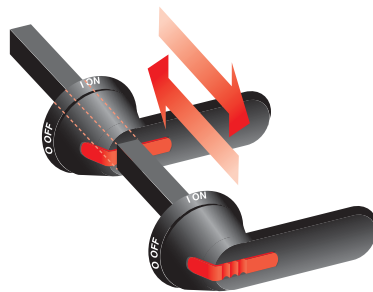
Flange: versions available in 30A, 60A, 100A, & 200A sizes

A rotary disconnect switch may be installed nearly anywhere in a control panel — mounting is not limited to the upper right hand corner of the panel.

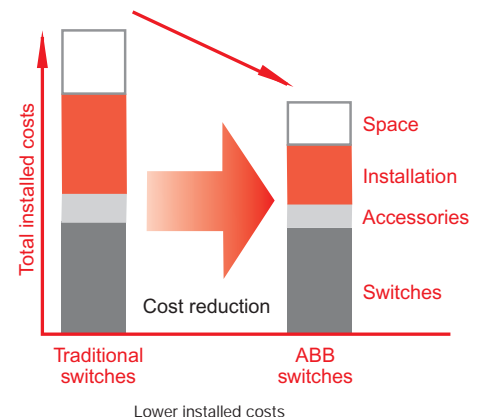
Mount the switch where it conveniently fits in your panel and simply install the handle on the door, in line with the switch. The switch and handle are mechanically linked through an easily adjusted shaft. This allows fast and easy installation into panels of different depths and layouts.



Rotary through the door installation

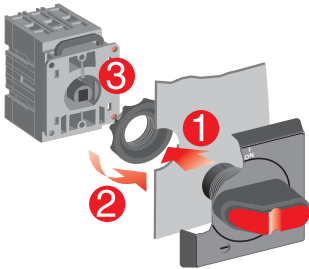
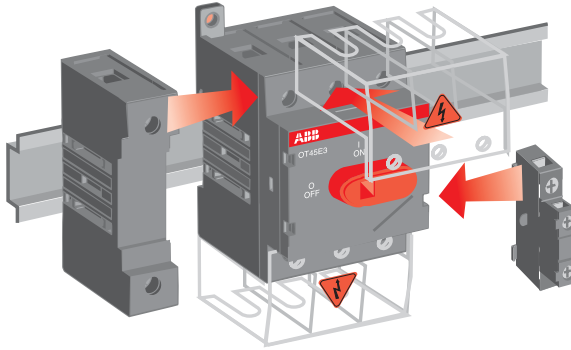


Easily adjusted shaft

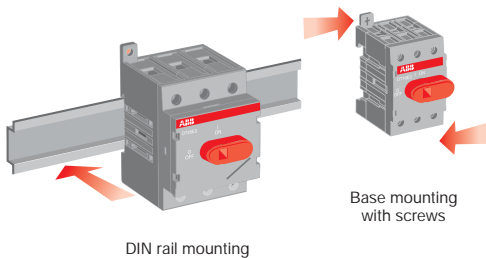


Broad range of accessories

- Handles — UL/NEMA type 1, 3R, 4, 4X, 12; IP54, 65, 66
- Auxiliary contacts available for every switch size
- Additional power poles
- Additional terminal poles (neutrals & grounds)
- Terminal shrouds
- 6 & 8 pole mechanisms
- Transfer mechanisms
- Bypass mechanisms
- Mechanical interlock mechanisms
- Electro-mechanical interlock mechanisms
- Motor operators



Door mounting



DIN rail mounting

Base mounting with screws

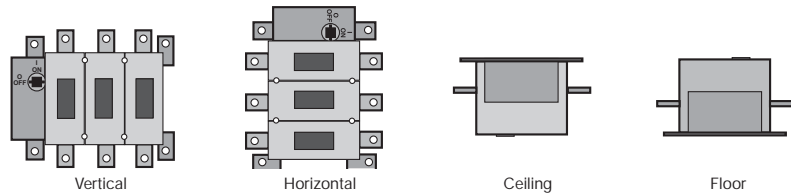
Mounting

SwitchLine disconnect switches offer several mounting possibilities:

- Door mounting on an enclosure door or sidewall, 16A – 125A
- DIN rail mounting, 16A – 125A
- Base mounting with screws, 16A – 3150A

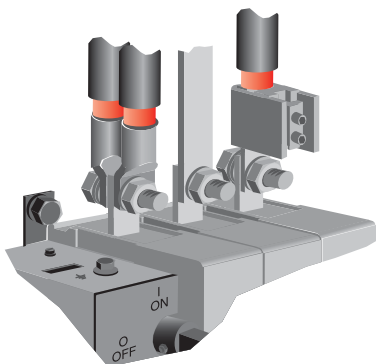
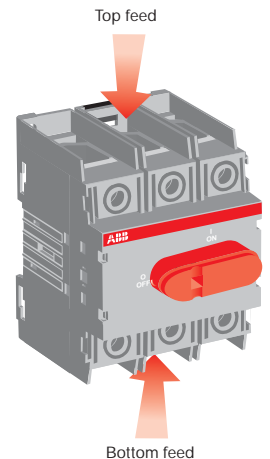
Mounting positions

SwitchLine disconnect switches may be mounted in any position:



Incoming power feeds

SwitchLine disconnect switches can be used equally well with either top or bottom incoming power feeds.



Terminal connections

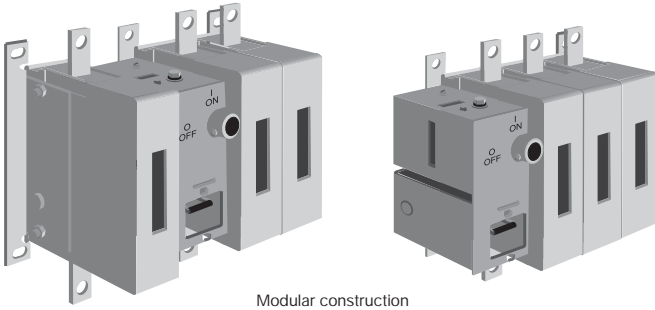
Versatile connecting possibilities, 200A – 3150A:

- Ring tongue crimp on lugs
- Direct bus
- Terminal lugs

General information

Modular construction ①

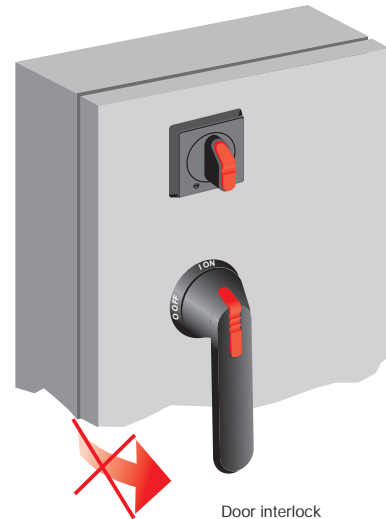
Modular switch construction allows the operating mechanism to be placed at either end of the switch or anywhere in-between, 125A – 3150A.



Modular construction

Finger proof

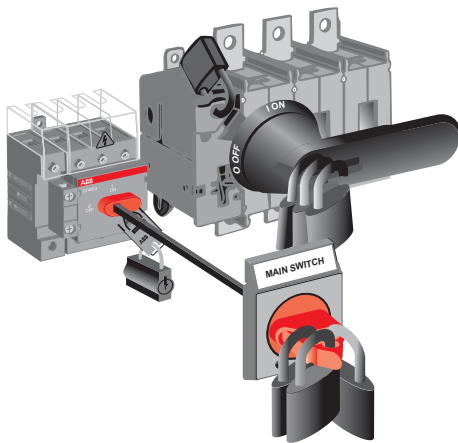
Dead-front construction plus terminal shrouds reduce the risk of touching live parts, improving the safety and reliability of the installation.



Door interlock

Door interlock

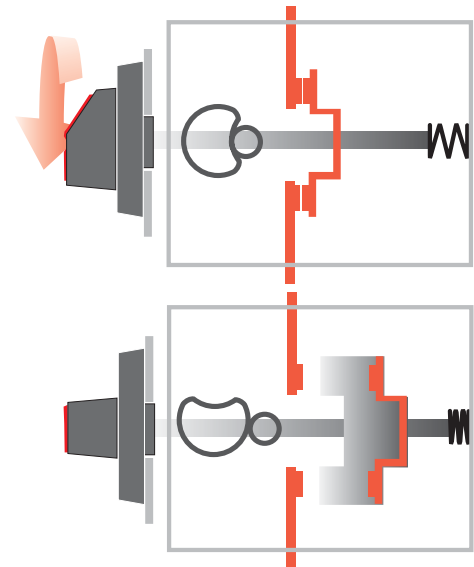
The handle and shaft provide a door interlock; the door can not be opened when the switch is in the "ON" position. NOTE: Some handles provide a method for qualified personnel to circumvent the door interlock. This is commonly referred to as a "defeater" mechanism.



Handle and mechanism padlocked OFF

Padlockable

Handles can be padlocked in the "OFF" position with up to three padlocks: Additionally, the switch mechanism can be directly padlocked in the "OFF" position when the door is open. NOTE: Some handles can be ordered with the ability to padlock in both the "ON" & "OFF" positions, please consult your ABB sales office.

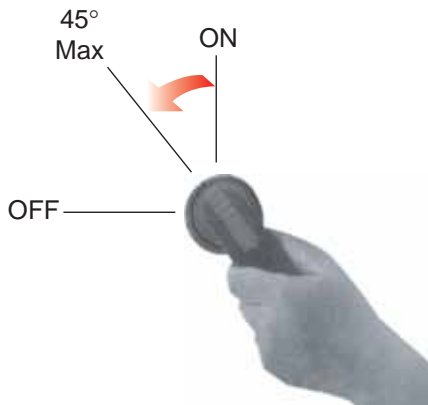


Positive opening operation

Positive opening operation

All switches operate according to the "positive opening operation" principle. This means the contacts are opened and closed by a driven mechanism, a solid moving bridge, not merely springs. This provides reliable position indication to the user; if the switch is in the "OFF" position, the contacts are open.

① Please consult ABB sales office for additional information.



Welded contact protection

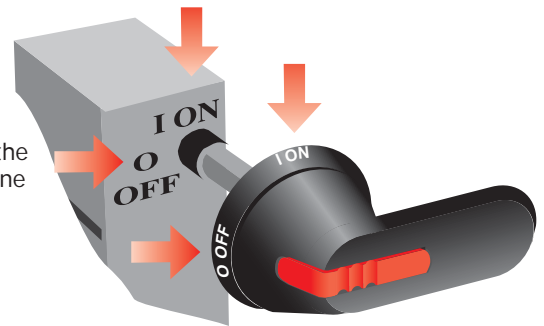
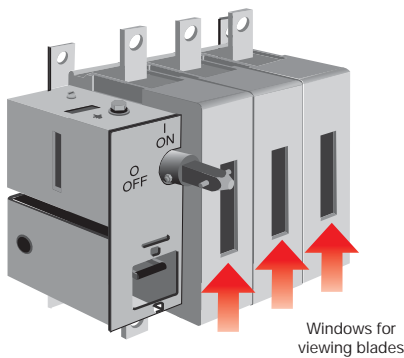
Positive opening operation safeguards users in case of welded contacts due to an overload or short circuit.

The switch can not reach the "OFF" position unless the contacts are truly open. If any or all of the contacts are welded shut, the switch mechanism will only allow the handle to operate a maximum of 45°. This safeguards personnel by:

- alerting them a problem has occurred
- maintaining the door interlock and
- not allowing a padlock to be inserted.

Clear position indication

All switches and handles have clear "ON" and "OFF" designations. Whether the door is open or closed, it is possible to simply look at the switch and determine if the switch is "ON" or "OFF".



Visible blades

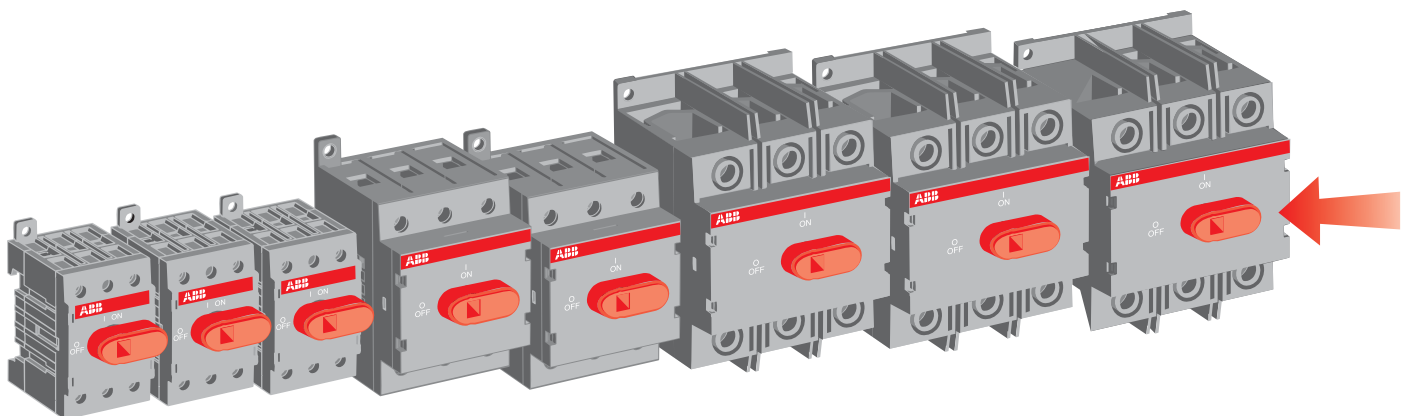
Visible blades offer additional safety from 125A — 1200A.

Track resistant material

Excellent track resistant material, CTI > 600V, IEC 112, reduces the risk of flashover between phases in even the most severe circumstances.

Constant control

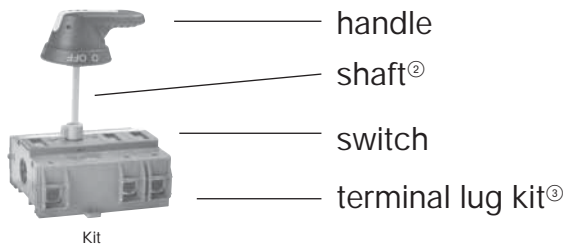
The OT16E3 to OT100E3 provide the user with constant control over the power circuit. Whether the enclosure door is open or closed, qualified personnel have the ability to manually operate the switch. This is most meaningful when qualified personnel are working with the enclosure door open: In case of an emergency down-stream, the main three phase power can be disconnected immediately using the red, direct mounted handle.



Disconnect
switches
Non-fusible

Kits 16A – 3150A, 600V, 3 pole^①

Each kit includes:
1 three pole^① switch
1 handle
1 shaft
1 terminal lug kit



Kits with base & DIN rail mounted switches and selector handles

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating						Kit catalog number	List price
		Single phase		Three phase					
		120V	240V	200V – 208V	240V	480V	600V		
UL 508	16	1	2	3	5	10	10	OT16B2A1-180	\$ 100
	25	1.5	3	7.5	7.5	15	20	OT25B2A1-180	106
	40	2	5	10	10	20	25	OT32B2A1-180	110
UL 98	60	2	5	15	15	30	30	OT45B2A1-180	134
	80	2	5	20	20	40	40	OT63B2A1-180	154
	30	2	5	10	10	20	30	OT30B2A1-180	184
UL 98	60	3	7.5	20	20	40	40	OT60B2A1-180	209
	100	5	15	25	30	50	50	OT100B2A1-180	234

Kits with base and/or DIN rail mounted switches and pistol handles

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating						Kit catalog number	List price
		Single phase		Three phase					
		120V	240V	200V – 208V	240V	480V	600V		
UL 508	16	1	2	3	5	10	10	OT16B6-170	\$ 162
	25	1.5	3	7.5	7.5	15	20	OT25B6-170	168
	40	2	5	10	10	20	25	OT32B6-170	172
UL 98	60	2	5	15	15	30	30	OT45B6-170	196
	80	2	5	20	20	40	40	OT63B6-170	216
	30	2	5	10	10	20	30	OT30B6-170	246
UL 98	60	3	7.5	20	20	40	40	OT60B6-170	271
	100	5	15	25	30	50	50	OT100B6-170	296
	125	7.5	20	30	40	75	100	OT160B6-210	516
UL 98	200	—	—	60	75	150	200	OTK200B8-210	796
	400	—	—	100	125	250	350	OTK400B4-280	1736
	600	—	—	150	200	400	500	OT600B4-280	2706
UL 98	800	—	—	200	250	500	600	OT800B4-280	5066
	1200	—	—	—	—	—	—	OT1200B4-280	7926
	1600	—	—	—	—	—	—	OT1600M8-325	17,630
UL 98	2000	—	—	—	—	—	—	OT2000M8-325	19,430
	—	—	—	—	—	—	—	OT3150M8-325	21,130
	3150	—	—	—	—	—	—		

18 Kits with door mounted switches

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating						Kit catalog number	List price
		Single phase		Three phase					
		120V	240V	200V – 208V	240V	480V	600V		
UL 508	16	1	2	3	5	10	10	OT16ET3S	\$ 98
	25	1.5	3	7.5	7.5	15	20	OT25ET3S	104
	40	2	5	10	10	20	25	OT32ET3S	108
UL 98	60	2	5	15	15	30	30	OT45ET3S	132
	80	2	5	20	20	40	40	OT63ET3S	152
	30	2	5	10	10	20	30	OT30ET3S	182
UL 98	60	3	7.5	20	20	40	40	OT60ET3S	207
	100	5	15	25	30	50	50	OT100ET3S	232
	30	2	5	10	10	20	30	OT30ET3P	254
UL 98	60	3	7.5	20	20	40	40	OT60ET3P	279
	100	5	15	25	30	50	50	OT100ET3P	304
	125	7.5	20	30	40	75	100	OT160ET3P	640

① Four poles are available — please reference accessories pages 18.12 & 18.21.

② Shaft is not required with door mounted switch, except OT160ET3.

③ 16A – 125A switches include standard integral terminal lugs.

④ Available as a kit using the standard base mount switch and a door mount bracket.

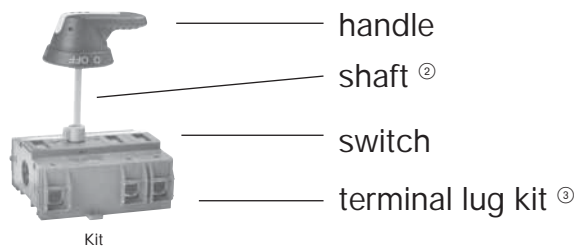
Kit components

16A – 3150A, 600V, 3 pole^①

Disconnect
switches
Non-fusible

Each kit includes:

- 1 three pole ^① switch
- 1 handle
- 1 shaft
- 1 terminal lug kit



Kit components ^② for base & DIN rail mounted switches with selector handles

Kit catalog number	Switch		Handle ^④			Shaft			Terminal lugs		
	Catalog number	NEMA type	Marking	De-feat-able	Catalog number	Mounting depth ^⑤ (inches)	Length (inches/mm)	Catalog number	Wire size	Wire type	Catalog number
OT16B2A1-180	OT16E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	7.4 – 8.1	7.1/180	OXS5X180	#18 – 8	Cu	Integral
OT25B2A1-180	OT25E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	7.4 – 8.1	7.1/180	OXS5X180	#18 – 8	Cu	Integral
OT32B2A1-180	OT32E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	7.4 – 8.1	7.1/180	OXS5X180	#18 – 8	Cu	Integral
OT45B2A1-180	OT45E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	8.1 – 8.7	7.1/180	OXS5X180	#14 – 1	Cu	Integral
OT63B2A1-180	OT63E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	8.1 – 8.7	7.1/180	OXS5X180	#14 – 1	Cu	Integral
OT30B2A1-180	OT30E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	7.6 – 8.6	7.1/180	OXS5X180	#14 – 4	Cu	Integral
OT60B2A1-180	OT60E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	7.6 – 8.6	7.1/180	OXS5X180	#14 – 4	Cu	Integral
OT100B2A1-180	OT100E3	1,3R,12	O/I & Off/On	—	OHB2AJ1	7.6 – 8.6	7.1/180	OXS5X180	#8 – 1/0	Cu	Integral

Kit components ^② for base and/or DIN rail mounted switches with pistol handles

Kit catalog number	Switch		Handle ^④			Shaft			Terminal lugs		
	Catalog number	NEMA type	Marking	De-feat-able	Catalog number	Mounting depth ^⑤ (inches)	Length (inches/mm)	Catalog number	Wire size	Wire type	Catalog number
OT16B6-170	OT16E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.0 – 7.5	6.7/170	OMP5X170	#18 – 8	Cu	Integral
OT25B6-170	OT25E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.0 – 7.5	6.7/170	OMP5X170	#18 – 8	Cu	Integral
OT32B6-170	OT32E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.0 – 7.5	6.7/170	OMP5X170	#18 – 8	Cu	Integral
OT45B6-170	OT45E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.7 – 8.1	6.7/170	OMP5X170	#14 – 1	Cu	Integral
OT63B6-170	OT63E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.7 – 8.1	6.7/170	OMP5X170	#14 – 1	Cu	Integral
OT30B6-170	OT30E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.2 – 8.2	6.7/170	OMP5X170	#14 – 4	Cu	Integral
OT60B6-170	OT60E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.2 – 8.2	6.7/170	OMP5X170	#14 – 4	Cu	Integral
OT100B6-170	OT100E3	1,3R,12	O/I & Off/On	Yes	OHB65J5	7.2 – 8.2	6.7/170	OMP5X170	#8 – 1/0	Cu	Integral
OT160B6-210	OT160E3	1,3R,12	O/I & Off/On	Yes	OHB65J6	7.3 – 8.5	8.3/210	OMP6X210	#8 – 1/0	Cu	Integral
OTK200B8-210	OT200U03	1,3R,12	O/I & Off/On	Yes	OHB80J6	7.4 – 9.6	8.3/210	OMP6X210	#4 – 300 kcmil	Cu/Al	OZXA-200
OTK400B4-280	OT400U03	1,3R,12	O/I & Off/On	Yes	OHB145J12	10.2 – 13.4	11.0/280	OMP12X280	#2 – 600 kcmil	Cu/Al	OZXA-400
OT600B4-280	OETL-NF600ASW	1,3R,12	O/I & Off/On	Yes	OHB145J12	10.2 – 14.5	11.0/280	OMP12X280	(2)#2 – 600 kcmil	Cu/Al	OZXA-27
OT800B4-280	OETL-NF800ASW	1,3R,12	O/I & Off/On	Yes	OHB145J12	11.6 – 15.3	11.0/280	OMP12X280	(2)#2 – 600 kcmil	Cu/Al	OZXA-30
OT1200B4-280	OETL-NF1200SW	1,3R,12	O/I & Off/On	Yes	OHB145J12	11.6 – 15.3	11.0/280	OMP12X280	(4)#2 – 600 kcmil	Cu/Al	OZXA-28
OT1600M8-325	OETL-NF1600SW	1,3R,4,4X,12	Off/On	—	YASDA-8	13.4 – 23.1	12.8/325	OMP12X325	(4)#2 – 600 kcmil	Cu/Al	OZXA-28
OT2000M8-325	OETL-NF2000SW	1,3R,4,4X,12	Off/On	—	YASDA-8	13.4 – 23.1	12.8/325	OMP12X325	(8)#2 – 600 kcmil	Cu/Al	OZXA-28/2
OT3150M8-325	OETL-NF3150SW	1,3R,4,4X,12	Off/On	—	YASDA-8	13.4 – 23.1	12.8/325	OMP12X325	(8)#2 – 600 kcmil	Cu/Al	OZXA-28/2

Kit components ^② for door mounted switches

Kit catalog number	Switch		Handle ^④			Shaft			Terminal lugs		
	Catalog number	NEMA type	Marking	De-feat-able	Catalog number	Mounting depth (inches)	Length (inches/mm)	Catalog number	Wire size	Wire type	Catalog number
OT16ET3S	OT16ET3	1,3R,12	O/I & Off/On	—	OHB2PJ	—	No shaft required	—	#18 – 8	Cu	Integral
OT25ET3S	OT25ET3	1,3R,12	O/I & Off/On	—	OHB2PJ	—	No shaft required	—	#18 – 8	Cu	Integral
OT32ET3S	OT32ET3	1,3R,12	O/I & Off/On	—	OHB2PJ	—	No shaft required	—	#18 – 8	Cu	Integral
OT45ET3S	OT45ET3	1,3R,12	O/I & Off/On	—	OHB2RJ	—	No shaft required	—	#14 – 1	Cu	Integral
OT63ET3S	OT63ET3	1,3R,12	O/I & Off/On	—	OHB2RJ	—	No shaft required	—	#14 – 1	Cu	Integral
OT30ET3S	OT30ET3	1,3R,12	O/I & Off/On	—	OHB2RJ	—	No shaft required	—	#14 – 4	Cu	Integral
OT60ET3S	OT60ET3	1,3R,12	O/I & Off/On	—	OHB2RJ	—	No shaft required	—	#14 – 4	Cu	Integral
OT100ET3S	OT100ET3	1,3R,12	O/I & Off/On	—	OHB2RJ	—	No shaft required	—	#8 – 1/0	Cu	Integral
OT30ET3P	OT30ET3	1,3R,12	O/I & Off/On	—	OHB65J5	—	Includes OHZX6 adapter	—	#14 – 4	Cu	Integral
OT60ET3P	OT60ET3	1,3R,12	O/I & Off/On	—	OHB65J5	—	Includes OHZX6 adapter	—	#14 – 4	Cu	Integral
OT100ET3P	OT100ET3	1,3R,12	O/I & Off/On	—	OHB65J5	—	Includes OHZX6 adapter	—	#8 – 1/0	Cu	Integral
OT160ET3P	OT160ET3	1,3R,12	Off/On	—	OHB65J6	—	—	5.2/130	#8 – 1/0	Cu	Integral

If other handles or shafts are desired, please order from the individual component pages 18.10, 18.11, 18.20, 18.23, 18.27 and 18.31.

- ① Other pole configurations available; please see individual components.
- ② For more information please see individual components.
- ③ 16A – 125A switches include standard integral terminal lugs.
- ④ Handles are black and accept three padlocks. For other handles see individual components.

- ⑤ Mounting depth is the distance from the outside of door to the disconnect switch mounting plate. Shaft can be cut to desired length.
- ⑥ Consists of standard base mounted switch with door mount conversion bracket.

Disconnect
switches
Non-fusible

16A – 100A, Base & DIN rail mounted

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft



OT63E3



OXS5X180



OHB2AJ1



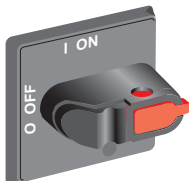
OT16E3
OT25E3
OT32E3



OT30E3
OT60E3
OT100E3



OHB1AH1



OHB3AH1



OHY2AJ



OXS5X_

16 – 100 Amp switches, 600V, 3 pole^①

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating						Terminal lugs		Catalog number	List price
		Single phase		Three phase				Wire size	Wire type		
		120V	240V	200V	240V	480V	600V				
UL 508 ↑ 16 25 40	16	1	2	3	5	10	10	#18 – 8	Cu	OT16E3	\$ 66
	25	1.5	3	7.5	7.5	15	20	#18 – 8	Cu	OT25E3	72
	40	2	5	10	10	20	25	#18 – 8	Cu	OT32E3	76
UL 98 ↑ 60 80	63	2	5	15	15	30	30	#14 – 1	Cu	OT45E3	100
	80	2	5	20	20	40	40	#14 – 1	Cu	OT63E3	120
UL 98 ↑ 30 60 100	40	2	5	10	10	20	30	#14 – 4	Cu	OT30E3	150
	63	3	7.5	20	20	40	40	#14 – 4	Cu	OT60E3	175
	115	5	15	25	30	50	50	#8 – 1/0	Cu	OT100E3	200

Selector handles — for use with shafts $\square .20 \times .20$ " ($\square 5 \times 5$ mm)

UL/NEMA type	IEC type	Color	Defeat- able	Padlock- able	Weight (lbs)	Catalog number	List price
A							
1	IP54	Black	—	—	0.09	OHB1AH1 ^②	\$ 22
1	IP54	Red/Yel	—	—	0.09	OHY1AH1 ^②	22
1	IP54	Black	—	Yes	0.12	OHB3AH1 ^②	24
1	IP54	Red/Yel	—	Yes	0.12	OHY3AH1 ^②	24
1,3R,12	IP65	Black	—	Yes	0.16	OHB2AJ1	28
1,3R,12	IP65	Red/Yel	—	Yes	0.16	OHY2AJ1	28
1,3R,12	IP65	Black	Yes	Yes	0.16	OHB2AJ	30
1,3R,12	IP65	Red/Yel	Yes	Yes	0.16	OHY2AJ	30

Shafts — for use with OH selector handles $\square .20 \times .20$ " ($\square 5 \times 5$ mm)

Shaft length inches/mm	Mounting depth ^③ in inches					Weight (lbs)	Catalog number	List price
	OT16E3 OT25E3 OT32E3		OT45E3 OT63E3		OT30E3 OT60E3 OT100E3			
	OH_1_ & OH_3_	OH_2_	OH_1_ & OH_3_	OH_2_	OH_2_			
3.3/85	4.2 – 5.0	3.6 – 4.3	4.9 – 5.6	4.4 – 5.0	3.9 – 4.9	0.04	OXS5X85	\$ 4
4.1/105	5.0 – 5.8	4.4 – 5.1	5.7 – 6.4	5.1 – 5.8	4.7 – 5.7	0.04	OXS5X105	4
4.7/120	5.6 – 6.4	5.0 – 5.8	6.3 – 7.0	5.7 – 6.4	5.3 – 6.3	0.05	OXS5X120	4
5.1/130	6.0 – 6.7	5.4 – 6.1	6.7 – 7.4	6.1 – 6.8	5.6 – 6.7	0.05	OXS5X130	6
7.1/180	7.1 – 8.7	7.4 – 8.1	8.6 – 9.4	8.1 – 8.7	7.6 – 8.6	0.08	OXS5X180	6
9.8/250	10.7 – 11.5	10.1 – 10.8	11.4 – 12.1	10.9 – 11.5	10.4 – 11.4	0.10	OXS5X250	12
13/330	13.8 – 14.6	13.3 – 14.0	14.6 – 15.3	14.0 – 14.7	13.5 – 14.5	0.14	OXS5X330	20

① A snap on fourth pole may be added — please reference accessories pg 18.12.

② Not suitable for use with OT30E3, OT60E3, OT100E3.

③ Mounting depth is the distance from the outside of door to the disconnect switch mounting plate. Shaft can be cut to desired length.

16A – 100A, Base & DIN rail mounted Handles & shafts

Disconnect
switches
Non-fusible



Pistol handles — for use with shafts $\square .20 \times .20$ " ($\square 5 \times 5$ mm)

UL/NEMA type	IEC type	Color	Marking	Length inches/mm	Defeatable	Padlockable	Weight (lbs.)	Catalog number	List price
1,3R,12	IP65	Black	O/I & Off/On	1.8/45	Yes	Yes	0.28	OHB45J5	\$ 70
1,3R,12	IP65	Red/Yel	O/I & Off/On	1.8/45	Yes	Yes	0.28	OHY45J5	70
1,3R,12	IP65	Black	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHB65J5	80
1,3R,12	IP65	Red/Yel	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHY65J5	80
1,3R,12,4,4X	IP66	Black	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHB65L5	120
1,3R,12,4,4X	IP66	Red/Yel	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHY65L5	120

Shafts — for use with pistol handles $\square .20 \times .20$ " ($\square 5 \times 5$ mm)

Shaft length (inches/mm)	Mounting depth ^① (inches)			Weight (lbs.)	Catalog number	List price
	OT16E3 OT25E3 OT32E3	OT45E3 OT63E3	OT30E3 OT60E3 OT100E3			
5.9/150	6.2 – 6.7	6.9 – 7.4	6.4 – 7.4	0.07	OXPSX150	\$ 14
6.7/170	7.0 – 7.5	7.7 – 8.1	7.2 – 8.1	0.08	OXPSX170	16
10.4/265	10.7 – 11.3	11.4 – 11.9	10.9 – 11.9	0.12	OXPSX265	18
15.8/400	16.0 – 16.6	16.8 – 17.2	16.2 – 17.2	0.18	OXPSX400	30
19.7/500	20.0 – 20.5	20.7 – 21.1	20.1 – 21.1	0.23	OXPSX500	42

Twisted shafts — Rotates handle 45° $\square .20 \times .20$ " ($\square 5 \times 5$ mm)

Shaft length (inches/mm)	Mounting depth ^① (inches)			Weight (lbs.)	Catalog number	List price
	OT16E3 OT25E3 OT32E3	OT45E3 OT63E3	OT30E3 OT60E3 OT100E3			
5.9/150	6.2 – 6.7	6.9 – 7.4	6.4 – 7.4	0.07	OXPSX150-45	\$ 14
6.7/170	7.0 – 7.5	7.7 – 8.1	7.2 – 8.1	0.08	OXPSX170-45	16
10.4/265	10.7 – 11.3	11.4 – 11.9	10.9 – 11.9	0.12	OXPSX265-45	18
15.8/400	16.0 – 16.6	16.8 – 17.2	16.2 – 17.2	0.18	OXPSX400-45	30
19.7/500	20.0 – 20.5	20.7 – 21.1	20.1 – 21.1	0.23	OXPSX500-45	42

Replacement knob — mounts directly to switch; no shaft necessary

UL/NEMA Type	Color	For use on:	Length (inches)	Padlockable	Catalog number	List price
1	Red	OT16, OT25, OT32	1.0	—	CXBY68135	\$ 8
1	Red	OT30, OT45 – OT100	1.4	—	CXBY68306	12
1	Red	OT30, OT45 – OT100	1.6	Yes ^②	CXBY68419/1	14
Metal collar		OT16 – OT100	—	—	OTZS1	13
Set screw		OT16 – OT100	—	—	FLSWM5X8AY	2 ^③

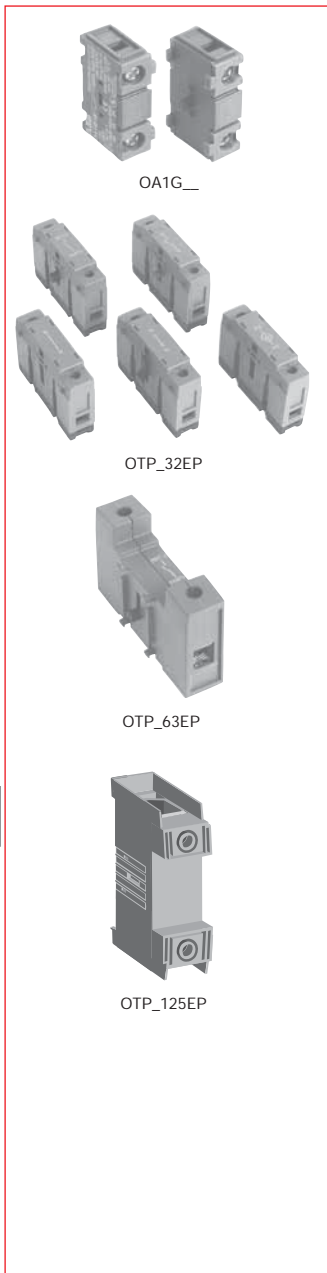
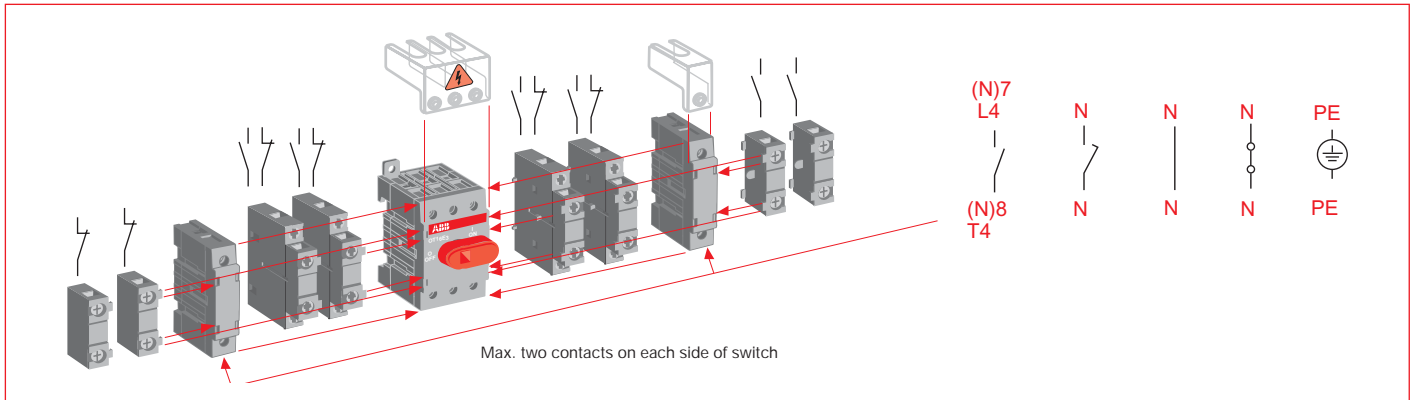
Modular adapter cover — for OT16, OT25, OT32

Item	For use	Length (inches)	Padlockable (inches)	Catalog number	List price
Adapter cover	OT16, OT25 OT32	—	Yes	OHY7	\$ 28

A padlock can be used with the adapter cover.

① Mounting depth is the distance from the outside of door to the disconnect switch mounting plate. Shaft can be cut to desired length.
 ② .1875" (3/16") diameter shackle required.
 ③ Set screw FLSWM5X8AY needed with replacement knobs CXBY_.

16A – 100A, Base & DIN rail mounted Accessories



Auxiliary contacts ① — snap-on mounting

Description	For use on:	Weight (lbs.)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. mounts on right side of switch only	OT16 – OT100	0.07	10	600	OA1G10	\$ 20
1 N.O. mounts on left side of switch only	OT16E3C – OT100E3C	0.07	10	600	OA7G10	20
1 N.C. mounts on left side of switch only	OT16 – OT100	0.07	10	600	OA1G01	20
1 N.C. mounts on right side of switch only	OT16E3C – OT100E3C	0.07	10	600	OA3G01	20
1 N.O. & 1 N.C. mounts on left or right side of switch	OT16 – OT100	0.07	10	600	OA2G11	40

Power poles

- Only one power pole per switch
- Mounts on left or right side of switch

Description	For use on:	Weight (lbs.)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Fourth pole ②	OT16, OT25, OT32	0.07	40	600	OTPS32EP	\$ 36
	OT45, OT63	0.13	80	600	OTPS63EP	44
	OT30, OT60	0.31	60	600	OTPS60EP	54
	OT100	0.31	100	600	OTPS125EP	54
Late-break/early-make ②	OT16, OT25, OT32	0.07	40	600	OTPL32EP	36
	OT45, OT63	0.13	80	600	OTPL63EP	44
	OT30, OT60, OT100	0.31	100	600	OTPL125EP	54

Terminal poles

- Switch accepts one terminal pole per side
- Mounts on left or right side of switch

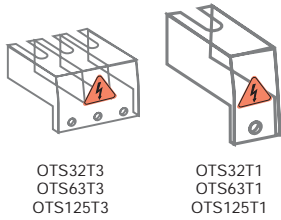
Description	For use on:	Weight (lbs.)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Solid neutral ②	OT16, OT25, OT32	0.07	40	600	OTPN32EP	\$ 20
	OT45, OT63	0.13	80	600	OTPN63EP	36
	OT30, OT60, OT100	0.31	100	600	OTPN125EP	50
Detachable neutral ②	OT16, OT25, OT32	0.07	40	600	OTPD32EP	28
	OT45, OT63	0.13	80	600	OTPD63EP	36
	OT30, OT60	0.31	60	600	OTPD60EP	50
	OT100	0.31	100	600	OTPD125EP	54
Ground terminal ②	OT16, OT25, OT32	0.07	40	600	OTPE32EP	20
	OT45, OT63	0.13	80	600	OTPE63EP	36
	OT30, OT60, OT100	0.31	100	600	OTPE125EP	50

① UL File # E83510

② Switch accepts one power pole or one terminal pole per side. Only one power pole per switch.

16A – 100A, Base & DIN rail mounted Accessories

Disconnect
switches
Non-fusible



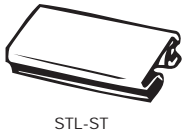
Terminal shrouds ① — snap on mounting for line or load side

Description	For use on:	Weight (lbs.)	Catalog number	List price
3 pole includes one shroud for line or load side	OT16, OT25, OT32	0.02	OTS32T3	\$ 8
	OT45, OT63	0.02	OTS63T3	12
	OT30, OT60, OT100	0.02	OTS125T3	20
4th pole includes one shroud for line or load side	OTP_32EP	0.02	OTS32T1	4
	OTP_63EP	0.02	OTS63T1	6
	OTP_125EP	0.02	OTS125T1	10



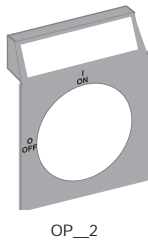
Padlocking adapter

Description	For use on:	Weight (lbs.)	Catalog number	List price
Adapter for one padlock with a max. 0.137" shackle	OT30, OT45 - OT100	0.02	DS-SA1	\$ 10
Padlock for DS-SA1	OT30, OT45 - OT100	0.22	DS-SA2	28
Adapter and padlock	OT30, OT45 - OT100	0.24	DS-SA3	38



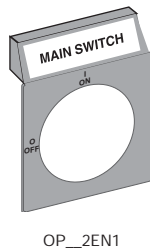
Labelling accessories

Description	For use on:	Package quantity	Catalog number	List price
1 Pkg. of label carriers	OT30, OT45 – OT100	100 pieces	STL-ST	\$ 74
1 Pkg of blank description labels		315 pieces	ST-E	12



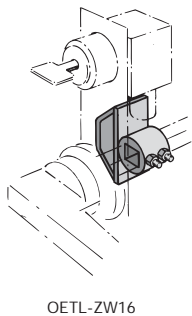
Legend plates for selector handles

Description	For use on:	Catalog number	List price
Blank plate			
Black	OH_1_ & OH_3_ OH_1_ & OH_3_	OPB1	\$ 6
Yellow		OPY1	6
Black	OH_2_ OH_2_	OPB2	8
Yellow		OPY2	8
Plate marked with: MAIN SWITCH			
Black	OH_1_ & OH_3_ OH_1_ & OH_3_	OPB1EN1	10
Yellow		OPY1EN1	10
Black	OH_2_ OH_2_	OPB2EN1	12
Yellow		OPY2EN1	12



Locking accessories

Description	For use on:	Weight (lbs.)	Catalog number	List price
Cam attachment for Kirk Key, Castell, Lowe & Fletcher and Ronis interlock. For adapting to the interlock system. The interlock is not included.	5, 6 & 8mm shafts	0.29	OETL-ZW16	\$ 190



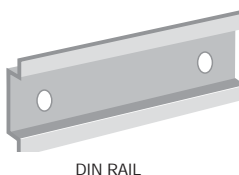
DIN rail

Description	For use on:	Weight (lbs.)	Length inches/mm	Catalog number	List price
35mm DIN Rail	OT16 – OT100	2.96	39.4/1000	DIN RAIL	\$ 52

Shaft support

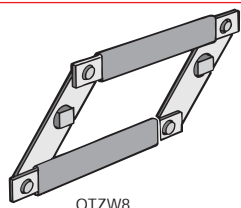
Description	For use on:	Weight (lbs.)	Catalog number	List price
Shaft support	OT16 – OT100	0.30	OETL-ZX58	\$ 14

The shaft support is used for disconnects installed in deep enclosures.

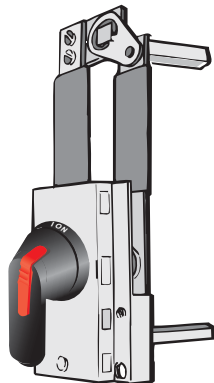


① All disconnects are IP20 touch safe as standard. Terminal shrouds provide an additional level of protection.

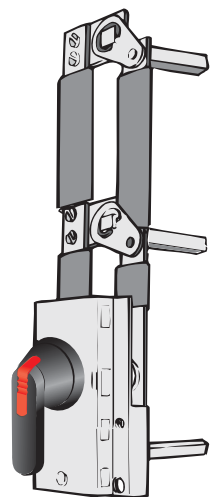
16A – 100A, Base & DIN rail mounted Accessories



OTZW8



OTZW6



OTZW17



OETL-ZW24

Conversion mechanisms

- For use with Base and DIN rail mounted switches only
- Switches are not included

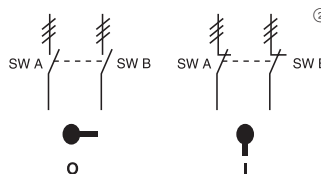
Description	For use on:	Weight (lbs.)	UL/NEMA type	Catalog number	List price
6 or 8 pole Transfer	OT16 – OT100	0.33	—	OTZW8	\$ 60
	OT16 – OT100	1.87	1,3R,12	OTZW6	240
Bypass	OT16 – OT100	1.87	1,3R, 4, 4X,12	OTZW6X	280
	OT16 – OT100	1.54	1,3R,12	OTZW17	340
Mechanical interlock	OT16 – OT100	1.54	1,3R, 4, 4X,12	OTZW17X	380
	OT16 – OT100	0.33	—	OETL-ZW24	80

6 or 8 pole — OTZW8

6 (8) pole mechanism allows two switches controlled by one handle to open or close simultaneously.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.10)
- One handle^① (see page 18.10 – 18.11)
- One shaft (see page 18.10 – 18.11)



	POS. O	POS. I
SW. A	O	X
SW. B	O	X

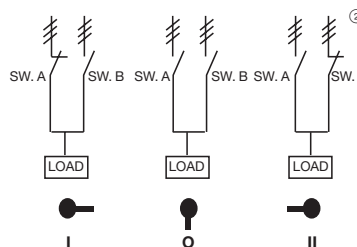
X = Closed
O = Open

Transfer — OTZW6, OTZW6X

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position.

A 3-position handle is included:
OHB80J6E011 (UL Type 1, 3R & 12) or
OHB80L6E011 (UL Type 1, 3R, 4, 4X, 12)
Shafts included. Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.10.)



	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

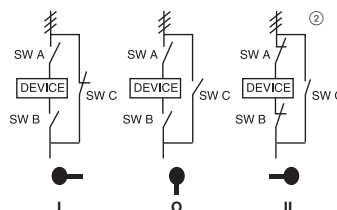
X = Closed
O = Open

Bypass — OTZW17, OTZW17X

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass.

A 3-position handle is included:
OHB80J6E011 (UL Type 1, 3R & 12) or
OHB80L6E011 (UL Type 1, 3R, 4, 4X, 12)
Shafts included. Equipment required for a complete installation:

- One conversion mechanism
- Three disconnect switches (see page 18.10.)



	POS. I	POS. O	POS. II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

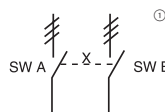
X = Closed
O = Open

Mechanical interlock — OETL-ZW24

Mechanical interlock mechanism prevents both switches from being in the ON position at the same time.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.10)
- Two handles (see page 18.10 – 18.11)
- Two shafts (see page 18.10 – 18.11)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

Drawing and mounting information found on pg 18.69

① OT16E3 – OT32E3 can use a selector or pistol handle. All other sizes must use a pistol handle.

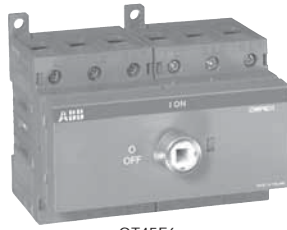
② ≡ = Three poles

16A – 100A, Base & DIN rail mounted 6 Pole switches

Disconnect
switches
Non-fusible

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft



OT45E6



OXP6X210



OHY_J6



OT45E6



OHB_J6



OHY_J6



OXP5X_

16 – 100 Amp switches, 600V, 6 pole ①

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower ratings						Terminal lugs		Shaft size (mm)	Catalog number	List price
		Single phase		Three phase				Wire size	Wire type			
		120V	240V	200V	240V	480V	600V					
UL 508	16	1	2	3	5	10	10	#18 – 8	Cu	5	OT16E6	\$ 192
	25	1.5	3	7.5	15	20	20				OT25E6	204
	40	2	5	10	20	25	25				OT32E6	212
UL 98	60	2	5	15	15	30	30	#14 – 1	Cu	6	OT45E6	260
	80	2	5	20	20	40	40				OT63E6	300
	30	2	5	10	10	20	30				#14 – 4	Cu
60	3	7.5	20	20	40	40	#14 – 4	OT60E6	410			
100	5	15	25	30	50	50	#8 – 1/0	OT100E6	460			

Pistol handles — 5 & 6mm, for use with 6-pole switches

UL/NEMA type	IEC type	Color	Length in/mm	Marking	Defeat-able	Padlock-able	Weight (lbs)	Shaft size (mm)	Catalog number	List price
1, 3R, 12	IP65	Black Red/Yel	2.6/65	O/I & Off/On	Yes	Yes	0.29	5	OHB65J5 OHY65J5	\$ 80
1, 3R, 4, 4X, 12	IP66	Black Red/Yel	2.6/65	O/I & Off/On	Yes	Yes	0.29	5	OHB65L5 OHY65L5	120
1, 3R, 12	IP65	Black Red/Yel	2.6/65	O/I & Off/On	Yes	Yes	0.29	6	OHB65J6	80
		Black Red/Yel	2.6/65				0.29		OHY65J6	80
		Black Red/Yel	3.1/80				0.30		OHB80J6	90
		Black Red/Yel	3.1/80				0.30		OHY80J6	90
1, 3R, 4, 4X, 12	IP66	Black Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	6	OHB80L6 OHY80L6	130

Shafts — 5 & 6mm, for use with 6 pole switches

Shaft length (inches/mm)	Mounting depth ^② (inches)			Weight (lbs)	Shaft size (mm)	Catalog number	List price
	OT16E6 OT25E6 OT32E6	OT45E6 OT63E6	OT30E6 OT60E6 OT100E6				
5mm— for use with OT16, OT25 & OT32							
5.9/160	7.2	—	—	0.07	5	OXP5X150	\$ 14
6.7/170	8.0	—	—	0.08		OXP5X170	16
10.4/265	11.7	—	—	0.12		OXP5X265	18
15.8/400	17.0	—	—	0.18		OXP5X400	30
19.7/500	21.0	—	—	0.23		OXP5X500	42
6mm— for use with OT45, OT63, OT30E6, OT60E6 & OT100E6							
5.2/130	—	6.6	6.7	0.08	6	OXP6X130	12
5.9/150	—	7.4	7.5	0.09		OXP6X150	12
8.3/210	—	9.7	9.8	0.13		OXP6X210	16
11.4/290	—	12.9	13.0	0.18		OXP6X290	20
14.2/360	—	15.6	15.7	0.23		OXP6X360	24
16.9/430	—	18.4	18.5	0.27		OXP6X430	28

① A snap-on power pole may be added to build a 7 or 8 pole switch; please reference accessories, page 18.12.

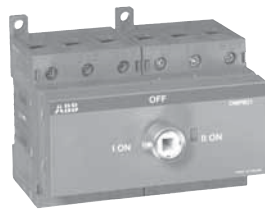
② Mounting depth is the distance from the outside of door to the disconnect switch mounting surface. Shaft can be cut to desired length.

Disconnect switches
Non-fusible

16A – 100A, Base & DIN rail mounted 3 Pole transfer switches

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft



OT45E3C



OXP5X170



OHB_J5



OT45E3C



OHB2AJE011



OHB_J5



OHY_J5



OXS5X_

16 – 100 Amp – 600V, 3 Pole transfer switches ①

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower ratings						Terminal lugs		Shaft size (mm)	Catalog number	List price
		Single phase		Three phase			Wire size	Wire type				
		120V	240V	200V	240V	480V	600V					
16	16	1	2	3	5	10	10	#18 – 8	Cu	5	OT16E3C	\$ 258
25	25	1.5	3	7.5	7.5	15	20				OT25E3C	270
40	40	2	5	10	10	20	25				OT32E3C	288
60	63	2	5	15	15	30	30	#14 – 1	Cu	5	OT45E3C	328
80	80	2	5	20	20	40	40				OT63E3C	368
100	115	5	15	25	30	50	50				OT100E3C	514
30	40	2	5	10	10	20	30	#14 – 4	Cu	5	OT30E3C	428
60	63	3	7.5	20	20	40	40				OT60E3C	478
100	115	5	15	25	30	50	50				OT100E3C	514

UL 508
UL 98

Selector handles — 5mm, for use with transfer switches; marked I/ON - O/OFF - II/ON

UL/NEMA type	IEC type	Color	Defeatable	Padlockable	Weight (lbs.)	Catalog number	List price
1, 3R, 12	IP65	Black Red/Yel	Yes	Yes	0.16	OHB2AJE011② OHY2AJE011②	\$ 40

Shafts for selector handles —5mm, for use with transfer switches

Shaft length (inches/mm)	Mounting depth② (inches)			Weight (lbs)	Shaft size (mm)	Catalog number	List price
	OT16E3C OT25E3C OT32E3C	OT45E3C OT63E3C	OT30E3C OT60E3C OT100E3C				
3.3/85	3.6 - 4.3	4.4 - 5.0	3.9 - 4.9	0.04	5	OXS5X85	\$ 4
4.1/105	4.4 - 5.1	5.1 - 5.8	4.7 - 5.7	0.04		OXS5X105	4
4.7/120	5.0 - 5.8	5.7 - 6.4	5.3 - 6.3	0.05		OXS5X120	4
5.1/150	5.4 - 6.1	6.1 - 6.8	5.6 - 6.7	0.05		OXS5X150	6
7.1/180	7.4 - 8.1	8.1 - 8.7	7.6 - 8.6	0.08		OXS5X180	6
9.8/250	10.1 - 10.8	10.9 - 11.5	10.4 - 11.4	0.1		OXS5X250	12
13/330	13.3 - 14.0	14.0 - 14.7	13.5 - 14.5	0.14		OXS5X330	20

Pistol handles — 5mm, for use with transfer switches; marked I/ON - O/OFF - II/ON

UL/NEMA type	IEC type	Color	Length in/mm	Defeat-able	Padlock-able	Weight (lbs)	Shaft size (mm)	Catalog number	List price
1, 3R, 12	IP65	Black Red/Yel	2.6/65	Yes	Yes	0.29	5	OHB65J5E011 OHY65J5E011	\$ 90
1, 3R, 4, 4X, 12	IP66	Black Red/Yel	2.6/65	Yes	Yes	0.29	5	OHB65L5E011 OHY65L5E011	130

Shafts for pistol handles —5mm, for use with transfer switches

Shaft length (inches/mm)	Mounting depth② (inches)			Weight (lbs)	Shaft size (mm)	Catalog number	List price
	OT16E3 OT25E3 OT32E3	OT45E3 OT63E3	OT30E3 OT60E3 OT100E3				
5.9/160	7.2	7.4	7.5	0.07	5	OXPS5X150	\$ 14
6.7/170	8.0	8.2	8.3	0.08		OXPS5X170	16
10.4/265	11.7	11.9	12.0	0.12		OXPS5X265	18
15.8/400	17.0	17.2	17.3	0.18		OXPS5X400	30
19.7/500	21.0	21.2	21.3	0.23		OXPS5X500	42

① A snap on power pole may be added to build a 4 pole transfer switch; please reference accessories and auxiliary contact information on page 18.12.

② Not suitable for use with OT30E3C, OT60E3C, OT100E3C.

③ Mounting depth is the distance from the outside of door to the disconnect switch mounting plate. Shaft can be cut to desired length.

16A – 100A, Door mounted

Disconnect
switches
Non-fusible

For a complete assembly,
please order one of each:

- 1 switch
- 1 handle



OT45ET3



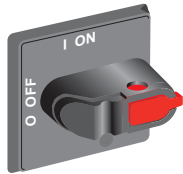
OHB2RJ



OT16ET3
OT25ET3
OT32ET3



OHY1__



OHB3__



OHB2__



OHY2__

16 – 100 Amp switches, 600V, 3 pole^{①②}

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating						Terminal lugs		Catalog number	List price
		Single phase		Three phase				Wire size	Wire type		
		120V	240V	200V	240V	480V	600V				
UL 508	16	1	2	3	5	10	10	#18 – 8	Cu	OT16ET3	\$ 70
	25	1.5	3	7.5	7.5	15	20	#18 – 8	Cu	OT25ET3	76
	40	2	5	10	10	20	25	#18 – 8	Cu	OT32ET3	80
UL 98	60	2	5	15	15	30	30	#14 – 1	Cu	OT45ET3	104
	80	2	5	20	20	40	40	#14 – 1	Cu	OT63ET3	124
	30	2	5	10	10	20	30	#14 – 4	Cu	OT30ET3	154
	60	3	7.5	20	20	40	40	#14 – 4	Cu	OT60ET3	179
100	5	15	25	30	50	50	#8 – 1/0	Cu	OT100ET3	204	

Selector handles

UL/NEMA type	IEC type	Color	Defeat- able	Padlock- able	Weight (lbs)	Catalog number	List price
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All marked both O/I & Off/On

Snap-on mounting — for use on OT16, 25, 32ET3

1	IP54	Black	—	—	0.10	OHB1PH	\$ 22
1	IP54	Red/Yel	—	—	0.10	OHY1PH	22
1	IP54	Black	—	Yes	0.13	OHB3PH	24
1	IP54	Red/Yel	—	Yes	0.13	OHY3PH	24
1,3R,12	IP65	Black	—	Yes	0.17	OHB2PJ	28
1,3R,12	IP65	Red/Yel	—	Yes	0.17	OHY2PJ	28

Screw mounting — for use on OT16 – OT100. For OT30, OT60, OT100 use OH_2_ only

1	IP54	Black	—	—	0.11	OHB1RH	22
1	IP54	Red/Yel	—	—	0.11	OHY1RH	22
1	IP54	Black	—	Yes	0.14	OHB3RH	24
1	IP54	Red/Yel	—	Yes	0.14	OHY3RH	24
1,3R,12	IP65	Black	—	Yes	0.18	OHB2RJ	28
1,3R,12	IP65	Red/Yel	—	Yes	0.18	OHY2RJ	28

Door mounted switches do not provide door interlock

Pistol grip handle adapter

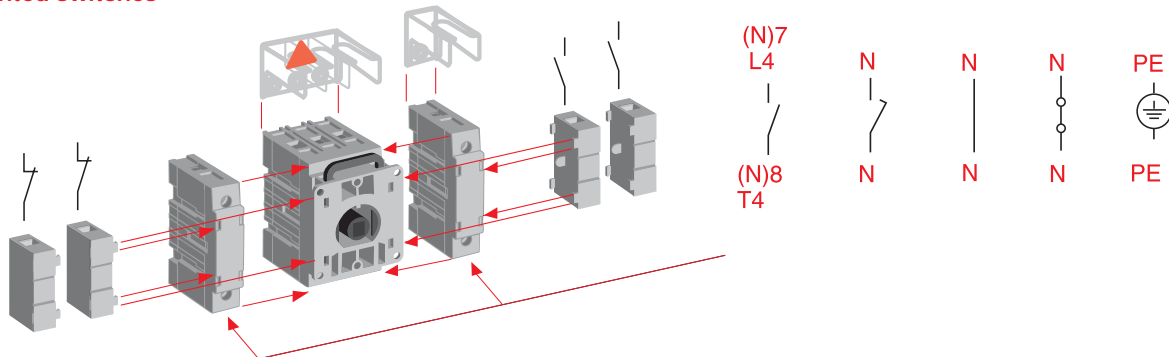
Description	For use on:	Weight (lbs)	Catalog number	List price
Adapter piece for pistol grip handle	OT30, OT60, OT100	0.18	OHZX6	\$ 20

Includes hardware and a shaft. For pistol grip handles.

① A snap on fourth pole may be added — please reference accessories pg 18.18.
② Door mounted switches do not require shafts.

16A – 100A, Door mounted Accessories

Door mounted switches



Auxiliary contacts ① — snap-on mounting

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. mounts on righthand side of switch	OT16 – OT100	0.07	10	600	OA1G10	\$ 20
1 N.C. mounts on lefthand side of switch		0.07	10	600	OA1G01	20

Max. two contacts on each side of switch.

Power poles

- Only one power pole per switch
- Mounts on left or right side of switch

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Fourth pole②	OT16, OT25, OT32	0.07	40	600	OTPS32ED	\$ 36
	OT45, OT63	0.13	80	600	OTPS63ED	44
	OT30, OT60, OT100	0.20	100	600	OTPS125ED	54
Late-break/early-make②	OT16, OT25, OT32	0.07	40	600	OTPL32ED	36
	OT45, OT63	0.13	80	600	OTPL63ED	44
	OT30, OT60, OT100	0.20	100	600	OTPL125ED	54

Terminal poles

- Switch accepts one terminal pole per side
- Mounts on left or right side of switch

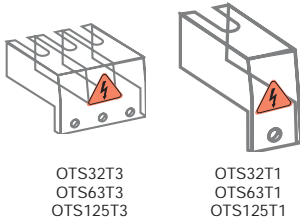
Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Solid neutral ②	OT16, OT25, OT32	0.07	40	600	OTPN32ED	\$ 20
	OT45, OT63	0.13	80	600	OTPN63ED	36
	OT30, OT60, OT100	0.20	100	600	OTPN125ED	50
Detachable neutral ②	OT16, OT25, OT32	0.07	40	600	OTPD32ED	28
	OT45, OT63	0.13	80	600	OTPD63ED	36
	OT30, OT60, OT100	0.20	100	600	OTPD125ED	50
Ground terminal ②	OT16, OT25, OT32	0.07	40	600	OTPE32ED	20
	OT45, OT63	0.13	80	600	OTPE63ED	36
	OT30, OT60, OT100	0.20	100	600	OTPE125ED	50

① UL File # E83510

② Switch accepts one power pole or one terminal pole per side. Only one power pole per switch.

16A – 100A, Door mounted Accessories

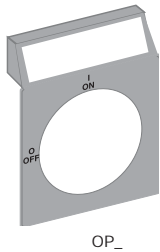
Disconnect switches
Non-fusible



Terminal shrouds* — snap-on mounting for line or load side

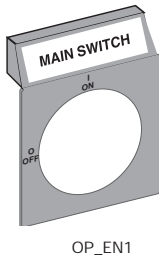
Description	For use on:	Weight (lbs)	Catalog number	List price
3 pole includes one shroud for line or load side	OT16, OT25, OT32	0.02	OTS32T3	\$ 8
	OT45, OT63	0.02	OTS63T3	12
	OT30, OT60, OT100	0.02	OTS125T3	20
4th pole includes one shroud for line or load side	OTP_32ED	0.02	OTS32T1	4
	OTP_63ED	0.02	OTS63T1	6
	OTP_125ED	0.02	OTS125T1	10

All disconnects are IP20 touch safe as standard. Terminal shrouds provide an additional level of protection.



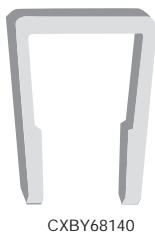
Legend plates for selector handles

Description	For use on:	Catalog number	List price
Blank plate	OH_1_ & OH_3_	OPB1	\$ 6
	OH_1_ & OH_3_	OPY1	6
	OH_2_	OPB2	8
	OH_2_	OPY2	8
Plate marked with: MAIN SWITCH	OH_1_ & OH_3_	OPB1EN1	10
	OH_1_ & OH_3_	OPY1EN1	10
	OH_2_	OPB2EN1	12
	OH_2_	OPY2EN1	12



Locking clip (replacement part)

Description	For use on:	Catalog number	List price
Door mounted switch handle locking clip	OT16, OT25, OT32	CXBY68140	\$ 11

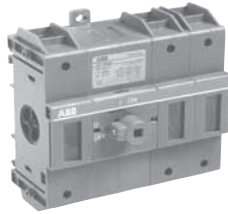


Disconnect
switches
Non-fusible

125A

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft



OT160E3



OXP6X210



OHB65J6

125 Amp Base & DIN rail mounted switches^①, 600V

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating					Terminal lugs		Catalog number	List price
		Three phase					Wire size	Wire type		
		200V	208V	240V	480V	600V				
2 pole 125	160	—	—	—	—	—	#8 – 1/0	Cu	2 pole OT160E2	\$ 380
3 pole 125	160	30	30	40	75	100	#8 – 1/0	Cu	3 pole OT160E3	420


125 Amp Door mounted switch^①, 600V, 3 pole

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating					Terminal lugs		Catalog number	List price
		Three phase					Wire size	Wire type		
		200V	208V	240V	480V	600V				
125	160	30	30	30	75	100	#8 – 1/0	Cu	OT160ET3	\$ 548


Pistol handles — for use with $\square .24 \times .24$ " ($\square 6 \times 6$ mm)

UL/NEMA type	IEC type	Color	Length in/mm	Marking	Defeat-able	Padlock-able	Weight (lbs)	Catalog number	List price
1, 3R, 12	IP65	Black	2.6/65	O/I & Off/On	Yes	Yes	0.29	OHB65J6	\$ 80
1, 3R, 12	IP65	Red/Yel	2.6/65	O/I & Off/On	Yes	Yes	0.29	OHY65J6	80
1, 3R, 12	IP65	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80J6	90
1, 3R, 12	IP65	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80J6	90
1, 3R, 4, 4X, 12	IP66	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80L6	130
1, 3R, 4, 4X, 12	IP66	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80L6	130

Shafts — for use with pistol handles $\square .24 \times .24$ " ($\square 6 \times 6$ mm)

Shaft length inches/mm		Mounting depth ^② in inches	Weight (lbs)	Catalog number	List price
5.2/130		4.3 – 6.0	0.08	OXP6X130	\$ 12
5.9/150		5.0 – 6.7	0.09	OXP6X150	12
8.3/210		7.4 – 9.1	0.13	OXP6X210	16
11.4/290		10.5 – 12.2	0.18	OXP6X290	20
14.2/360		13.3 – 15.0	0.23	OXP6X360	24
16.9/430		16.0 – 17.8	0.27	OXP6X430	28

Twisted shafts — Rotates handle 45° $\square .24 \times .24$ " ($\square 6 \times 6$ mm)

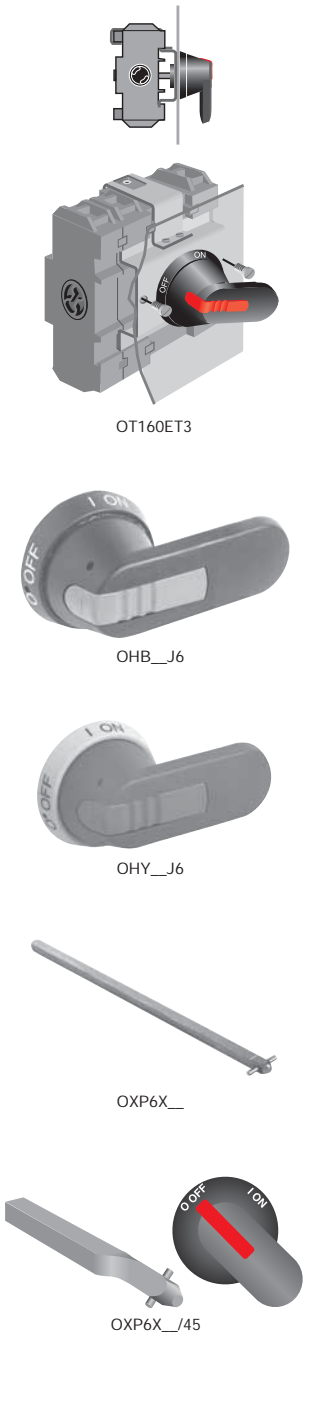
Shaft length inches/mm		Mounting depth ^② in inches	Weight (lbs)	Catalog number	List price
5.2/130		4.3 – 6.0	0.08	OXP6X130-45	\$ 12
8.3/210		7.4 – 9.1	0.13	OXP6X210-45	16
11.4/290		10.5 – 12.2	0.18	OXP6X290-45	20
14.2/360		13.3 – 15.0	0.23	OXP6X360-45	24

Direct mount handle

Item	Weight (lbs)	Catalog number	List price
Mounts directly on switch. No shaft necessary.	0.05	OHB13	\$ 22

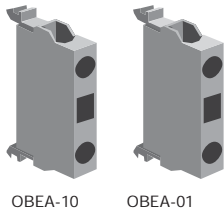
① A snap on fourth pole may be added – please reference accessories page 18.21.

② Mounting depth is the distance from the outside of the door to the disconnect switch mounting plate. Shaft can be cut to desired length.

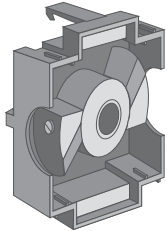


125A Accessories

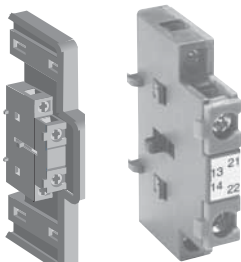
Disconnect
switches
Non-fusible



OBEA-10 OBEA-01



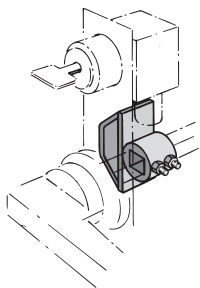
OEZNP1



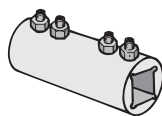
OAZX1 OA2G11



OTP_160EP



OETL-ZW16



OETL-ZX167
OETL-ZX95

Auxiliary contacts, top mounted

- Accepts four contacts maximum, mounting base always required

Description	For use with:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. 1 N.C.	OEZNP1 OT160	0.07	10 10	600 600	OBEA-10 OBEA-01	\$ 28 28
1 N.O. gold plated ^① 1 N.C. gold plated ^①	OEZNP1 OT160	0.07	10 10	600 600	OBEA-10AU OBEA-01AU	56 56
Mounting base – required for OBEA_	OBEA_	0.06	—	—	OEZNP1	20

Auxiliary contacts, side mounted

- Accepts four contacts maximum

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. & 1 N.C. Mounting base – required for OA2G11	OT160 OT160	0.07 0.06	10 —	600 —	OA2G11 OAZX1	\$ 40 20

Max. two contacts on each side of switch. One mounting base required for each side of switch

Numbering stickers ^②

Description	For use on:	Package qty.	Catalog number	List price
1 Pkg. of blank labels for OBEA-10, 1 N.O.	OT160	10	OBEA-ZX10	\$ 32
1 Pkg. of blank labels for OBEA-01, 1 N.C.	OT160	10	OBEA-ZX01	32

Power pole — for use with base or door mounted switch

- Only one power pole per switch
- Mounts on left or right side of switch

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Fourth pole	OT160	0.66	125	600	OTPS160EP	\$ 100

Terminal poles — for use with base or door mounted switch

- Switch accepts one terminal pole per side
- Mounts on left or right side of switch

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Detachable neutral mounts on side of switch or DIN rail	OT160	0.66	125	600	OTPN160EP	\$ 100
Ground terminal	OT160	0.66	125	600	OTPE160EP	100

Locking accessories

Description	For use on:	Weight (lbs)	Catalog number	List price
Cam attachment for Kirk Key, Castell, Lowe & Fletcher and Ronis interlock. For adapting to the interlock system. The interlock is not included.	5, 6 & 8mm shafts	0.29	OETL-ZW16	\$ 190

Handle support bracket

Description	For use on:	Weight (lbs)	Catalog number	List price
Allows pistol handle to be directly mounted to switch behind the door	OT160	0.33	OHZX5	\$ 24

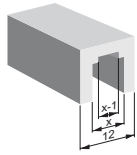
Shaft extension couplers

Description	For use on:	Weight (lbs)	Catalog number	List price
Joins two shafts together for applications where extended length is required	for 6mm shafts for 12mm shafts	0.26 0.26	OESA-ZX167 OETL-ZX95	\$ 56 100

^① Type _AU for low energy applications. The contacts are gold-plated. AC & DC ratings — Maximum: A600 & P600. Minimum: 12V, 1mA; 5V, 2mA

^② Required if several contact blocks are used in the same installation.

125A Accessories



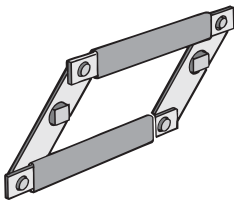
OETL-ZK19
(X = 6mm)



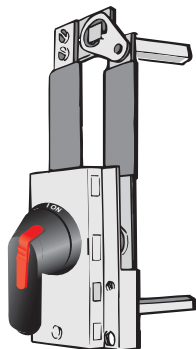
CXBY68005



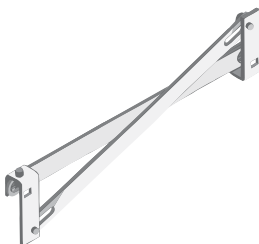
OTZS2



OESA-ZW2



OESA-ZW1



OTZW10

Shaft adapter

Description	For use on:	Weight (lbs)	Catalog number	List price
Adapts one end of a 5 or 6mm shaft to 12mm Use with shaft extension coupler	5 & 6mm shafts	0.20	OETL-ZK19	\$ 40

Power pole interlock (replacement part)

Description	For use on:	Weight (lbs)	Catalog number	List price
Interlocks a power pole with an adjacent power pole	OT160	0.05	CXBY68005	\$ 12

Replacement collar (optional replacement for knob)

Description	For use on:	Weight (lbs)	Catalog number	List price
Red knob (like original) for locking shaft in place ** re-use original set screw **	OT160	0.05	CXBY68100	\$ 2
Metal collar replaces original red knob for locking shaft in place ** re-use original set screw **	OT160	0.05	OTZS2	13

Conversion mechanisms

- For use with Base and Din rail mounted switches only
- Switches are not included

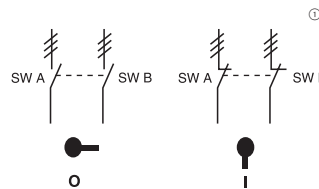
Description	For use on:	Weight (lbs.)	UL/NEMA type	Catalog number	List price
6 or 8 pole	OT160	1.52	—	OESA-ZW2	\$ 220
Transfer		2.20	Type 1,3R,12	OESA-ZW1	300
Transfer		2.20	Type 1,3R,4,4X,12	OESA-ZW1X	340
Mechanical interlock		0.55	—	OTZW10	100

6 or 8 pole — OESA-ZW2

6 (8) pole mechanism allows two switches controlled by one handle, to open or close simultaneously.

Equipment required for a complete installation:

- Includes OHB145J12 handle
- One conversion mechanism
- Two disconnect switches
- Two shafts (see page 18.20)



	POS. O	POS. I
SW. A	O	X
SW. B	O	X

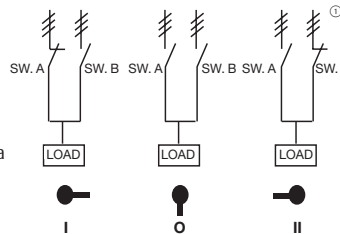
X = Closed
O = Open

Transfer — OESA-ZW1

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position. A 3 position handle is included.

OHB80J6E011 (UL Type 1, 3R & 12) or OHB80L6E011 (UL Type 1, 3R, 4, 4X, 12) Shafts included. Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.20)



	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

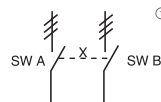
X = Closed
O = Open

Mechanical interlock — OTZW10

Mechanical interlock mechanism prevents both switches from being in the ON position at the same time.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.20)
- Two handles (see page 18.20)
- Two shafts (see page 18.20)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

Drawing and mounting information found on pg 18.70

① ≡ = Three poles

200A

Disconnect
switches
Non-fusible

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft
- 1 terminal lug kit



OT200U03



OXP6X210



OHB80J6



OZXA-200



OT200U03



OHB_J6



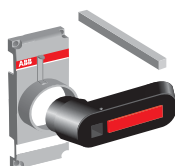
OHY_J6



OXP6X_



OXP6X360-45



OTV250EK

200 Amp switches, 600V

UL general purpose amp. rating	IEC AC21 Amp rating	Maximum horsepower rating					Catalog number	List price
		Three phase						
		200V	208V	240V	480V	600V		
2 pole 200	250	—	—	—	—	—	OT200U02 OT200U11	\$ 560
		3 pole 200	—	—	—	—	—	
4 pole 200			60	60	75	150	200	OT200U04 OT200U13 OT200U22

Pistol handles — for use with shafts □ .24 x .24" (□ 6 x 6mm)

UL/NEMA type	IEC type	Color	Length mm	Marking	Defeat- able	Padlock- able	Weight (lbs)	Catalog number	List price
1,3R,12	IP65	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80J6	\$ 90
	IP65	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80J6	
1,3R,4,4X,12	IP66	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80L6	130
	IP66	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80L6	

Shafts for use with pistol grip handles □ .24 x .24" (□ 6 x 6mm)

Length in / mm	Mounting depth [Ⓢ] in inches OT200U	Weight lbs	Catalog number	List price
5.1 / 130	4.3 - 6.5	0.08	OXP6X130	\$ 12
5.9 / 150	5.0 - 7.2	0.10	OXP6X150	12
8.3 / 210	7.4 - 9.6	0.13	OXP6X210	16
11.4 / 290	10.5 - 12.7	0.18	OXP6X290	20
14.2 / 360	13.3 - 15.5	0.23	OXP6X360	24
16.9 / 430	16 - 18.2	0.28	OXP6X430	28

Twisted shafts — Rotates handle 45° □ .24 x .24" (□ 6 x 6mm)

Shaft length (inches/mm)	Mounting depth [Ⓢ] in inches OT200	Weight lbs	Catalog number	List price
5.2 / 130	4.29 - 6.85	0.08	OXP6X130-45	\$ 12
8.3 / 210	7.44 - 10.0	0.13	OXP6X210-45	16
11.4 / 290	10.59 - 13.15	0.18	OXP6X290-45	20
14.2 / 360	13.34 - 15.9	0.23	OXP6X360-45	24

Direct mount handle Test-OFF ON

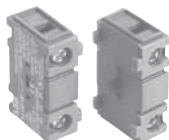
Item	Weight lbs	Catalog number	List price
Up to 3 padlocks in OFF-position. Includes shaft and mechanism	.22	OTV250EK OTVY250EK	\$ 105

Ⓢ Mounting depth is the distance from the outside of the door to the disconnect switch mounting plate. Shaft can be cut to desired length.

200A Accessories



OZXA-200



OATG_



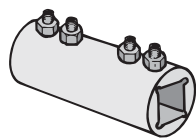
OEA28



OTS250G1L/3



OTS250G1S/3



OETL-ZX95

Terminal lug kits

For use on	Wire size	Wire type	Lugs /kit	Weight lbs.	Catalog number	List price
OT200_	#4 - 300kcmil	Cu /Al	6	.5	OZXA-200	\$ 80
	#4 - 300kcmil		3	0.25	OZXA-200/3P	40
	(6) 14-6 AWG		3	0.25	OZXA-206	180

Auxiliary contacts blocks

Mounting on the left side of the switch: Max 8 auxiliary contact blocks with the OEA28 module

Mounting under the mechanism cover: Max 4 auxiliary contact blocks

Function	Protection degree	Weight lbs	Catalog number	List price
1 NO 1 NC	IP20	0.07	OA1G10	\$ 20
			OA3G01	

Module for auxiliary contacts

Description	Weight lbs	Catalog number	List price
Screw mounting to the left side of the switch	0.1	OEA28	\$ 50

Terminal poles

Description	For use on:	Weight lbs	AC thermal amp rating	AC rated voltage	Catalog number	List price
Mounting separately on baseplate, protected construction	OT200	0.57	200	600	OXN250	Consult factory

Terminal shrouds

Snap-on mounting, grey plastic, IP30. Transparent shrouds available on request.

Includes 3 shrouds for either line or load side

For use with:	Description	Number of poles	Weight lbs	Catalog number	List price
OT200_	Long type	3	0.20	OTS250G1L/3	\$ 50
	Short type	3	0.13	OTS250G1S/3	50
	Long type	4	0.26	OTS250G1L/4	65
	Short type	4	0.18	OTS250G1S/4	61

Shaft extension coupler

Description	For use on:	Weight (lbs.)	Catalog number	List price
Joins two shafts together for applications where extended length is required	6mm shafts	0.26	OESA-ZX167	\$ 56
	12mm shafts		OETL-ZX95	

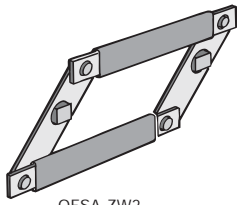
Shaft adapter

Description	For use on:	Weight (lbs.)	Catalog number	List price
Adapts one end of a 5 or 6mm shaft to a 12mm shaft. Use with shaft extension coupler.	5 or 6mm shafts	0.20	OETL-ZK19	\$ 40

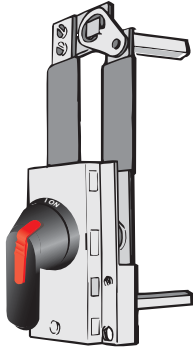
① UL File E83510

200A Accessories

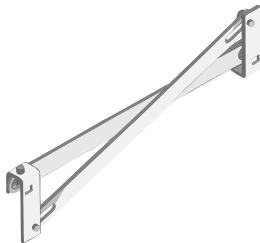
Disconnect
switches
Non-fusible



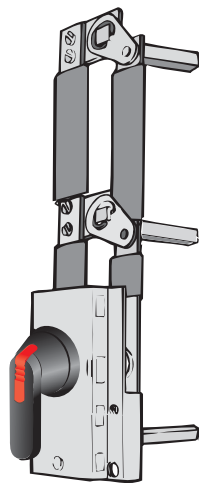
OESA-ZW2



OESA-ZW1



OTZW10



OTZW26

Conversion mechanisms

- For use with Base and Din rail mounted switches only
- Switches are not included

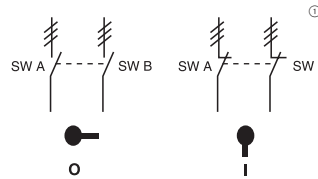
Description	For use on:	Weight (lbs.)	UL/NEMA type	Catalog number	List price
6 or 8 pole	OT200	1.52	—	OESA-ZW2	\$ 220
Transfer		2.20	Type 1,3R,12	OTZW25	790
Transfer		2.20	Type 1,3R,4,4X,12	OTZW25X	840
Mechanical interlock	OS200	0.55	—	OTZW10	100
Bypass		7.28	1, 3R, 12	OTZW26	950

6 or 8 pole — OESA-ZW2

6 (8) pole mechanism allows two switches controlled by one handle, to open or close simultaneously.

Equipment required for a complete installation:

- Includes OHB145J12 handle
- One conversion mechanism
- Two disconnect switches
- Two shafts (see page 18.23)



	POS. O	POS. I
SW. A	O	X
SW. B	O	X

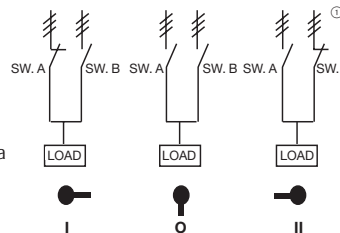
X = Closed
O = Open

Transfer — OTZW25, OTZW25X

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position. A 3 position handle is included.

OHB80J6E011 (UL Type 1, 3R & 12) or OHB80L6E011 (UL Type 1, 3R, 4, 4X, 12) Shafts included. Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.23)



	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

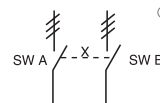
X = Closed
O = Open

Mechanical interlock — OTZW10

Mechanical interlock mechanism prevents both switches from being in the ON position at the same time.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.23)
- Two handles (see page 18.23)
- Two shafts (see page 18.23)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

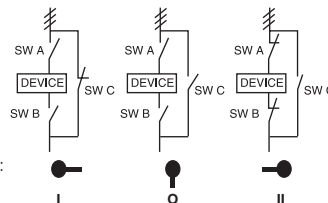
Bypass — OTZW26

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass.

A 3-position handle is included: OHB-145J12E011 (Type 1,3R & 12) or OHB145L12E011 (Type 1, 3R, 4, 4X, 12) Shafts included.

Equipment required for a complete installation:

- One conversion mechanism
- Three disconnect switches (see page 18.87)



	POS. I	POS.O	POS.II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

X = Closed
O = Open

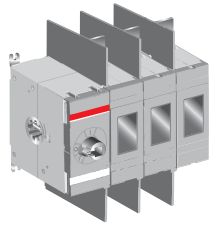
① ≡ Three poles

Disconnect
switches
Non-fusible

400A – 800A

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft
- 1 terminal lug kit



OT400U03



OXP12X280



OHB145J12



OZXA-400



OETL-NF600ASW



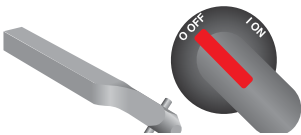
OETL-NF800ASW



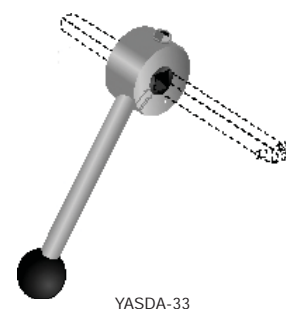
OHB145J12



OXP12X280



OHB145J12



YASDA-33

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating					Catalog number	List price
		200V	208V	240V	480V	600V		
2 pole								
400	630	—	—	—	—	—	OT400U02	\$ 1280
400	630	—	—	—	—	—	OT400U011	1280
600	800	—	—	—	—	—	OETL-NF600A2SW	2000
800	1250	—	—	—	—	—	OETL-NF800A2SW	2600
3 pole								
400	630	100	100	125	250	350	OT400U03	1420
400	630	100	100	125	250	350	OT400U12	1420
600	800	150	150	200	400	500	OETL-NF600ASW	2200
800	1250	200	200	250	500	600	OETL-NF800ASW	4200
4 pole								
400	630	100	100	125	250	350	OT400U04	1800
400	630	100	100	125	250	350	OT400U13	1800
400	630	100	100	125	250	350	OT400U22	1800
600	800	150	150	200	400	500	OETL-NF600A4SW	2800
—	1250	200	200	250	500	600	OETL-NF800A4SW	5200

Pistol handles — for use with shafts □ .47 x .47" (□ 12 x 12 mm)

UL/NEMA type	IEC type	Color	Length in/mm	Marking	Defeat-able	Padlock-able	Weight (lbs)	Catalog number	List price
1,3R,12	IP65	Blk	4.9/125	O/I & Off/On	Yes	Yes	0.39	OHB125J12	\$ 90
1,3R,12	IP65	R/Y	4.9/125	O/I & Off/On	Yes	Yes	0.39	OHY125J12	90
1,3R,12	IP65	Blk	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHB145J12	90
1,3R,12	IP65	R/Y	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHY145J12	90
1,3R,12	IP65	Blk	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHB175J12	100
1,3R,12	IP65	R/Y	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHY175J12	100
1,3R,4,4X,12	IP66	Blk	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHB145L12	130
1,3R,4,4X,12	IP66	R/Y	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHY145L12	130
1,3R,4,4X,12	IP66	Blk	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHB175L12	140
1,3R,4,4X,12	IP66	R/Y	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHY175L12	140
1,3R,4,4X,12	IP65	Metal	8.7/220	Off/On	—	Yes	1.50	YASDA-8	190

Shafts — for use with pistol handles □ .47 x .47" (□ 12 x 12 mm)

Shaft length inches/mm	Mounting depth ^① in inches	Weight (lbs)	Catalog number	List price
11.0/280	10.2 – 14.5	0.77	OXP12X280	\$ 36
12.8/325	12.0 – 16.3	0.90	OXP12X325	40
15.6/395	14.8 – 19.1	1.10	OXP12X395	44
18.3/465	17.5 – 21.9	1.32	OXP12X465	48
21.1/535	20.3 – 24.6	1.54	OXP12X535	52

Twisted shafts — Rotates handle 45° □ .47 x .47" (□ 12 x 12 mm)

Shaft length inches/mm	Mounting depth ^① in inches	Weight (lbs)	Catalog number	List price
11.0/280	10.2 – 14.5	0.77	OXP12X280-45	\$ 36
12.8/325	12.0 – 16.3	0.90	OXP12X325-45	40
18.3/465	17.5 – 21.9	1.32	OXP12X465-45	48

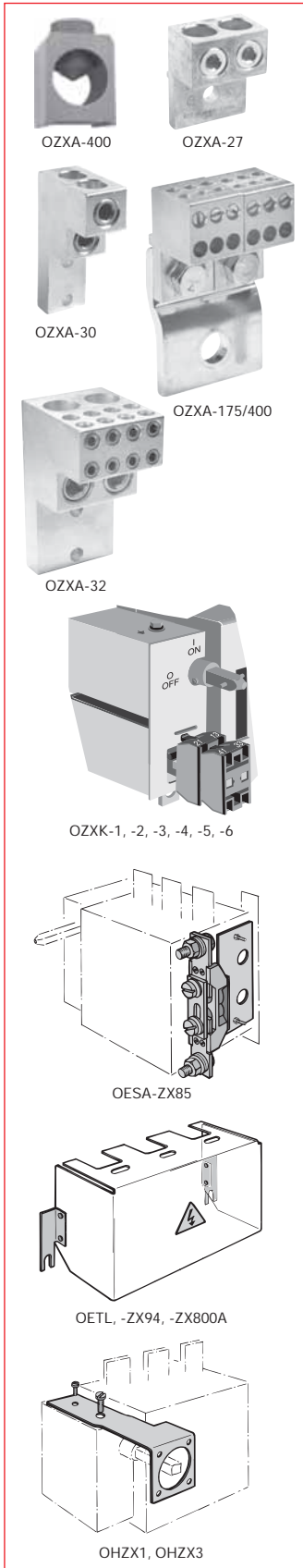
Direct mount handle

Item	Weight (lbs)	Catalog number	List price
Mounts on shaft.	.78	YASDA-33	\$ 150

① Mounting depth is the distance from the outside of the door to the disconnect switch mounting plate. Shaft can be cut to desired length.

400A – 800A Accessories

Disconnect
switches
Non-fusible



Terminal lug kits

For use on:	Wire size	Kit weight (lbs.)	Wire type	Terminal lugs per kit	Kit catalog number	List price
OT400	#2 – 600 kcmil	0.50	Cu/Al	6	OZXA-400	\$ 190
OT400	#2 – 600 kcmil	0.50	Cu/Al	3	OZXA-400/3P	95
OT400	(6) #14 – 6 AWG	0.50	Cu/Al	3	OZXA-406	270
OETL-NF600A	(2) #2 – 600 kcmil	4.62	Cu/Al	6	OZXA-27	380
OETL-NF600A	(2) #2 – 600 kcmil	2.31	Cu/Al	3	OZXA-27/3P	190
OETL-NF800A	(2) #2 – 600 kcmil	6.90	Cu/Al	6	OZXA-30	740
OETL-NF800A	(2) #2 – 600 kcmil	3.45	Cu/Al	3	OZXA-30/3P	370
OETL-NF800A ①	(8) 2/0 + (2)#2 600 kcmil	6.90	Cu/Al	3	OZXA-32	600
OETL-NF600 ①	(12) #14 – 6	1.10	Cu/Al	3	OZXA-175/400	270

Auxiliary contacts blocks

Mounting on the left side of the switch: Max 8 auxiliary contact blocks with the OEA28 module

Mounting under the mechanism cover: Max 4 auxiliary contact blocks

Function	For use on	Protection degree	Weight lbs	Catalog number	List price
1 NO 1 NC	OT400	IP20	0.07	OA1G10 OA3G01	\$ 20

Module for auxiliary contacts

Description	Weight lbs	Catalog number	List price
Screw mounting to the left side of the switch	0.1	OEA28	\$ 50

Auxiliary contacts ②

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. + 1 N.C.	OETL-NF600 – OETL-NF800A	0.20	10	600	OZ XK-1	\$ 100
2 N.O. + 2 N.C.		0.26	10	600	OZ XK-2	170
4 N.O. + 4 N.C.		0.40	10	600	OZ XK-3	340
2 N.O.		0.18	10	600	OZ XK-4	100
4 N.O.		0.25	10	600	OZ XK-5	170
8 N.O.		0.40	10	600	OZ XK-6	340

Terminal poles

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Detachable neutral link mounts separately on baseplate (protected construction)	OT400	1.54	400	600	OXN400	Consult factory
Detachable neutral link mounts on side of switch or DIN rail	OETL-NF600A	1.04	400	600	OESA-ZX85	150

Terminal shrouds – OT400 (Snap-on mounting, grey plastic, IP30)

Description	For use with:	Number of poles	Weight lbs	Catalog number	List price
Long type	OT400_	3	0.33	OTS400G1L/3	\$ 113
Short type		3	0.20	OTS400G1S/3	106
Long type		4	0.44	OTS400G1L/4	140
Short type		4	0.26	OTS400G1S/4	130

NOTE: Transparent shrouds available upon request.

Terminal shrouds – OETL-NF600A – OETL-NF800A

Description	For use on:	Weight (lbs)	Catalog number	List price
Includes one shroud for line or load side	OETL-NF600A	0.66	OETL-ZX94	\$ 130
	OETL-NF800A	0.88	OETL-ZX800A	180

Direct mount handle – Test-OFF ON

Item	Weight lbs	Catalog number	List price
Up to 3 padlocks in OFF-position. Includes shaft and mechanism	.44	OTV400EK OTVY400EK	\$ 130

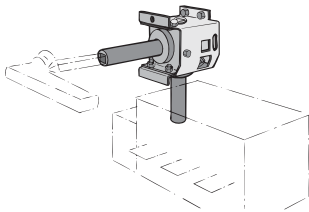
Handle support bracket

Description	For use on:	Weight (lbs)	Catalog number	List price
Allows handle to be directly mounted to switch behind the door	OETL-NF600	0.51	OHZX1	\$ 24
	OETL-NF800A	0.88	OHZX3	30

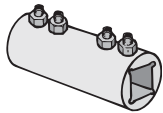
① A load side distribution lug eliminates the need to purchase, install and wire a separate distribution block.

② UL File E57057

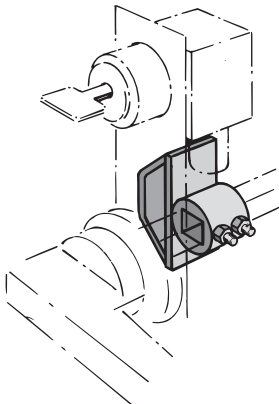
400A – 800A Accessories



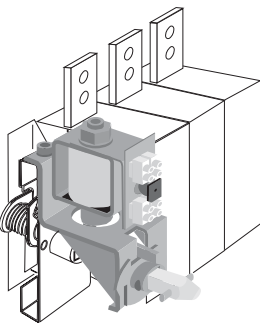
OETL-ZX108



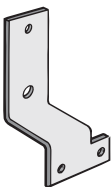
OETL-ZX95



OETL-ZW5



OETL-ZT80_



OETL-ZT100

90° angle kit

Description	For use on:	Weight (lbs)	Catalog number	List price
Converts switch mechanism from front operation to side operation	OT400, OETL-NF600A OETL-NF800A	4.63	OETL-ZX108	\$ 794

Shaft extension coupler

Description	For use on:	Weight (lbs)	Catalog number	List price
Joins two shafts together for applications where extended length is required	12mm shafts	0.26	OETL-ZX95	\$ 100

Locking accessories

Description	For use on:	Weight (lbs)	Catalog number	List price
Cam attachment for Kirk Key, Castell, Lowe & Fletcher and Ronis interlock. For adapting to the interlock system. The interlock is not included.	12mm shafts	0.29	OETL-ZW5	\$ 190
Electrical interlock ^① Closed circuit principle for interlocking the switch movement. When the coil circuit is dead, A-types cannot be operated to ON-position and L-types cannot be operated to ON- or OFF-position. Coil voltages 110VAC, 220VAC, 24VDC, 48VDC, 60 VDC, 110VDC, 220VDC, P = 15W U = 0.7 - 1.1 Un (U = coil voltage, Un = nominal voltage)	OT400 OETL-NF600 – OETL-NF800A	2.42	OETL-ZT 80A★ OETL-ZT 80L★	1280 1220
Mounting bracket	OETL-NF600	0.40	OETL-ZT100	40

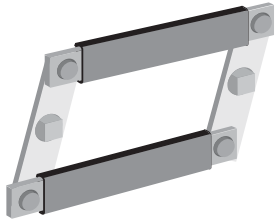


★ – Coil voltage

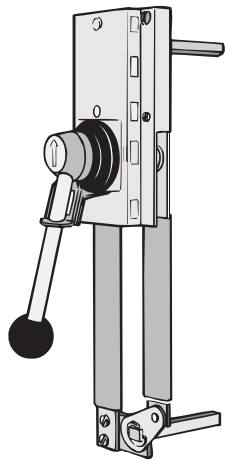
① OETL-ZT100 mounting bracket required for OETL-NF600

400A – 800A Accessories

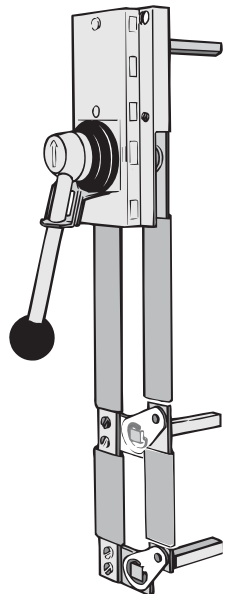
Disconnect
switches
Non-fusible



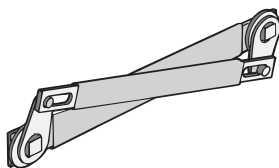
OETL-ZW9



OETL-ZW12



OETL-ZW13



OETL-ZW3, -ZW14, -ZW15

Conversion mechanisms

• Switches are not included

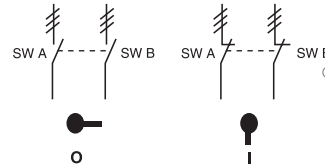
Description	For use on:	Weight (lbs)	UL/NEMA type	Catalog number	List price
6 or 8 pole Transfer Bypass	OT400, & OETL-NF600 – OETL-NF800A	2.42	—	OETL-ZW9	\$ 260
		10.1	1,3R,4,4X,12	OETL-ZW12	560
		8.81	1,3R,4,4X,12	OETL-ZW13	560
Mechanical interlock		1.26	—	OETL-ZW3	140
		1.15	—	OETL-ZW14	140
		2.64	—	OETL-ZW15	160

6 or 8 pole — OETL-ZW9

6 (8) pole mechanism allows two switches controlled by one handle to open or close simultaneously.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.26)
- One handle (see page 18.26)
- Two shafts (see page 18.26)



	POS.O	POS.I
SW. A	O	X
SW. B	O	X

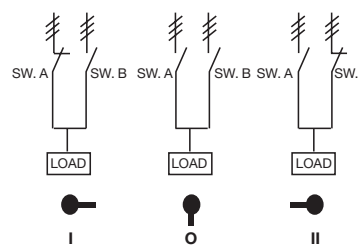
X = Closed
O = Open

Transfer — OETL-ZW12

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position. A 3 position handle is included. YASDA-21 (UL Type 1, 3R, 4, 4X, 12). Shafts included.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.26)



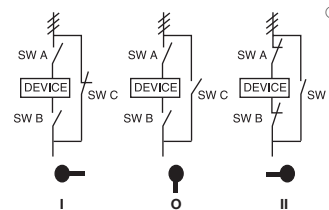
	POS. I	POS.O	POS.II
SW. A	X	O	O
SW. B	O	O	X

X = Closed
O = Open

Bypass — OETL-ZW13

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass. A 3 position handle is included. YASDA-6 (UL Type 1, 3R, 4, 4X, 12). Shafts included.

- Equipment required for a complete installation:
- One conversion mechanism
 - Three disconnect switches (see page 18.26)



	POS. I	POS.O	POS.II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

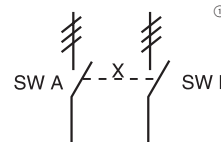
X = Closed
O = Open

Mechanical interlock — OETL-ZW3, OETL-ZW14, OETL-ZW15

Mechanical interlock mechanism prevents both switches from being in the ON position at the same time.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.26)
- Two shafts (see page 18.26)
- Two handles (see page 18.26)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

Drawing and mounting information found on pg 18.71 & 18.72

① ≡ = Three poles

Disconnect
switches
Non-fusible

1200A – 3150A

For a complete assembly
please select one of each:

- 1 switch
- 1 handle
- 1 shaft
- 1 terminal lug kit



OETL-NF1200ASW



OXP12X280



OHB175J12



OZXA-28



OETL-NF1600SW
OETL-NF2000SW
OETL-NF3150SW



OHB_J12



OHY_J12



YASDA-8



OXP12X_

1200 – 3150 Amp switches, 600V

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating	Catalog number	List price
2 pole			2 pole	
1200	1600	The US National Electric Code does not specify HP ratings for switches this large. Please select a switch based on 115% of application FLA. For example: a motor with an FLA of 800A would require a 1200A switch: 800A x 115% = 920A, the closest higher rated switch is 1200A.	OETL-NF12002SW	\$ 6200
1600	2500		OETL-NF16002SW	14,800
2000	2500		OETL-NF20002SW	15,500
—	3150		OETL-NF31502SW	17,000
3 pole			3 pole	
1200	1600		OETL-NF12003SW	6800
1600	2500		OETL-NF16003SW	16,400
2000	2500		OETL-NF20003SW	17,200
—	3150		OETL-NF31503SW	18,900
4 pole			4 pole	
—	1600		OETL-NF12004SW	8600
—	2500		OETL-NF16004SW	20,500
—	2500		OETL-NF20004SW	21,500
—	3150		OETL-NF31504SW	23,600

Pistol handles — for use with shaft □ .47 x .47" (□ 12 x 12mm)

UL/NEMA type	IEC type	Color	Length mm	Marking	Defeat-able	Padlock-able	Weight (lbs)	Catalog number	List price
For use with OETL-NF1200									
1,3R,12	IP65	Black	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHB145J12	\$ 90
1,3R,12	IP65	Red/Yel	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHY145J12	90
1,3R,12	IP65	Black	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHB175J12	100
1,3R,12	IP65	Red/Yel	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHY175J12	100
1,3R,4,4X,12	IP66	Black	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHB145L12	130
1,3R,4,4X,12	IP66	Red/Yel	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHY145L12	130
1,3R,4,4X,12	IP66	Black	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHB175L12	140
1,3R,4,4X,12	IP66	Red/Yel	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHY175L12	140
1,3R,4,4X,12	IP65	Metal	8.7/220	Off/On	—	Yes	1.50	YASDA-8	190
For use with OETL-NF1600 – OETL-NF3150									
1,3R,4,4X,12	IP65	Metal	8.7/220	Off/On	—	Yes	1.50	YASDA-8	190

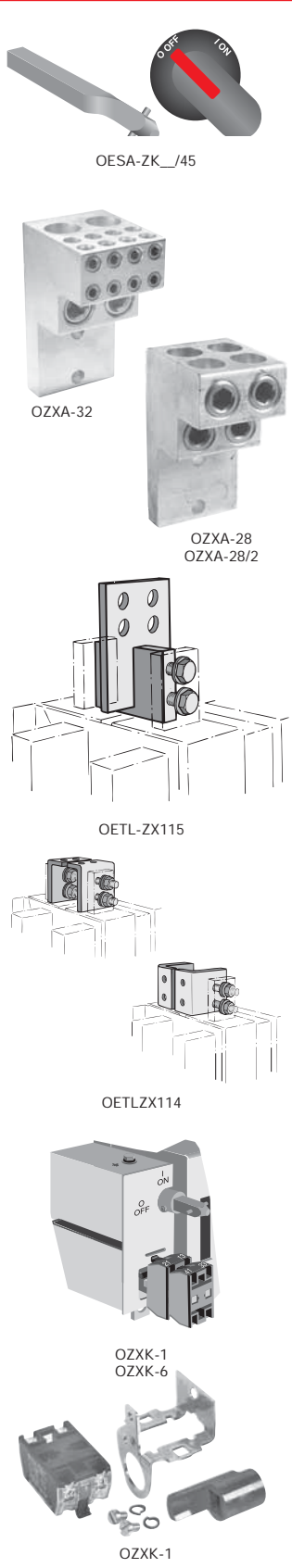
Shafts — for use with pistol handles □ .47 x .47" (□ 12 x 12 mm)

Shaft length inches/mm	Mounting depth [Ⓞ] in inches	Weight (lbs)	Catalog number	List price
For use with OETL-NF1200				
11.0/280	11.6 – 15.3	0.77	OXP12X280	\$ 36
12.8/325	13.7 – 17.1	0.90	OXP12X325	40
15.6/397	16.2 – 19.9	1.10	OXP12X395	44
18.3/465	18.9 – 22.6	1.32	OXP12X465	48
21.1/535	21.7 – 25.4	1.54	OXP12X535	52
For use with OETL-NF1600 – OETL-NF3150				
12.8/325	13.7 – 17.1	0.90	OXP12X325	40
15.6/397	16.2 – 19.9	1.10	OXP12X395	44
18.3/465	18.9 – 22.6	1.32	OXP12X465	48
21.1/535	21.7 – 25.4	1.54	OXP12X535	52


Ⓞ Mounting depth is the distance from the outside of the door to the disconnect switch mounting plate. Shaft can be cut to desired length.

1200A – 3150A Accessories

Disconnect
switches
Non-fusible



Twisted shafts – Rotates handle 45° □ .47 x .47" (□ 12 x 12 mm)

Shaft length inches/mm	 Mounting depth ① in inches	Weight (lbs)	Catalog number	List price
For use with OETL-NF1200				
11.0/280	11.6 – 15.3	0.77	OXPD12X280-45	\$ 36
12.8/325	13.7 – 17.1	0.90	OXPD12X325-45	40
18.3/465	18.9 – 22.6	1.32	OXPD12X465-45	48
For use with OETL-NF1600 – OETL-NF3150				
12.8/325	16.2 – 19.9	0.90	OXPD12X325-45	40
18.3/465	18.9 – 22.6	1.32	OXPD12X465-45	48

Terminal lug kits

For use on:	Wire size	Kit weight (lbs.)	Wire type	Terminal lugs per kit	Kit catalog number	List price
OETL-NF1200 & OETL-NF1600	(4) #2 – 600 kcmil	10.44	Cu/Al	6	OZXA-28	\$ 1000
OETL-NF1200 & OETL-NF1600	(4) #2 – 600 kcmil	5.22	Cu/Al	3	OZXA-28/3P	500
OETL-NF1200 & OETL-NF1600②	(8) 2/0 + (2) #2 600kcmil	10.44	Cu/Al	3	OZXA-32	600
OETL-NF2000 & OETL-NF3150	(8) #2 – 600kcmil	20.88	Cu/Al	12	OZXA-28/2	2000

OZXA-32 Power distribution lugs eliminate the need to purchase a separate distribution block

Busbar connections

Description	For use on:	Weight (lbs)	Catalog number	List price
Vertical ③, back or edgewise mounting	OETL-NF1600 – OETL-NF3150	46.2 31.0	OETL-ZX115 OETL-ZX114	\$ 3920 2820

Auxiliary contacts

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. + 1 N.C.	OETL-NF1200 – OETL-NF31500	0.20	10	600	OZXX-1	\$ 100
2 N.O. + 2 N.C.		0.26	10	600	OZXX-2	170
4 N.O. + 4 N.C.		0.40	10	600	OZXX-3	340
2 N.O.		.18	10	600	OZXX-4	100
4 N.O.		0.25	10	600	OZXX-5	170
8 N.O.		0.40	10	600	OZXX-6	340

Terminal shrouds

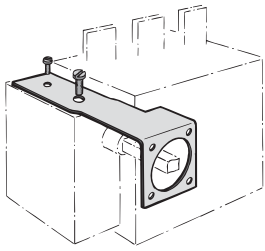
Description	For use on:	Weight (lbs)	Catalog number	List price
Includes one shroud for line or load side	OETL-NF1200	1.20	OETL-ZX119	\$ 220

Direct mount handle

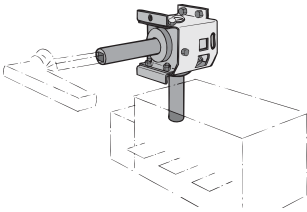
Item	Catalog number	List price
Mounts on shaft.	YASDA-34	\$ 180

① Mounting depth is the distance from the outside of the door to the disconnect switch mounting plate. Shaft can be cut to desired length.
 ② A load side distribution lug eliminates the need to purchase, install and wire a separate distribution block.
 ③ Provided as standard with OETL-NF1600, OETL-NF2000 and OETL-NF3150.

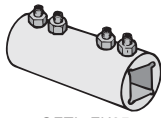
1200A – 3150A Accessories



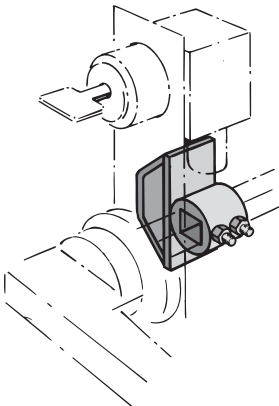
OHZX3



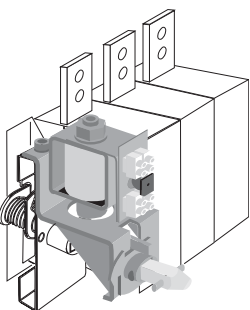
OETL-ZX108



OETL-ZX95



OETL-ZW5



OETL-ZT80

Handle support bracket

Description	For use on:	Weight (lbs)	Catalog number	List price
Allows handle to be directly mounted to switch behind the door	OETL-NF1200 – OETL-NF3150	0.88	OHZX3	\$ 30

90° angle kit

Description	For use on:	Weight (lbs)	Catalog number	List price
Converts switch mechanism from front operation to side operation	OETL-NF1200 – OETL-NF3150	4.63	OETL-ZX108	\$ 794

Shaft extension coupler

Description	For use on:	Weight (lbs)	Catalog number	List price
Joins two shafts together for applications where extended length is required	12mm shafts	0.26	OETL-ZX95	\$ 100

Locking accessories

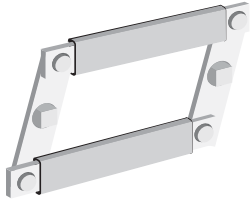
Description	For use on:	Weight (lbs)	Catalog number	List price
Cam attachment for Kirk Key, Castell, Lowe & Fletcher and Ronis interlock. For adapting to the interlock system The interlock is not included.	12mm shafts	0.29	OETL-ZW5	\$ 190
Electrical interlock Closed circuit principle for interlocking the switch movement. When the coil circuit is dead, A-types cannot be operated to ON-position and L-types cannot be operated to ON- or OFF-position. Coil voltages 110VAC, 220VAC, 24VDC, 48VDC, 60 VDC, 110VDC, 220VDC, P = 15W U = 0.7 – 1.1 Un (U= coil voltage, Un = nominal voltage)	OETL-NF1200 OETL-NF3150	2.42	OETL-ZT80A/★ OETL-ZT80L/★	1280 1220



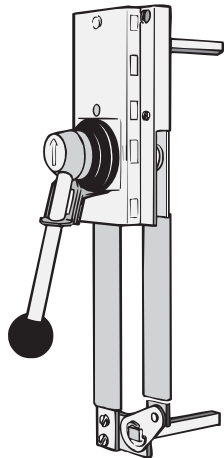
★ = Coil voltage

1200A – 3150A Accessories

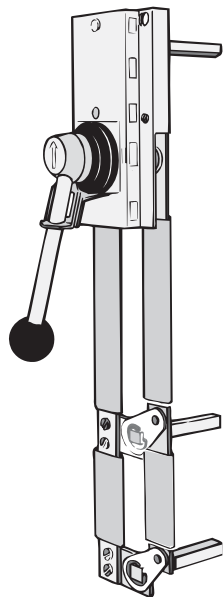
Disconnect
switches
Non-fusible



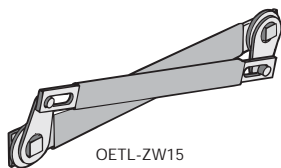
OETL-ZW9



OETL-ZW12



OETL-ZW13



OETL-ZW15

Conversion mechanisms

- Switches are not included

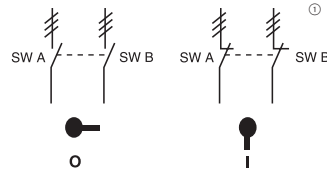
Description	For use on:	Weight (lbs)	UL/NEMA type	Catalog number	List price
6 or 8 pole Transfer Bypass	OETL-NF1200	2.42	—	OETL-ZW9	\$ 260
		10.1	1,3R,4,4X,12	OETL-ZW12	560
		8.81	1,3R,4,4X,12	OETL-ZW13	560
Mechanical interlock	OETL-NF1200 – OETL-NF3150	2.64	—	OETL-ZW15	160

6 or 8 pole — OETL-ZW9

6 (8) pole mechanism allows two switches controlled by one handle to open or close simultaneously.

Equipment required for a complete installation:

- One conversion mechanism.
- Two disconnect switches (see page 18.30)
- One handle (see page 18.30)
- Two shafts (see page 18.30)



	POS. O	POS. I
SW. A	O	X
SW. B	O	X

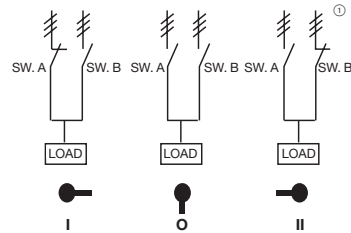
X = Closed
O = Open

Transfer — OETL-ZW12

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position. A 3 position handle is included. YASDA-21 (Type 1, 3R, 4, 4X, 12). Shafts included.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.30)



	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

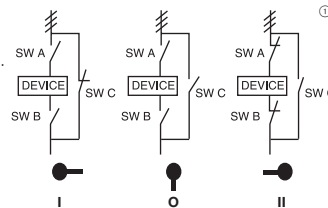
X = Closed
O = Open

Bypass — OETL-ZW13

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass. A 3 position handle is included. YASDA-6 (Type 1, 3R, 4, 4X, 12). Shafts included.

Equipment required for a complete installation:

- One conversion mechanism
- Three disconnect switches (see page 18.30)



	POS. I	POS. O	POS. II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

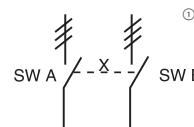
X = Closed
O = Open

Mechanical interlock — OETL-ZW15

Mechanical interlock mechanism prevents both switches from being in the "ON" position at the same time. Handles are not included.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see page 18.30)
- Two shafts (see page 18.30)
- Two handles (see page 18.30)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

Drawing and mounting information found on pg 18.71 & 18.72

① ≡ = Three poles

Disconnect
switches
Non-fusible

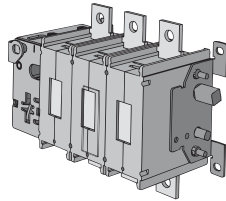
Other configurations

Side operated

30A – 800A^{①②}

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft
- 1 terminal lug kit



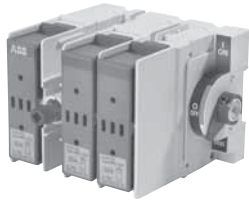
OETL-NF200A-S



EXP8X240



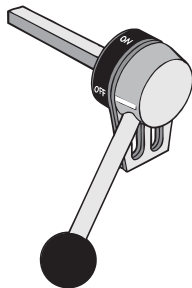
OHB80J8TE00S



OSNF30-S



OHY_J



OETL-ZX74



EXP5X170
EXP8X240
EXP12X325



OZXA-24



OZXA-25



OZXA-26



OZXA-27

Side operated switches – 3 pole

UL general purpose amp rating	IEC AC21 amp rating	Maximum horsepower rating					Weight (lbs)	Catalog number	List Price
		Three phase							
		200V	208V	240V	480V	600V			
30	32	5	7.5	7.5	15	20	1.90	OSNF30-S	\$ 380
60	63	15	15	15	30	50	3.90	OSNF60-S	560
100	125	25	25	30	60	75	4.50	OSNF100-S	660
200	250	60	60	75	150	200	6.61	OETL-NF200A-S	780
400	630	100	100	125	250	350	13.66	OETL-NF400-S	1500
600	800	150	150	200	400	500	13.66	OETL-NF600A-S	2400

Handles

UL/NEMA type	Color	Length inches/mm	Marking	Defeat-able	Padlock-able	Weight (lbs)	Catalog number	List price
For use with OSNF30-S								
1, 12, 3R	Black	2.65/65	O/I & Off/On	Yes	Yes	0.29	OHB65J5	\$ 80
1, 12, 3R	Red/Yel	2.65/65	O/I & Off/On	Yes	Yes	0.29	OHY65J5	
For use with OSNF60-S – OSNF100-S								
1, 12, 3R	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80J6	80
1, 12, 3R	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80J6	
For use with OETL-NF200A-S								
1, 12, 3R	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80J8	80
1, 12, 3R	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80J8	
For use with OETL-400DM1 – OETL-NF600A-S								
1, 12, 3R	Black	4.9/145	O/I & Off/On	Yes	Yes	0.39	OHB145J12	80
1, 12, 3R	Red/Yel	4.9/145	O/I & Off/On	Yes	Yes	0.39	OHY145J12	80
1, 12, 3R	Metal	4.9/145	Off/On	Yes	Yes	1.50	OETL-ZX74	190

Shafts

For use with:	Length inches/mm	Description	Weight (lbs)	Catalog number	List price
OSNF30-S	6.7/170	.20 x .20" (5 x 5mm)	0.08	EXP5X170	\$ 16
OSNF60-S – OSNF100-S	8.3/210	.24 x .24" (6 x 6mm)	0.10	EXP6X210	16
OETL-NF175-S – OETL-NF200A-S	9.5/240	.31 x .31" (8 x 8mm)	0.26	EXP8X240	24
OETL-NF400-S – OETL-NF600A-S	12.8/325	.47 X .47" (12 X 12mm)	0.90	EXP12X325	40

Terminal lug kits

For use on:	Wire size	Weight	Wire type	Lugs per kit	Catalog number	List price
OSNF30-S	#18 – 8	—	Cu	—	Integral	—
OSNF60-S	#14 – 4	—	Cu	—	Integral	—
OSNF100-S	#14 – 2/0	0.43	Cu/Al	6	OZXA-24	\$ 24
OETL-NF200A-S	#6 – 300 kcmil	0.93	Cu/Al	6	OZXA-25	80
OETL-NF400-S	#2 – 600 kcmil	3.520	Cu/Al	6	OZXA-26	190
OETL-NF600A-S	(2) #2 – 600 kcmil	4.62	Cu/Al	6	OZXA-27	380

① Side operated switches available through 800A as IEC rated.
② Please consult factory for additional information.

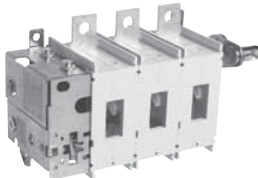
Flange operated disconnect switches

Shaft operated non-fusible

30A - 200A

Disconnect
switches
Non-fusible

For a complete assembly, please select one of each.



Switch



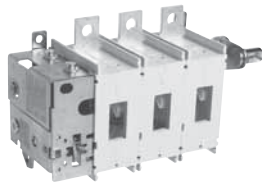
Handle



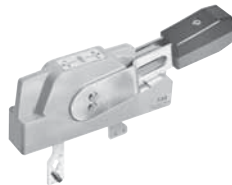
Shaft



Lug kit (as required)



OETL-NF200A-F



DSFHN-HS12



DSFHS-12

30A -200A Flange operated non fusible switches (Shaft) - 3 pole

UL general purpose amp rating	Maximum horsepower rating					Catalog number	List price
	Three phase						
	200V	208V	240V	480V	600V		
30	10	10	10	20	30	OT30E3-F	\$ 500
60	20	20	20	40	40	OT60E3-F	590
100	25	25	25	50	40	OT100E3-F	690
200	60	60	75	150	200	OETL-NF200A-F	890

Flange handles for use with OT30_, OT60_, OT100_ and OETL-NF200_

UL/ NEMA type	Marking	Defeatable	Padlockable	Catalog number	List price
1, 3R, 12	OFF/ON	Yes	Yes	DSFHN-HS12	\$ 156
4, 4X	OFF/ON	Yes	Yes	DSFHN-HS4	240

Shafts

For use with:	Maximum enclosure depth (inches)	Catalog number	List price
OT30_ - OT100_	16	OTFS-16	\$ 25
OT30_ - OT100_	24	OTFS-24	30
OETL-NF200A-F	16	DSFHS-12	28
OETL-NF200A-F	21	DSFHS-17	40
OETL-NF200A-F	26.5	DSFHS-22	52

Flange operated fusible and non-fusible disconnect switches

ABB's solution for complying with the new NFPA79 requirements is Flange Operated Fusible and Non-fusible Disconnect Switches.

New 2002 NFPA 79 changes requires main disconnecting means to be operable without the use of accessory tools or devices, independent of door position. This code also includes an interlocking provision to prevent the closing of disconnects while the enclosure door is open, unless an interlock is operated by a deliberate action.

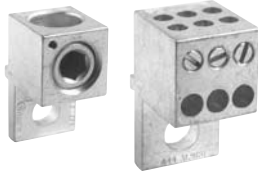
The flange operated disconnect switches are available as ridged shaft or flexible cable operated versions. The cable operated version allows you to install the disconnect switch anywhere in the enclosure depending on the length of the cable. Cables are available in lengths up to 84 inches.

The designs are cost-effective NFPA 79 solutions offering quick and easy installation.

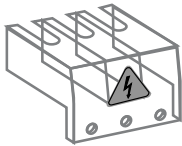
Flange operated disconnect switches

Shaft operated non-fusible

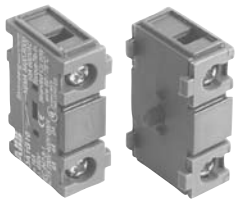
30A - 200A



OZXA-25 OZXA-175



OTS125T3



OA1G_

Terminal lug kit and accessories

For use on:	Description	Wire size	Wire type	Qty.	Catalog number	List price
OT30E3-F	Lug	#14 - #4	Cu	--	Integral	--
OT60E3-F	Lug	#14 - #4	Cu	--	Integral	--
OT100E3-F	Lug	#8 - 1/0	Cu	--	Integral	--
OETL-NF200A-F	Lug	#6 - 300kcmil	Cu/Al	6	OZXA-25	\$ 80
OETL-NF200A-F	Distribution	(6) #14 - #6	Cu/Al	3	OZXA-175	180
OETL-NF200A-F	Lug	#6 - 300kcmil	Cu/Al	3	OZXA-25/3P	40
OT30_ - OT100_	Shroud	Includes one shroud for line or load side		1	OTS125T3	20
OETL-NF200A-F	Shroud	Includes one set of shrouds for line or load side		1	OETL-ZX200A	94
OT30_ - OT100_	Aux. Contact	1 NO		1	OA1G10	20
		1 NC		1	OA1G01	20
		1 NO + 1 NC		1	OA2G11	40
OETL-NF200A-F	Aux. Contact	1 NO + 1 NC		1	OZXK-12	72

Door hardware NEMA 12

Item	Catalog number	List price
Safety door latch, 2 point, door less than 40" high	KDH2R	\$ 200
Safety door latch, 3 point, door less than 40" high	KDH3R	225

For additional technical information and accessories, please consult the AC1000 Product Selector catalog, section 18 or the factory

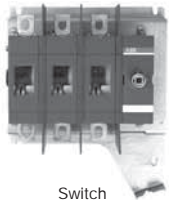
Flange operated disconnect switches

Cable operated non-fusible

125A - 1200A

Disconnect
switches
Non-fusible

For a complete assembly, please select one of each.



Switch



Handle



Cable



Lug kit (as required)



OT200U03-FC



K5FCH



K5C0_

125A - 1200A Non-fusible flange cable operating kit

UL general purpose amp rating	Maximum horsepower rating				Poles	Catalog number	List price
	Three phase						
	200V-208V	240V	480V	600V			
125	30	40	75	100	3	OT160E3-FC	\$ 820
200	60	75	150	200	3	OT200U03-FC	1020
400	100	125	250	350	3	OT400U03-FC	1920
600	150	200	400	500	3	OETL-NF600A-FC	2700
800	200	250	500	600	3	OETL-NF800A-FC	4900
1200	--	--	--	--	3	OETL-NF1200-FC	7500

Flange handle

For use with:	NEMA type	Catalog number	List price
OT160_ - OT200_ OT400_, OETL-NF600_ - OETL-NF1200_	1, 3R, 12	K5FCH K7FCH	\$ 213 310
OT160_ - OT200_ OT400_, OETL-NF600_ - OETL-NF1200_	4, 4X	K5FCH4 K7FCH4	243 415

Cable

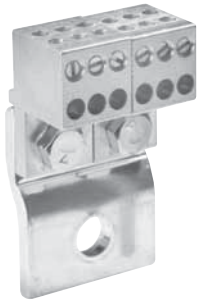
For use with:	Cable length (inches)	Catalog number	List price
OT160_ - OT200_	36	K5C036	\$ 114
	48	K5C048	146
	60	K5C060	160
	72	K5C072	175
OT400, OETL-NF600_ - OETL-NF1200_	48	K7C048	190
	60	K7C060	220
	72	K7C072	256
	84	K7C084	270

Flange operated disconnect switches Cable operated non-fusible 125A - 1200A



OZXA-200

OZXA-400



OZXA-175/400

Terminal lug kits

For use on :	Wire size	Wire type		Lugs / kit	Catalog number	List price
OT160_	8-1/0 AWG	Cu	--	--	Integral	--
OT200_	#4 - 300 kcmil (6) 14-6 AWG	Cu/Al Cu/Al	-- Distribution Lug	3 3	OZXA-200 OZXA-206	\$ 80 40
OT400_	#2 - 600 kcmil #2 - 600 kcmil (6) 14-6 AWG	Cu/Al Cu/Al Cu/Al	-- -- Distribution Lug	6 3 3	OZXA-400 OZXA-400/3P OZXA-406	190 95 270
OETL-NF600 - OETL-NF800	#2 - 600 kcmil #2 - 600 kcmil (12) 14-6 AWG	Cu/Al Cu/Al Cu/Al	-- -- Distribution Lug	6 3 3	OZXA-27 OZXA-27/3P OZXA-175/400	380 190 270
OETL-NF1200	(4) #2-600 kcmil (8) 2/0 + (2) #2-600 kcmil	Cu/Al Cu/Al Cu/Al	-- -- Distribution Lug	6 3 3	OZXA-28 OZXA-28/3P OZXA-32	1000 500 600

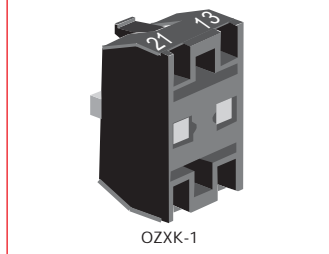
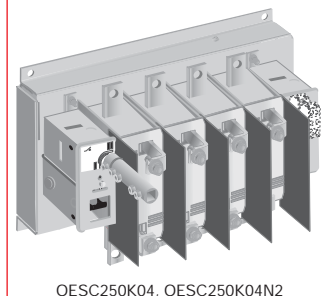
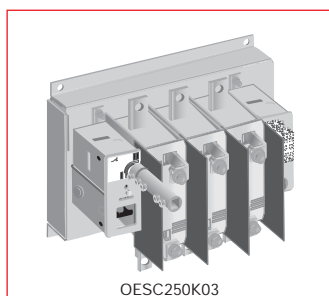
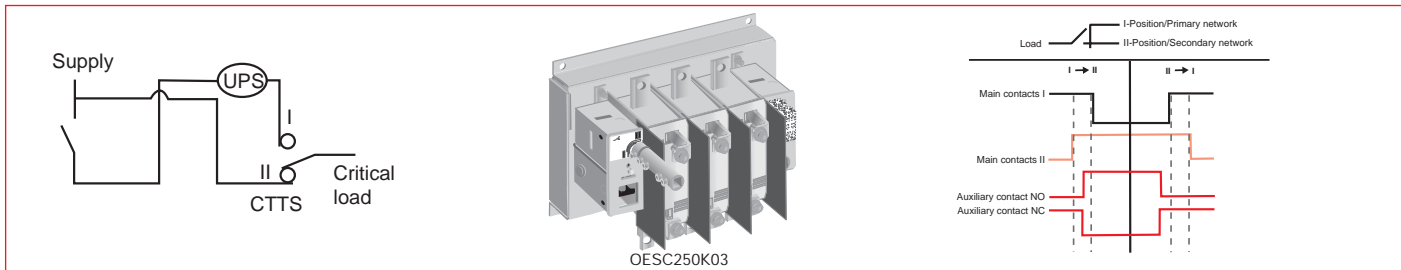
Door hardware NEMA 12

Item	Catalog number	List price
Safety door latch, 2 point, door less than 40" high	KDH2R	\$ 200
Safety door latch, 3 point, door less than 40" high	KDH3R	225

For additional technical information and accessories, please consult pages 18.21 - 18.68.

Maintenance bypass switches for UPS 250A – 500A

Disconnect
switches
Non-fusible



Description

The OESC range is a "make before break" or Closed Transition Transfer Switch type that guarantees a transfer from the static switch to the power line as manual bypass switch and back again without any interruption. This ensures equipment is powered, even when maintenance work is carried out. The OESC switches are available with double rated neutral to withstand the thermal overload from the harmonics normally produced by the UPS and added up in the neutral conductor. The range is UL508 recognized.

General character and use

OESC switches are open type and manually operated. They are intended for use as maintenance switches in UPS applications. The unit is inded to switch between normal and maintenance positions, with an over lapping time (closed transition) of a minimum of 8 msec.

Bypass switches — 3-pole, I-II indication

UL general purpose amp rating	IEC AC22 amp rating	Voltage AC	Isc rms ① kA	Weight lbs	Catalog number	List price
250	250	480	50	26.5	OESC250K03	Consult factory
500	500	480	50	26.5	OESC500K03	

The switch includes a black handle OHB175J12E16, a shaft OXP12X325 and bolt set for the cable connections.

Bypass switches — 4-pole, I-II indication

UL general purpose amp rating	IEC AC22 amp rating	Voltage AC	Isc rms ① kA	Weight lbs	Catalog number	List price
250	250	480	50	32.2	OESC250K04	Consult factory
500	500	480	50	32.2	OESC500K04	

The switch includes a black handle OHB175J12E16, a shaft OXP12X325 and bolt set for the cable connections.

Bypass switches — 4-pole, with double rated neutral, I-II indication

UL general purpose amp rating	IEC AC22 amp rating	Voltage AC	Isc rms ① kA	Weight lbs	Catalog number	List price
250	250	480	50	33.5	OESC250K04N2	Consult factory
400	400	480	50	33.5	OESC400K04N2	

The switch includes a black handle OHB175J12E16, a shaft OXP12X325 and bolt set for the cable connections.

Auxiliary contacts — Early break, late make ②

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. + 1 N.C.	OETL-NF400 – OETL-NF800A	0.20	10	600	OZXX-1	\$ 100
2 N.O. + 2 N.C.		0.26	10	600	OZXX-2	170
4 N.O. + 4 N.C.		0.40	10	600	OZXX-3	340
2 N.O.		0.18	10	600	OZXX-4	100
4 N.O.		0.25	10	600	OZXX-5	170
8 N.O.		0.40	10	600	OZXX-6	340

The auxiliary contacts are of the early break type which means that the NO auxiliary contacts break before the main contacts open.

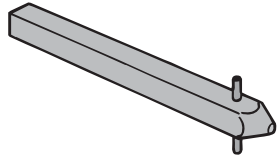
① Isc rms 50kA, 480VAC with 600A Class J fuses (600 VAC / 200kA)
② UL File E57057

Disconnect
switches
Non-fusible

Maintenance bypass switches for UPS 250A – 500A



OHB175J12E16



OXP12X280

External handles — I-II indication

UL/NEMA Type	IEC type	Color	Length	Defeatable	Padlockable	Weight	Catalog number	List price
1, 3R, 12	IP65	Black	6.9 / 175	Yes	Yes	0.41	OHB175J12E16	Consult factory

The handles are equipped with door interlock in II-position; when padlocked, the door interlock is in the I-position. Padlockings with 3 padlocks, bail diameter from 5 - 10mm.

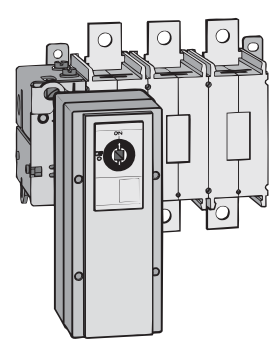
Shafts — for use with pistol handles □ .47 x .47" (□ 12 x 12 mm)

Shaft length inches/mm	Mounting depth ^① in inches	Weight (lbs)	Catalog number	List price
11.0/280	10.2 – 14.5	0.77	OSP12X280	\$ 36
12.8/325	12.0 – 16.3	0.90	OSP12X325	40
15.6/395	14.8 – 19.1	1.10	OSP12X395	44
18.3/465	17.5 – 21.9	1.32	OSP12X465	48
21.1/535	20.3 – 24.6	1.54	OSP12X535	52

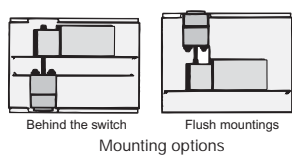
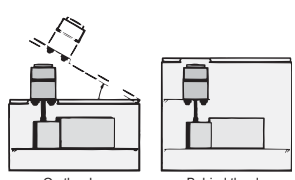
Other configurations Motor operators^① for 400A – 3150A



OEMO__



OEMO__



Mounting options

Motor operators^① — Function I/O (On/Off)

For use on:	Voltage	Weight (lbs.)	Catalog number	List price
OT400 – OETL-NF600	24 VDC/AC 48 VDC/AC 110 VAC 220 VAC 220 VDC 230 VAC 240 VAC	14.0	OEMO002/24VDCAC OEMO002/48VDCAC OEMO002/110VAC OEMO002/220VAC OEMO002/220VDC OEMO002/230VAC OEMO002/240VAC	\$ 6514
OETL-NF800 – OETL-NF1200	24 VDC/AC 48 VDC/AC 110 VAC 110 VDC 220 VAC 220 VDC 230 VAC 240 VAC	14.0	OEMO003/24VDCAC OEMO003/48VDCAC OEMO003/110VAC OEMO003/110VDC OEMO003/220VAC OEMO003/220VDC OEMO003/230VAC OEMO003/240VAC	7644
OETL-NF1600 – OETL-NF3150	24 VDC/AC 48 VDC/AC 110 VAC 220 VAC 220 VDC 230 VAC 240 VAC	14.0	OEMO004/24VDCAC OEMO004/48VDCAC OEMO004/110VAC OEMO004/220VAC OEMO004/220VDC OEMO004/230VAC OEMO004/240VAC	9180

Motor operators^① — Function I/O/II (I-OFF-II)

For use on:	Voltage	Weight (lbs.)	Catalog number	List price
OT400 – OETL-NF600	24 VDC/AC 48 VDC/AC 110 VAC 220 VAC 220 VDC 240 VAC	14.0	OEMO202/24VDCAC OEMO202/48VDCAC OEMO202/110VAC OEMO202/220VAC OEMO202/220VDC OEMO202/240VAC	\$ 7644
OETL-NF800 – OETL-NF1200	24 VDC/AC 48 VDC/AC 110 VAC 220 VAC 240 VAC	14.0	OEMO303/24VDCAC OEMO303/48VDCAC OEMO303/110VAC OEMO303/220VAC OEMO303/240VAC	9490

Mounting kit for OEMO motor operator

For use on:	Package (lbs.)	Catalog number	List price
OT400 – OETL-NF600	1	OEMOZX1	\$ 400
OETL-NF800 – OETL-NF1200	1	OEMOZX2	

① IEC rated only.

Disconnect
switches
Non-fusible

Technical data OT16E3 – OT160E3 UL & CSA

UL & CSA

Catalog number	3 pole	OT16E3	OT25E3	OT32E3	OT45E3	OT63E3	OT30E3	OT60E3	OT100E3	OT160E3	
Approvals ^①	2 pole 3 pole 4 pole	N/A UL508 & IEC UL508 & IEC	N/A UL508 & IEC UL508 & IEC	N/A UL508 & IEC UL508 & IEC	N/A UL508 & IEC UL508 & IEC	N/A UL508 & IEC UL508 & IEC	N/A UL98 & IEC UL98 & IEC	N/A UL98 & IEC UL98 & IEC	N/A UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	
General purpose amp rating -40° to 40°C pf = 0.7 – 0.8	A	16	25	40	60	80	30	60	100	125	
Max. operating voltage	V	600	600	600	600	600	600	600	600	600	
Max. horsepower rating/motor FLA current, pf = 0.4 – 0.5											
Three phase	200V – 208V 240V 480V 600V	HP/A HP/A HP/A HP/A	3/10.6 5/15.2 10/14.0 10/11.0	7.5/24.2 7.5/22.0 15/21.0 20/22.0	10/30.8 10/28.0 20/27.0 25/27.0	15/46.2 15/42.0 30/40.0 30/32.0	20/60.0 20/54.0 40/52.0 40/41.0	10/30.8 10/28.0 20/27.0 30/32.0	20/60.0 20/54.0 40/52.0 40/41.0	25/75.0 30/80.0 50/65.0 50/52.0	30/88.0 40/104.0 75/96.0 100/99.0
Single phase	120V 240V	HP/A HP/A	1/16 2/13.2	1.5/20 3/18.7	2/24 5/30.8	2/24.0 7.5/40.0	2/24.0 10/57.5	2/24.0 5/28.0	3/34.0 7.5/40.0	5/56.0 15/68.0	7.5/80 20/88.0
Short circuit rating with fuse											
Fuse type	CC J T RK1 RK5 L H	KA KA KA KA KA KA KA	10 10 10 10 5 — —	— 10 10 — 5 — —	10 10 10 10 5 — —	— 10 10 — 10 — —	— 100 100 — 10 — —	— 100 100 — 10 — —	— 50 50 — — — —	— 50 50 — — — —	— 100 — — — — —
Maximum fuse size	A	30 60 ^④	30 60 ^④	30 60 ^④	100 150	100 150	60 —	150 —	150 —	200	
Short circuit rating with MCCB	KA	—	—	—	—	—	—	—	—	25	
Endurances											
Min. Electrical endurance, pf = 0.75 – 0.80	operation cycles	6000	6000	6000	6000	6000	6000	6000	6000	6000	
Min. Electrical endurance, pf = 0.40 – 0.50	operation cycles	1000	1000	1000	1000	1000	②	②	②	②	
Mechanical endurance	operations	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	16,000	
Physical characteristics											
Weight, switches	3 pole 4 pole	lb lb	0.24 0.33	0.24 0.33	0.24 0.33	0.59 0.77	0.59 0.77	0.79 1.10	0.79 1.10	0.79 1.10	2.42 2.86
Dimension, switches	3 pole	H in W in D in	2.68 1.38 2.20	2.68 1.38 2.20	2.68 1.38 2.20	3.60 2.07 2.85	3.60 2.07 2.85	3.94 2.76 2.95	3.94 2.76 2.95	3.94 2.76 2.95	5.00 4.96 2.93
Shaft set screw tightening torque		lb. in.	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
Shaft size — square □		in mm	.20 x .20 5 x 5	.20 x .20 5 x 5	.20 x .20 5 x 5	.20 x .20 5 x 5	.20 x .20 5 x 5	.20 x .20 5 x 5	.20 x .20 5 x 5	.20 x .20 5 x 5	.24 x .24 6 x 6
Switch operating torque for rotary 3 pole switches		lb. in.	8.8	8.8	8.8	10.5	10.5	17.5	17.5	17.5	52.5
Terminal lug kits											
Wire range	AWG	#18 – 8	#18 – 8	#18 – 8	#14 – 1	#14 – 1	#14 – 4	#14 – 4	#8 – 1/0	#8 – 1/0	
Torque:											
Wire tightening	lb. in.	7	7	7	18	18	55	55	55	70	
Lug mounting	lb. in.	Integral	Integral	Integral	Integral	Integral	Integral	Integral	Integral	Integral	
Auxiliary contacts											
NEMA ratings, AC		OA1G_ _ A600	OA1G_ _ A600	OA1G_ _ A600	OA1G_ _ A600	OA1G_ _ A600	OA1G_ _ A600	OA1G_ _ A600	OA1G_ _ A600	OA1G_ _ A600	OBEA_ _ A600
AC rated voltage	VAC	600	600	600	600	600	600	600	600	600	
AC thermal rated current	A	10	10	10	10	10	10	10	10	10	
AC maximum volt-ampere making	VA	7200	7200	7200	7200	7200	7200	7200	7200	7200	
AC maximum volt-ampere breaking	VA	720	720	720	720	720	720	720	720	720	
NEMA ratings, DC		R300	R300	R300	R300	R300	R300	R300	R300	P600	
DC rated voltage	VDC	300	300	300	300	300	300	300	300	600	
DC thermal rated current	A	1	1	1	1	1	1	1	1	5	
DC maximum make-break	VA	28	28	28	28	28	28	28	28	138	
Torque: Wire tightening	lb. in.	7	7	7	7	7	7	7	7	7	
Wire range	AWG	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#22 – 14	

① UL Listed switches are also CSA Approved.
② UL98 overload test, 50 operations, pf 0.40 – 0.50 at 2x FLA.
③ Multi-tap lug available, please see pg. 18.24 and 18.27.
④ Fuse size 70A for RK5

Technical data

OT200U03 – OETL-NF3150

UL & CSA

Disconnect
switches
Non-fusible

UL & CSA

Catalog number	3 pole	OT200U03	OT400U03	OETL-NF600A	OETL-NF800A	OETL-NF1200	OETL-NF1600	OETL-NF2000	OETL-NF3150 ③
Approvals ^①	2 pole 3 pole 4 pole	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC IEC	UL98 & IEC UL98 & IEC IEC	IEC IEC IEC
General purpose amp rating pf = 0.7 – 0.8	-40° to 40°C A	200	400	600	800	1200	1600	2000	3150
Max. operating voltage	V	600	600	600	600	600	600	480	—
Max. horsepower rating/Max. motor FLA current, pf = 0.4 – 0.5									
Three phase	200 – 208V HP/A 240V HP/A 480V HP/A 600V HP/A	60/160.0 75/192.0 150/180.0 200/192.0	100/273.0 125/312.0 250/302.0 350/336.0	150/396.0 200/480.0 400/477.0 500/472.0	200/528.0 250/602.0 500/590.0 600/576	— — — —	— — — —	— — — —	— — — —
Single phase	120V HP/A 240V HP/A	— —	— —	— —	— —	— —	— —	— —	— —
Short circuit rating with fuse									
Fuse type CC	kA	—	—	—	—	—	—	—	—
Fuse type J	kA	100	100	100	—	—	—	—	—
Fuse type T	kA	—	—	100	—	—	—	—	—
Fuse type RK1	kA	—	—	—	—	—	—	—	—
Fuse type RK5	kA	—	—	100	—	—	—	—	—
Fuse type L	kA	—	—	—	100	100	100	100	—
Fuse type H	kA	—	—	—	—	—	—	—	—
Maximum fuse size	A	350	600	600	1200	1200	2000	2000	—
Short circuit rating with MCCB	kA	15	30	50	50	50	65	65	—
Endurances									
Min. Electrical endurance, pf = 0.75 – 0.80 operation cycles		6000	1000	1000	500	500	500	500	400
Min. Electrical endurance, pf = 0.40 – 0.50 operation cycles		②	②	②	②	②	②	②	②
Mechanical endurance operations		20,000	20,000	10,000	10,000	10,000	6000	6000	6000
Physical characteristics									
Weight, switches 3 pole lb		2.9	5.7	13.66	35.9	38.55	127.7	127.7	127.7
4 pole lb		3.5	6.8	16.74	45.15	49.56	149.7	149.7	149.7
Dimension, switches 3 pole H in		5.9	6.9	8.54	14.65	14.65	21.5	21.5	21.5
W in		6.7	8.7	11.69	14.25	14.25	18.11	18.11	18.11
D in		2.8	3.4	5.12	4.92	4.92	10.67	10.67	10.67
Shaft set screw tightening torque lb. in.		14-17.7	—	—	—	—	—	—	—
Shaft size — square □ in		.24 x .24	.47 x .47	.47 x .47	.47 x .47	.47 x .47	.47 x .47	.47 x .47	.47 x .47
mm		6 x 6	12 x 12	12 x 12	12 x 12	12 x 12	12 x 12	12 x 12	12 x 12
Switch operating torque for rotary 3 pole switches lb. in.		62	142	184	184	184	438	438	438
Terminal lug kits		OZXA-200	OZXA-400	OZXA-27	OZXA-30	OZXA-28	OZXA-28	OZXA-28/2	OZXA-28/2
Wire range AWG		#4-300kcmil ^⑤	#2-600kcmil ^⑤	(2)#2-600kcmil ^⑤	(2)#2-600kcmil ^⑤	(4)#2-600kcmil	(4)#2-600kcmil	(8)#2-600kcmil	(8)#2-600kcmil
Torque:									
Wire tightening lb. in.		200	375	500	375	375	375	375	375
Lug mounting lb. in.		72	240	480	230	230	230	230	230
Auxiliary contacts		OZ XK-__	OZ XK-__	OZ XK-__	OZ XK-__	OZ XK-__	OZ XK-__	OZ XK-__	OZ XK-__
NEMA ratings, AC		A600	A600	A600	A600	A600	A600	A600	A600
AC rated voltage VAC		600	600	600	600	600	600	600	600
AC thermal rated current A		10	10	10	10	10	10	10	10
AC maximum volt-ampere making VA		7200	7200	7200	7200	7200	7200	7200	7200
AC maximum volt-ampere breaking VA		720	720	720	720	720	720	720	720
NEMA ratings, DC		P600	P600	P600	P600	P600	P600	P600	P600
DC rated voltage VDC		600	600	600	600	600	600	600	600
DC thermal rated current A		5	5	5	5	5	5	5	5
DC maximum make-break VA		138	138	138	138	138	138	138	138
Torque: Wire tightening lb. in.		7	7	7	7	7	7	7	7
Wire range AWG		#22 – #14	#22 – #14	#22 – #14	#22 – #14	#22 – #14	#22 – #14	#22 – #14	#22 – #14

① UL Listed switches are also CSA Approved.

② UL98 overload test, 50 operations, pf 0.40 – 0.50 at 2x FLA.

③ Multi-tap lug available, please see pg. 18.24 and 18.27.

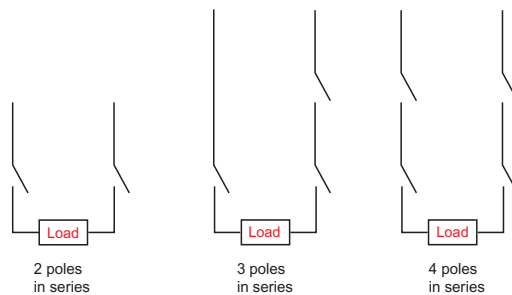
④ Fuse size 70A for RK5

⑤ IEC rated only.

Technical data OT16E3 – OT160E3 IEC

IEC

Catalog number	3 pole	OT16E3	OT25E3	OT32E3	OT45E3	OT63E3	OT30E3	OT60E3	OT100E3	OT160E3	
Rated insulation and operation voltage, AC20 and DC20	40°C V	750	750	750	750	750	750	750	750	750	
Rated impulse withstand voltage	kV	8	8	8	8	8	8	8	8	12	
Rated thermal current, I_m											
AC 20/DC 20	open ①	A	25	32	40	63	80	40	63	115	200
	40°C enclosed	A	25	32	40	63	80	40	63	115	160
	60°C enclosed	A	25	32	40	63	80	40	63	115	160
Rated operational currents											
AC 21A	≤500V	A	16	25	40	63	80	40	63	100	160
	≤690V	A	16	25	40	63	80	40	63	100	160
	≤1000V	A	—	—	—	—	—	—	—	—	—
AC 22A	≤500V	A	16	25	40	63	80	40	63	100	160
	≤690V	A	16	25	40	63	80	40	63	100	160
	≤1000V	A	—	—	—	—	—	—	—	—	—
AC 23A	≤415V	A	16	20	23	45	75	40	63	80	135
	≤500V	A	16	20	23	45	58	40	60	60	125
	≤690V	A	10	11	12	20	20	40	40	40	80
	≤1000V	A	—	—	—	—	—	—	—	—	—
Rated operational currents/poles in series											
DC21A	48V	A	16/1	25/1	32/1	45/1	63/1	40/1	63/1	100/1	160/1
	110V	A	16/2	25/2	32/2	45/2	63/2	40/2	63/2	100/2	160/1
	220V	A	16/3	25/3	32/3	45/4	63/4	40/4	63/4	100/4	160/2
	440V	A	16/4	25/6	32/6	③	③	③	③	③	160/3
	750V	A	16/8	25/8	32/8	③	③	③	③	③	160/4
DC22A	48V	A	16/1	25/1	32/1	45/1	63/1	40/1	63/1	100/1	160/1
	110V	A	16/2	25/2	32/2	45/2	63/2	40/2	63/2	100/2	160/1
	220V	A	16/3	25/3	32/4	45/4	63/4	40/4	63/4	63/4	160/2
	440V	A	16/6	25/8	③	③	③	③	③	③	160/3
	750V	A	16/8	25/8	③	③	③	③	③	③	③
DC23A	48V	A	16/1	25/1	32/1	45/1	63/1	40/1	63/1	100/1	160/1
	110V	A	16/2	25/2	32/2	45/2	63/2	40/2	63/2	100/2	160/1
	220V	A	16/4	25/4	32/4	45/4	63/4	40/4	63/4	63/4	160/2
	440V	A	10/4	③	③	③	③	③	③	③	160/3
	750V	A	16/8	③	③	③	③	③	③	③	③
Rated operational power											
AC23A	230V	kW	3	4	5.5	11	22	7.5	11	22	45
	400/415V	kW	7.5	9	11	22	37	15	18.5	37	75
	500V	kW	7.5	9	11	22	37	15	18.5	37	75
	690V	kW	7.5	9	11	15	18.5	15	15	37	75
Short-circuit current	kA	50	50	50	50	50	50	50	50	100	
with back-up fuses of size	A	25	32	40	63	80	100	100	100	200	



① The ambient air temperature does not exceed +40°C and its average over a period of 24 hours does not exceed +35°C according to IEC 947.
 ② IEC 947-3, utilization category B, infrequent operation.
 ③ Not available at time of printing, please consult factory.

Technical data

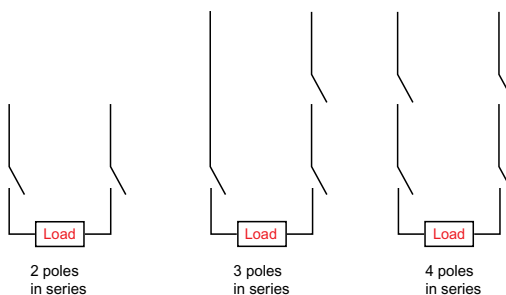
OT200U03 – OETL-NF3150

IEC

Disconnect
switches
Non-fusible

IEC

Catalog number	3 pole	OT200U03	OT400U03	OETL-NF600A	OETL-NF800A	OETL-NF1200	OETL-NF1600	OETL-NF2000	OETL-NF3150
Rated insulation and operational voltage, AC20 and DC20	40°C V	1000	1000	1000	1000	1000	1000	1000	1000
Rated impulse withstand voltage	kV	12	12	12	8	8	8	8	8
Rated thermal current, I_n									
AC 20/DC 20	open ^① A	250	400	800	1250	1600	2500	3150	
	40°C enclosed A	250	400	720	1250	1600	2300	2300	2600
	60°C enclosed A	—	—	600	1000	1250	1950	1950	2300
Rated operational currents									
AC 21A	≤500V A	250	400	800	1250	1600	2500^②	2500^②	3150^②
	≤690V A	250	400	800	1250	1600	2500 ^②	2500 ^②	3150 ^②
	≤1000V A	—	—	630	—	—	—	—	—
AC 22A	≤500V A	250	400	800	1250	1600	1600 ^②	1600 ^②	1600 ^②
	≤690V A	250	400	800	—	—	—	—	—
	≤1000V A	—	—	400	—	—	—	—	—
AC 23A	≤415V A	250	400	720	800	800	800 ^②	800 ^②	800 ^②
	≤500V A	250	400	600	800	800	800 ^②	800 ^②	800 ^②
	≤690V A	250	400	350	—	—	—	—	—
	≤1000V A	—	—	200	—	—	—	—	—
Rated operational currents/poles in series									
DC21A	48V A	250/1	630/2	800/2	1250/2	1600/2	2500/2	2500/2	3150/2
	110V A	250/2	630/2	800/2	1250/2	1600/2	2500/2	2500/2	3150/2
	220V A	250/2	630/2	800/2	1250/2	1600/2	2500/2	2500/2	3150/2
	440V A	250/3	630/3	800/3	1250/3	1600/3	2500/3	2500/3	3150/2
	750V A	250/4	—	—	—	—	—	—	—
DC22A	48V A	250/1	630/2	800/2	1250/2	1600/2	2500/2	2500/2	3150/2
	110V A	250/2	630/2	800/2	1250/2	1600/2	2500/2	2500/2	3150/2
	220V A	250/2	630/2	800/2	1250/2	1600/2	2500/2	2500/2	3150/2
	440V A	250/3	630/3	800/3	—	—	—	—	—
	750V A	250/4	—	—	—	—	—	—	—
DC23A	48V A	250/1	630/2	—	—	—	—	—	—
	110V A	250/2	630/2	—	—	—	—	—	—
	220V A	250/2	630/2	—	—	—	—	—	—
	440V A	250/3	—	—	—	—	—	—	—
	750V A	250/4	—	—	—	—	—	—	—
Rated operational power									
AC23A	230V kW	75	110	200	250	250	250	250	250
	400/415V kW	132/140	220/230	355	400	400	400	400	400
	500V kW	170	280	400	450	450	450	450	450
	690V kW	240	355	355	—	—	—	—	—
Short-circuit current	kA	100	100	100	50/50 ^③	50/50 ^③	50/63 ^④	50/63 ^④	50/63 ^④
with back-up fuses of size	A	400	800	800	—	—	—	—	—



① The ambient air temperature does not exceed +40°C and its average over a period of 24 hours does not exceed +35°C according to IEC 947.

② IEC 947-3, utilization category B, infrequent operation.

③ Not available at time of printing, please consult factory.

④ 690V / 500V

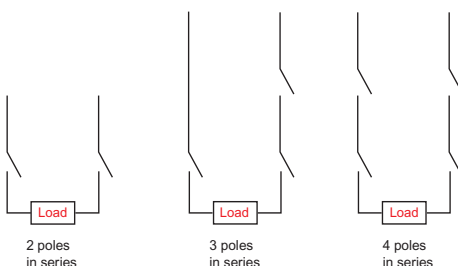
Technical data

OT16E3 – OT160E3

IEC

IEC

Catalog number	3 pole	OT16E3	OT25E3	OT32E3	OT45E3	OT63E3	OT30E3	OT60E3	OT100E3	OT160E3	
Rated voltage, U ^e	V/V	415/690	415/690	415/690	415/690	415/690	415/690	415/690	415/690	500/690	
Rated conditional short-circuit current	kA	50	50	50	50	50	50	50	50	100/50	
Max. allowed fuse size, type OFAA	A	25	32	40/32	63/50	80	100	100	100	200	
Max. allowed cut-off current, peak value	kA	6.5/4	6.5/4	6.5/4	8.3/6.7	11	18/10	18/10	18/10	30/25	
Rated short-circuit making capacity, prospective peak value, i ^{cm}	kA	0.7	0.7	0.7	1.4	1.4	3.6	3.6	3.6	12	
Rated short time withstand current,											
RMS i ^{cw}	0.2s	kA	—	—	—	—	—	—	—	7	
RMS i ^{cw}	1.0s	kA	0.5	0.5	0.5	1	1	2.5	2.5	4	
AC breaking capacity											
pf = 0.35	≤415V	A	128	160	184	240	304	320	504	640	1080
	≤500V	A	128	160	184	240	256	320	480	480	1000
	≤690V	A	80	88	96	160	160	320	320	320	640
DC breaking capacity/poles in series											
L/R = 15ms, 3 pole in series											
≤48V	A	64/1	100/1	128/1	180/1	252/1	160/1	252/1	400/1	640/1	
≤110V	A	64/2	100/2	128/2	180/2	252/2	160/2	252/2	400/2	640/1	
≤220V	A	64/3	100/4	128/4	180/4	180/4	160/4	252/4	252/4	640/2	
≤440V	A	①	①	①	①	①	①	①	①	640/3	
≤750V	A	①	①	①	①	①	①	①	①	①	
Capacitor ratings	≤400/415V	kVar	①	①	①	①	①	①	①	①	
Physical characteristics											
Electrical endurance at rated operational current, pf = 0.65 operation cycles											
			3000	3000	3000	3000	3000	3000	3000	1000	
Mechanical endurance operations											
			20,000	20,000	20,000	20,000	20,000	20,000	20,000	16,000	
Weight	3 pole	kg	0.11	0.11	0.11	0.27	0.27	0.36	0.36	1.1	
	4 pole	kg	0.15	0.15	0.15	0.35	0.35	0.5	0.5	1.3	
Dimension	3 pole	H mm	68	68	68	91.5	91.5	100	100	127	
		W mm	35	35	35	52.5	52.5	70	70	126	
		D mm	56	56	56	72.5	72.5	75	75	74.5	
Power loss per pole		W	0.3	0.6	1	1.4	2.8	1	1.6	4	6.5
Shaft size — square □		mm	5 X 5	5 x 5	5 x 5	5 x 5	5 x 5	5 x 5	5 x 5	6 x 6	
Switch operating torque for rotary 3 pole switches											
		Nm	1	1	1	1.2	1.2	2	2	2	6
Suitable conductor cross section Cu											
		mm ²	0.75 – 10	0.75 – 10	0.75 – 10	1.5 – 25	1.5 – 25	1.5 – 25	1.5 – 25	10 – 70	10 – 70
Bolt size											
			—	—	—	—	—	—	—	—	
Auxiliary contacts											
			OA1G_ _	OA1G_ _	OA1G_ _	OA1G_ _	OA1G_ _	OA1G_ _	OA1G_ _	OBEA_ _	
Ratings according to IEC 947-5-1											
Rated voltage, U ⁱ											
		VAC	690	690	690	690	690	690	690	690	
Thermal current, I th											
		A	16	16	16	16	16	16	16	10	
AC12/DC12 I ^e , A U ^e = 120V											
		A	—	—	—	—	—	—	—	8/—	
		A	—	—	—	—	—	—	—	—/1.1	
		A	6 ②	6 ②	6 ②	6 ②	6 ②	6 ②	6 ②	6/—	
		A	—	—	—	—	—	—	—	—/0.55	
		A	4 ②	4 ②	4 ②	4 ②	4 ②	4 ②	4 ②	4/—	
		A	—	—	—	—	—	—	—	4/—	
		A	—	—	—	—	—	—	—	—/0.31	
		A	—	—	—	—	—	—	—	3/—	
		A	—	—	—	—	—	—	—	3/0.27	
		A	—	—	—	—	—	—	—	—/0.2	
		A	2 ②	2 ②	2 ②	2 ②	2 ②	2 ②	2 ②	2/—	



① Not available at time of printing, please consult factory.
② AC15, according to IEC947-5-1.

Technical data

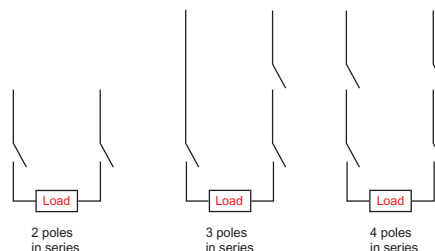
OT200U03 – OETL-NF3150

IEC

Disconnect
switches
Non-fusible

IEC

Catalog number	3 pole	OT200U03	OT400U03	OETL-NF600A	OETL-NF800A	OETL-NF1200	OETL-NF1600	OETL-NF2000	OETL-NF3150
Rated voltage, U _e	V/V	500/690	500/690	500/690	500/690	500/690	500/690	500/690	500/690
Rated conditional short-circuit current	kA	100/80	100/80	100/50	50	50	63/50	63/50	63/50
Max. allowed fuse size, type OFAA	A	315/355	500/500	800	—	—	—	—	—
Max. allowed cut-off current, peak value	kA	40.5/40.5	615/59	70/63	—	—	—	—	—
Rated short-circuit making capacity, prospective peak value, I _m 500/690V	kA	30	65	80	105	105	140/105	140/105	140/105
Rated short time withstand current,									
RMS I _{ew} 0.2s	kA	15	28	38	—	—	—	—	—
RMS I _{ew} 1.0s	kA	8	15	17	50 ②	50 ②	80 ②	80 ②	80 ②
AC breaking capacity									
pf = 0.35	≤415V	A	2000	3200	5760	6400	6400	6400	6400
	≤500V	A	2000	3200	4800	6400	6400	6400	6400
	≤690V	A	2000	3200	2800	2500 ③	2500 ③	4800 ④	4800 ④
DC breaking capacity/poles in series									
L/R = 15ms, 3 pole in series									
	48V	A	1000/2	①	①	①	①	①	①
	110V	A	1000/2	①	①	①	①	①	①
	220V	A	1000/2	1600/2	2000/2	1900/2	2600/2	2600/2	2600/2
	440V	A	1000/3	1600	2000	①	①	①	①
	750V	A	1000/4	①	①	①	①	①	①
Capacitor ratings	400/415V	kVar	—	—	330	①	①	①	①
Rated capacitor duty		kA	—	—	500	①	①	①	①
Physical characteristics									
Electrical endurance at rated operational current, pf = 0.65									
	operation cycles		1000	1000	500	500	500	100 ⑤	100 ⑤
Mechanical endurance									
	operations		20,000	16,000	10,000	10,000	10,000	6000	6000
Weight									
	3 pole	kg	1.2	2.2	6.2	16.3	17.5	37	37
	4 pole	kg	1.6	2.6	7.6	20.5	22.5	47	47
Dimension									
	3 pole	H mm	162	216	216	372	372	546	546
		W mm	219	260	304	363	363	468	468
		D mm	92.5	130	130	125	125	271	271
Power loss per one pole		W	6.5	10	40	40	67	90	140
Shaft size — square □		mm	6 x 6	12 x 12	12 x 12	12 x 12	12 x 12	12 x 12	12 x 12
Switch operating torque for rotary 3 pole switches									
		Nm	7	16	21	21	21	50	50
Suitable conductor cross section Cu		mm ²	—	—	—	—	—	—	—
Bolt size			8 x 25	10 x 30	12 x 40	12 x 60	12 x 60	12 x 60	12 x 60
Auxiliary contacts			OA_G_	OA_G_	OZ XK_ _	OZ XK_ _	OZ XK_ _	OZ XK_ _	OZ XK_ _
Ratings according to IEC 947-5-1									
Rated voltage, U _i	VAC		690	690	690	690	690	690	690
Thermal rated current, I _{th}	A		16	16	10	10	10	10	10
AC12/DC12 I _e , A U _e =									
	120V	A	—	—	8/—	8/—	8/—	8/—	8/—
	125V	A	—	—	—/1.1	—/1.1	—/1.1	—/1.1	—/1.1
	240V	A	6/—	6/—	6/—	6/—	6/—	6/—	6/—
	250V	A	—	—	—/0.55	—/0.55	—/0.55	—/0.55	—/0.55
	400V	A	4/—	4/—	4/—	4/—	4/—	4/—	4/—
	415V	A	—	—	4/—	4/—	4/—	4/—	4/—
	440V	A	—	—	—/0.31	—/0.31	—/0.31	—/0.31	—/0.31
	480V	A	—	—	3/—	3/—	3/—	3/—	3/—
	500V	A	—	—	3/0.27	3/0.27	3/0.27	3/0.27	3/0.27
	600V	A	—	—	—/0.2	—/0.2	—/0.2	—/0.2	2—/0.2
	690V	A	2/—	2/—	2/—	2/—	2/—	2/—	2/—



- ① Not available at time of printing, please consult factory.
- ② Maximum distance between busbar support and switch terminal 70mm.
- ③ pf 0.95.
- ④ pf 0.65.
- ⑤ IEC 947-3, utilization category B, infrequent operation.

Selecting switches per NEC & IEC

Selecting switches per NEC

Article 430 of the US National Electric Code includes two methods for properly sizing disconnect switches:

1. Single motor application

A properly sized disconnect switch for a single motor will:

- have an ampere rating greater than or equal to 115 percent of the rated motor full load current; or,
- have a HP rating greater than or equal to the rated motor HP (at applied voltage) if the disconnect switch under consideration is HP rated.

2. Combination load application

A properly sized disconnect switch for a combination load will be selected by adding all the simultaneous individual loads in the circuit under consideration.

Using motor nameplate information, load information, and tables from section 430 of the NEC, determine one equivalent full load current and one equivalent locked rotor current. The equivalent locked rotor current can be used with table 430-151 to determine an equivalent HP rating. Select a disconnect switch:

- greater than or equal to 115 percent of the equivalent full load current; and,
- greater than or equal to the equivalent HP rating.

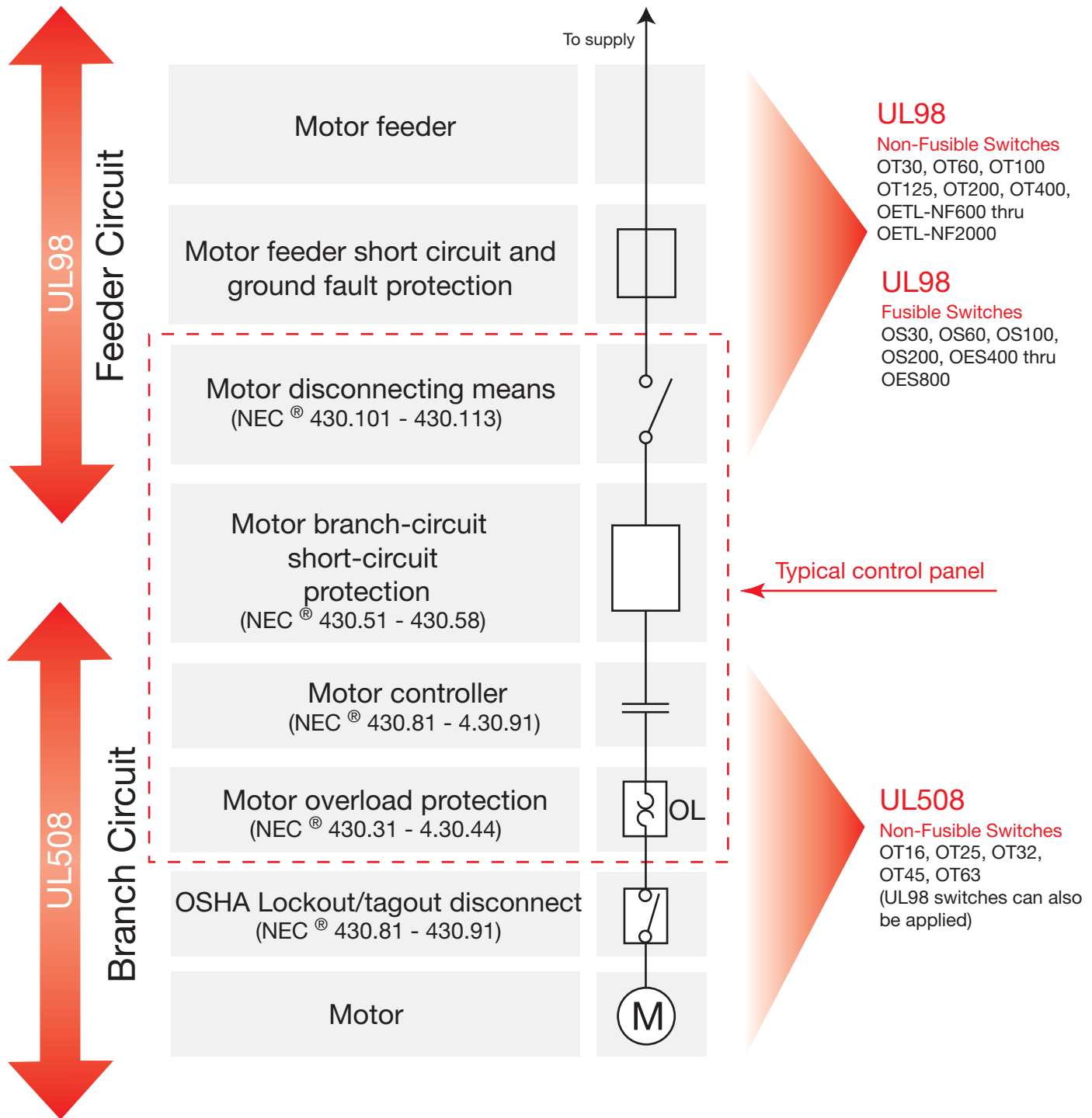
Selecting switches per IEC

Utilization categories

Nature of current	Utilization category		Typical applications
	Frequent operation	Infrequent operation	
Alternating current	AC-20A	AC-20B	<ul style="list-style-type: none"> Connecting and disconnecting under no-load conditions Switching of resistive loads including moderate overloads (PF > 0.95) Switching of mixed resistive and inductive loads, including moderate overloads (PF > 0.65) Switching of motor loads or other highly inductive loads (PF > 0.45 below 100A; PF > 0.35 above 100A)
	AC-21A	AC-21B	
	AC-22A	AC-22B	
	AC-23A	AC-23B	
Direct current	DC-20A	DC-20B	<ul style="list-style-type: none"> Connecting and disconnecting under no-load conditions Switching of resistive loads including moderate overloads (L/R < 1ms) Switching of mixed resistive and inductive loads, including moderate overloads e.g., shunt motors (L/R < 2.5ms) Switching of highly inductive loads e.g., series motors (L/R < 15ms)
	DC-21A	DC-21B	
	DC-22A	DC-22B	
	DC-23A	DC-23B	
Mechanical endurance	Number of operations	Number of operations	
100A	10,000	2000	
315A	8000	1600	
>315A	2000	400	

- Category AC-23 includes occasional switching of individual motors. The switching of capacitors of tungsten filament lamps shall be subject to agreement between manufacturer and user.

Use of UL98 & UL508 Disconnects According to NEC® Article 430



AC – Alternating current — Current that reverses its direction of flow twice per cycle.

Ambient temperature — Temperature of the air surrounding the unit.

Amp rating — The basic unit of measurement for electric current (coulombs / seconds).

Conventional thermal current I_{th} — Value of the current the disconnect switch can withstand with poles in closed position, in free air for an eight hour duty, without the temperature rise of its various parts exceeding the limits specified by the standards.

Cycle duration — Total time of the on-load + off-load period.

DC – Direct current — Current that flows in only one direction.

Electrical endurance — Number of on-load operating cycles.

IEC environmental protection type — see page 18.52.

Full load amp current FLA — The current required by a motor to produce full-load torque at the motor's rated speed.

Inductive load — An electrical load characterized by having significant inrush (5 to 6 times FLA for typical design-B AC induction motors).

kW — Kilowatts (1000 watts)

Lockout/Tagout — Means of removing power from electrical equipment during inspection, service or repair.

Make / Break — ON / OFF

Mechanical endurance — Number of off-load operating cycles.

Poles in series — Means of connection poles using wires or bus bars to increase breaking capacity of load.

Power factor — The relationship between working power and total power consumed. Power factor measures how effectively electrical power is being used.

Rated insulation U_i — Voltage value which designates the unit and to which dielectric tests, clearance and creepage distances are referred.

Rated operating current I_e — Current value stated by the manufacturer and taking into account the rated operating voltage U_e , the rated frequency, the rated duty, the utilization category, the electrical contact life and the type of protective enclosure.

Rated operating voltage U_e — Voltage value to which utilization characteristics of the disconnect switch are referred, i.e. phase-to-phase voltage in 3 phase circuits.

Rated short circuit making capacity I_{cm} — The rated short-circuit making capacity of a disconnect switch, a disconnect or a switch-disconnector is the value assigned to equipment at the rated operational voltage, frequency (if any) and specified power-factor for AC or time constant for DC. It is expressed as the maximum prospective peak current under prescribed conditions.

Rated short time withstand current I_{cw} — The rated short-time withstand current of a disconnect switch, a disconnect or a switch-disconnector is the value that the equipment can carry without damage, under the test conditions specified in the relevant product standard. The value of the rated short-time withstand current shall be not less than twelve times the maximum rated operational current unless otherwise stated by manufacturer and the duration of the current shall be 1 s.

Resistive load — An electrical load characterized by not having any significant inrush current.

Short circuit protection coordination — Co-ordination types "1" and "2" are defined in IEC 947-4-1.

Type 1 coordination — There has to be no discharge of parts beyond the enclosure. Damage to the contactor and the overload is acceptable.

Type 2 coordination — No damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated.

Time constant — Ratio of inductance to the resistance:
 $L/R = \text{mH}/\text{Ohm} = \text{ms}$.

Torque — The force that produces rotation. It is commonly measured in pound-feet (lb-ft). Torque applies to such things as motor operations, handle rotations, wire tightening.

NEMA environmental protection type — see page 18.51.

Volt — The unit of electrical potential difference and electromotive force.

NEMA Environmental ratings

Disconnect
switches
Non-fusible

Introduction

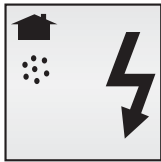
An enclosure is a surrounding case constructed to provide a degree of protection to personnel against accidental contact with the enclosed equipment and to provide a degree of protection to the enclosed equipment against specified environmental conditions.

A brief description of the more common types of enclosures used by the electrical industry relating to their environmental

capabilities follows. Refer to NEMA Standards Publication for more information regarding applications, features and design tests.

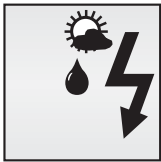
Individual NEMA product Standards Publications or third party certification standards may contain additional requirements for product testing and performance.

Definitions pertaining to nonhazardous locations



Type 1

Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt. (NEMA Standard 7-15-1991.)



Type 3R

Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet and damage from external ice formation. (NEMA Standard 7-15-1991.)



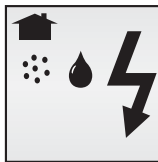
Type 4

Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979.)



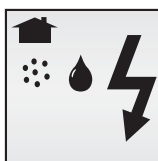
Type 4X

Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979)



Type 12

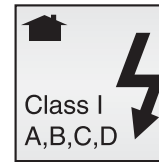
Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids. (NEMA Standard 7-15-1991.)



Type 13

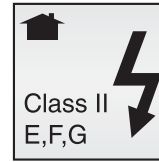
Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil and noncorrosive coolant. (NEMA Standard 1-10-1979.)

Definitions pertaining to hazardous locations



Type 7

Enclosures are intended for indoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the National Electrical Code. (NEMA Standard 7-15-1991.)



Type 9

Enclosures are intended for indoor use in locations classified as Class II, Groups E, F, or G, as defined in the National Electrical Code. (NEMA Standard 7-15-1991.)











Legend

- Indoors
- Outdoors
- Water
- Dirt/dust
- Corrosion

IEC Environmental ratings

IP ratings

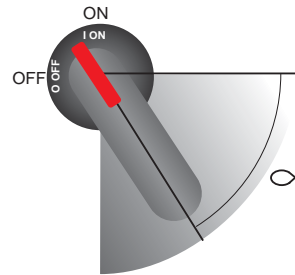
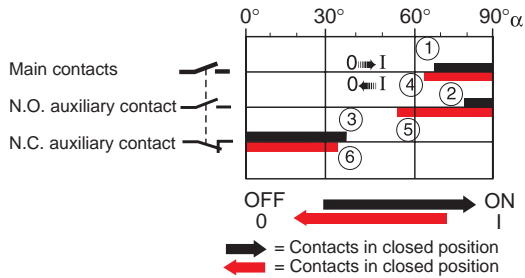
indicate the degree of protection against dust, liquids and impacts. The IP degrees of protection are defined by the French standard NFC 20-010. To rate a device's degrees of protection, the letters IP are followed by up to three numbers. These numbers are defined as follows:

first number protection against solid objects	second number protection against liquids	third number protection against mechanical impacts
<p>IP 0  no protection</p>	<p>IP 0  no protection</p>	<p>IP 0  no protection</p>
<p>1  protected against solid objects over 50mm (e.g. accidental touch by hands.)</p>	<p>1  protected against vertically falling rain or condensation</p>	<p>1  impact 0,225 joule 150g falling from 15 cm</p>
<p>2  protected against solid objects over 12 mm (e.g. fingers)</p>	<p>2  protected against direct sprays of water up to 15° from vertical</p>	<p>2  impact 0,375 joule 250g falling from 15 cm</p>
<p>3  protected against solid objects over 2.5 mm (tools & wires)</p>	<p>3  protected against sprays to 60° from vertical</p>	<p>3  impact 0,50 joule 250g falling from 20cm</p>
<p>4  protected against solid objects over 1mm (small tools & small wires)</p>	<p>4  protected against water sprayed from all directions</p>	<p>5  impact 2,00 joule 500g falling from 40 cm</p>
<p>5  protected against dust (no harmful deposit)</p>	<p>5  protected against low pressure jets of water from all directions</p>	<p>7  impact 6,00 joule 1.5kg falling from 40 cm</p>
<p>6  totally protected against dust</p>	<p>6  protected from strong jets of water (e.g. for use on ship decks)</p>	<p>9  impact 20,00 joule 5 kg falling from 40 cm</p>
	<p>7  protected against the effects of immersion between 15cm and 1m</p>	

Auxiliary contact timing diagrams OT16 – OT100

Disconnect
switches
Non-fusible

Legend



Contacts closing

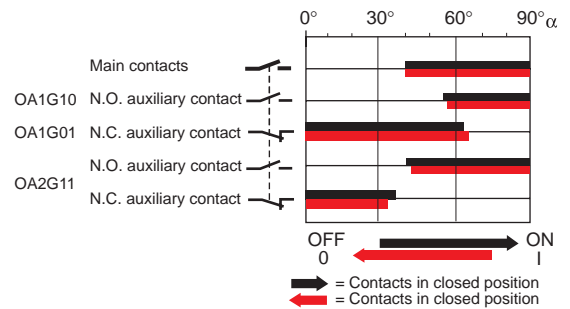
- ① Main contacts close
- ② N.O. auxiliary contacts close
- ③ N.C. auxiliary contacts open

Contacts opening

- ④ Main contacts open
- ⑤ N.O. auxiliary contacts open
- ⑥ N.C. auxiliary contacts close

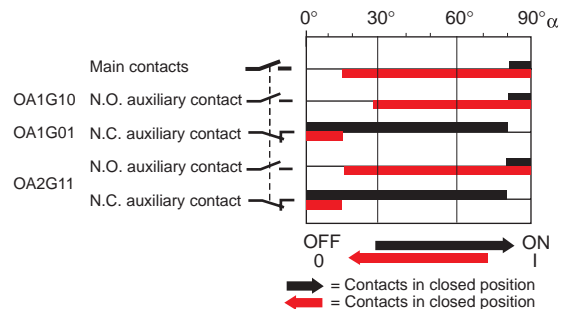
OT16, OT25, OT32

Catalog number	Auxiliary contact	Contact configuration
OT16, OT25, OT32	OA1G10 OA1G01 OA2G11	1 N.O. 1 N.C. 1 N.O. & 1 N.C.



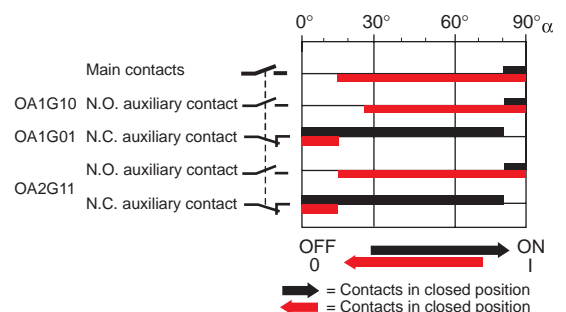
OT45, OT63

Catalog number	Auxiliary contact	Contact configuration
OT45, OT63	OA1G10 OA1G01 OA2G11	1 N.O. 1 N.C. 1 N.O. & 1 N.C.



OT30, OT60, OT100

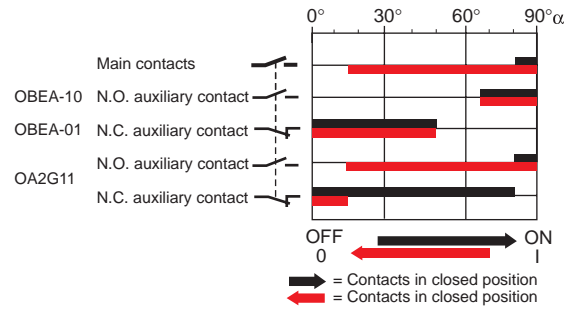
Catalog number	Auxiliary contact	Contact configuration
OT30, OT60, OT100	OA1G10 OA1G01 OA2G11	1 N.O. 1 N.C. 1 N.O. & 1 N.C.



Auxiliary contact timing diagrams OT160 – OT400

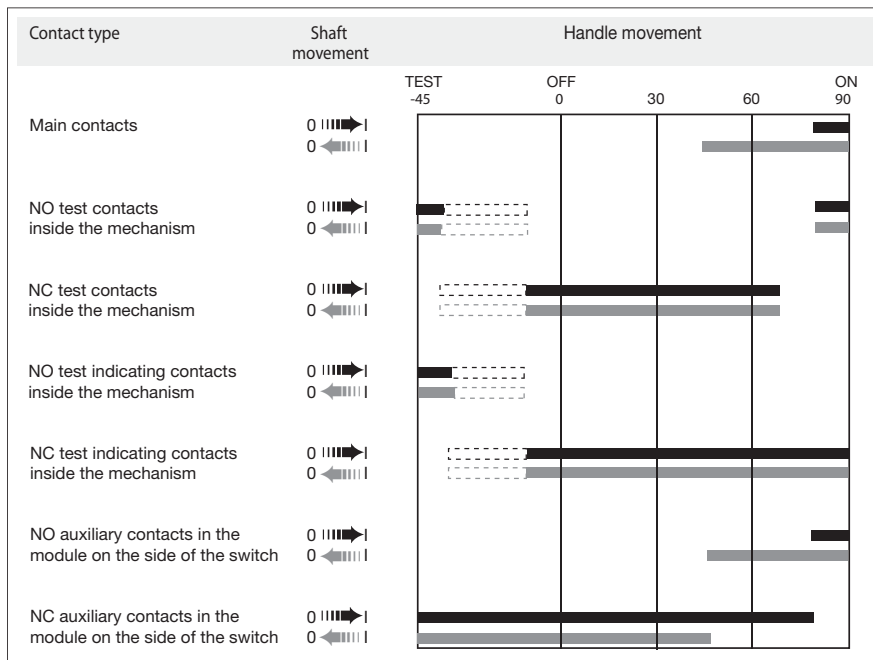
OT160E3

Catalog number	Auxiliary contact	Contact configuration
OT160E3	OBEA-10 OBEA-01 OA2G11	1 N.O. 1 N.C. 1 N.O. & 1 N.C.



OT200U03 – OT400U03

Catalog number	Auxiliary contact	Contact configuration
OT200U03 – OT400U03	OA1G10 OA3G01	1 N.O. 1 N.C.



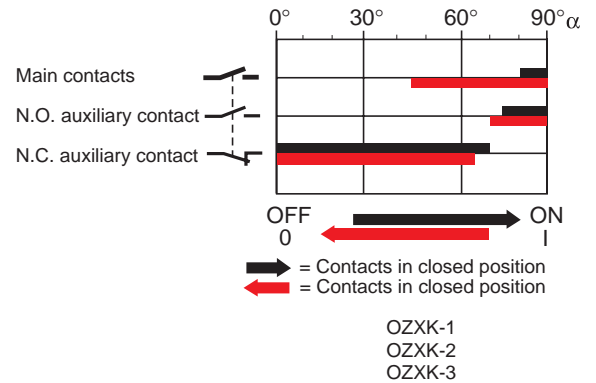
Auxiliary contact timing diagrams

OETL-NF600 – OETL-NF3150

Disconnect
switches
Non-fusible

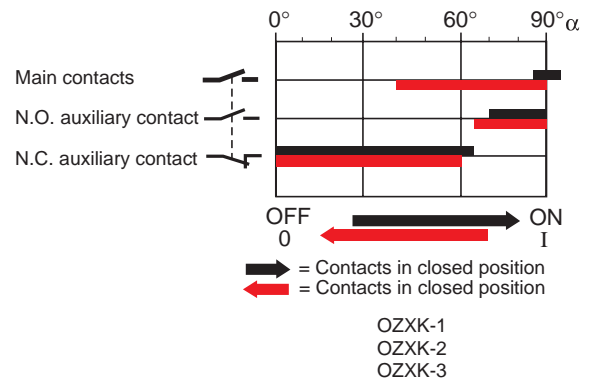
OETL-NF600A

Catalog number	Auxiliary contact	Contact configuration form C
OETL-NF600A	OZK-1	1 N.O. & 1 N.C.
	OZK-2	2 N.O. & 2 N.C.
	OZK-3	4 N.O. & 4 N.C.



OETL-NF800A – OETL-NF3150

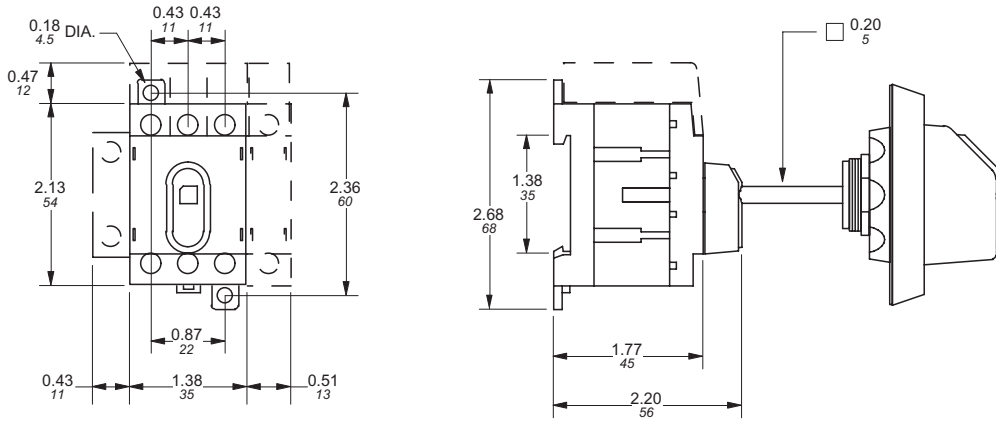
Catalog number	Auxiliary contact	Contact configuration
OETL-NF800A – OETL-NF3150	OZK-1	1 N.O. & 1 N.C.
	OZK-2	2 N.O. & 2 N.C.
	OZK-3	4 N.O. & 4 N.C.



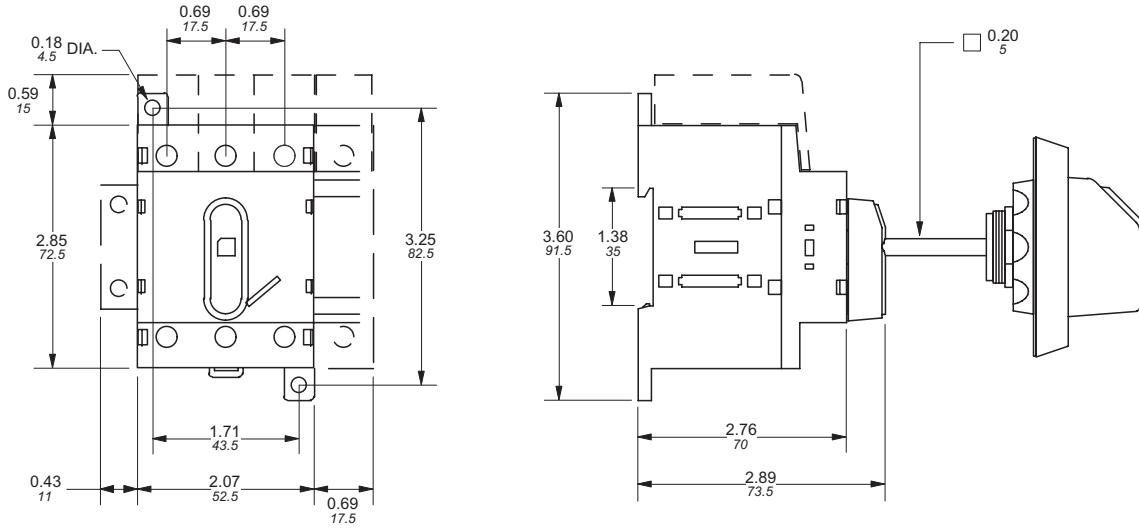
Approximate dimensions OT16E3 – OT100E3 Base & DIN rail mounted switches

00.00 Inches
00.00 [Millimeters]

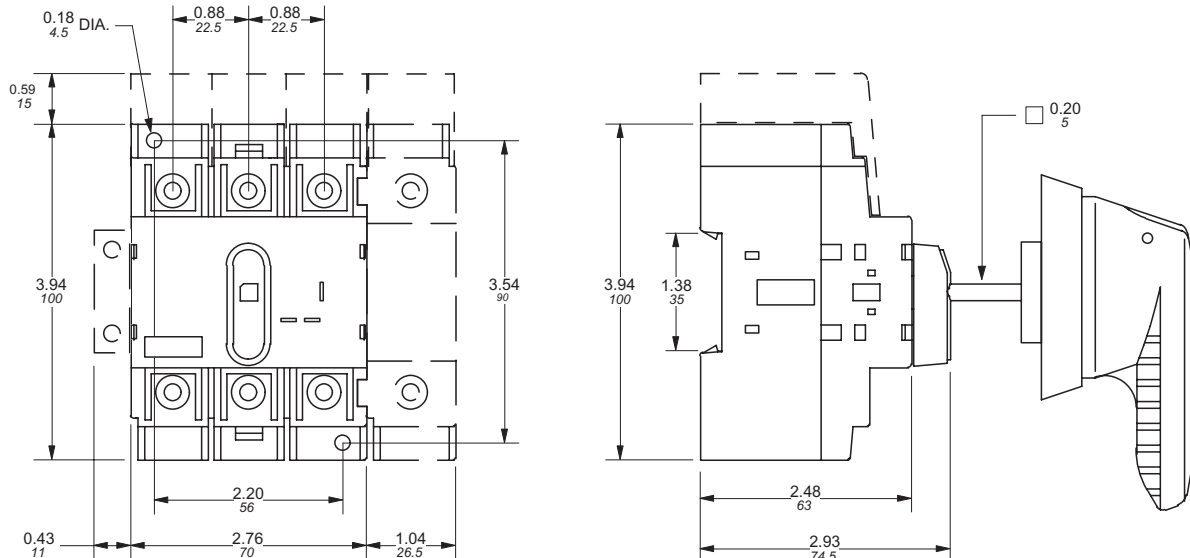
OT16E3, OT25E3, OT32E3 — base & DIN rail mounted switch



OT45E3, OT63E3 — base & DIN rail mounted switch



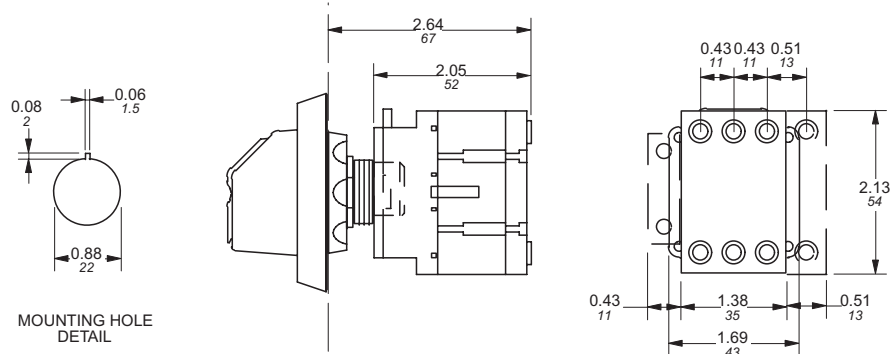
OT30E3, OT60E3, OT100E3 — base & DIN rail mounted switch



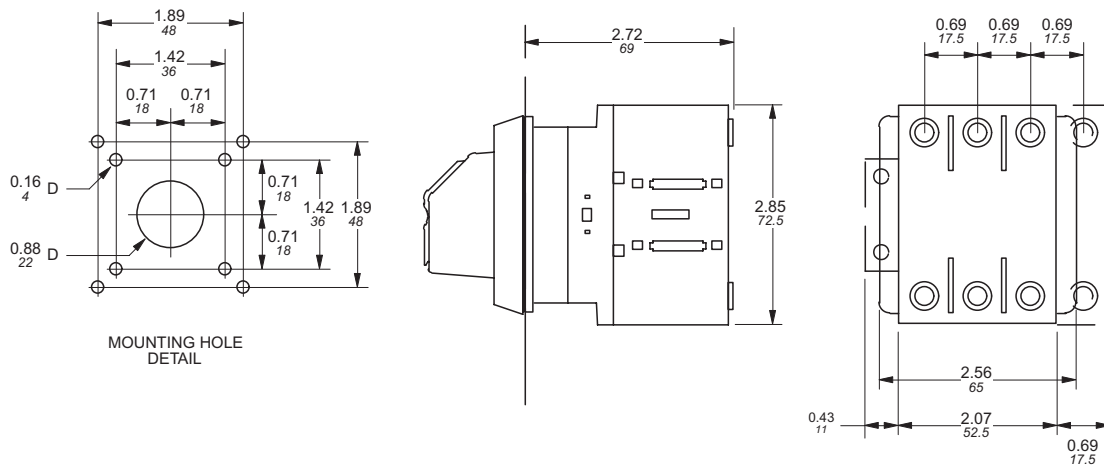
Approximate dimensions OT16ET3 – OT100ET3 Door mounted switches

00.00 Inches
00.00 [Millimeters]

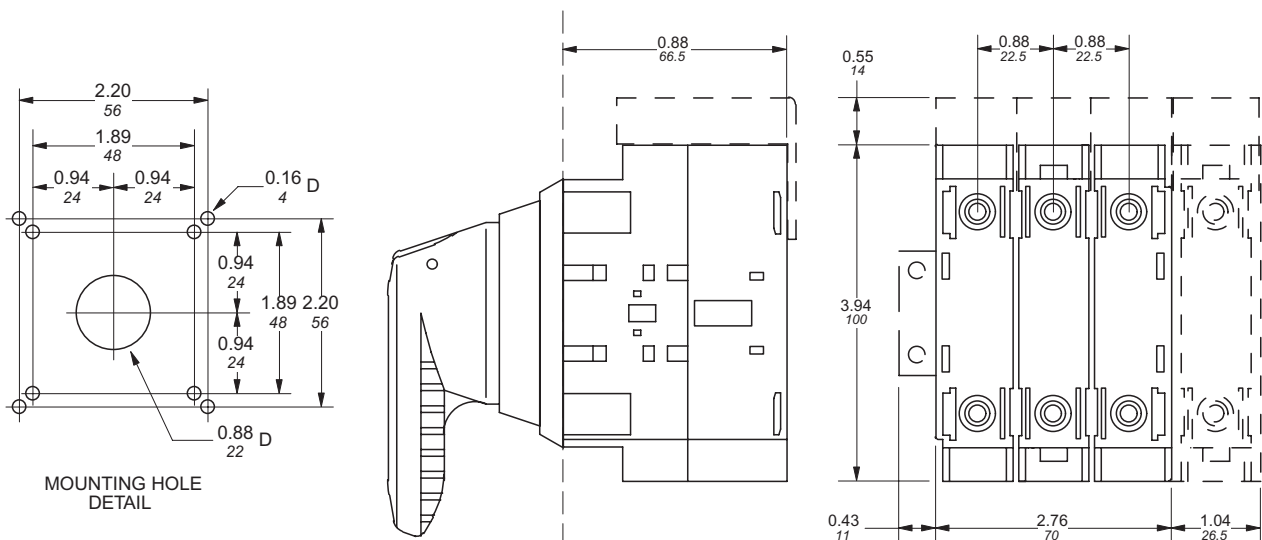
OT16ET3, OT25ET3, OT32ET3 — door mounted switch



OT45ET3, OT63ET3 — door mounted switch



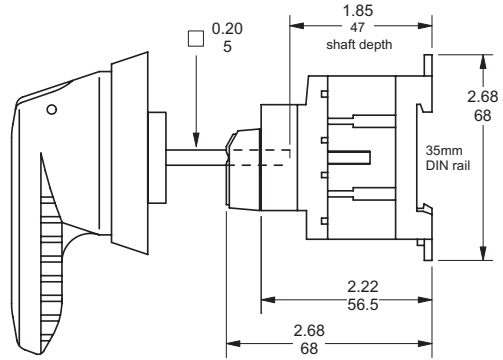
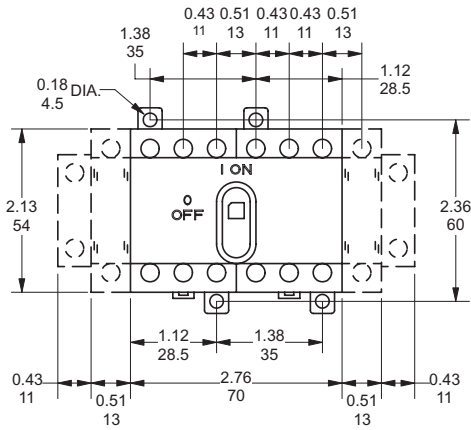
OT30ET3, OT60ET3, OT100ET3 — door mounted switch



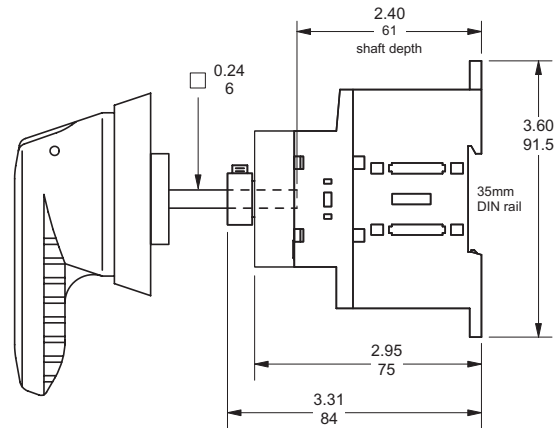
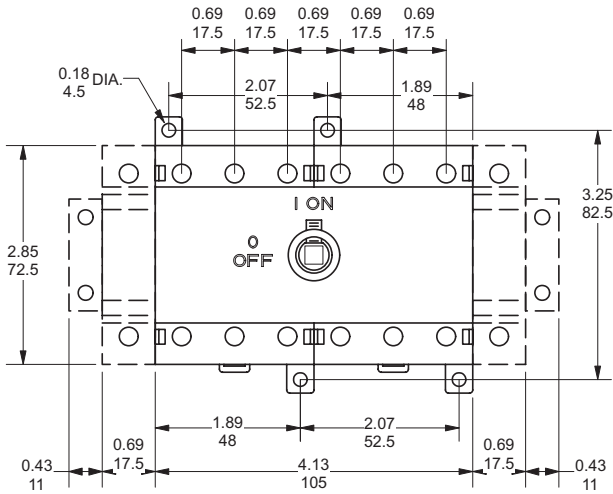
Approximate dimensions OT16E6 & E8 – OT100E6 & E8 6-pole switches

00.00 Inches
00.00 [Millimeters]

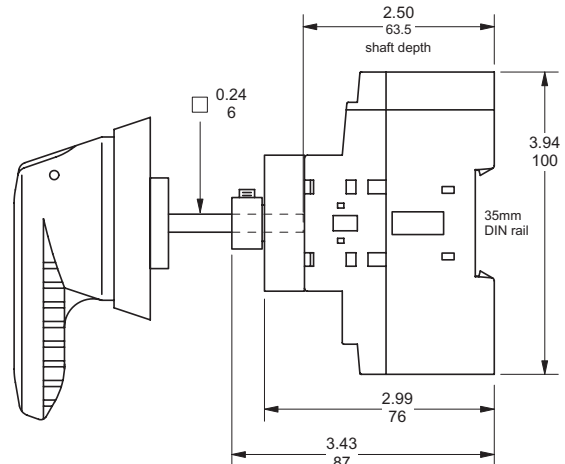
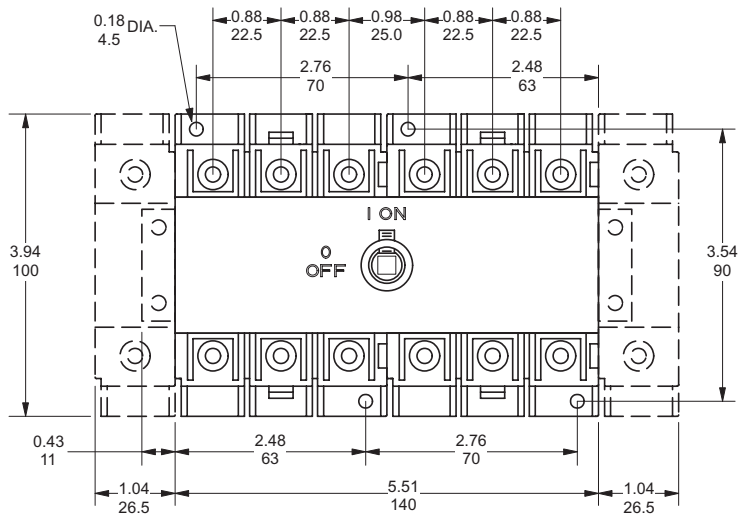
OT16, 25, 32E6 & E8 — 6 Pole switches



OT45, 63E6 & E8 — 6 Pole switches



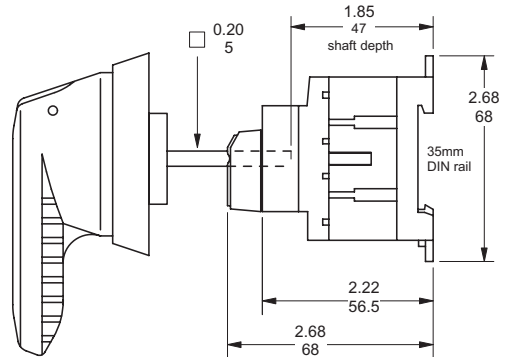
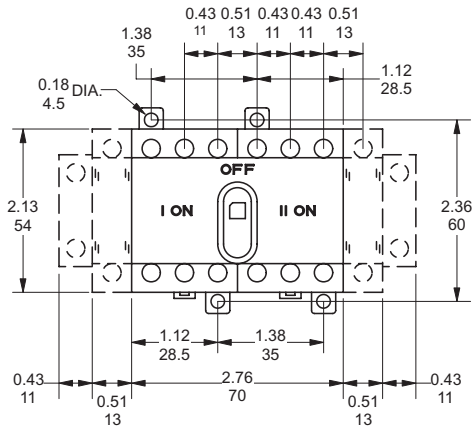
OT100E6 & E8 — 6 Pole switches



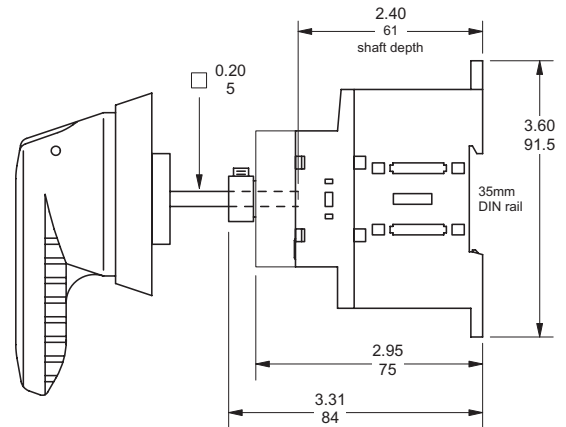
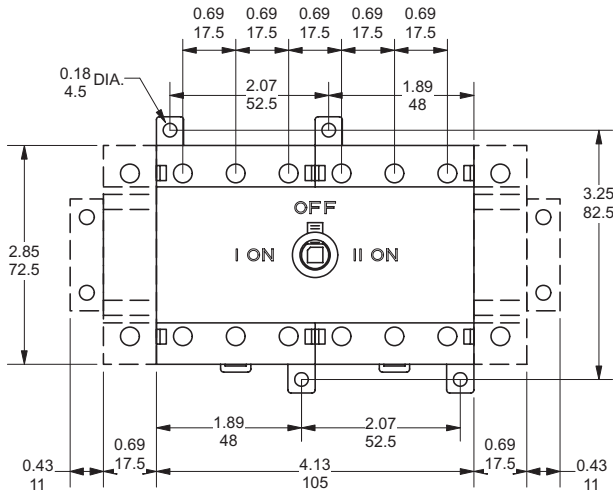
Approximate dimensions OT16E3C & E4C – OT100E3C & E4C Transfer switches

00.00 — Inches
00.00 — [Millimeters]

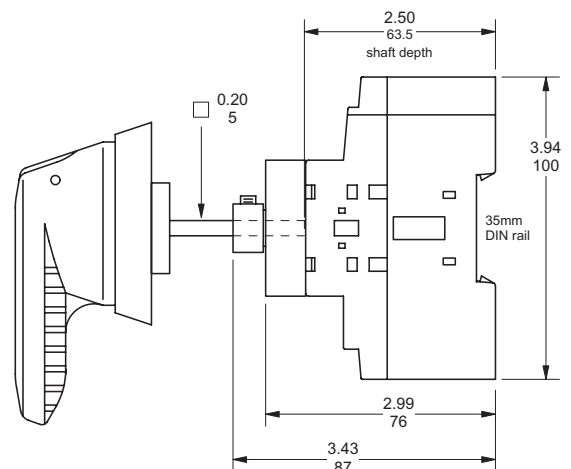
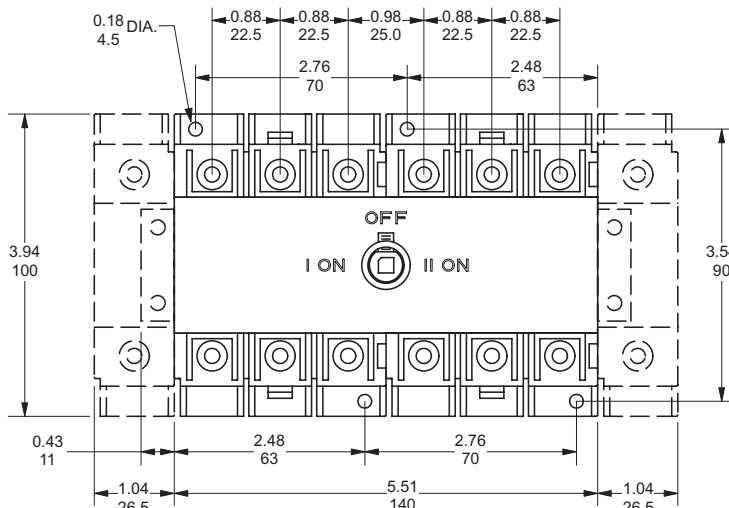
OT16, 25, 32E3C & E4C – Transfer switches



OT45, 63E3C & E4C – Transfer switches



OT100E3C & E4C – Transfer switches

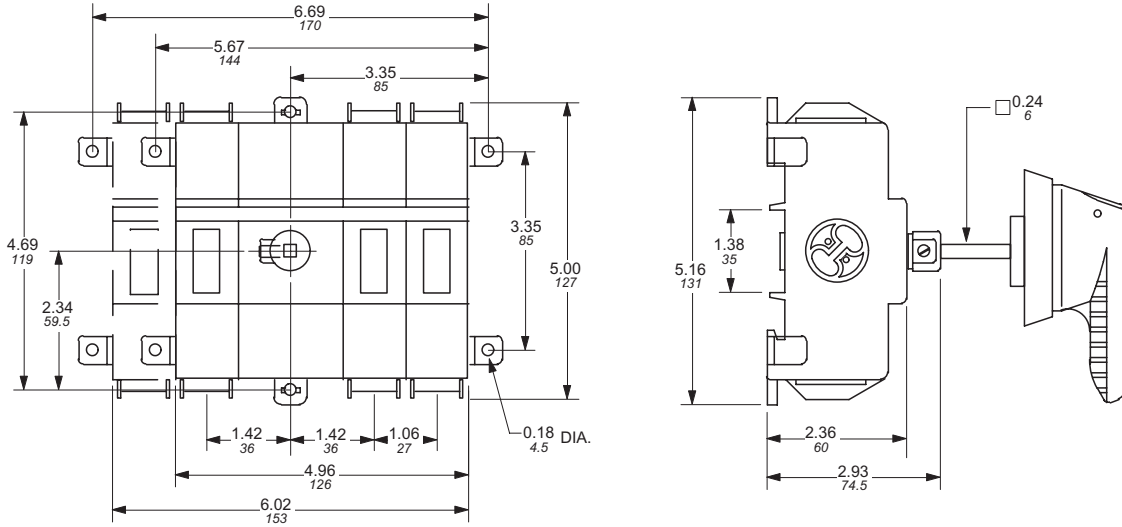


Disconnect
switches
Non-fusible

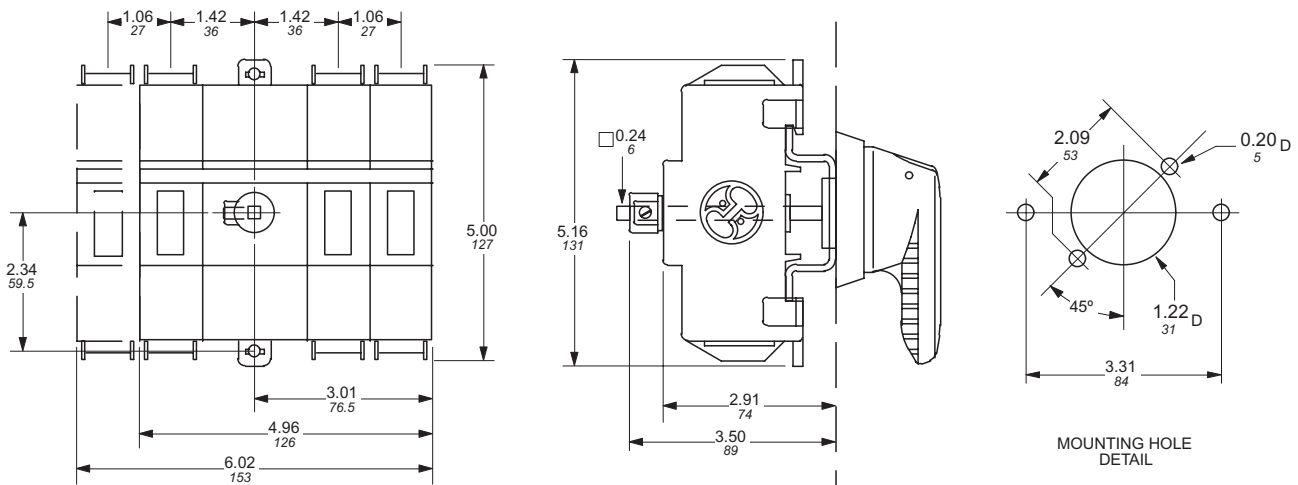
Approximate dimensions OT160E3 & OT160ET3

00.00 Inches
00.00 [Millimeters]

OT160E3 — base & DIN rail mounted switch



OT160ET3 — Door mounted switch

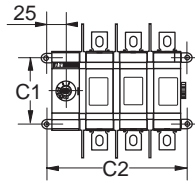
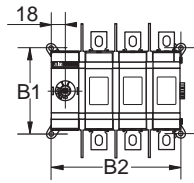
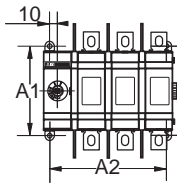
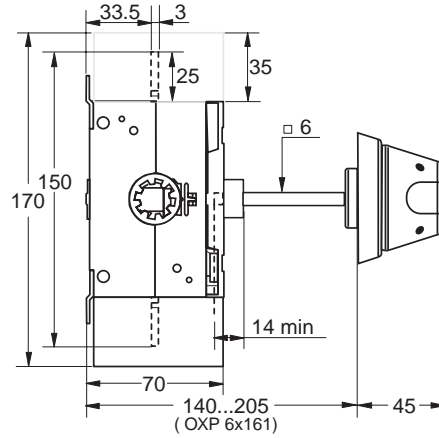
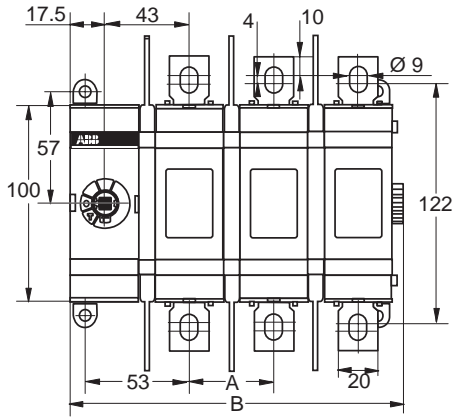


Approximate dimensions OT200_

Disconnect
switches
Non-fusible

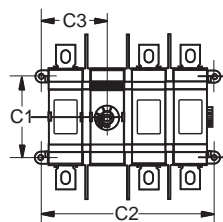
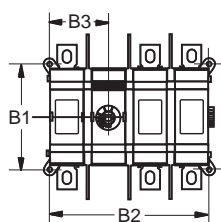
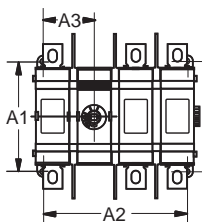
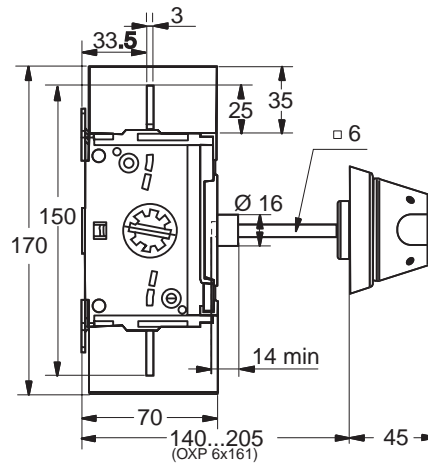
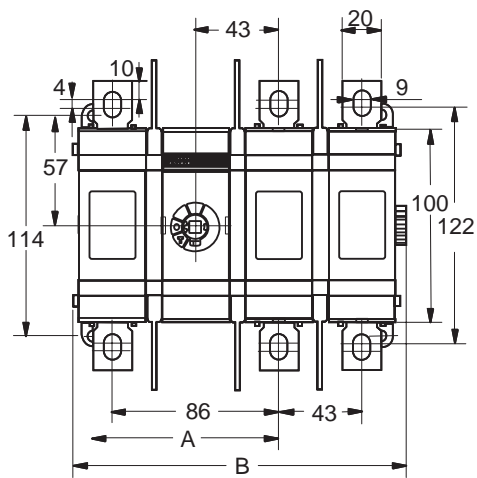
← 00.00 → Millimeters

OT200U02, -03, -04



OT200 (mm)			
	U02	U03	U04
A	43	43	43
B	126.5	169.5	212.5
A1	114	114	114
A2	106	149	192
B1	109.5	109.5	109.5
B2	122	165	208
C1	84	84	84
C2	136	179	222

OT200U11, -12, -13, -22

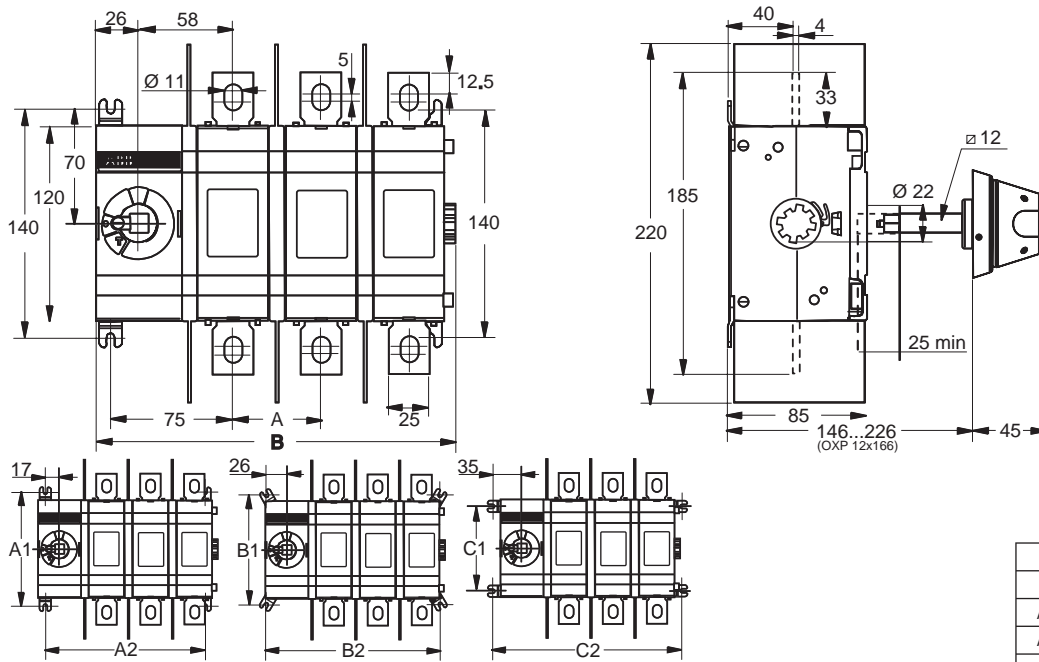


OT200 (mm)				
	U11	U12	U13	U22
A	96	96	96	139
B	131.5	174.5	217.5	217.5
A1	114	114	114	114
A2	106	149	192	192
A3	53	53	53	96
B1	109.5	109.5	109.5	109.5
B2	122	165	208	208
B3	61	61	61	104
C1	84	184	84	84
C2	136	179	222	222
C3	68	68	68	111

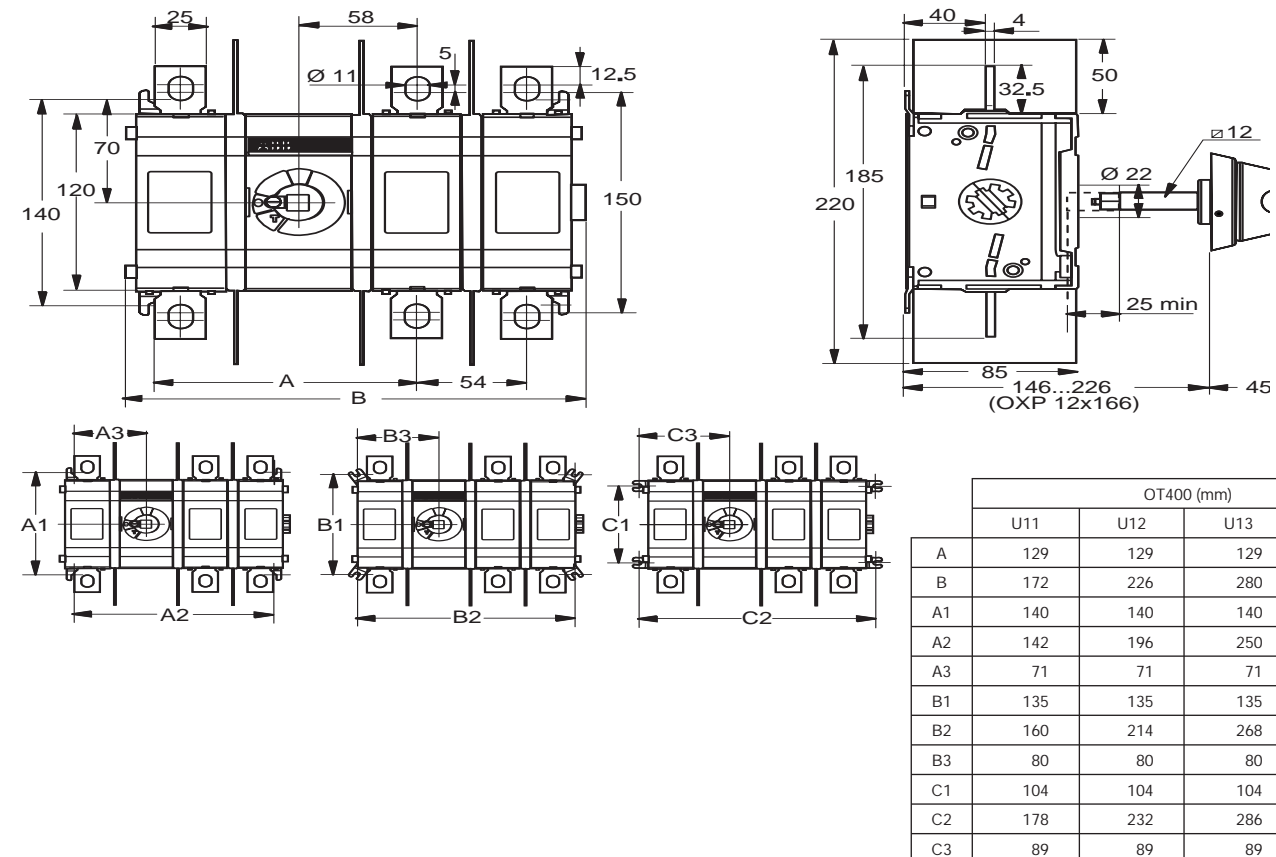
Approximate dimensions OT400_

← 00.00 → Millimeters

OT400U02, -03, -04



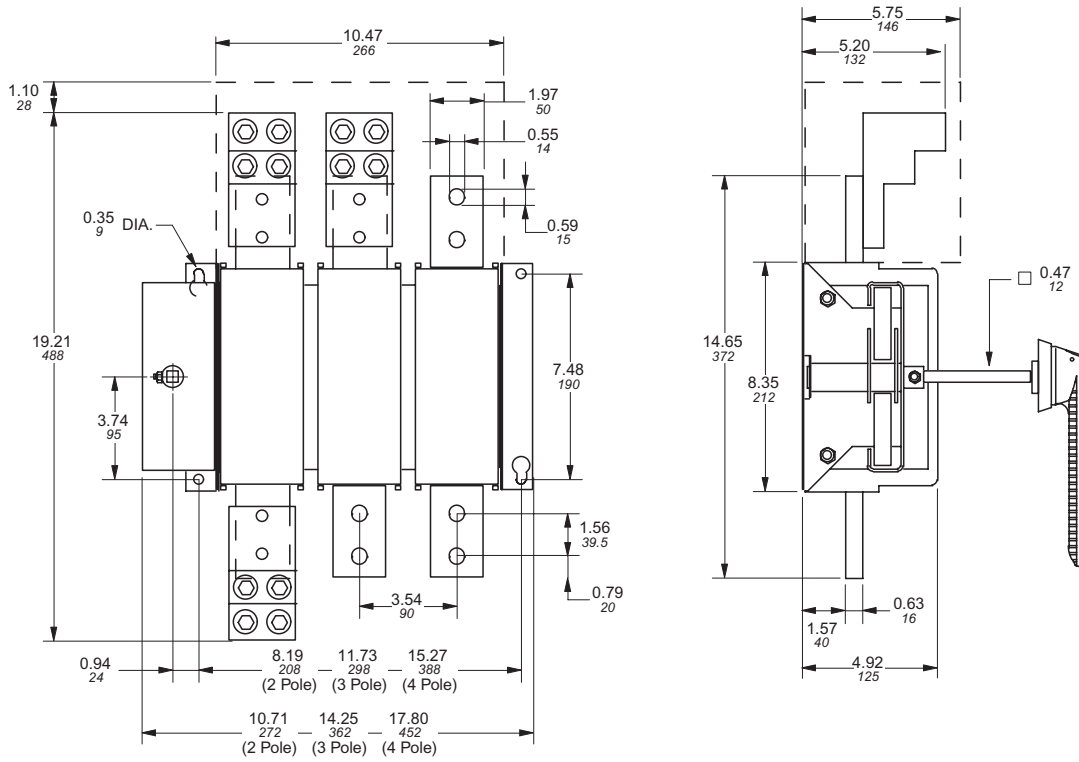
OT400U11, -12, -13, -22



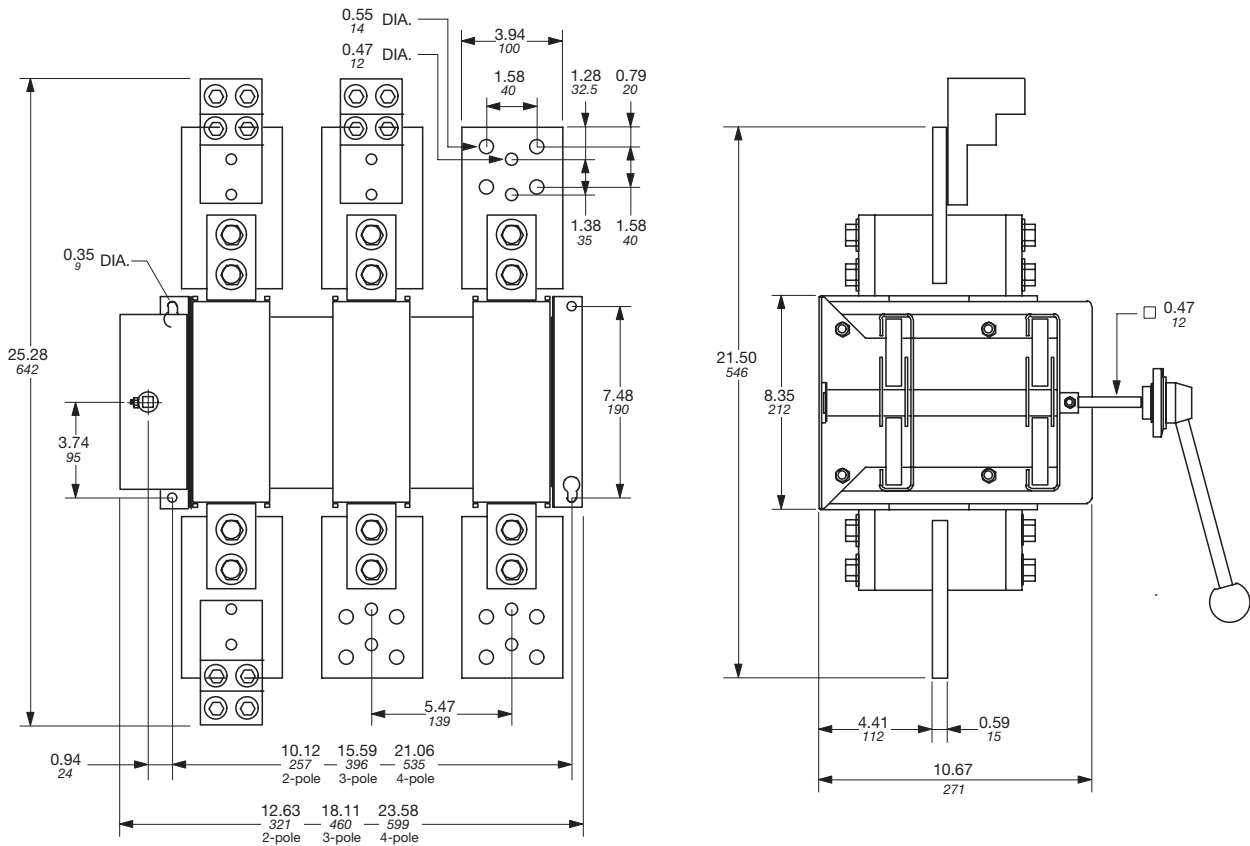
Approximate dimensions OETL-NF1200 – OETL-NF1600

00.00 Inches
00.00 [Millimeters]

OETL-NF1200



OETL-NF1600

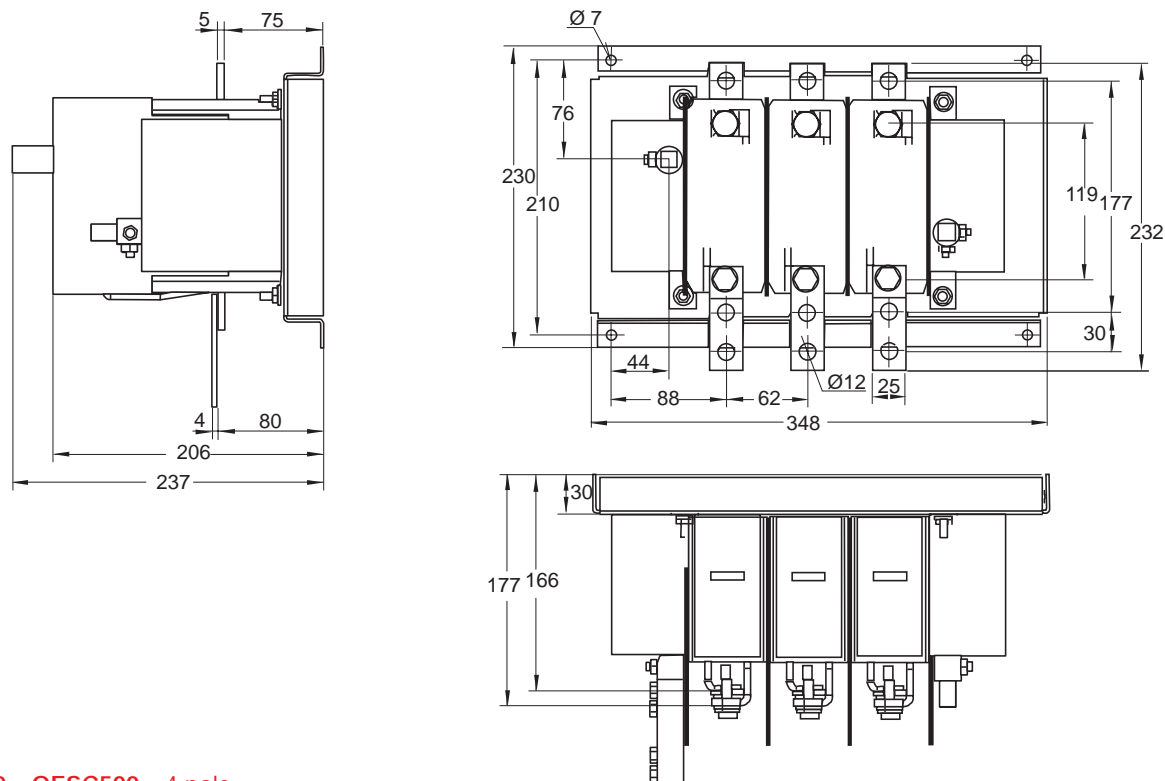


Disconnect
switches
Non-fusible

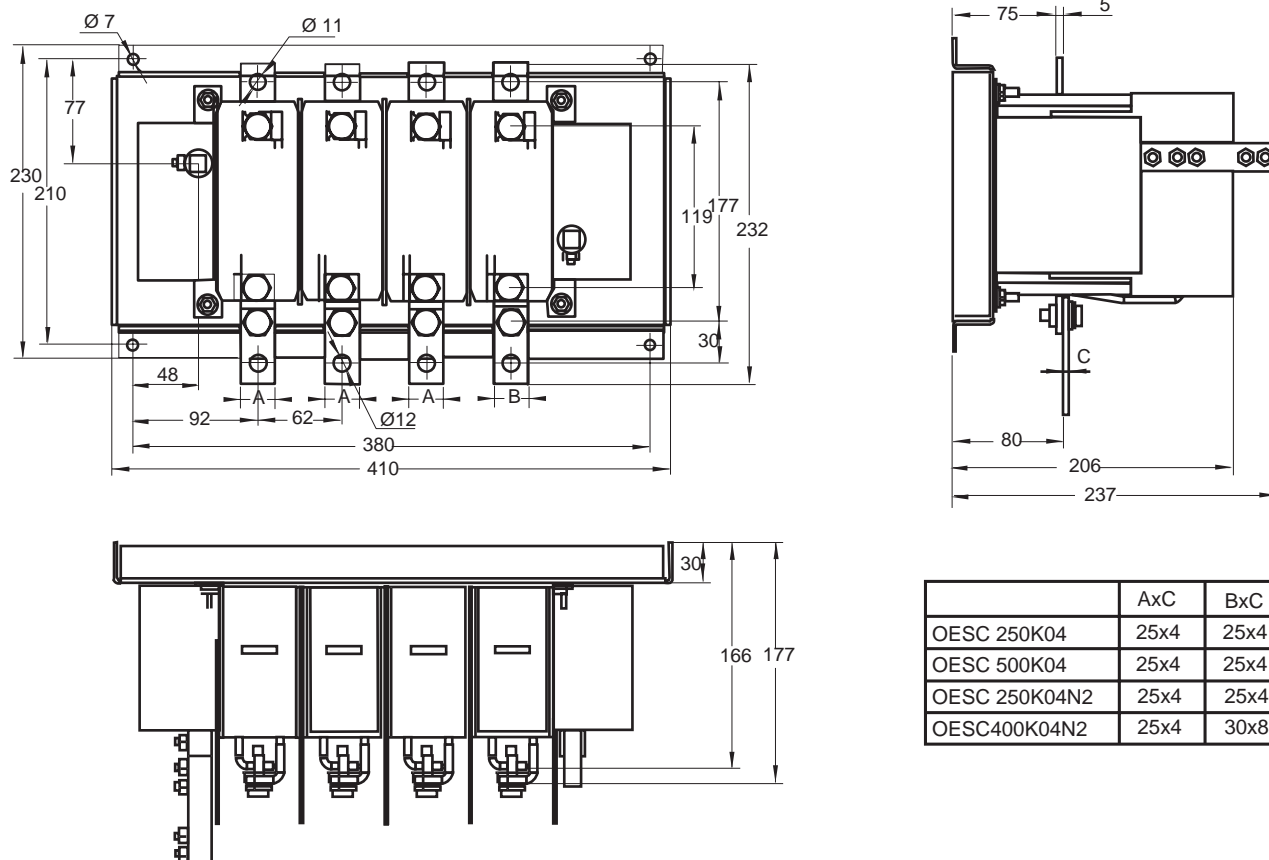
Approximate dimensions OESC250 — OESC500

← 00.00 → Millimeters

OESC250 – OESC500 – 3 pole



OESC250 – OESC500 – 4 pole



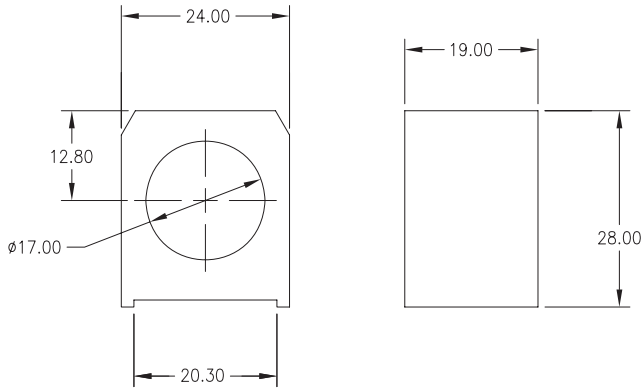
	AxC	BxC
OESC 250K04	25x4	25x4
OESC 500K04	25x4	25x4
OESC 250K04N2	25x4	25x4
OESC400K04N2	25x4	30x8

Approximate dimensions for Terminal lugs

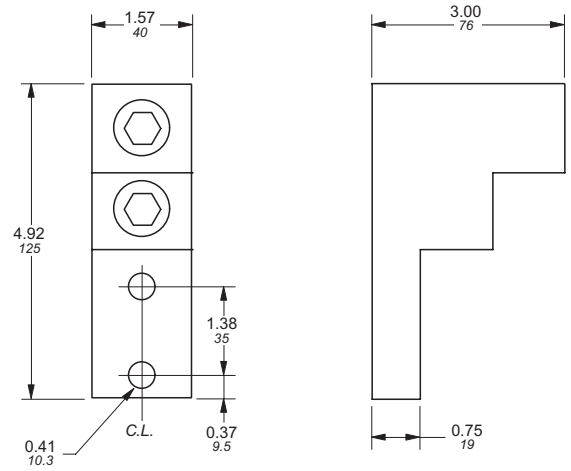
Disconnect
switches
Non-fusible

00.00 — Inches
00.00 — (Millimeters)

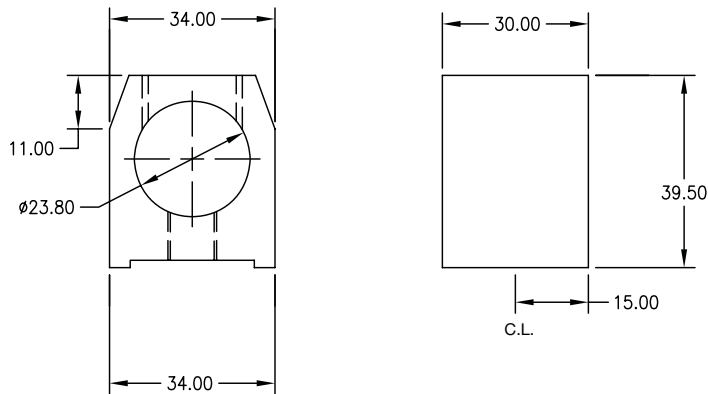
OZXA-200



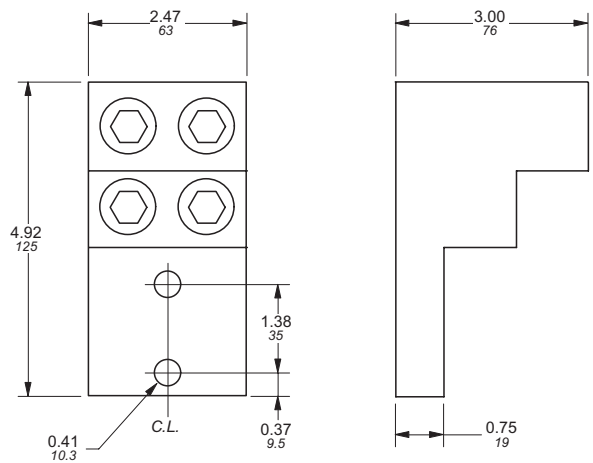
OZXA-30 — for use with 800A switches



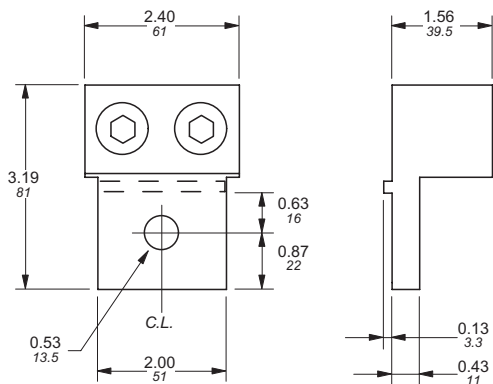
OZXA-400



OZXA-28 & OZXA-28/2 — for use with 1200A – 3150A switches



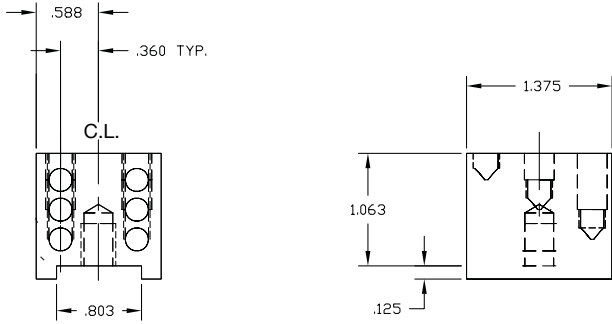
OZXA-27 — for use with 600A switches



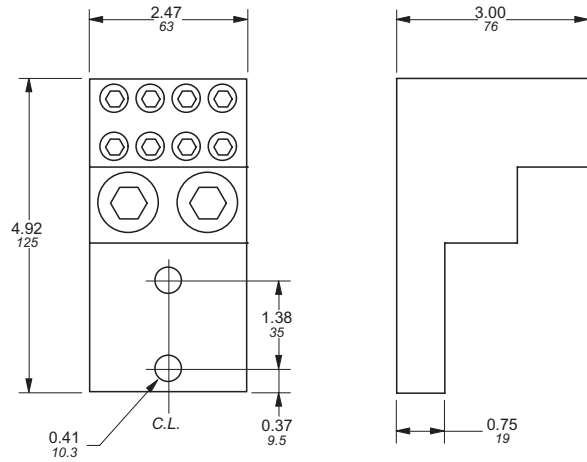
Approximate dimensions for Terminal lugs

← 00.00 → Inches
00.00 [Millimeters]

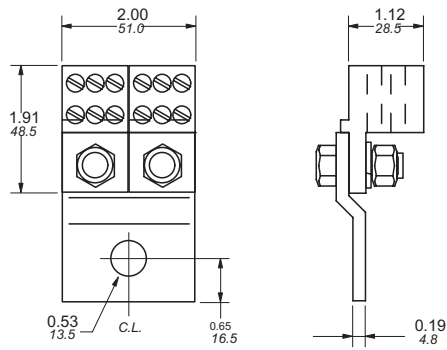
OZXA-406 – for use with 400A switches



OZXA-32 – for use with 800A - 1600A switches



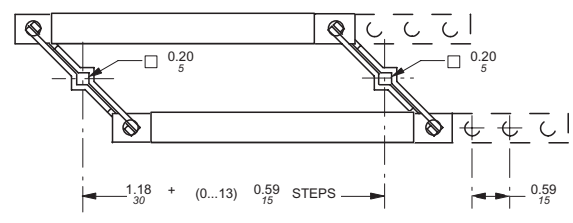
OZXA-175/400 – for use with 600A switches



Approximate dimensions for 16A – 100A conversion mechanisms

00.00 Inches
00.00 (Millimeters)

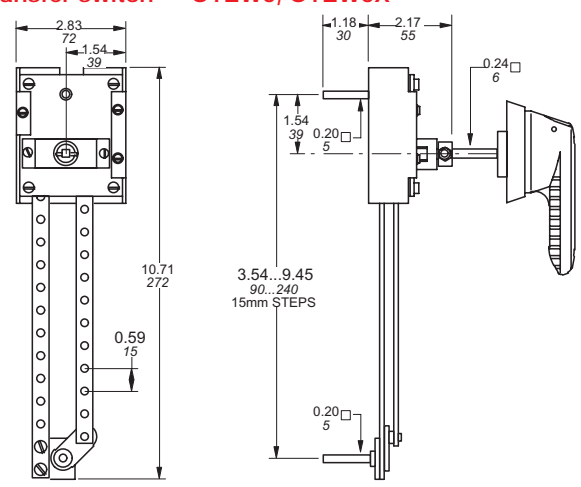
6 or 8 pole — OTZW8



For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

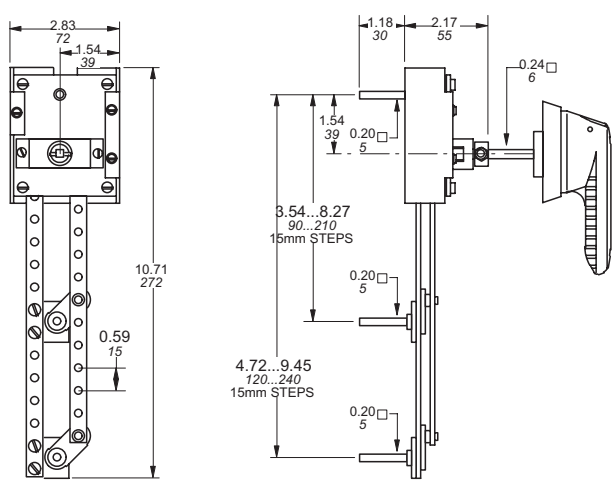
OTZW8 in combination with:	Minimum inches/mm	Maximum inches/mm
OT16E3, OT25E3, OT32E3	3.07/78	N/A
OT45E3, OT63E3	3.74/95	N/A
OT30E3, OT60E3, OT100E3	3.82/97	N/A

Transfer switch — OTZW6, OTZW6X



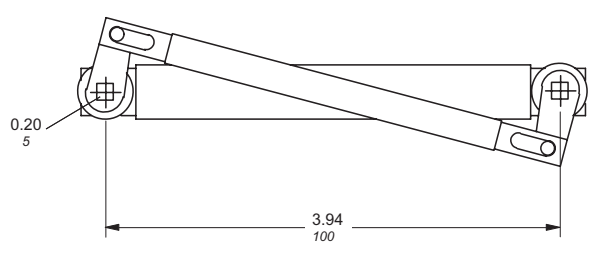
OTZW6, OTZW6X in combination with:	Minimum inches/mm	Maximum [Ⓞ] inches/mm
OT16E3, OT25E3, OT32E3	4.61/117	6.57/167
OT45E3, OT63E3	5.31/135	7.28/185
OT30E3, OT60E3, OT100E3	4.84/123	6.81/173

Bypass switch — OTZW17, OTZW17X



OTZW17, OTZW17X in combination with:	Minimum inches/mm	Maximum [Ⓞ] inches/mm
OT16E3, OT25E3, OT32E3	4.61/117	6.57/167
OT45E3, OT63E3	5.31/135	7.28/185
OT30E3, OT60E3, OT100E3	4.84/123	6.81/173

Mechanical interlock — OETL-ZW24



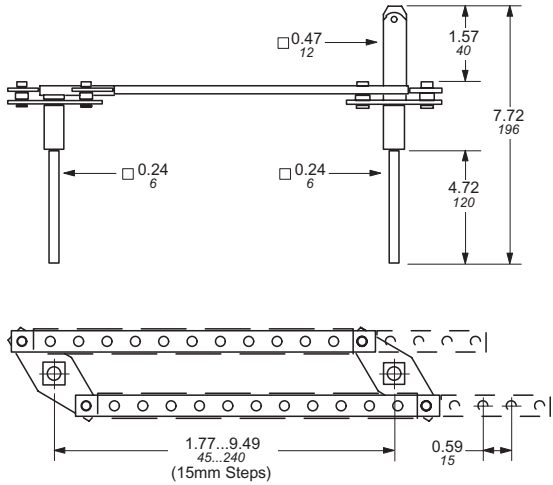
OETL-ZW24 in combination with:	Minimum inches/mm	Maximum [Ⓞ] inches/mm
OT16E3, OT25E3, OT32E3	3.39 / 86	—
OT45E3, OT63E3	4.09 / 104	—
OT30E3, OT60E3, OT100E3	4.13 / 105	—

Ⓞ Deeper enclosures will require a longer shaft. Please select a 5mm shaft from page 18.10 - 18.11.

Approximate dimensions for 125 – 200A conversion mechanisms

00.00 Inches
00.00 [Millimeters]

6 or 8 pole — OESA-ZW2

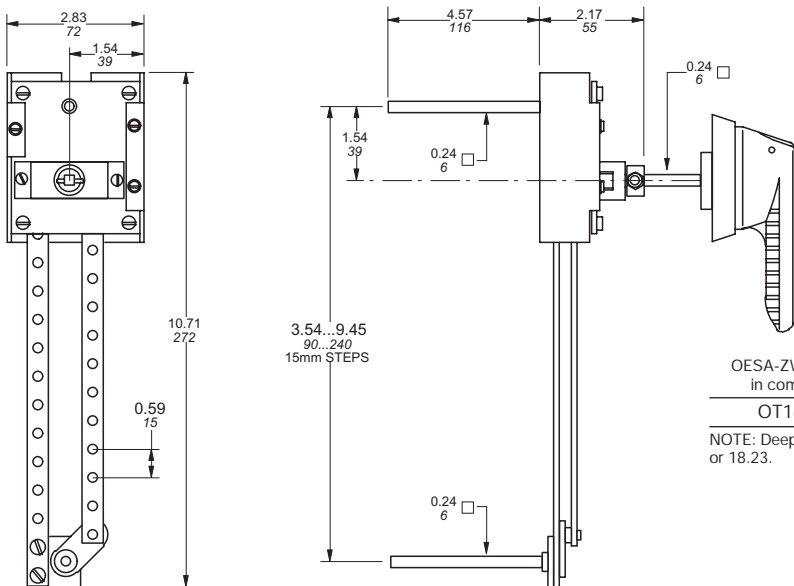


For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

OESA-ZW2 in combination with:	Minimum inches/mm	Maximum inches/mm
OT160 - OT200	5.35/136	9.49/241

NOTE: Deeper enclosures will require a longer shaft. Please select a 12mm shaft from page 18.26 and an OETL-ZX95 shaft extension coupler from page 18.28.

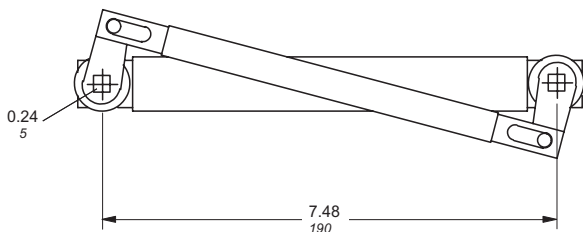
Transfer switch — OESA-ZW1, OESA-ZW1X



OESA-ZW1, OESA-ZW1X in combination with:	Minimum inches/mm	Maximum inches/mm
OT160 - OT200	4.61/117	6.57/167

NOTE: Deeper enclosures will require a longer shaft. Please select a 6mm shaft from page 18.20 or 18.23.

Mechanical interlock — OTZW10



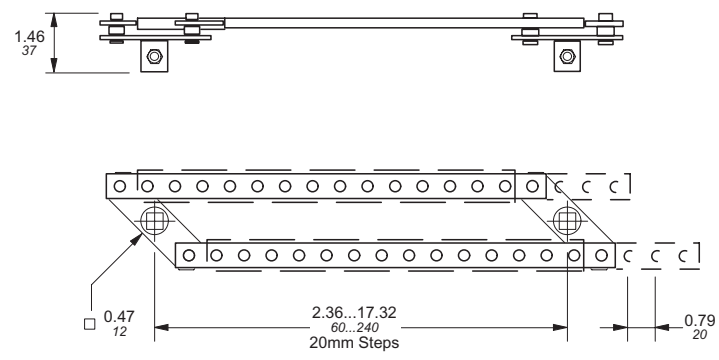
OTZW10 in combination with:	Minimum inches/mm	Maximum inches/mm
OT160 - OT200	4.13 / 105	—

NOTE: Deeper enclosures will require a longer shaft. Please select a 6mm shaft from page 18.20 or 18.23.

Approximate dimensions for 400A – 1200A conversion mechanisms

00.00 Inches
00.00 [Millimeters]

6 or 8 pole — OETL-ZW9

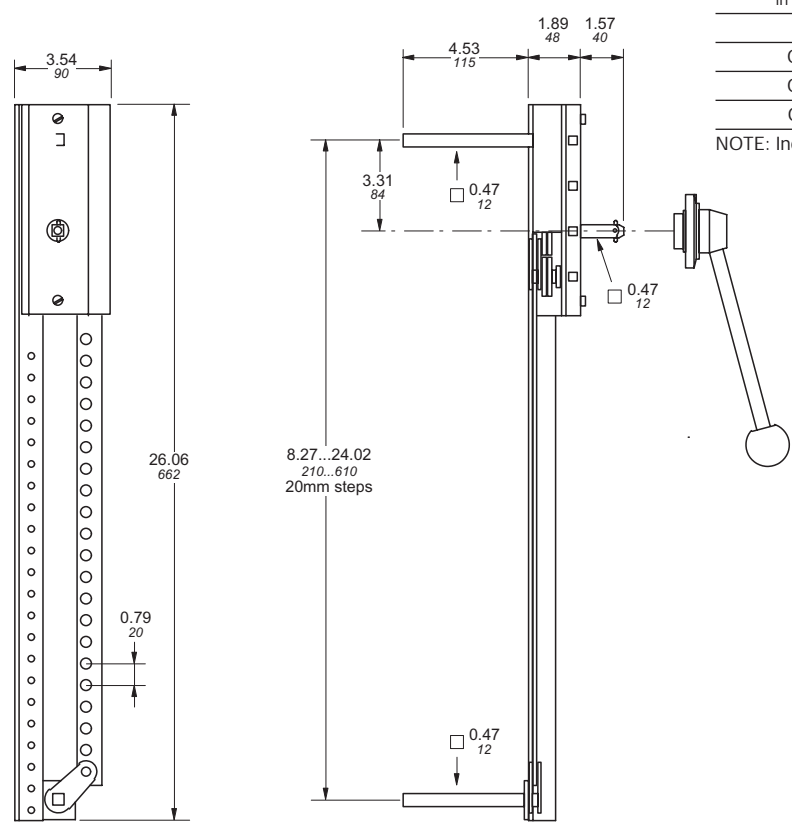


For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

OETL-ZW9 in combination with:	Minimum inches/mm	Maximum inches/mm
OT400	7.52/191	N/A
OETL-NF600A	7.52/191	N/A
OETL-NF800A	7.52/191	N/A
OETL-NF1200	7.52/191	N/A

NOTE: Handle not included

Transfer switch — OETL-ZW12



OETL-ZW12 in combination with:	Minimum inches/mm	Maximum [Ⓞ] inches/mm
OT400	8.19/208	11.73/298
OETL-NF600A	8.19/208	11.73/298
OETL-NF800A	8.19/208	11.73/298
OETL-NF1200	8.19/208	11.73/298

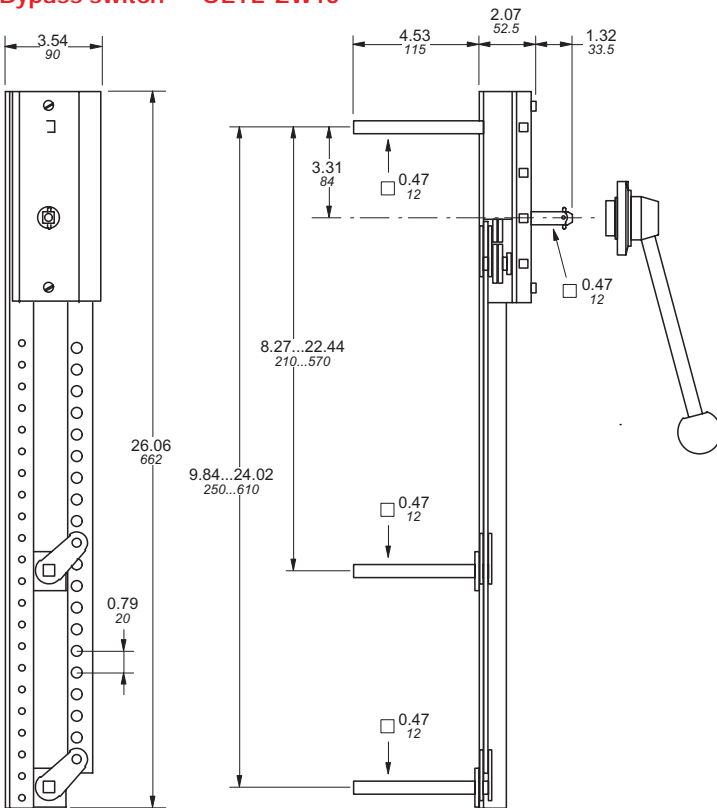
NOTE: Includes YASDA-21 handle

Ⓞ Deeper enclosures will require a longer shaft. Please select a 12mm shaft from page 18.26 and an OETL-ZX95 shaft extension coupler from pg. 18.28.

Approximate dimensions for 400A – 3150A conversion mechanisms

00.00 Inches
00.00 [Millimeters]

Bypass switch — OETL-ZW13

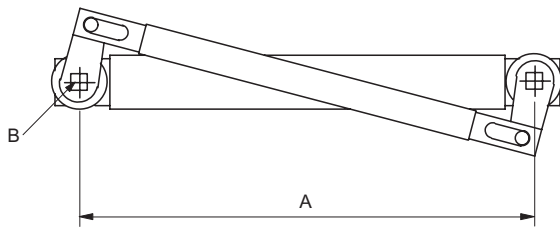


For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

OETL-ZW12 in combination with:	Minimum inches/mm	Maximum ^① inches/mm
OT400	8.19/208	11.73/298
OETL-NF600A	8.19/208	11.73/298
OETL-NF800A	8.19/208	11.73/298
OETL-NF1200	8.19/208	11.73/298

NOTE: Includes YASDA-21 handle

Mechanical interlock — OETL-ZW3, OETL-ZW14, OETL-ZW15



Dimensions in Inches
& mm

	A	B
OETL-ZW3	11.81 300.0	0.47 12.0
OETL-ZW14	9.84 250.0	0.47 12.0
OETL-ZW15	19.69 500.0	0.47 12.0

OETL-ZW3, 14 & 15 in combination with:	Minimum inches/mm	Maximum ^① inches/mm
OT400 & OETL-NF600	6.50/165	—
OETL-NF800 – OETL-NF1200	6.30/160	—
OETL-NF1600 – OETL-NF3150	12.00/305	—

NOTE: Handle(s) not included.

NOTE: OETL-ZW15 is the only mechanical interlock
OETL-NF1200 – OETL-NF3150 can use.

① Deeper enclosures will require a longer shaft. Please select a 12mm shaft from page 18.26 and an OETL-ZX95 shaft extension coupler from page 18.28.

Approximate dimensions for Handles

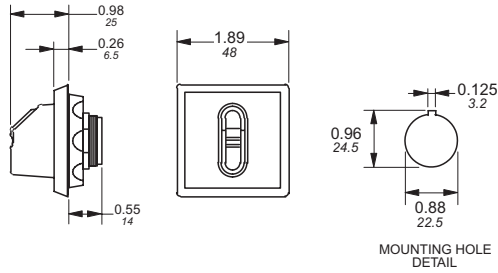


00.00 Inches
00.00 [Millimeters]

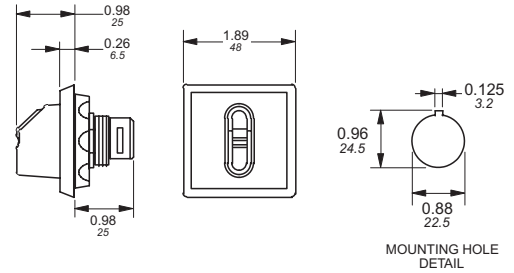
Selector handles for base and DIN rail mounted switches

Selector handles for door mounted switches

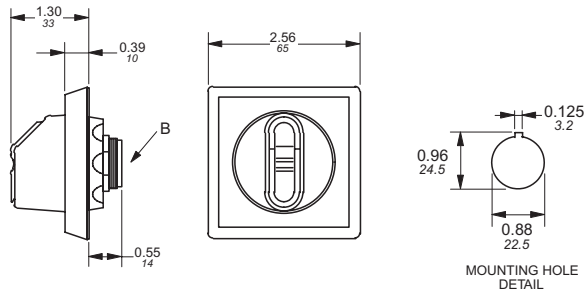
OH_1AH1 & OH_3AH1



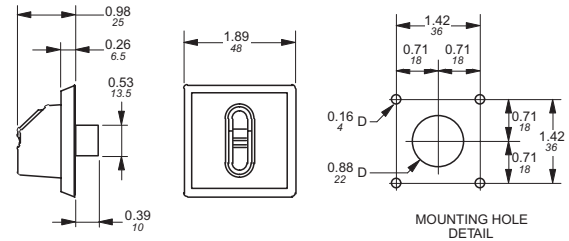
OH_1P_ & OH_3P_



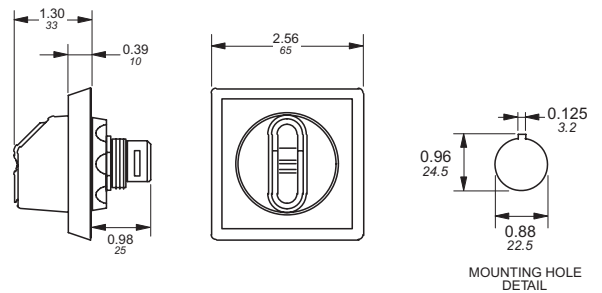
OH_2A_



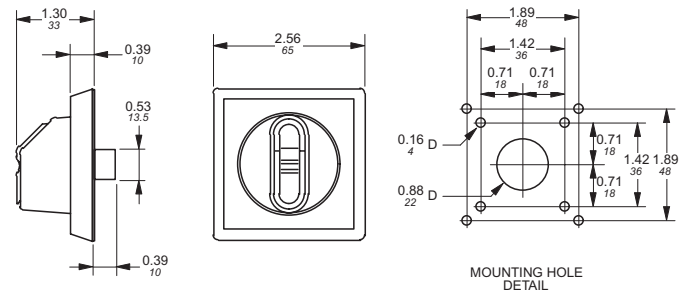
OH_1R_ & OH_3R_



OH_2P_



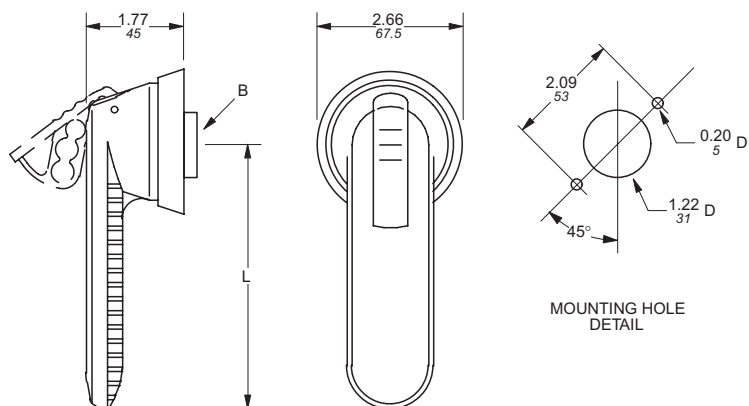
OH_2R_



Approximate dimensions for Handles

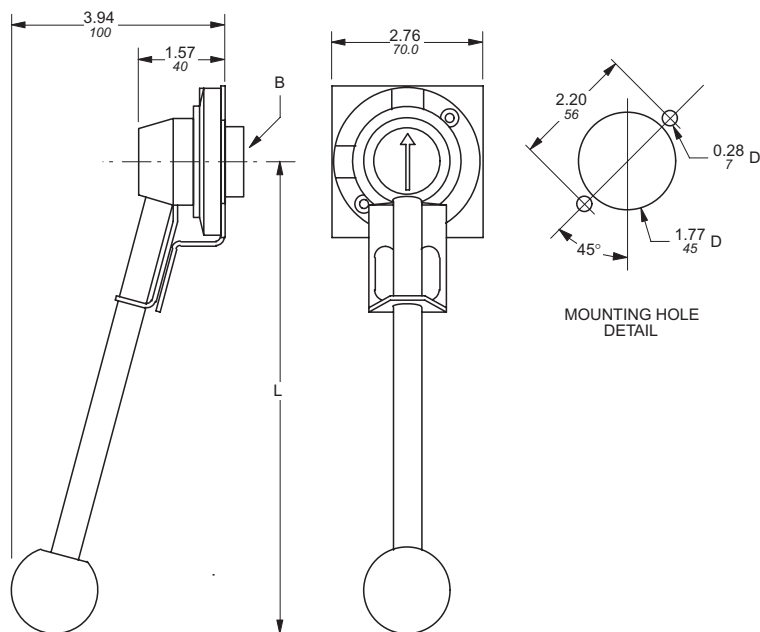
← 00.00 → Inches
00.00 → [Millimeters]

Pistol handles



A Catalog number	L Inches/ mm	□B Shaft size Inches/ mm	NEMA / UL Type
OH_45J5	1.8/45	0.20/5	1, 3R, 12
OH_65J5	2.6/65	0.20/5	1, 3R, 12
OH_45J6	1.8/45	0.24/6	1, 3R, 12
OH_65J6	2.6/65	0.24/6	1, 3R, 12
OH_80J6	3.1/80	0.24/6	1, 3R, 12
OH_65J8	2.6/65	0.31/8	1, 3R, 12
OH_80J8	3.1/80	0.31/8	1, 3R, 12
OH_125J12	4.9/125	0.47/12	1, 3R, 12
OH_145J12	5.7/145	0.47/12	1, 3R, 12
OH_175J12	6.9/175	0.47/12	1, 3R, 12
OH_65L5	2.6/65	0.20/5	1, 3R, 4, 4X, 12
OH_80L6	3.1/80	0.24/6	1, 3R, 4, 4X, 12
OH_80L8	3.1/80	0.31/8	1, 3R, 4, 4X, 12
OH_145L12	5.7/145	0.47/12	1, 3R, 4, 4X, 12
OH_175L12	6.9/175	0.47/12	1, 3R, 4, 4X, 12

__ = Handle color, B (Black) or Y (Red/Yellow)



A catalog number	L inches/mm	□B Shaft size inches/mm	NEMA Type
YASDA-7	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-8	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-21	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-6	12.60/320	0.47/12	1, 3R, 4, 4X, 12

PowerLine Fusible Disconnect switches



PowerLine
Compact, heavy duty
Fusible disconnect switches
30A – 800A, 600V

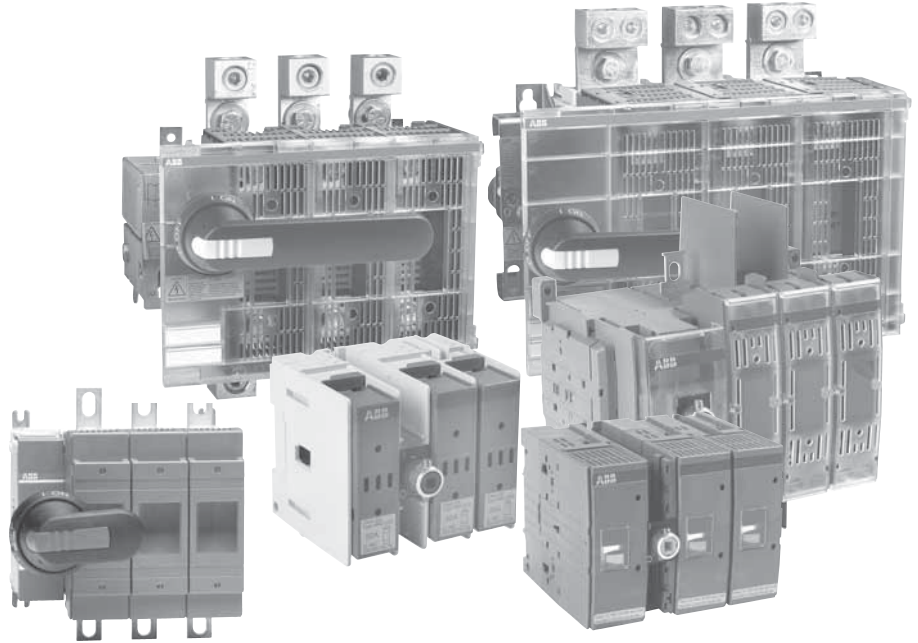
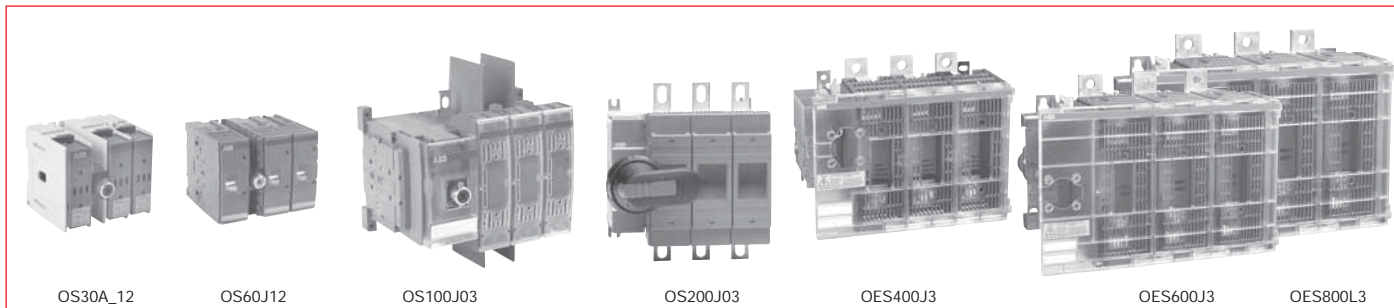


ABB PowerLine includes seven different amperage sizes from 30A to 800A. All PowerLine fusible switches are designed to meet customer requirements in terms of high interrupting capacity and long electrical life while occupying little more panel space than the appropriate fuses. The basic construction provides flexibility and high performance in an extremely compact size. ABB PowerLine switches are a perfect choice to withstand the heat and humidity of the tropics, the extreme cold of the arctic and any rugged industrial environment you may have.

General information

Selection guide

OS30ACC12 – OES800L3



Catalog number	3 pole	OS30ACC12	OS30AJ12	OS60J12	OS100J03	OS200J03	OES400J3	OES600J3	OES800L3	
General purpose amp rating	A	30	30	60	100	200	400	600	800	
Catalog reference	Page #	18.83	18.83	18.87	18.87	18.87	18.91	18.91	18.91	
Approvals ①	2 pole 3 pole 4 pole	N/A UL98 & IEC UL98 & IEC	N/A UL98 & IEC UL98 & IEC	N/A UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	
Technical ratings (UL,CSA)										
Max operating voltage	V	600	600	600	600	600	600	600	600	
Max horsepower rating	Three phase									
	200 – 208V	HP	5/7.5	5/7.5	15	25	50	100/125	150	200
	240V	HP	7.5	7.5	15	30	60	125	200	250
	480V	HP	15	15	30	60	125	250	400	500
	600V	HP	20	20	50	75	150	350	500	600
Single phase										
	120V	HP	2	2	—	—	—	—	—	
	240V	HP	3	3	—	—	—	—	—	
UL fuse class		CC	J	J	J	J	J,T	J,T	L	
Technical ratings (IEC)										
Rated insulation and operational voltage. AC20 and DC20	V	1000	1000	1000	1000	1000	1000	1000	1000	
Rated thermal current, I _n										
AC 20/DC 20 open	A	32	32	63	160	200	400	630	800	
AC 20/DC 20 enclosed	A	32	32	63	160	200	400	600	720	
AC 21A ≤500V	A	32	32	63	160	200	400	630	800	
AC 21A ≤690V	A	32	32	63	160	200	400	630	800	
Rated operational power AC23										
400/415V	kW	14/15	14/15	30	80/90	110	210/230	315/340	350/380	
690V	kW	25	25	60	132	200	330	540	600	
Physical characteristics										
Weight	3 pole switch	lb	1.54	1.54	2.86	3.30	5.9	17.18	37.44	
	4 pole	lb	1.98	1.98	3.52	3.96	7.5	19.38	46.26	
Dimension	3 pole	H in	3.66	3.60	3.94	5.67	6.5	8.90	10.10	
		W in	4.15	4.15	5.63	7.07	7.1	11.26	14.80	
		D in	4.10	4.10	5.04	5.10	5.2	8.07	9.17	
Accessories										
Double break contacts		S	S	S	S	S	S	S	S	
Fuse cover		S	S	S	S	S	S	S	S	
Terminal lug kit		Integral	Integral	Integral	OZXA-24	OZXA-200	OZXA-26	OZXA-27	OZXA-27	
Terminal shroud		Not required	Not required	Not required	•	•	•	•	•	
Auxiliary contact		•	•	•	•	•	•	•	•	
Handle UL/NEMA type										
Type 1, 3R, 12		•	•	•	•	•	•	•	•	
Type 1, 3R, 4, 4X, 12		•	•	•	•	•	•	•	•	
Conversion kit										
6 pole		•	•	•	•	•	•	•	•	
Transfer		•	•	•	•	•	•	•	•	
Bypass		—	—	•	•	•	•	•	•	
Mechanical interlock		•	•	•	•	•	•	•	•	
Electrical interlock		—	—	—	—	—	•	•	•	

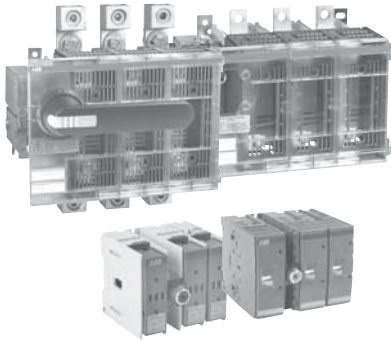
S = Standard
• = Available
— = Not available

UL listed, CSA approved, IEC rated, CE marked, CCC certified

① UL listed switches are also CSA approved.

General information

Disconnect switches
Fusible



Versatility

ABB PowerLine fusible disconnect switches are designed to offer maximum versatility in many ways.

Broad range

PowerLine is seven amperage sizes from 30A – 800A. All sizes are compact, heavy duty, 600V disconnect switches. Many sizes are available in 2, 3, 4, 6, and 8 pole configurations.

Compact size

The PowerLine's unique compact dimensions allow panel size reduction in new applications or easily retrofits into space-sensitive existing applications. The entire switch occupies little more panel space than the appropriate fuses.

International acceptance

PowerLine fusible switches are available with a wide range of fuse clip options:

UL	USA	CSA	Canada
DIN	Europe	BS	United Kingdom
NFC	France	Ultra-rapid	

As well as the corresponding approvals: UL listed, CSA approved, IEC rated, CE marked, and most other international standards.

UL98 (CSA 22.2 No.4) — UL File # E101914, CSA File #LR58077

For 30A – 800A switches, OH_ pistol grip handles

Suitable for use as motor disconnects or industrial control panel disconnects on service entrance equipment, panelboards, switchboards, industrial control equipment, motor control centers, etc. and are horsepower rated and ampere rated.

IEC

Tested in accordance to IEC 947-1 and 3, IEC 664, IEC 269, and IEC 204

CE

Compliance with the European Machine Directive IEC 204 (EN 60204)



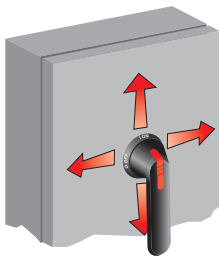
Installation options

Rotary through the door: available in all sizes, 30A – 800A

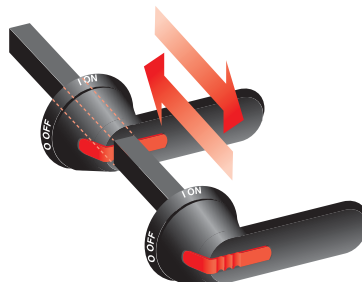
Flange: versions available in 30A to 800A sizes

A rotary disconnect switch may be installed nearly anywhere in a control panel — mounting is not limited to the upper right hand corner of the panel.

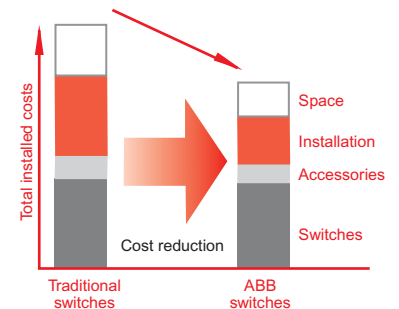
Mount the switch where it conveniently fits in your panel and simply install the handle on the door, in line with the switch. The switch and handle are mechanically linked through an easily adjusted shaft. This allows fast and easy installation into panels of different depths and layouts.



Rotary through the door installation

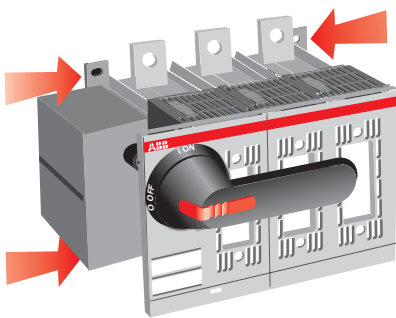


Easily adjusted shaft

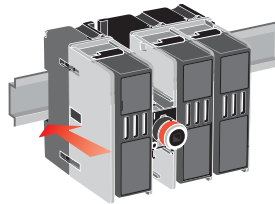


Broad range of accessories

- Handles — UL/NEMA type 1, 3R, 4, 4X, 12
IP 54, 65, 66
- Auxiliary contacts available for every switch size
- Additional terminal poles (neutrals & grounds)
- Terminal shrouds
- 6 & 8 pole mechanisms
- Transfer mechanisms
- Bypass mechanisms
- Mechanical interlock mechanisms
- Electro-mechanical interlock mechanisms
- Motor operators



Base mounting with screws



DIN rail mounting

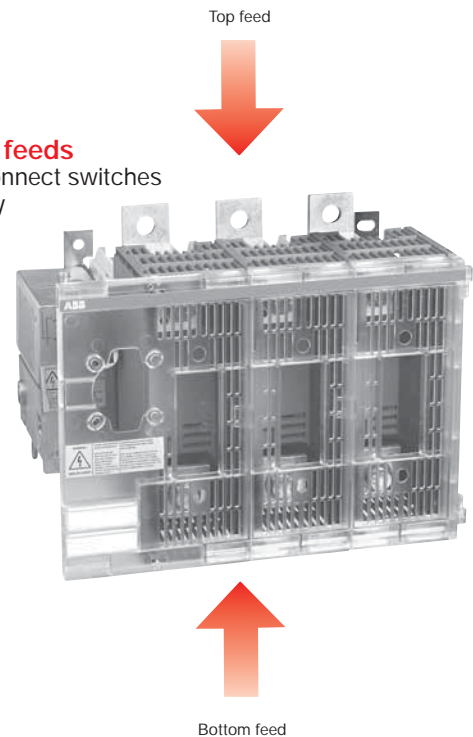
Mounting

PowerLine disconnect switch mounting possibilities:

- DIN rail mounting — OS30, OS60 & OS100
- Base mounting with screws

Incoming power feeds

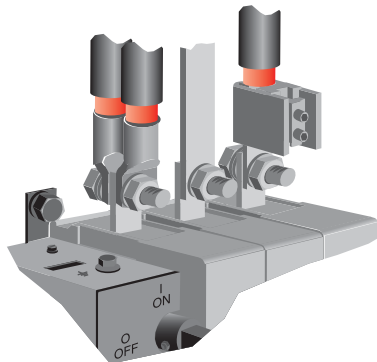
All PowerLine disconnect switches can be used equally well with either top or bottom incoming power feeds.



Terminal connections

18 Versatile connecting possibilities, 100A – 800A:

- Ring tongue crimp on lugs
- Direct bus
- Terminal lugs

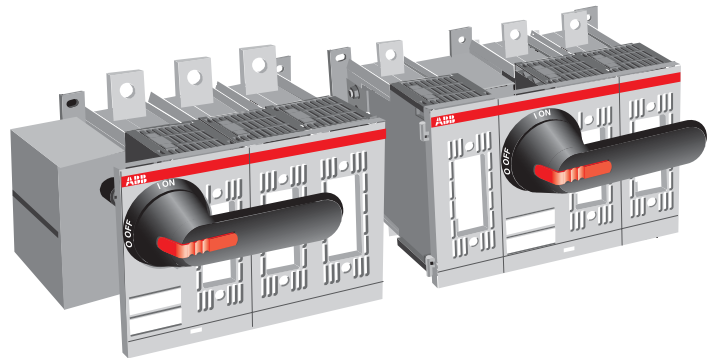
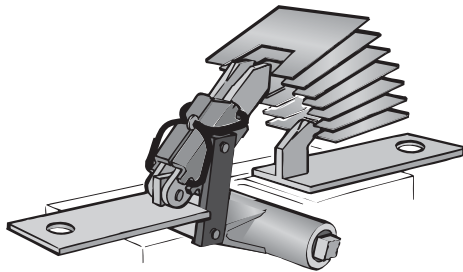


General information

Disconnect
switches
Fusible

High performance

The mechanism is quick-make/quick-break, meaning the contacts operate independently of the speed and force at which the handle is operated. This, in combination with unique, patented self-cleaning contacts, provides a long, reliable, electrical life.

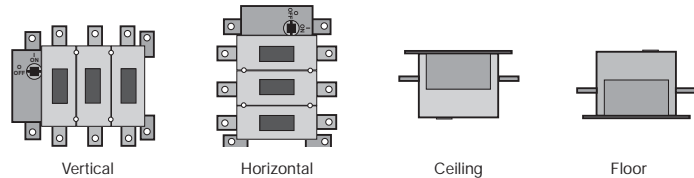


Modular construction^①

Modular switch construction allows the operating mechanism to be placed at either end of the switch or anywhere in-between, 100A – 800A.

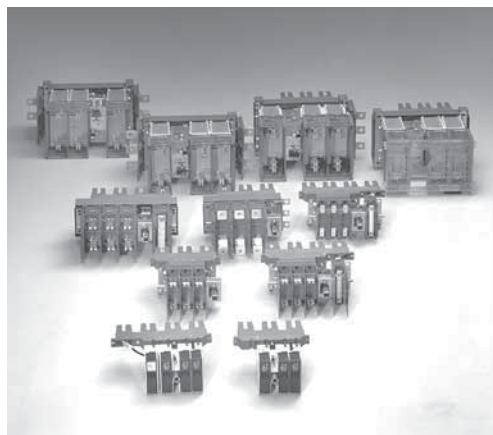
Mounting positions

PowerLine disconnect switches may be mounted in any position:

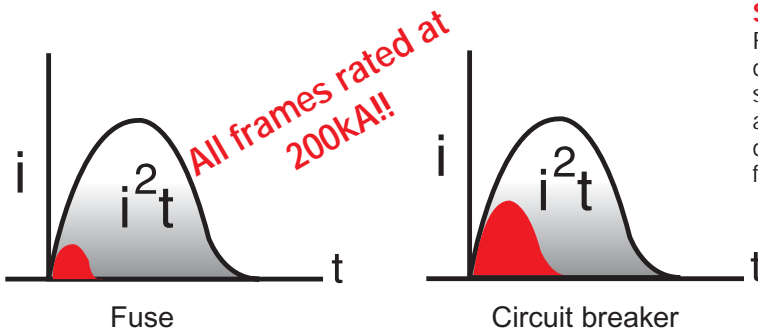


Unique terminal locations^①

- Side connections
- Rear connections
- Bus stabs



^① Please consult ABB sales office for additional information



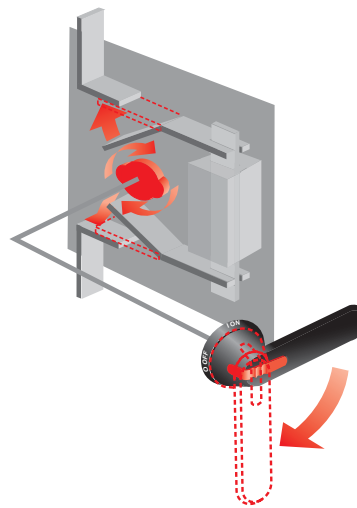
Superior short circuit protection

Fuses efficiently limit the peak let-through current, i^2t , during a fault better than any other product, contributing to safety and reliability. Selectivity and coordination are easily accomplished with fused protection. PowerLine fusible disconnect switches accept a wide range of North American fuses:

Class CC	30A
Class J	30A – 600A
Class L	800A
Class T	400A – 800A

Fuse isolation

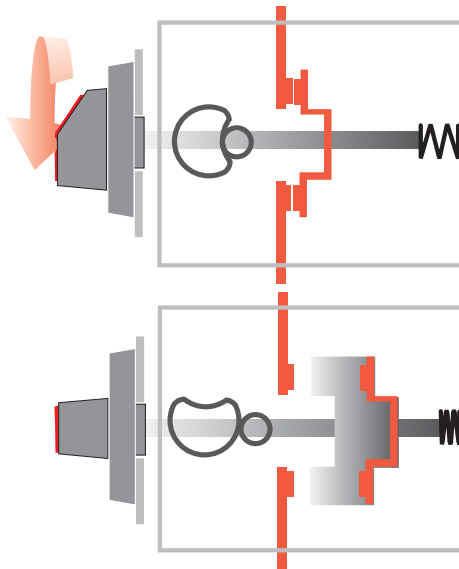
PowerLine switches contain contacts on both sides of the fuse. The fuses are totally isolated in the "OFF" position, reducing the risk of shock to authorized personnel — even if the switch has been back fed.



Fuse isolation

Finger proof

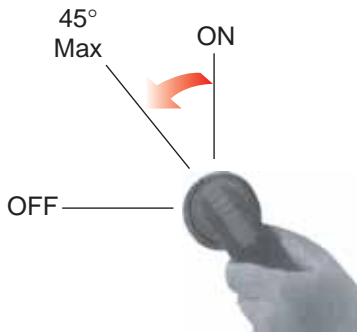
Dead-front construction plus terminal shrouds reduce the risk of touching live parts, improving the safety and reliability of the installation.



Positive opening operation

Positive opening operation

All switches operate according to the "positive opening operation" principle. This means the contacts are opened and closed by a driven mechanism, a solid moving bridge, not merely springs. This provides reliable position indication to the user; if the switch is in the "OFF" position, the contacts are open.



Welded contact protection

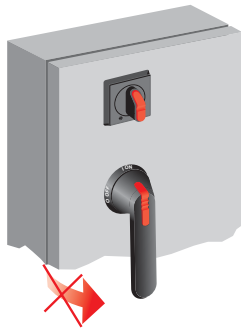
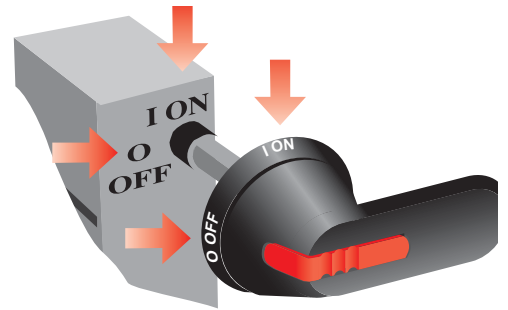
Positive opening operation safeguards users in case of welded contacts due to an overload or short circuit.

The switch can not reach the "OFF" position unless the contacts are truly open. If any or all of the contacts are welded shut, the switch mechanism will only allow the handle to operate a maximum of 45°. This safeguards personnel by:

- alerting them a problem has occurred
- maintaining the door interlock and
- not allowing a padlock to be inserted.

Clear position indication

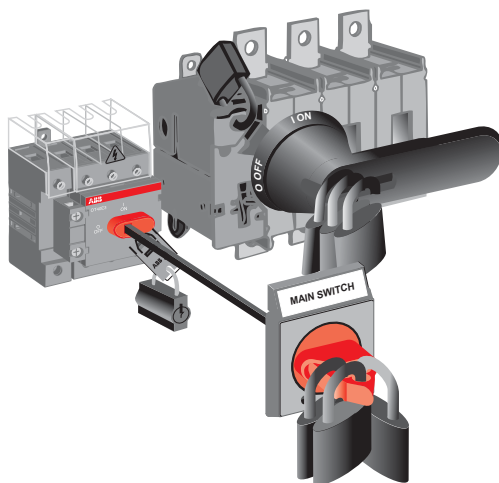
All switches and handles have clear "ON" and "OFF" designations. Whether the door is open or closed, it is possible to simply look at the switch and determine if the switch is "ON" or "OFF".



Door interlock

Door interlock

The handle and shaft provide door interlock, the door can not be opened when the switch is in the "ON" position. NOTE: Some handles provide a method for qualified personnel to circumvent the door interlock. This is commonly referred to as a "defeater" mechanism.



Handle and mechanism padlocked OFF

Padlockable

Handles can be padlocked in the "OFF" position with up to three padlocks; additionally, the switch mechanism can be directly padlocked in the "OFF" position when the door is open. NOTE: Some handles can be ordered with the ability to padlock in both the "ON" & "OFF" positions. Please consult your ABB sales office for ordering information.

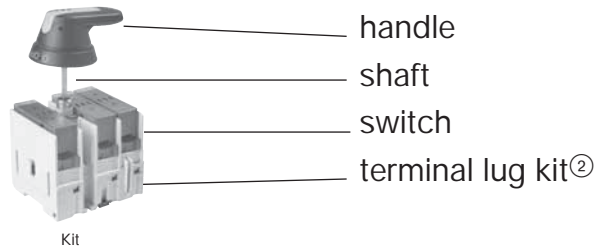
Track resistant material

Excellent track resistant material, CTI > 600V, IEC 112, reduces the risk of flashover between phases in even the most severe circumstances.

Kits

30A – 800A, 600V, 3 pole ①
UL fuse class J, CC, T, L

- Each kit includes:
- 1 three pole switch
 - 1 handle
 - 1 shaft
 - 1 terminal lug kit



Kits with selector handles

UL general purpose amp rating	UL Fuse type 600V	Maximum horsepower rating					Kit catalog number	List price
		Three phase						
		200V	208V	240V	480V	600V		
30	J	5	7.5	7.5	15	20	OSJ30B2A1-180	\$ 314
30	CC	5	7.5	7.5	15	20	OSC30B2A1-180	314

Kits with pistol handles

UL general purpose amp rating	UL Fuse type 600V	Maximum horsepower rating					Kit catalog number	List price
		Three phase						
		200V	208V	240V	480V	600V		
30	J	5	7.5	7.5	15	20	OSJ30B6-150	\$ 374
30	CC	5	7.5	7.5	15	20	OSC30B6-150	374
60	J	15	15	15	30	50	OSJ60B6-150	472
100	J②	25	25	30	60	75	OSJ100B8-150	646
200	J	50	50	60	125	150	OSKJ200B8-290	1566
400	J②	100	125	125	250	350	OSJ400B4-280	2176
600	J②	150	150	200	400	500	OSJ600B4-280	3406
800	L	200	200	250	500	600	OSL800B4-280	5266

Components for kits with selector handles

Kit catalog number	Switch		Handle ④			Shaft			Terminal lugs		
	Catalog number	NEMA type	Marking	Handle Defeat-able	Mounting catalog number	Length depth⑤ (inches)	Shaft (inches/mm)	Catalog number	Wire size	Wire type	Catalog number
OSJ30B2A1-180	OS30AJ12	1, 3R, 12	I/O & Off/On	—	OHB2AJ1	6.3 - 9.5	7.1/180	OXS5X180	#18 - 8	Cu	Integral
OSC30B2A1-180	OS30ACC12	1, 3R, 12	I/O & Off/On	—	OHB2AJ1	6.3 - 9.5	7.1/180	OXS5X180	#18 - 8	Cu	Integral

Components for kits with pistol handles

Kit catalog number	Switch		Handle ④			Shaft			Terminal lugs		
	Catalog number	NEMA type	Marking	Handle Defeat-able	Mounting catalog number	Length depth⑤ (inches)	Shaft (inches/mm)	Catalog number	Wire size	Wire type	Catalog number
OSJ30B6-150	OS30AJ12	1, 3R, 12	I/O & Off/On	Yes	OHB65J5	5.3 - 8.3	5.9/150	OSP5X150	#18 - 8	Cu	Integral
OSC30B6-150	OS30ACC12	1, 3R, 12	I/O & Off/On	Yes	OHB65J5	5.3 - 8.3	5.9/150	OSP5X150	#18 - 8	Cu	Integral
OSJ60B6-150	OS60J12	1, 3R, 12	I/O & Off/On	Yes	OHB65J6	5.5 - 8.5	5.9/150	OSP6X150	#14 - 4	Cu	Integral
OSJ100B8-150	OS100J03	1, 3R, 12	I/O & Off/On	Yes	OHB80J6	5.5 - 8.5	5.9/150	OSP6X150	#14 - 2/0	Cu/Al	OZXA-24
OSKJ200B8-290	OS200J03	1, 3R, 12	I/O & Off/On	Yes	OHB80J6	10.5 - 12.7	11.4/290	OSP6X290	#6 - 300kcmil	Cu/Al	OZXA-200
OSJ400B4-280	OES400J3	1, 3R, 12	I/O & Off/On	Yes	OHB145J12	7.9 - 12.2	11.0/280	OSP12X280	#2 - 600kcmil	Cu/Al	OZXA-26
OSJ600B4-280	OES600J3	1, 3R, 12	I/O & Off/On	Yes	OHB145J12	11.2 - 14.0	11.0/280	OSP12X280	(2) #2 - 600kcmil	Cu/Al	OZXA-27
OSL800B4-280	OES800J3	1, 3R, 12	I/O & Off/On	Yes	OHB145J12	11.2 - 14.0	11.0/280	OSP12X280	(2) #2 - 600kcmil	Cu/Al	OZXA-27

If other handles or shafts are desired, please order from the individual component pages 18.83 – 18.92.

① Other pole configurations available. Please see the individual component pages.
 ② 30A and 60-A fusible switches include standard integral terminal lugs.
 ③ J type fuse clips are standard. If 600V Type "T" fuse clips are desired, please select a fuse adapter kit from the individual component pages.
 ④ All handles are black and accept three padlocks. For others, please see the individual component pages.
 ⑤ Mounting depth is the distance from the outside of the door to the disconnect switch mounting plate. Shaft can be cut to desired length.

30A, Base & DIN rail mounted UL fuse Class J,CC

Disconnect
switches
Fusible

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft



OS30AJ12



OXS5X180



OHB2AJ1



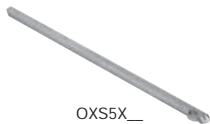
OS30A_12



OHB2_



OHY2_



OXS5X_

30 Amp switches, 600V

UL general purpose amp rating	UL Fuse type 600V	Maximum horsepower rating					Terminal lugs		Catalog number	List price
		Three phase					Wire size	Wire type		
		200V	208V	240V	480V	600V				
3 pole										
30	J	5	7.5	7.5	15	20	#18 - 8	Cu	3 pole OS30AJ12 OS30ACC12	\$ 280
30 ^⓪	CC	5	7.5	7.5	15	20	#18 - 8	Cu		
4 pole										
30	J	5	7.5	7.5	15	20	#18 - 8	Cu	4 Pole OS30AJ22F OS30ACC22F	350
30 ^⓪	CC	5	7.5	7.5	15	20	#18 - 8	Cu		

Selector handles — for use with shafts \square .20 x .20" (\square 5 x 5 mm)

UL/NEMA type	IEC type	Color	Defeat- able	Padlock- able	Weight (lbs.)	Catalog number	List price
AI							
1,3R,12	IP65	Black	—	Yes	0.16	OHB2AJ1	\$ 28
1,3R,12	IP65	Red/Yel	—	Yes	0.16	OHY2AJ1	28
1,3R,12	IP65	Blk	Yes	Yes	0.16	OHB2AJ	30
1,3R,12	IP65	Red/Yel	Yes	Yes	0.16	OHY2AJ	30

Shafts — for use with OH_2_ selector handles \square .20 x .20" (\square 5 x 5 mm)

Shaft length (inches/mm)	Mounting depth ^⓪ (in inches)	Weight (lbs.)	Catalog number	List price
3.3/85	5.5 - 5.7	0.04	OXS5X85	\$ 4
4.1/105	5.5 - 6.5	0.04	OXS5X105	4
4.7/120	5.5 - 7.1	0.05	OXS5X120	4
5.1/130	5.5 - 7.5	0.05	OXS5X130	6
7.1/180	6.3 - 9.4	0.08	OXS5X180	6
9.8/250	9.1 - 12.2	0.10	OXS5X250	12
13.0/330	12.2 - 15.4	0.14	OXS5X330	20

^⓪ Rejection style fuses only.

30A, Base & DIN rail mounted Handles & shafts

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft



OS30AJ12



OXP5X170



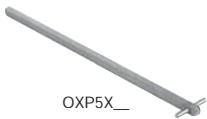
OHB65J5



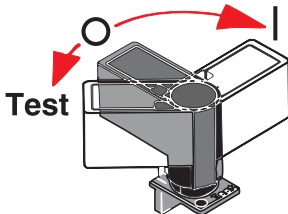
OHB_J5



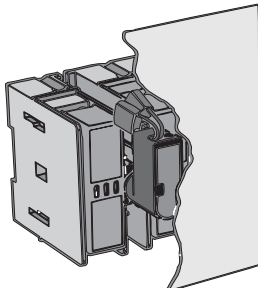
OHY_J5



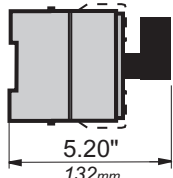
OXP5X_



OHB5



OHB5 Mounted




OHB5 Mounted depth

Pistol handles — for use with shafts $\square .20 \times .20$ " ($\square 5 \times 5$ mm)

UL/NEMA type	IEC type	Color	Marking	Length inches/mm	Defeat-able	Padlock-able	Weight (lbs.)	Catalog number	List price
1,3R,12	IP65	Black	O/I & Off/On	1.8/45	Yes	Yes	0.28	OHB45J5	\$ 70
1,3R,12	IP65	R/Y	O/I & Off/On	1.8/45	Yes	Yes	0.28	OHY45J5	70
1,3R,12	IP65	Black	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHB65J5	80
1,3R,12	IP65	R/Y	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHY65J5	80
1,3R,4,4X,12	IP65	Black	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHB65L5	120
1,3R,4,4X,12	IP65	R/Y	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHY65L5	120
1,3R,12	IP65	Black	Off/On/Test	2.6/65	Yes	Yes	0.29	OHB65J5T ①	100
1,3R,12	IP65	R/Y	Off/On/Test	2.6/65	Yes	Yes	0.29	OHY65J5T ①	100

Shafts — for use with pistol handles $\square .20 \times .20$ " ($\square 5 \times 5$ mm)

Shaft length (inches/mm)		Mounting depth (in inches)	Weight (lbs.)	Catalog number	List price
5.9/150		4.9 – 8.9	0.07	OXP5X150	\$ 14
6.7/170		5.9 – 9.7	0.08	OXP5X170	16
10.4/265		9.5 – 13.4	0.12	OXP5X265	18
15.8/400		15.0 – 18.7	0.18	OXP5X400	30
19.7/500		20.5 – 22.6	0.23	OXP5X500	42

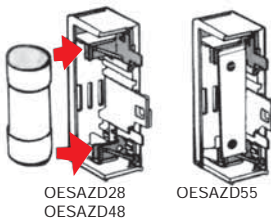
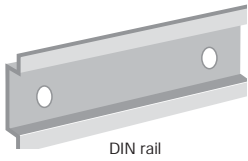
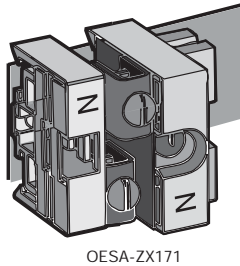
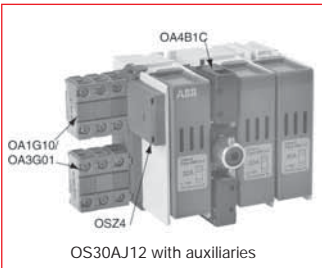
Direct mount handle — mounts directly to switch, no shaft necessary

UL/NEMA type	Color	Marking	Length mm	Padlockable	Weight (lbs.)	Catalog number	List price
1	Blk	O/I/Test	50	Yes	0.10	OHB5	\$ 60

① The OS30_ switch has a TEST position, accessed by rotating the mechanism 45° counterclockwise from the OFF position. In the TEST position, optional auxiliary contacts, OA4B1C, are actuated but the main switch contacts are not.

30A, Base & DIN rail mounted Accessories

Disconnect switches
Fusible



Auxiliary contacts ①

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Form C 1 N.O. & 1 N.C. (2 maximum)	OS30_ for direct mounting to switch	0.04	6	250	OA4B1C	\$ 40
1 N.O. 1 N.C. (6 maximum)	OS30_ OSZ4 mounting base required	0.03	NEMA A600,P600		OA1G10 OA3G01	20

Mounting base

Description	For use with:	Weight (lbs)	Catalog number	List price
Mounting base	OA1G10, OA3G01	0.08	OSZ4	\$ 20

Terminal pole

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Detachable neutral mounts on side of switch or DIN rail	OS30_	0.45	30	600	OESA-ZX171	\$ 40

DIN rail

Description	For use on:	Weight (lbs.)	Length inches/mm	Catalog number	List price
35mm DIN Rail	OS30_	2.96	39.4/1000	DIN RAIL	\$ 52

Fuse carriers (replacement part)

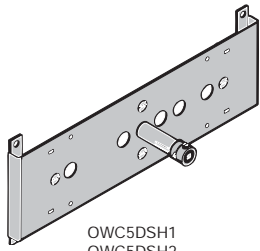
Description	For use on:	Catalog number	List price
CC fuse carrier J fuse carrier	OS30CC_ OS30AJ_	OESAZD48 OESAZD28	\$ 50
Solid link carrier ^②	OS30_	OESAZD55	

Terminal cover (replacement part)

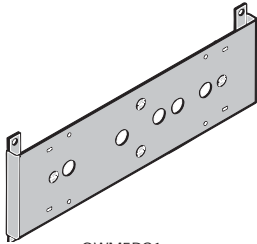
Description	For use on:	Catalog number	List price
Covers terminal below fuse carrier	OS30_	CXBY67121	\$ 10

① UL File # E83510
② Solid link installed in carrier.

30A, Base & DIN rail mounted Accessories



OWC5DSH1
OWC5DSH2



OWM5DS1
OWM5DS2
OWP5DS1
OWP5DS2

Conversion mechanisms

- Switches are not included

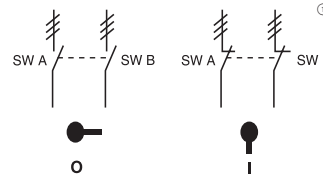
Description	For use on:	Weight (lbs)	UL/NEMA type	Catalog number	List price
6 pole	OS30A_12	1.74	—	OWP5DS1	\$ 220
8 pole	OS30A_22	1.90	—	OWP5DS2	240
Transfer					
3 pole	OS30A_12	2.11	1,3R,12	OWC5DSH1	300
3 pole	OS30A_12	2.11	1,3R,4,4X,12	OWC5DSH1X	340
4 pole	OS30A_12	2.30	1,3R,12	OWC5DSH2	300
4 pole	OS30A_22	2.30	1,3R,4,4X,12	OWC5DSH2X	340
Mechanical interlock					
3 pole	OS30A_12	1.74	—	OWM5DS1	190
4 pole	OS30A_22	1.90	—	OWM5DS2	190

6 or 8 pole — OWP5DS1, OWP5DS2

6 (8) pole mechanism allows two switches, controlled by one handle, to open or close simultaneously.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.83)
- One handle (see pg. 18.83 – 18.84)
- One 5 mm shaft (see pg. 18.83 – 18.84)



	POS. O	POS. I
SW. A	O	X
SW. B	O	X

X = Closed
O = Open

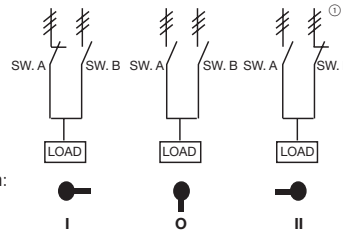
Transfer — OWC5DSH1, OWC5DSH2, OWC5DSH1X, OWC5DSH2X

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position. A 3 position handle is included.

OHB65J5E011 (UL Type 1,3R,12) or
OHB65L5E011 (UL Type 1,3R,4,4X,12)

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.83)
- One 5 mm shaft (see pg. 18.84)



	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

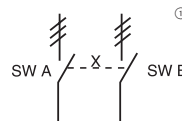
X = Closed
O = Open

Mechanical interlock — OWM5DS1, OWM5DS2

Mechanical interlock mechanism prevents both switches from being in the "ON" position at the same time.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (from pg. 18.83)
- Two handles (from pgs. 18.83 – 18.84)
- Two 5 mm shafts (from pgs. 18.83 – 18.84)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

① = Three poles

Drawing and mounting information found on pg 18.122

60A – 200A

Base & DIN rail mounted

UL fuse class J, T



For a complete assembly, please select one of each:

- 1 switch
- 1 handle
- 1 shaft
- 1 terminal lug kit



OS60J12



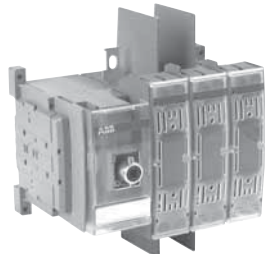
OXP6X210



OHB65J6



OS60J12



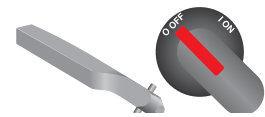
OS100J03



OHB__J6



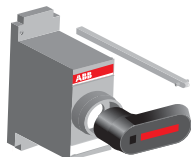
OXP6X__



OXP6X__-45



OHB4



OSV250

60 – 200 Amp switches, 600V

UL general purpose amp rating	UL Fuse type 600V	Maximum horsepower rating					Catalog number	List price
		Three phase						
		200V	208V	240V	480V	600V		
2 pole								
200	J	—	—	—	—	—	OS200J02 OS200J11	\$ 1240
3 pole								
60	J	15	15	15	30	50	OS60J12	380
100	J	25	25	30	60	75	OS100J03	520
200	J	50	50	60	125	150	OS200J03	1380
200	J	50	50	60	125	150	OS200J12	1380
4 pole								
60	J	15	15	15	30	50	OS60J22F	490
100	J	25	25	30	60	75	OS100J04F	660
200	J	50	50	60	125	150	OS200J04	1725
200	J	50	50	60	125	150	OS200J13	1725
200	J	50	50	60	125	150	OS200J22	1725

Pistol handles — □ .24 x .24" (□ 6 x 6mm)

UL/NEMA type	IEC type	Color	Length in/mm	Marking	De-featable	Pad-lockable	Weight (lbs.)	Catalog number	List price
1,3R,12	IP65	Black	2.6/65	O/I & Off/On	Yes	Yes	0.29	OHB65J6	\$ 80
1,3R,12	IP65	Red/Yel	2.6/65	O/I & Off/On	Yes	Yes	0.29	OHY65J6	80
1,3R,12	IP65	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80J6	90
1,3R,12	IP65	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80J6	90
1,3R,4,4X,12	IP65	Black	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHB80L6	130
1,3R,4,4X,12	IP65	Red/Yel	3.1/80	O/I & Off/On	Yes	Yes	0.30	OHY80L6	130

Shafts — □ .24 x .24" (□ 6 x 6mm)

Shaft length (inches/mm)	Mounting depth (inches)	Weight (lbs.)	Catalog number	List price
5.9/150	5.0 – 8.5	0.09	OXP6X150	\$ 12
8.3/210	7.4 – 11.0	0.13	OXP6X210	16
11.4/290	10.5 – 14.0	0.18	OXP6X290	20
14.2/360	13.3 – 16.8	0.23	OXP6X360	24
16.9/430	16 – 19.7	0.27	OXP6X430	28

Twisted shafts — Rotates handle 45° □ .24 x .24" (□ 6 x 6mm)

Shaft length (inches/mm)	Mounting depth (inches)	Weight (lbs.)	Catalog number	List price
5.1/130	4.3 – 7.8	0.08	OXP6X130-45	\$ 12
8.3/210	7.4 – 11.0	0.13	OXP6X210-45	16
11.4/290	10.5 – 14.0	0.18	OXP6X290-45	20
14.2/360	13.3 – 16.8	0.23	OXP6X360-45	24

Direct mount handle — mounts directly to switch, no shaft necessary

For use on	Color	Marking	Length mm	Padlockable	Weight (lbs.)	Catalog number	List price
OS60 - OS100	Black	O/I	50	Yes	0.10	OHB4	\$ 60
OS200	Black Red/Yel	O/I	—	Yes	0.30	OSV200BK OSVY200BK	130

60A – 200A Accessories



OZXA-24



OA1G10, OA3G01



OSC60J1

CXBY68362



OSS160T3



OHZX10



OEA28



OSS200G1S/3



OSS200G1L/3

Terminal lug kits – OS60 & OS100

For use on:	Wire size	Kit weight (lbs)	Wire type	Terminal lugs per kit	Catalog number	List price
OS60J_	#14 – 4	—	Cu	—	Integral	—
OS100J_	#14 – 2/0	0.43	Cu/Al	6	OZXA-24	\$ 24

Terminal lug kits – OS200

For use on	Wire size	Wire type	Description	Lugs /kit	Catalog number	List price
OS200_	#4 - 300kcmil	Cu /Al	—	6	OZXA-200	\$ 80
	#4 - 300kcmil		—	3	OZXA-200/3P	40
	(6) 14-6 AWG		Distribution lug	3	OZXA-206	180

Auxiliary contacts

Description	For use on:	Weight	Catalog number	List price
1 N.O. 1 N. C.	OS60 - OS100	.07	OA1G10 OA3G01	\$ 20
1 N.O. 1 N. C.				

Module for auxiliary contacts

Description	Weight	Catalog number	List price
Screw mounting to the left side of the switch	0.1	OEA28	\$ 50

Mounting on the left side of the switch :Max 8 auxiliary contact blocks with the OEA28 module
Mounting under the mechanism cover: Max 4 auxiliary contact blocks

Replacement parts

Description	For use on:	Catalog number	List price
Removable fuse carrier	OS60J12	OSC60J3	\$ 60
	OS60J22F	OSC60J4	80
Transparent fuse cover	OS100	CXBY68362	20
Fuse cover	OS200	CXBY68674	20
Phase barrier		CXBY68794	15

Terminal shrouds

For use on:	Description	Number of poles	Weight lbs	Catalog number	List price
OS100		1	0.04	OSS160T1	\$ 20
		3		OSS160T3	60
OS200_	Long type	3	0.20	OSS200G1L/3	50
	Short type	3	0.13	OSS200G1S/3	50
	Long type	4	0.26	OSS200G1L/4	65
	Short type	4	0.18	OSS200G1S/4	61

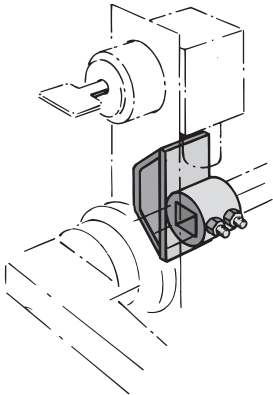
Snap-on mounting, grey plastic, IP3X Transparent shrouds available on request.

Shaft Guide

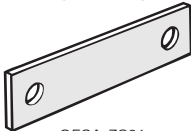
Description	Catalog number	List price
Fits all pistol grip handles, mounts on the inside of the enclosure door with provided hardware	OHZX10	\$ 12

60A – 200A Accessories

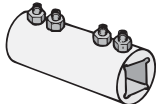
Disconnect
switches
Fusible



OETL-ZW16



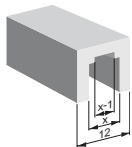
OESA-ZS36



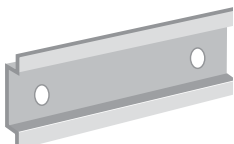
OESA-ZX167
OETL-ZX95



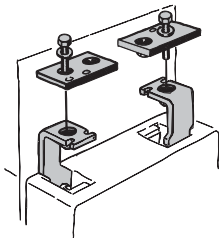
OSZ1



OETL-ZK19
(X=6MM)



DIN rail



OESA-ZX1-J1T6

Locking accessories

Description	For use on:	Weight (lbs)		Catalog number	List price
Cam attachment for Kirk Key, Castell, Lowe & Fletcher and Ronis interlock. Cam attachment for adapting to the interlock system. The interlock is not included.	OS60 – OS200	0.25		OETL-ZW16	\$ 190

Shorting bars

Description	For use on:		AC thermal amp rating	AC rated voltage	Catalog number	List price
Dummy fuse	OS60		60	600	OESA-ZD54	\$ 50
Solid links: Metal strap	OS100		100	600	OESA-ZS36	24
	OS200		400	600	OESA-ZK98	23

Shaft extension coupler

Description	For use on:	Weight (lbs)			Catalog number	List price
Joins two shafts together for applications where extended length is required	6mm shafts	0.26			OESA-ZX167	\$ 56
	12mm shafts	0.26			OETL-ZX95	100

Shaft adapter

Description	For use on:	Weight (lbs)			Catalog number	List price
Adapts one end of a 6mm shaft to 12mm. Use with shaft extension coupler	6mm shafts	0.20			OETL-ZK19	\$ 40

Terminal poles

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Detachable neutral mounts on side of switch or DIN rail	OS60	0.13	63	600	OSZ1	\$ 50
	OS100	0.31	125	600	OSZ2	50
	OS200	.88	200	600	OXN250	①

DIN rail

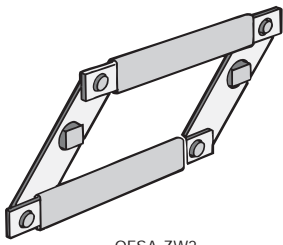
Description	For use on:	Weight (lbs.)	Length inches/mm	Catalog number	List price
35mm DIN Rail	OS60	2.36	39.4/1000	DIN RAIL	\$ 52

"T" type fuse adapter kit

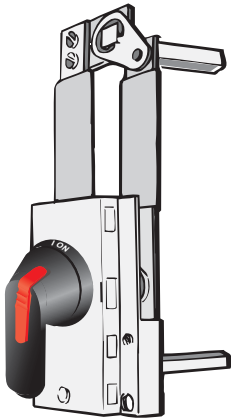
Description	For use on:		Catalog number	List price
100A, 600V, 3 pole	OS100		OS100-J1T6	\$ 60

① Consult factory.

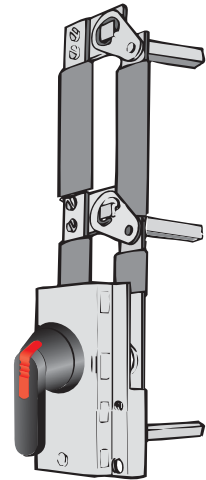
60A – 200A Accessories



OESA-ZW2



OESA-ZW1



OTZW26



OTZW10

Conversion mechanisms

- Switches are not included

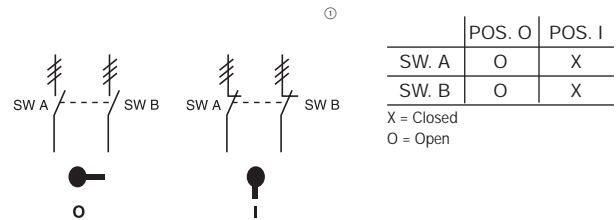
Description	For use on:	Weight (lbs)	UL/NEMA type	Catalog number	List price
6 and 8 pole	OS60 – OS200	1.52	—	OESA-ZW2	\$ 220
Transfer	OS60 – OS100	2.20	1,3R,12	OESA-ZW1	300
Transfer	OS60 – OS100	2.20	1,3R,4,4X,12	OESA-ZW1X	340
Mechanical interlock	OS60 – OS200	0.55	—	OTZW10	100
Transfer	OS200	6.17	1,3R,12	OTZW25	790
Transfer	OS200	6.17	1,3R,4,4X,12	OTZW25X	840
Bypass	OS200	7.28	1,3R,12	OTZW26	950

6 or 8 pole — OESA-ZW2

6 (8) pole mechanism allows two switches controlled by one handle, to open or close simultaneously. OHB145J12 handle included.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.87)



Transfer — OESA-ZW1, OESA-ZW1X, OTZW25, OTZW25X

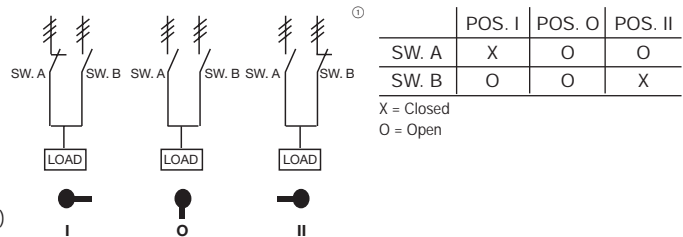
Transfer mechanism manually transfers between two power sources using two switches and a center OFF position. A 3-position handle is included.

- OHB145J12E011 (UL Type 1,3R,12) or OHB145L12E011 (UL Type 1,3R4,4X,12)

Shafts included.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.87)



Bypass — OTZW26

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass.

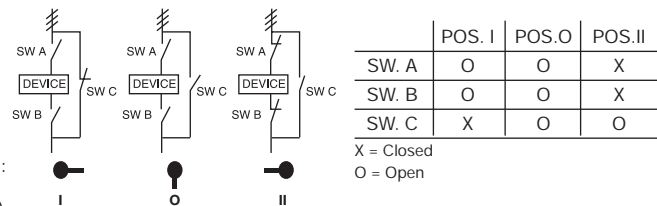
A 3-position handle is included:

- OHB145J12E011 (Type 1,3R & 12) or OHB145L12E011 (Type 1, 3R, 4, 4X, 12)

Shafts included.

Equipment required for a complete installation:

- One conversion mechanism
- Three disconnect switches (see page 18.87)

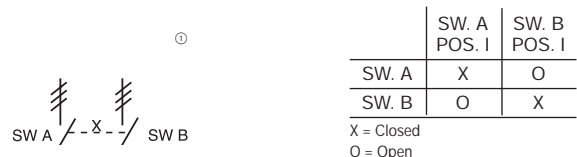


Mechanical interlock — OTZW10

Mechanical interlock mechanism prevents both switches from being in the "ON" position at the same time.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.87)
- Two handles (see pg. 18.87)
- Two shafts (see pg. 18.87)



① ≡ = Three poles

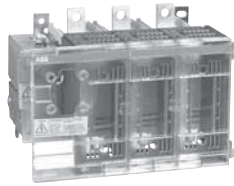
Drawing and mounting information found on pg 18.123

400A – 800A UL fuse class J, T, L

Disconnect
switches
Fusible

For a complete assembly,
please select one of each:

- 1 switch
- 1 handle
- 1 shaft
- 1 terminal lug kit



OES400J3



OXP12X280



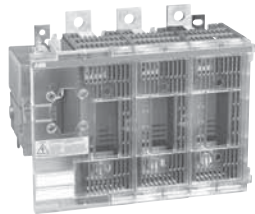
OHB145J12



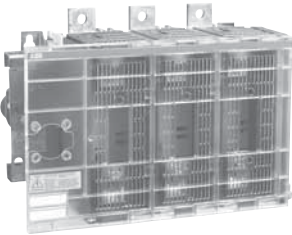
OZXA-26

200 – 800 Amp switches, 600V

UL general purpose amp rating	UL Fuse type 600V	Maximum horsepower rating					Catalog number	List price
		Three phase						
		200V	208V	240V	480V	600V		
2 pole								
400	J	—	—	—	—	—	OES400J2	\$ 1680
600	J	—	—	—	—	—	OES600J2	2600
800	L	—	—	—	—	—	OES800L2	4280
3 pole								
400	J	100	125	125	250	350	OES400J3	1860
600	J	150	150	200	400	500	OES600J3	2900
800	L	200	200	250	500	600	OES800L3	4760
4 pole								
400	J	100	125	125	250	350	OES400J4	2320
600	J	150	150	200	400	500	OES600J4	3620
800	L	200	200	250	500	600	OES800L4	5950



OES400J3



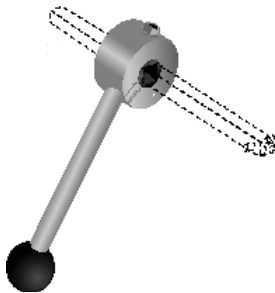
OES600J3
OES800L3



OHB_J12



OHY_J12



YASDA-33

Pistol handles — □ .47 x .47" (□ 12 x 12mm)

UL/NEMA type	IEC type	Color	Length inches/mm	Marking	Defeat-able	Padlock-able	Weight (lbs)	Catalog number	List price
1,3R,12	IP65	Black	4.9/125	O/I & Off/On	Yes	Yes	0.39	OHB125J12	\$ 90
1,3R,12	IP65	Red/Yel	4.9/125	O/I & Off/On	Yes	Yes	0.39	OHY125J12	90
1,3R,12	IP65	Black	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHB145J12	90
1,3R,12	IP65	Red/Yel	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHY145J12	90
1,3R,12	IP65	Black	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHB175J12	100
1,3R,12	IP65	Red/Yel	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHY175J12	100
1,3R,4,4X,12	IP65	Black	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHB145L12	130
1,3R,4,4X,12	IP65	Red/Yel	5.7/145	O/I & Off/On	Yes	Yes	0.39	OHY145L12	130
1,3R,4,4X,12	IP65	Black	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHB175L12	140
1,3R,4,4X,12	IP65	Red/Yel	6.9/175	O/I & Off/On	Yes	Yes	0.41	OHY175L12	140
1,3R,4,4X,12	IP65	Metal	8.7/220	Off/On	—	Yes	1.50	YASDA-8	190

Direct mount handles

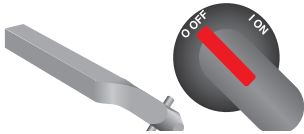
Item	Weight (lbs)	Catalog number	List price
Mounts to 12mm shaft	0.78	YASDA-33	\$ 155

400A – 800A Accessories

Shafts — □ .47 x .47" (□ 12 x 12mm)



OXP12X_



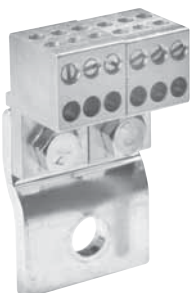
OXP12X_-45



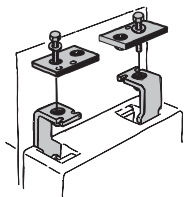
OZXA-26




OZXA-27



OZXA-175/400




OESA-ZX1-J_

Shaft length inches/mm	 Mounting depth [Ⓞ] in inches	Weight (lbs)	Catalog number	List price
For use on OES400				
8.7/220	7.9 – 12.2	0.61	OXP12X220	\$ 28
9.8/250	9.1 – 13.4	0.70	OXP12X250	32
11.0/280	10.2 – 14.5	0.77	OXP12X280	36
12.8/325	12.0 – 16.3	0.90	OXP12X325	40
15.6/395	14.8 – 19.1	1.10	OXP12X395	44
18.3/465	17.5 – 21.9	1.32	OXP12X465	48
21.1/535	20.3 – 24.6	1.54	OXP12X535	52

For use on OES600 – OES800				
9.8/250	10.0 – 12.8	0.70	OXP12X250	32
11.0/280	11.2 – 14.0	0.77	OXP12X280	36
12.8/325	13.0 – 15.8	0.90	OXP12X325	40
15.6/395	15.8 – 18.6	1.10	OXP12X395	44
18.3/465	18.5 – 21.3	1.32	OXP12X465	48
21.1/535	21.1 – 24.1	1.54	OXP12X535	52

Twisted shafts — Rotates handle 45° □ .47 x .47" (□ 12 x 12mm)

Shaft length (inches/mm)	 Mounting depth (inches)	Weight (lbs.)	Catalog number	List price
For use on OES400				
11.0/280	10.2 – 14.5	0.77	OXP12X280-45	\$ 36
12.8/325	12.0 – 16.3	0.90	OXP12X325-45	40
18.3/465	17.5 – 21.9	1.32	OXP12X465-45	48

For use on OES600 - OES800				
11.0/280	11.2 – 14.0	0.77	OXP12X280-45	36
12.8/325	13.0 – 15.8	0.90	OXP12X325-45	40
18.3/465	18.5 – 21.3	1.32	OXP12X465-45	48

Terminal lug kit

For use on:	Wire size	Kit weight (lbs)	Wire type	Terminal lugs per kit	Catalog number	List price
OES400	#2 – 600 kcmil	3.50	Cu/Al	6	OZXA-26	\$ 190
OES400	#2 – 600 kcmil	1.75	Cu/Al	3	OZXA-26/3P	95
OES400	(2) #2 – 500 kcmil	—	Cu/Al	6	OZXA-33	375
OES600 – OES800	(12)#14 – 6 kcmil	1.10	Cu/Al	3	OZXA-175/400	270
OES600 – OES800	(2) #2 – 600 kcmil	4.62	Cu/Al	6	OZXA-27	380
OES600 – OES800	(2) #2 – 600 kcmil	2.31	Cu/Al	3	OZXA-27/3P	190

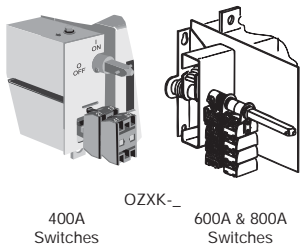
"T" type fuse adapter kit

For use on:	For use with	AC thermal amp rating	AC rated voltage	Poles	Catalog number	List price
OES400	600V Class T fuse	400	600	3	OESA-ZX1-J4T6	\$ 140
OES600	600V Class T fuse	600	600	3	OESA-ZX1-J6T6	240
OES800	300 & 600V Class T fuse	800	600	3	OESA-ZX1-L8T6	280

Ⓞ Mounting depth is the distance from the outside of the door to the disconnect switch mounting plate. Shaft can be cut to desired length.

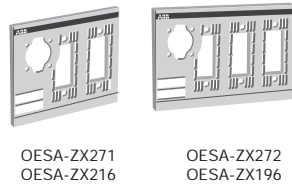
400A – 800A Accessories

Disconnect
switches
Fusible



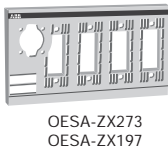
Auxiliary contacts ①

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
1 N.O. + 1 N.C.	OES400 – OES800	0.20	10	600	OZ XK-1	\$ 100
2 N.O. + 2 N.C.		0.26	10	600	OZ XK-2	170
4 N.O. + 4 N.C.		0.40	10	600	OZ XK-3	340
2 N.O.		0.18	10	600	OZ XK-4	100
4 N.O.		0.25	10	600	OZ XK-5	170
8 N.O.		0.40	10	600	OZ XK-6	340



Fuse covers (replacement part)

Description	For use on:	Weight (lbs)	Catalog number	List price
2 pole	OES400	0.30	OESA-ZX271	\$ 140
3 pole		0.40	OESA-ZX272	200
4 pole		0.53	OESA-ZX273	270
2 pole	OES600 – OES800	0.40	OESA-ZX216	180
3 pole		0.50	OESA-ZX196	260
4 pole		0.67	OESA-ZX197	350



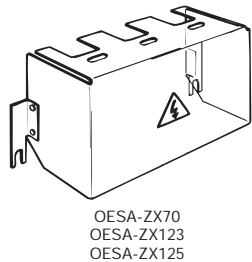
Fuse cover interlock

Description	For use on:	Catalog number	List price
Prevents the fuse cover from being opened when the switch is in the ON position	OES400 – OES800	OESA-ZX204	\$ 90



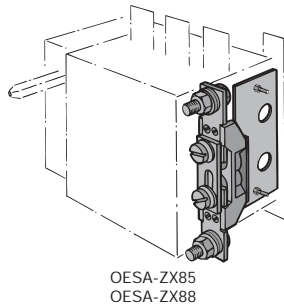
Terminal shroud

Description	For use on:	Weight (lbs)	Catalog number	List price
Includes one terminal shroud for line or load side	OES400	0.13	OESA-ZX123	\$ 110
	OES600 – OES800	0.11	OESA-ZX125	160



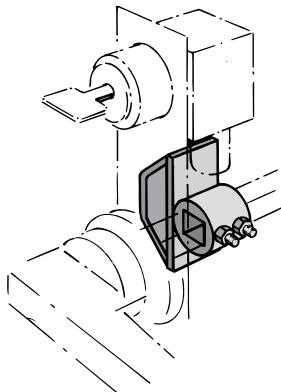
Terminal pole

Description	For use on:	Weight (lbs)	AC thermal amp rating	AC rated voltage	Catalog number	List price
Detachable neutral mounts on side of switch or DIN rail	OES400	1.04	400	600	OESA-ZX85	\$ 150
	OES600 – OES800	1.19	800	600	OESA-ZX88	160

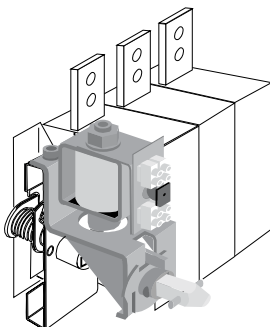


① UL file #E57057

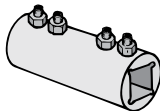
400A – 800A Accessories



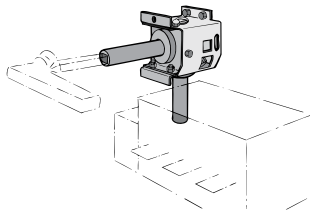
OETL-ZW5



OETL-ZT80



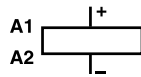
OETL-ZX95



OETL-ZX108

Locking accessories

Description	For use on:	Weight (lbs)	Catalog number	List price
Cam attachment for Kirk Key, Castell, Lowe & Fletcher and Ronis interlock. For adapting to the interlock system. The interlock is not included.	OES400 – OES800	0.29	OETL-ZW5	\$ 190
Electrical interlock Closed circuit principle for interlocking the switch movement. When the coil circuit is dead, A-types cannot be operated to ON-position and L-types cannot be operated to ON- or OFF-position. Coil voltages 110VAC, 220VAC, 24VDC, 48VDC, 60 VDC, 110VDC, 220VDC, P = 15W	OES600 – OES800	2.42	OETL-ZT80A OETL-ZT80L	1280 1220



★ - Coil voltage

Shaft extension coupler

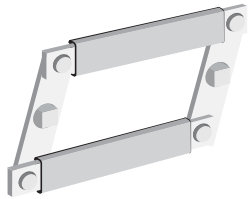
Description	For use on:	Weight (lbs)	Catalog number	List price
Joins two shafts together for applications where extended length is required	12mm shafts	0.26	OETL-ZX95	\$ 100

90° angle kit

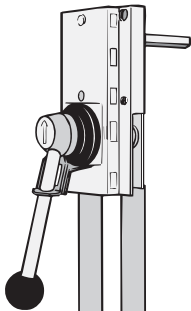
Description	For use on:	Weight (lbs)	Catalog number	List price
Converts switch mechanism from front operation to side operation	OES400 – OES800	4.63	OETL-ZX108	\$ 794

400A – 800A Accessories

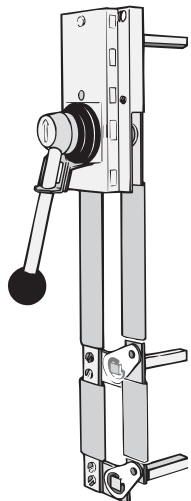
Disconnect
switches
Fusible



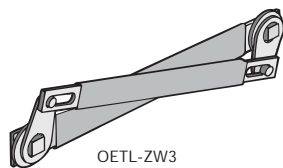
OETL-ZW9



OETL-ZW12



OETL-ZW13



OETL-ZW3
OETL-ZW14
OETL-ZW15

Conversion mechanisms

- Switches are not included

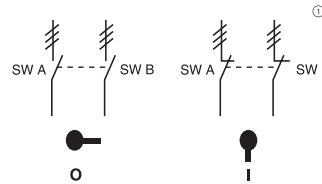
Description	For use on:	Weight (lbs)	UL/NEMA type	Catalog number	List price
6 or 8 pole Transfer Bypass	OES400 – OES800	2.42	—	OETL-ZW9	\$ 260
		10.1	1,3R,4,4X,12	OETL-ZW12	560
		8.81	1,3R,4,4X,12	OETL-ZW13	560
Mechanical interlock	OES400 – OES800	1.26	—	OETL-ZW3	140
		1.15	—	OETL-ZW14	140
		2.64	—	OETL-ZW15	160

6 or 8 pole — OETL-ZW9

6 (8) pole mechanism allows two switches controlled by one handle, to open or close simultaneously.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.91)
- One handle (see pg. 18.91)
- Two shafts (see pg. 18.92)



	POS. O	POS. I
SW. A	O	X
SW. B	O	X

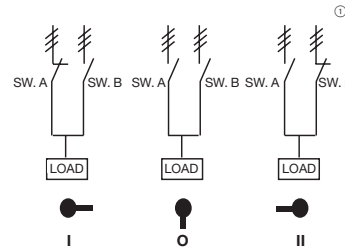
X = Closed
O = Open

Transfer — OETL-ZW12

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position. A 3 position handle is included. YASDA-21 (UL Type 1, 3R, 4, 4X & 12).

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.91)
- Two OETL-ZX95 shaft extension couplers (see pg. 18.94)
- Two shafts (see pg. 18.92)



	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

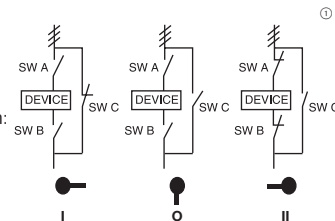
X = Closed
O = Open

Bypass — OETL-ZW13

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass. A 3 position handle is included. YASDA-6 (UL Type 1, 3R, 4, 4X & 12).

Equipment required for a complete installation:

- One conversion mechanism
- Three disconnect switches (see pg. 18.91)
- Three OETL-ZX95 shaft extension couplers (see pg. 18.94)
- Three shafts (see pg. 18.92)



	POS. I	POS. O	POS. II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

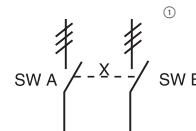
X = Closed
O = Open

Mechanical interlock — OETL-ZW3, OETL-ZW14, OETL-ZW15

Mechanical interlock mechanism prevents both switches from being in the "ON" position at the same time.

Equipment required for a complete installation:

- One conversion mechanism
- Two disconnect switches (see pg. 18.91)
- Two handles see page 18.91
- Two shafts (see pg. 18.92)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

① ≡ = Three poles

Drawing and mounting information found on pg 18.124 & 18.125

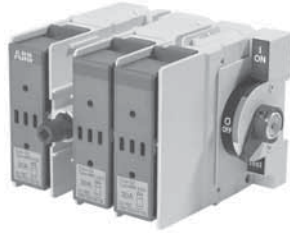
Other configurations

Side operated ①

30A – 400A, UL fuse class J,CC,T

For a complete assembly, please select one of each:

- 1 switch
- 1 handle
- 1 shaft
- 1 terminal lug



OS30A_S_



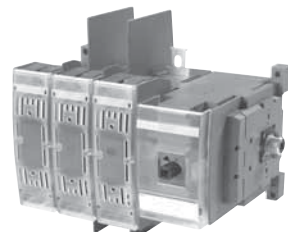
OXP5X170



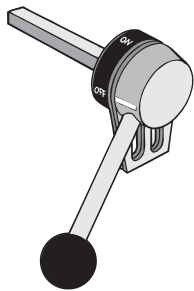
OHY65J5TE00S



OS60JS30



OS100JS30



OETL-ZX74



OZXA-25

Side operated switches — 3 pole

UL general purpose amp rating	UL fuse type 600V	Maximum horsepower rating					Weight (lbs)	Catalog number	List price
		Three phase							
		200V	208V	240V	480V	600V			
30	J	5	7.5	7.5	15	20	1.54	OS30AJS30	\$ 360
30	CC	5	7.5	7.5	15	20	1.54	OS30ACCS30	360
60	J	15	15	15	30	50	3.52	OS60JS30	540
100	J ^①	25	25	30	60	75	3.97	OS100JS30	640
200	J ^①	50	50	60	125	150	15.21	OES200J3-S	1800
400	J ^①	100	125	125	250	350	17.20	OES400J3-S	2600

Handles

UL/NEMA type	IEC type	Color	Length inches/mm	Marking	Defeat-able	Padlock-able	Weight	Catalog number	List price
For use with O									
1, 3R, 12	IP65	Black	2.6/65	OFF/ON	Yes	Yes	0.29	OHB65J5	\$ 80
1, 3R, 12	IP65	Red/Yel	2.6/65	OFF/ON	Yes	Yes	0.29	OHY65J5	
For use with O									
1, 3R, 12	IP65	Black	3.1/80	OFF/ON	Yes	Yes	0.30	OHB80J6	90
1, 3R, 12	IP65	Red/Yel	3.1/80	OFF/ON	Yes	Yes	0.30	OHY80J6	
For use with O									
1, 3R, 12	IP65	Black	4.9/145	OFF/ON	Yes	Yes	0.39	OHB145J12	80
1, 3R, 12	IP65	Red/Yel	4.9/145	OFF/ON	Yes	Yes	0.39	OHY145J12	
1, 3R, 12	IP65	Metal	4.9/145	OFF/ON	No	Yes	1.50	OETL-ZX74	190

Shafts

For use with:	Length (inches/mm)	Description	Weight (lbs.)	Catalog number	List price
OS30AJS30 & OS30ACCS30	6.7/170	0.20 x 0.20" (5 x 5mm)	0.08	OXP5X170	\$ 16
OS60JS30 & OS100JS30	6.7/170	0.24 x 0.24" (6 x 6mm)	0.08	OXP6X210	16
OES200J3-S & OES400J3-S	12.8/325	0.47 x 0.47" (12 x 12mm)	0.90	OXP12X325	40

Terminal lug kit

For use on:	Wire size	Kit weight (lbs)	Wire type	Lugs per kit	Catalog number	List price
OS30AJS30 & OS30ACCS30	#18 – 8	—	Cu	—	Integral	—
OS60JS30	#14 – 4	—	Cu	—	Integral	—
OS100JS30	#14 – 2/0	0.43	Cu/Al	6	OZXA-24	\$ 24
OES200J3-S	#6 – 300 kcmil	0.93	Cu/Al	6	OZXA-25	80
OES400J3-S	#2 – 600 kcmil	3.50	Cu/Al	6	OZXA-26	190

① J type fuse clips are standard. If 600V Type "T" fuse clips are desired, please order the "T" type fuse adapter kit.

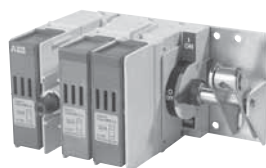
Flange operated disconnect switches

Shaft operated fusible

30A - 100A

Disconnect
switches
Fusible

For a complete assembly, please select one of each.



Switch



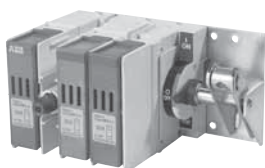
Handle



Shaft



Lug kit (as required)



OS30AJF30



DSFHN-HS_



DSFHS-_

30A - 100A Flange operated fusible switches (Shaft) - 3 pole

UL general purpose amp rating	UL fuse type 600V	Maximum horsepower rating					Catalog number	List price
		Three phase						
		200V	208V	240V	480V	600V		
A								
30	J	5	7.5	7.5	15	20	OS30AJF30	\$ 500
30	CC	5	7.5	7.5	15	20	OS30ACCF30	500
60	J	15	15	15	30	50	OS60JF30	590
100	J	25	25	30	60	75	OS100JF30	690

Flange handles

UL/ NEMA type	Marking	Defeatable	Padlockable	Catalog number	List price
1, 3R, 12 4, 4X	OFF/ON OFF/ON	Yes Yes	Yes Yes	DSFHN-HS12 DSFHN-HS4	\$ 156 240

Shafts

For use with:	Maximum enclosure depth (inches)	Catalog number	List price
OS30_ - OS100_	16	DSFHS-12	\$ 28
	21	DSFHS-17	40
	26.5	DSFHS-22	52

Flange operated fusible and non-fusible disconnect switches

ABB's solution for complying with the new NFPA79 requirements is Flange Operated Fusible and Non-fusible Disconnect Switches.

New 2002 NFPA 79 changes requires main disconnecting means to be operable without the use of accessory tools or devices, independent of door position. This code also includes an interlocking provision to prevent the closing of disconnects while the enclosure door is open, unless an interlock is operated by a deliberate action.

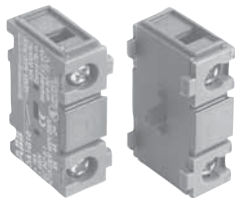
The flange operated disconnect switches are available as ridged shaft or flexible cable operated versions. The cable operated version allows you to install the disconnect switch anywhere in the enclosure depending on the length of the cable. Cables are available in lengths up to 84 inches.

The designs are cost-effective NFPA 79 solutions offering quick and easy installation.

Flange operated disconnect switches Shaft operated fusible 30A - 100A



OZXA-24



OA1G_



OS30AJ12 with auxiliaries



OSS160T3

Terminal lug kits and accessories

For use on:	Description	Wire size	Wire type	Qty.	Catalog number	List price
OS30_	Lug	#18 - #8	Cu	--	Integral	--
OS60_	Lug	#14 - #4	Cu	--	Integral	--
OS100_	Lug	#14 - 2/0	Cu/Al	6	OZXA-24	\$ 24
OS30_ - OS100_	Aux. Contact	1 NO		1	OA1G10	20
	Aux. Contact	1 NC		1	OA3G01	20
OS30_	Adapter	Needed for mounting aux. Contacts on OS30_		1	OSZ4	20
OS100_	Shroud	Includes one set of 3 for use on line or load side		1	OSS160T3	60

Door hardware NEMA 12

Item	Catalog number	List price
Safety door latch, 2 point, door less than 40" high	KDH2R	\$ 200
Safety door latch, 3 point, door less than 40" high	KDH3R	225

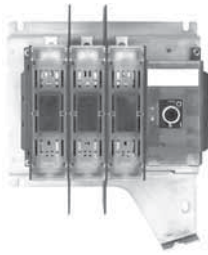
For additional technical information and accessories, please consult the AC1000 Product Selector catalog, section 18 or the factory

Flange operated disconnect switches

Cable operated fusible

30A - 800A

Disconnect
switches
Fusible



Switch kit



Handle



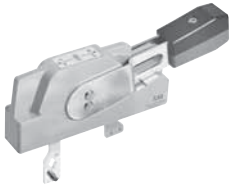
Cable



Lug kit (as required)



OS100J03-FC



K5FCH_



K5C0_

30A - 800A Fusible flange cable operating kit

UL general purpose amp rating	UL fuse type 600V	Maximum horsepower rating				Poles	Catalog number	List price
		Three phase						
		200V-208V	240V	480V	600V			
A								
30	CC	5/7.5	7.5	15	20	3	OS30ACC12-FC	\$ 680
30	J	5/7.6	7.6	15	20	3	OS30AJ12-FC	680
60	J	15	15	30	50	3	OS60J12-FC	780
100	J/T	25	30	60	75	3	OS100J03-FC	920
200	J	50	60	125	150	3	OS200J03-FC	1780
400	J/T	100	125	250	350	3	OES400J3-FC	2360
600	J/T	150	200	400	500	3	OES600J3-FC	3600
800	L	200	250	500	600	3	OES800L3-FC	5460

Flange handle

For use with:	NEMA type	Catalog number	List price
OS30_ - OS200J03_ OES400_ - OES800_	1, 3R, 12	K5FCH K7FCH	\$ 213 310
OS30_ - OS200J03_ OES400_ - OES800_	4, 4X	K5FCH4 K7FCH4	243 415

Cable

For use with:	Cable length (inches)	Catalog number	List price
OS30_ - OS200J03_	36	K5C036	\$ 114
	48	K5C048	146
	60	K5C060	160
	72	K5C072	175
OES400_ - OES800_	48	K7C048	190
	60	K7C060	220
	72	K7C072	256
	84	K7C084	270

Flange operated disconnect switches

Cable operated fusible

30A - 800A



OZXA-200



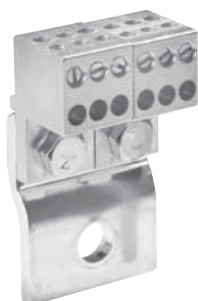
OZXA-26



OZXA-27



OZXA-175



OZXA-175/400

Terminal lug kit

For use on :	Wire size	Wire type		Lugs / kit	Catalog number	List price
OS30_ OS60J03_ OS100J03_	#18 - 8/0 #14 - 4 #14 - 2/0	Cu Cu Cu/Al	-- -- --	-- -- 6	Integral Integral OZXA-24	-- -- \$ 24
OS200_	#4 - 300 kcmil #4-300 kcmil (6)#14 - 6 AWG	Cu/Al Cu/Al Cu/Al	-- -- Distribution Lug	6 3 3	OZXA-200 OZXA-200/3P OZXA-206	80 40 180
OES400_	#2 - 600 kcmil #2 - 600 kcmil #2 - 500 kcmil	Cu/Al Cu/Al Cu/Al	-- -- --	6 3 6	OZXA-26 OZXA-26/3P OZXA-33	190 95 375
OES600-OES800	(12)#14 - 6 kcmil (2)#2 - 600 kcmil (2)#2 - 600 kcmil	Cu/Al Cu/Al Cu/Al	Distribution Lug -- --	3 6 3	OZXA-175/400 OZXA-27 OZXA-27/3P	270 380 190

Door hardware NEMA 12

Item	Catalog number	List price
Safety door latch, 2 point, door less than 40" high	KDH2R	\$ 200
Safety door latch, 3 point, door less than 40" high	KDH3R	225

For additional technical information and accessories, please consult pages 18.83 - 18.121.

Other configurations

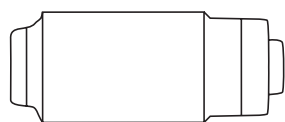
Global concept disconnect switches

30A – 60A

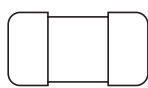
Disconnect switches
Fusible

For a complete assembly, please select one of each:

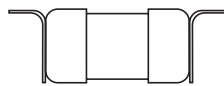
- 1 fusible disconnect body
- 1 set of fuse carriers
- 1 shaft
- 1 handle



DIN Neozed 0_



NFC Style



BS88

NOTE: Handles and shafts — see pages 18.83 – 18.84 for OS32_ and page 18.87 for OS63_.

About the global concept ...

Customers in Boston and Berlin?

Do your customers in Boston prefer UL Class J fuses and your customers in Berlin specify DIN standard fuses? No problem!

ABB Global concept fusible disconnect switches offer the flexibility to design a panel using a common disconnect

body. When the panel destination is known, simply insert the appropriate fuse carrier.

Global concept = common disconnect body + an assortment of fuse carriers.

High volumes with various fuse types — Global concept.

Fusible disconnect bodies — 30A & 60A

UL general purpose amp rating	IEC AC21 amp rating	Description	Technical ratings	Weight (lbs)	Catalog number	List price
30	32	3 pole	See pages 18.109 – 18.111	1.40	OS32M12	\$ 130
		4 pole		1.70	OS32M22F	150
		3 pole + neutral		1.70	OS32M22N1①	200
		3 pole, side operation		1.40	OS32MS30	210
		4 pole, side operation		1.70	OS32MS40F	270
		3 pole + neutral, side operation	1.70	OS32MS40N1①	320	
60	63	3 pole	See pages 18.109 – 18.111	2.40	OS63X12	\$ 230
		4 pole		2.80	OS63X22F	290
		3 pole + neutral		2.80	OS63X22N1①	340
		3 pole, side operation		2.40	OS63XS30	390
		4 pole, side operation		2.80	OS63XS40F	450
		3 pole + neutral, side operation	2.80	OS63XS40N1①	500	

Fuse carriers for 3 pole units and units with neutral ②

For use on:	Fuse type	Technical ratings	Weight (lbs)	Catalog number	List price
OS32M_	UL J 30A UL CC 30A DIN Neozed D01 DIN Neozed D02 NFC 10x38 NFC 14x51 BS88 A1 BS88 A2 BS88 E1 BS88 F1	See pages 18.109 – 18.111	0.48	OSC30AJ3 OSC30ACC3 OSC16D301 OSC35D302 OSC25F310 OSC32F314 OSC32B3A1 OSC32B3A2 OSC32B3E1 OSC32B3F1	\$ 150
OS63X_	UL J 60A NFC 14x51 NFC 22x58 BS88 A2, A3 CSA C30, C60 DIN 000, 00	See pages 18.109 – 18.111	0.60	OSC60J3 OSC50F3 OSC63F3 OSC63B3 OSC63D3	

Fuse carriers for 4 pole units ③

For use on:	Fuse type	Technical ratings	Weight (lbs)	Catalog number	List price
OS32M_	UL J 30A UL CC 30A DIN Neozed D01 DIN Neozed D02 NFC 10x38 NFC 14x51 BS88 A1 BS88 A2 BS88 E1 BS88 F1	See pages 18.109 – 18.111	0.64	OSC30AJ4 OSC30ACC4 OSC16D401 OSC35D402 OSC25F410 OSC32F414 OSC32B4A1 OSC32B4A2 OSC32B4E1 OSC32B4F1	\$ 200
OS63X_	UL J 60A NFC 14x51 NFC 22x58 BS88 A2, A3 CSA C30, C60 DIN 000, 00	See pages 18.109 – 18.111	0.80	OSC60J4 OSC50F4 OSC63F4 OSC63B4 OSC63D4	

① N1-versions will be delivered with neutral carrier.
② Part number includes 3 pieces of fuse carriers.
③ Part number includes 4 pieces of fuse carriers.

Other configurations

High speed fuse pattern

Special type fuses

For a complete assembly,
please select one of each:

- 1 switch body
- 1 adapter kit
- 1 shaft
- 1 handle



Selecting switch bodies and adapter kits

Please select switch body and adapter kit according to your fuses. Switch body alone can not be used — an adapter kit is always needed.

Switch bodies — 200A through 800A

UL general purpose amp rating	Maximum horsepower rating				Max. allowed fuse power dissipation at rated current	Weight (lbs)	Catalog number	List price
	Three phase							
	208V	240V	480V	600V				
3 pole								
200	50	60	125	150	22W	15.21	OES200R03	\$ 1220
400	125	125	250	350	45W	17.20	OES400R03	1740
600	150	200	400	500	60W	37.48	OES600R03	2640
800	200	250	500	600	65W	37.48	OES800R03	4590
4 pole								
200	50	60	125	150	22W	17.4	OES200R04	1510
400	125	125	250	350	45W	19.4	OES400R04	2140
600	150	200	400	500	60W	46.3	OES600R04	3270
800	200	250	500	600	65W	46.3	OES800R04	5710

Fuse adapter kits — for switches OES200 – OES400

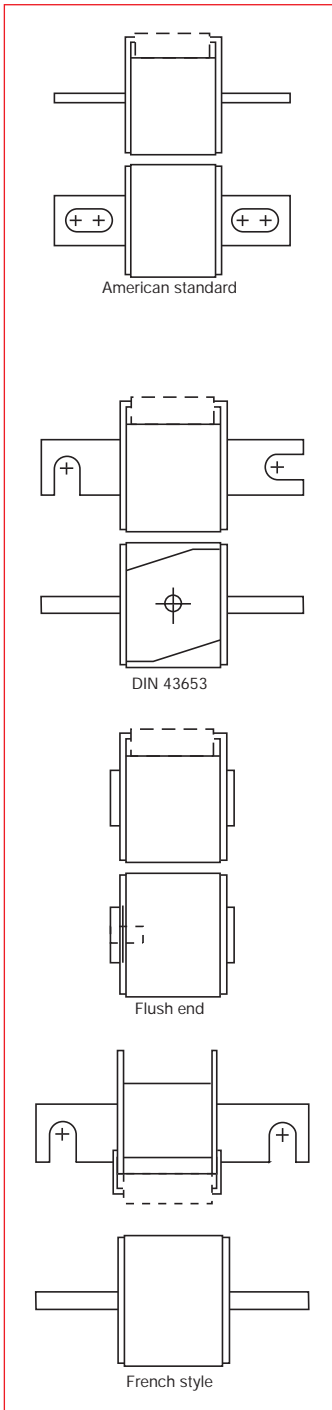
Fuse standard	For 3 pole switch		For 4 pole switch	
	Catalog number	List price	Catalog number	List price
American standard	OESAZX1-S4 OESAZX1-S5	\$ 220	OESAZX1-S4/4 OESAZX1-S5/4	\$ 290
DIN80 (DIN43653) DIN80 sizes 00 and 000 (DIN 43653) DIN110 (DIN43653) DIN140 (DIN43653)	OESAZX1-S7 OESAZX1-S9 OESAZX1-S2 OESAZX1-S6		OESAZX1-S7/4 OESAZX1-S9/4 OESAZX1-S2/4 OESAZX1-S6/4	
Flush-end, 70mm body Flush-end, 50mm body	OESAZX1-S8 OESAZX1-S3		OESAZX1-S8/4 OESAZX1-S3/4	
French French with micro switches	OESAZX1-S10 OESAZX1-S11		OESAZX1-S10/4 OESAZX1-S11/4	

Fuse adapter kits — for switches OES600 – OES800

Fuse standard	For 3 pole switch		For 4 pole switch	
	Catalog number	List price	Catalog number	List price
American standard DIN80, DIN 110, DIN 140 (DIN43653) Flush-end, 50mm and 70mm body French French with micro switches	OESAZX2-S4 OESAZX2-S2 OESAZX2-S3 OESAZX2-S5 OESAZX2-S6	\$ 400	OESAZX2-S4/4 OESAZX2-S2/4 OESAZX2-S3/4 OESAZX2-S5/4 OESAZX2-S6/4	\$ 530

Handles and shafts — see pages 18.91 – 18.92.

Selecting the right fusible disconnect for HSF fuses may be difficult. Due to UL restrictions it is not possible to give a general fuse selection table for your use. Therefore we ask you to contact ABB Inc., Wichita Falls, in application issues. Information needed is nominal current of the application and catalog number of the fuse.



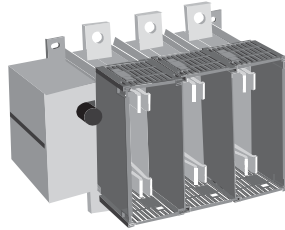
Other configurations

High speed fuse pattern

Standard switches

Disconnect
switches
Fusible

For a complete assembly, please select one switch catalog number which includes:



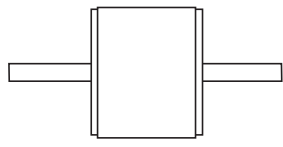
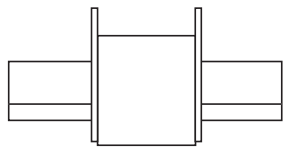
Switch body



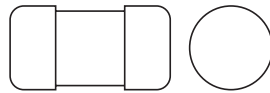
shaft



handle



DIN 43620



NFC Style

Selecting switch bodies

There are some HSF fuses that fit in standard pattern fusible disconnects, no adapter kits needed.

DIN-style fusible disconnects — 32A through 800A^①

UL general purpose amp rating	AC23A rated operational power in kW				Fuse type	Weight (lbs.)	Catalog number	List price
	230V	400V	500V	690V				
3 pole								
30	9	15	22	30	DIN 000, 00	2.9	OS32RD12	\$ 500
60	18.5	30	37	60	DIN 000, 00	2.9	OS63RD12	500
100	45	80	110	132	DIN 000, 00	3.3	OS160RD03	700
100	45	80	110	132	DIN 43653: 000/80	3.3	OS160RD0380	700
200	70	132	170	230	DIN 0, 1	16.1	OESA250RD3	1380
400	110	210	280	330	DIN 0, 1, 2	18.3	OESA400RD3	1860
600	180	315	400	540	DIN 3	35.2	OESA630RD3	2900
800	200	350	470	600	DIN 3	39.6	OESA800RD3	4760
4 pole								
30	9	15	22	30	DIN 000, 00	3.5	OS32RD22	660
60	18.5	30	37	60	DIN 000, 00	3.5	OS63RD22	660
100	45	80	110	132	DIN 000, 00	4.0	OS160RD04	930
100	45	80	110	132	DIN 43653: 000/80	4.0	OS160RD0480	930
200	70	132	170	230	DIN 0, 1	18.1	OESA250RD4	1840
400	110	210	280	330	DIN 0, 1, 2	20.7	OESA400RD4	2480
600	180	315	400	540	DIN 3	46.3	OESA630RD4	3860
800	200	350	470	600	DIN 3	52.9	OESA800RD4	6340

NFC-style fusible disconnects — 25A through 125A^②

UL general purpose amp rating	AC23A rated operational power in kW				Fuse type	Weight (lbs.)	Catalog number	List price
	230V	400V	500V	690V				
3 pole								
30	6	11	14	22	NFC 10x38	1.54	OS25RF1210	\$ 400
30	8	14	18	25	NFC 14x51	1.54	OS32RF1214	400
60	18.5	30	37	60	NFC 14x51	2.90	OS63RF1214	500
100	37	60	80	110	NFC 22x58	3.30	OS125RF0322	700
100	45	80	110	132	NFC 27x60	3.30	OS160RF0327	700
4 pole								
30	6	11	14	22	NFC 10x38	2.00	OS25RF2210	530
30	8	14	18	25	NFC 14x51	2.00	OS32RF2214	530
60	18.5	30	37	60	NFC 14x51	3.50	OS63RF2214	660
100	37	60	80	110	NFC 22x58	4.00	OS125RF0422	930
100	45	80	110	132	NFC 27x60	4.00	OS160RF0427	930

Selecting the right fusible disconnect for HSF fuses may be difficult. Due to UL restrictions it is not possible to give a general fuse selection table for your use. Therefore we ask you to contact ABB Control Inc., Wichita Falls, regarding application issues.

^① OS32 – OS160 include handle OHB65J6 and shaft OXP6X161.
OESA250 – OESA400 include handle OHB125J12 and shaft OXP12X250.
OESA630 – OESA800 include handle OHB145J12 and shaft OXP12X250.

^② OS25 – OS32 include handle OHB65J5 and shaft OXP5X150.
OS50 – OS125 include handle OHB65J6 and shaft OXP6X161.

Other configurations

BS fuse pattern ①

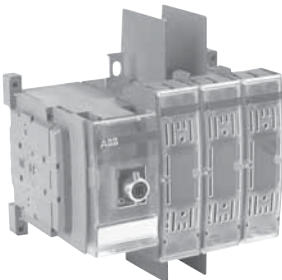
20A – 800A



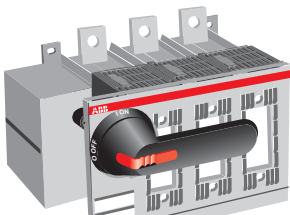
OS20B12A1



OS63B12



OS160



OESA200B3PL1

BS fuse pattern switches (20A – 32A)

Handle and shaft included

Catalog number	Number of poles	Rated op. current/ Rated op. power		Fuse type and size	Fuse standard
		415V	690V		
OS20B12A1 OS20B22A1N1 OS20B22A1F	3 3 + non-fused neutral 4	20 A 10 kW	20A 15 kW	A1 20 A	BS 88-2 IEC 269-2-1
OS32B12A1 OS32B22A1N1 OS32B22A1F	3 3 + non-fused neutral 4	32 A 15 kW	32A 25 kW	A1 32 A	
OS32B12A2 OS32B22A2N1	3 3 + non-fused neutral	32 A 15 kW	32A 25 kW	A2 32 A	
OS32B12F1 OS32B22F1N1	3 3 + non-fused neutral	32 A 15 kW	32A 25 kW	F1 32 A	BS 88-6

BS pattern switches (32A – 800A)

Handle and shaft included
Fuse covers included for 200A – 800A

Catalog number	Number of poles	Rated operational voltage AC23/[V]	I _{th} (open) [A]	Rated operational current/ Rated operational power in category AC23A, IEC947 [A/kW]					Weight with package [kg]
				230V	400V	415V	500V	690V	
OS32B12 OS32B22N1	3 4 ^②	500	32	32/7.5	32/11	32/15	32/15	—	1.3 1.6
OS63B12 OS63B22N1	3 4 ^②	690	63	63/15	63/30	63/30	63/30	401/30	1.3 1.6
OS100B12 OS100B13 OS100B01 OS100B11	3 4 ^② 1 2	690	125	100/30	100/55	100/55	100/70	501/45	1.5 1.8 0.9 1.9
OS160B12 OS160B13 OS160B01 OS160B11	3 4 1 2	690	160	100/30	100/55	100/55	100/70	50 ^③ /45	1.5 1.8 0.9 1.2
OESA200B3PL1 OESA200B4PL1 OESA200B1PL1 OESA200B2PL1	3 4 ^② 1 2	690	200	200/57	200/100	200/110	200/140	200/180	7.1 8.2 5.1 6.1
OESA250B3PL1 OESA250B4PL1	3 4 ^②	690	250	250/70	250/132	250/140	250/170	250/230	7.1 8.2
OESA315B3PL1 OESA315B4PL1 OESA315B1PL1 OESA315B2PL1	3 4 ^② 1 2	690	315	315/90	315/100	315/100	315/220	315/290	7.9 8.9 5.9 6.9
OESA400B3PL1 OESA400B4PL1 OESA400B1PL1 OESA400B2PL1	3 4 ^② 1 2	690	400	400/110	400/210	400/230	400/280	400/330	8.3 9.4 6.3 7.3
OESA630B3PL1 OESA630B4PL1 OESA630B1PL1 OESA630B2PL1	3 4 ^② 1 2	690	630	630/180	630/315	630/340	630/400	630/540	16.0 21.0 6.5 11.0
OESA800B3PL1 OESA800B4PL1 OESA800B1PL1 OESA800B2PL1	3 4 ^② 1 2	690	800	800/200	800/350	800/380	720/470	720/600	18.0 24.0 6.7 12.3



BS fuses are widely used in UK, South-Africa, Australia and Hong Kong

① Please consult factory for additional information.
② The fourth pole is provided with a solid link which can be replaced with a fuse.

Other configurations

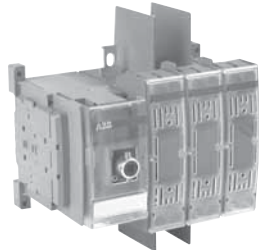
DIN fuse pattern^①

32A – 800A

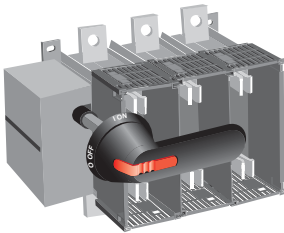
Disconnect
switches
Fusible



OS63D12



OS160



OESA250P3PL

DIN pattern switches (32A – 800A)

Handle and shaft included

Rated Catalog number voltage	Number of poles	operational AC23/[V]	I _{th} (open) [A]	Rated operational current/ Rated operational power in category AC23A, IEC947 [A/kW]					Weight with package [kg]
				230V	400V	415V	550V	690V	
OS32D12 OS32D22N1 OS32D22F	3 3 + non-fused neutral 4	690	32	32/7.5	32/11	32/15	32/15	—	1.3 1.6 1.6
OS63D12 OS63D22N1 OS63D22F	3 3 + non-fused neutral 4	690	63	63/15	63/30	63/30	63/30	40/30	1.3 1.6 1.6
OS125D12 OS125D22N1 OS125D22F OS125D01 OS125D11	3 3 + non-fused neutral 4 1 2	690	125	100/30	100/55	100/55	100/70	50/45	1.5 1.8 1.8 0.9 1.2
OS160D12 OS160D22N1 OS160D22F OS160D01 OS160D11	3 3 + non-fused neutral 4 1 2	690	160	100/30	100/55	100/55	100/70	50/45	1.5 1.8 1.8 0.9 1.2
OESA250D3PL OESA250D4PL OESA250DF4PL OESA250D1PL OESA250D2PL	3 3 + non-fused neutral 4 1 2	690	250	250/70	250/132	250/140	250/170	250/230	7.3 8.2 8.2 5.5 6.4
OESA400D3PL OESA400D4PL OESA400DF4PL OESA400D1PL OESA400D2PL	3 3 + non-fused neutral 4 1 2	690	400	400/110	400/210	400/230	400/280	400/330	8.3 9.4 9.4 6.3 7.3
OESA630D3PL OESA630D4PL OESA630DF4PL OESA630D1PL OESA630D2PL	3 3 + non-fused neutral 4 1 2	690	630	630/180	630/315	630/340	630/400	630/540	16.0 21.0 21.0 6.5 11.0
OESA800D3PL OESA800D4PL OESA800DF4PL OESA800D1PL OESA800D2PL	3 3 + non-fused neutral 4 1 2	690	800	800/200	800/350	800/380	720/470	720/600	18.0 24.0 24.0 8.5 13.0



DIN fuses are mainly used in continental Europe (excluding France below 125A), Asia, Africa and South-America

^① Please consult factory for additional information.

Other configurations

NFC fuse pattern

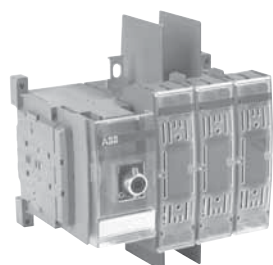
63A – 125A, 14x51 & 22x58



OS32F1214



OS63F12



OS125F03

NFC fuse pattern switches (cylinder) (10x38) (14x51)

Handle and shaft included

Catalog number	Number of poles	Rated op. current/ Rated op. power		Fuse type and size	Fuse standard
		415V	690V		
OS25F1210 OS25F2210N1 OS25F2210F	3 3 + non-fused neutral 4	25 A 12 kW	25A 22 kW	10 x 38 25 A	IEC 269-2-1
OS32F1214 OS32F2214N1 OS32F2214F	3 3 + non-fused neutral 4	32 A 15 kW	32A 25 kW	14 x 51 32 A	IEC 269-2-1

NFC fuse pattern (cylinder fuse links), (14x51 & 22x58)

Handle and shaft included

Catalog number	Number of poles	Rated operational voltage AC23/[V]	I _{in} (open) [A]	Rated operational power in category AC23A, IEC947 [A/kW]					Weight with package [kg]
				230V	400V	415V	550V	690V	
OS50F12	3	690	50	50/15	50/25	50/25	50/33	50/45	1.3
OS50F22F	4	690	50	50/15	50/25	50/25	50/33	50/45	1.6
OS63F12	3	690	63	63/18.5	63/30	63/30	63/37	63/60	1.3
OS63F22F	4	690	63	63/18.5	63/30	63/30	63/37	63/60	1.6
OS100F03	3	690	125	100/30	100/45	100/55	100/60	100/90	2.2
OS100F04F	4								2.8
OS100F04N1	3 + non-fuse N								2.8
OS125F03	3	690	125	125/37	125/60	125/60	125/80	125/110	1.3
OS125F04F	4								1.6
OS125F04N1	3 + non-fuse N	690							1.6



NFC fuses are used in France and in French speaking Africa

① Please consult factory for additional information.

Fuse monitors

Disconnect
switches
Fusible



OFM_

Fuse monitors

For switch size	Rated voltage	Weight (lbs.)	Catalog number	List price
OS30-100 and OES400-800	100 - 240	0.31	OFM240 OFM600	\$ 290
	380 - 600	0.31		
OS200	100 - 240	0.35	OFS240	
	380 - 600		OFS600	

Suitable for 3 phase circuits. Includes 1 N.O. & 1 N.C. auxiliary contacts and red & green LED lights.

Mounting accessories

For switch size	Crimp terminal size (mm)	Catalog number	List price
OS30 - 200	2.8 - 0.8	OFMZX2	\$ 20
OES400 - 800	6.3 - 0.8	OFMZX4	70

Includes 6 crimp terminals.

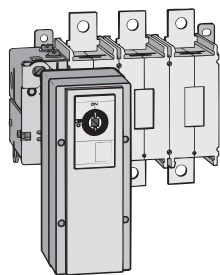
Description

- Indicates single phasing
- Operates with all fuse types
- No need for external supply voltage
- Wide voltage range, 100-240VAC and 380-600VAC
- UL Listed, EMC tested
- Fuse monitor is automatically reset after the blown fuses have been replaced
- One trip contact, one alarm contact and two LEDs (red and green)
- Phase imbalance immune
- Compact size
- Snap-on and screw-on mounting for OS disconnects
- Suitable to be used as a standalone device

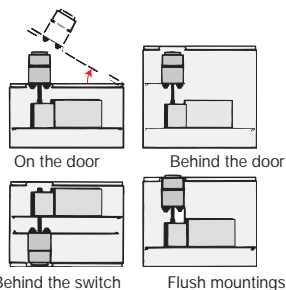
Motor operators^① for 400A – 800A



OEMO_



OEMO_



Mounting options

Motor operators^① — 2 position, I/O, ON/OFF

For use on:	Voltage	Weight (lbs.)	Catalog number	List price
OES400	24 VDC/AC 48 VDC/AC 220 VAC 220 VDC 230 VAC 240 VAC	14.0	OEMO002/24VDCAC OEMO002/48VDCAC OEMO002/220VAC OEMO002/220VDC OEMO002/230VAC OEMO002/240VAC	\$ 6514
OES600 – OES800	24 VDC/AC 48 VDC/AC 220 VAC 220 VDC 230 VAC 240 VAC	14.0	OEMO003/24VDCAC OEMO003/48VDCAC OEMO003/220VAC OEMO003/220VDC OEMO003/230VAC OEMO003/240VAC	7644

Motor operators^① — 3 position, I/O/II

For use on:	Voltage	Weight (lbs.)	Catalog number	List price
OES400	24 VDC/AC 48 VDC/AC 220 VAC 220 VDC 240 VAC	14.0	OEMO202/24VDCAC OEMO202/48VDCAC OEMO202/220VAC OEMO202/220VDC OEMO202/240VAC	\$ 7644
OES600 – OES800	24 VDC/AC 48 VDC/AC 220 VAC 240 VAC	14.0	OEMO303/24VDCAC OEMO303/48VDCAC OEMO303/220VAC OEMO303/240VAC	9490

OEMO 202_ – 303_ motor operators require a transfer mechanism.

Mounting kit for OEMO motor operator

For use on:	Package (pcs.)	Catalog number	List price
OES400 OES600 – OES800	1 1	OEMOZX1 OEMOZX2	\$ 400

① Not UL listed

Technical data

OS30A_12 – OES800L3

UL & CSA

Disconnect
switches
Fusible

UL & CSA

Catalog number	3 pole	OS30A_12	OS60J12	OS100J03	OS200J03	OES400J3	OES600J3	OES800L3
Approvals ①	2 pole 3 pole 4 pole	N/A UL98 & IEC UL98 & IEC	N/A UL98 & IEC UL98 & IEC	IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC
Technical ratings	-40° to 40°C							
General purpose amp rating pf = 0.7 – 0.8	A	30	60	100	200	400	600	800
Max operating voltage	V	600	600	600	600	600	600	600
Max horsepower rating/ Max motor FLA current pf = 0.4 – 0.5								
Three phase								
200 – 208V	HP/A	5/16.8 – 7.5/24.2	15/46.2	25/75.0	50/143.0	100/273 – 125/344	150/396	200/528
240V	HP/A	7.5/22.0	15/42.0	30/80.0	60/145.0	125/312.0	200/480.0	250/602.0
480V	HP/A	15/21.0	30/40.0	60/77.0	125/156.0	250/302.0	400/477.0	500/590.0
600V	HP/A	20/22.0	50/52.0	75/77.0	150/144.0	350/336.0	500/472.0	600/ —
Single phase								
120V	HP/A	2/24.0	—	—	—	—	—	—
240V	HP/A	3/17.0	—	—	—	—	—	—
Short circuit rating with fuse	kA	200	200	200	100	200	200	200
UL Fuse size	A	30	60	100	200	400	600	800
UL Fuse type	J/CC	J	J	J/T	J/T	J/T	J/T	L
Endurances								
Min. Electrical endurance, pf = 0.75 – 0.80	operation cycles	6000	6000	6000	6000	1000	1000	500
Mechanical endurance	operation	20,000	20,000	20,000	20,000	12,000	10,000	7000
Physical characteristics								
Weight	3 pole lb 4 pole lb	1.54 1.98	2.86 3.52	3.30 3.96	5.9 7.5	17.18 19.38	37.44 46.26	37.44 46.26
Dimension	3 pole H in W in D in	3.66 4.15 4.10	3.94 5.63 5.04	5.67 7.07 5.10	6.5 7.1 5.2	8.90 11.26 8.07	10.10 14.80 9.17	10.10 14.80 9.17
Shaft size square □	in mm	.20 5 x 5	.24 x .24 6 x 6	.24 x .24 6 x 6	.24 x .24 6 x 6	.47 x .47 12 x 12	.47 x .47 12 x 12	.47 x .47 12 x 12
Switch operating torque for rotary 3 pole switches	lb. in.	26.6	35.5	70.9	195	195	248	248
Terminal lug kits								
Wire range	AWG	Integral #18 – 8	Integral #14 – 4	OZXA-24 #14 – 2/0	OZXA-200 #4 – 300kcmil	OZXA-26 #2 – 600kcmil	OZXA-27 (2) #2 – 600 kcmil	OZXA-27 (2) #2 – 600 kcmil
Torque:								
Wire tightening	lb. in.	17	30	120	275	500	500	500
Lug mounting	lb. in.	N/A	N/A	50	150	480	480	480
Auxiliary contacts								
NEMA ratings, AC		OA4G_ OA1/3G_	OA_G_	OA_G_	OA_G_	OZXC_	OZXC_	OZXC_
AC rated voltage	VAC	— A600	A600	A600	A600	A600	A600	A600
AC thermal rated current	A	250 600	600	600	600	600	600	600
AC maximum volt ampere making	VA	6 10	10	10	10	10	10	10
AC maximum volt ampere breaking	VA	— 7200	7200	7200	7200	7200	7200	7200
NEMA ratings, DC		— P300	R300	R300	R300	P600	P600	P600
DC rated voltage	VDC	— 300	300	300	300	600	600	600
DC thermal rated current	A	— 1	1	1	1	5	5	5
DC maximum make break current	A	— 28	28	28	28	138	138	138
Torque:								
Wire tightening	lb. in.	7	7	7	7	7	7	7
Wire range	AWG	#22 – 14/#18 – 14	#18 – 14	#18 – 14	#18 – 14	#20 – 12	#20 – 12	#20 – 12

① The following UL Listed switches are also CSA approved.

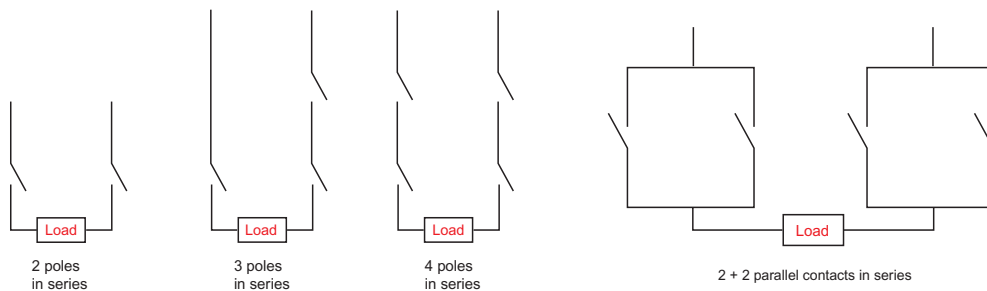
Technical data

OS30A_12 – OES800L3

IEC

IEC

Catalog number	3 pole	OS30A_12	OS60J12	OS100J03	OS200J03	OES400J3	OES600J3	OES800L3
Technical ratings	-40° to 40°C							
Rated insulation voltage		1000	1000	1000	1000	1000	1000	1000
Pollution degree 3 ⑥	V							
Dielectric strength	50Hz/60Hz, 1 min	10	10	10	10	10	10	10
Rated impulse withstand voltage	kV	12	12	12	12	12	12	12
Rated thermal current, I _{th} /max. fuse power dissipation ①								
AC 20/DC 20 open ②	A/W	32/3.5	63/7.5	160/12	200/17	400/45	630/60	800/65
40°C enclosed	A/W	32/3.5	63/7.5	160/10, 135/12	200/17	400/34, 360/37	600/45, 570/50	720/55
Enclosed with solid links	A/W	32	85	175	280	450	700	900
with minimum cable cross section Cu	mm ²	6	16	70	95	240	2 x 185	2 x 240
Rated operational voltage	AC 20 and DC 20V	1000	1000	1000	1000	1000	1000	1000
AC Rated operational currents								
AC 21A	≤500V A	32	63	160	200	400	630	800
	≤690V A	32	63	160	200	400	630	800
AC 22A	≤500V A	32	63	160	200	400	630	800
	≤690V A	32	63	160	200	400	630	800
AC 23A	≤500V A	32	63 ⑤	160 ⑤	200	400	630	720
	≤690V A	32	63 ⑤	160 ⑤	200	400	630	720
DC Rated operational currents/poles in series								
DC21A	48V A	32/2 ③	④	④	200/1	400/2	630/2	800/2
	110V A	32/2	④	④	200/1	400/2	630/2	800/2
	220V A	32/2	④	④	200/1	400/2	630/2	800/2
	440V A	32/4	63/4	160/3	200/2	400/2	630/2	800/2
	750V A	—	④	④	180/4	400/3	630/3	800/3
	1000V A	—	④	④	—	400/4	630/4	800/4
DC22A	48V A	32/2 ③	④	④	200/1	400/2	630/2	800/2
	110V A	32/2	④	④	200/1	400/2	630/2	800/2
	220V A	32/2	④	④	200/1	400/2	630/2	800/2
	440V A	32/4	63/4	160/3	200/2	400/2	630/2	800/2
	750V A	—	④	④	180/4	400/3	630/3	800/3
	1000V A	—	④	④	—	400/4	630/4	800/4
DC23A	48V A	32/2 ③	④	④	200/1	400/2	630/2	800/2
	110V A	32/2	④	④	200/1	400/2	630/2	800/2
	220V A	32/2	④	④	200/1	400/2	630/2	800/2
	440V A	32/4	63/4	160/3	200/2	400/2	630/2	800/2
	750V A	—	④	④	180/4	400/3	630/3	800/3
	1000V A	—	④	④	—	—	630/4	800/4
Rated operational power								
	AC23A							
	230V kW	8	18.5	45	60	110	180	200
	400V kW	14	30	80	110	210	315	350
	415V kW	15	30	90	110	230	340	380
	500V kW	18	37	110	140	280	400	470
	690V kW	25	60	132	190	330	540	600



① Ambient temperature 60°C: derating 20 percent. Mounting on ceiling: derating 10 percent. Mounting on wall, horizontal fuses: derating 8 percent.
 ② The ambient air temperature does not exceed +40°C and its average over a period of 24h does not exceed +35°C according to IEC 947.
 ③ For 30A switches, use 2 + 2 parallel contacts in series.
 ④ Available on request.
 ⑤ IEC 947-3, utilization category B, infrequent operation.
 ⑥ Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs, which becomes conductive due to condensation.

Technical data

OS30A_12 – OES800L3

IEC

Disconnect
switches
Fusible

IEC

Catalog number	3 pole	OS30A_12	OS60J12	OS100J03	OS200J03	OES400J3	OES600J3	OES800L3
Rated breaking capacity								
in category AC-23A	500V A	256	504	1280	1600	3200	5760	5760
	690V A	256	504	1280	1600	3200	5760	5760
Rated breaking capacity/poles in series								
in category DC-23	<220V A	128/2	—	—	1000/2	1600/2	3200/2	3200/2
	440V A	128/4	—	—	1000/2	1600/2	3200/2	3200/2
	500 – 750V A	—	—	—	1000/3	1600/3	3200/3	3200/3
	1000V A	—	—	—	—	—	3200/4	3200/4
Rated conditional short-circuit current r.m.s. ③								
	80 kA, 415V kA	9	17	22	35	40	75	75
	100 kA, 500 V kA	7.5	17	22	37.5	40	75	75
	50 kA, 690 V kA	6	13	15	35	35	60	60
	Rated short time withstand current, 1s. kA	1	2.5	5	8	10	16	16
Rated capacitor power								
The capacitor rating of the fusible disconnect switch is limited by the fuse link								
	400 V kVar	15	30	—	—	180	250	310
	415V kVar	15	32	—	—	200	270	340
	690V kVar	25	50	—	—	325	450	550
Power loss/pole								
with rated current, without fuse	W	2	4	9	8	30	55	77
Mechanical endurance	operations	20,000	20,000	20,000	20,000	16,000	10,000	10,000
Fuse types, IEC 269-2								
	DIN 43620	—	000, 00	000, 00	—	0 – 2	3	3
	NFC	10 x 38, 14 x 51	14 x 51, 22 x 58	22 x 58	—	0 – 2	3	—
	BS 88	A1, A2, F1	A2 – A3	A2 – A4	B1 – B2	B1 – B4	C1 – C2	C1 – C3
size/distance of link bolts								
		M4/44.5(A1) M5/73(A2)	M5/73	M5/73 M8/94	M6/111	M8/111	M10/133, 184	M10/133, 184
Physical characteristics								
Weight	3 pole kg	0.7	1.3	1.5	2.6	7.8	17.0	17.0
	4 pole kg	0.9	1.6	1.8	7.9	8.8	21.0	21.0
Dimension	3 pole							
	H mm	93	100	144	198.5	226	282	282
	W mm	106	143	179	181.5	286	376	376
	D mm	104	120	129	132	205	233	233
Shaft size	square mm	5 x 5	6 x 6	6 x 6	6 x 6	12 x 12	12 x 12	12 x 12
Terminals								
Built-in terminal size mm ²								
		0.5 – 10	2.5 – 25	—	—	—	—	—
Terminal bolt size, metric thread								
	diameter x length mm	—	—	M6 x 20	M8 x 25	M10 x 40	M12 x 40	M12 x 40
Terminal bolt tightening torque								
	Nm	2	3.5	6 – 9	15 – 22	30 – 44	50 – 75	50 – 75
Fuse-links bolts tightening torque								
	Nm	2	3.5	3.5 – 5	4	15	40	40
Operating torque								
	Nm	3	4	8	7	22	28	28
Auxiliary contacts								
		OA4G _①	OA1/3G _②	OA_G _②	OA_G _②	OA_G _②	OZXK_	OZXK_
Ratings according to IEC 947-5-1								
Rated voltage, U _i	VAC	690	690	690	690	690	690	690
Thermal current, I _{th}	A	10	16	16	16	10	10	10
AC12 / DC12, I _e	U _e =24V	— / 6	—	—	—	—	—	—
	120V	— / 6	—	—	—	8 / —	8 / —	8 / —
	125V	—	—	—	—	— / 1.1	— / 1.1	— / 1.1
	230V	—	6 / —	6 / —	6 / —	6 / —	6 / —	6 / —
	250V	3 / 0.1	—	—	—	— / 0.55	— / 0.55	— / 0.55
	400V	—	4 / —	4 / —	4 / —	4 / —	4 / —	4 / —
	415V	—	—	—	—	4 / —	4 / —	4 / —
	440V	2 / —	—	—	—	— / 0.31	— / 0.31	— / 0.31
	480V	—	—	—	—	3 / —	3 / —	3 / —
	500V	—	—	—	—	3 / 0.27	3 / 0.27	3 / 0.27
	600V	—	—	—	—	— / 0.2	— / 0.2	— / 0.2
	690V	—	2 / —	2 / —	2 / —	2 / —	2 / —	2 / —

① AC15 / DC12, according to IEC 947-5-1

② AC15, according to IEC 947-5-1

③ Values shown are corresponding max. allowed cut-off current, peak-values per single phase fuse tests.

Selecting switches per NEC & IEC

Selecting switches per NEC

Article 430 of the US National Electric Code includes two methods for properly sizing disconnect switches:

1. Single motor application

A properly sized disconnect switch for a single motor will:

- have an ampere rating greater than or equal to 115 percent of the rated motor full load current; or,
- have a HP rating greater than or equal to the rated motor HP (at applied voltage) if the disconnect switch under consideration is HP rated.

2. Combination load application

A properly sized disconnect switch for a combination load will be selected by adding all the simultaneous individual loads in the circuit under consideration.

Using motor nameplate information, load information, and tables from section 430 of the NEC, determine one equivalent full load current and one equivalent locked rotor current. The equivalent locked rotor current can be used with table 430-151 to determine an equivalent HP rating. Select a disconnect switch:

- greater than or equal to 115 percent of the equivalent full load current; and,
- greater than or equal to the equivalent HP rating.

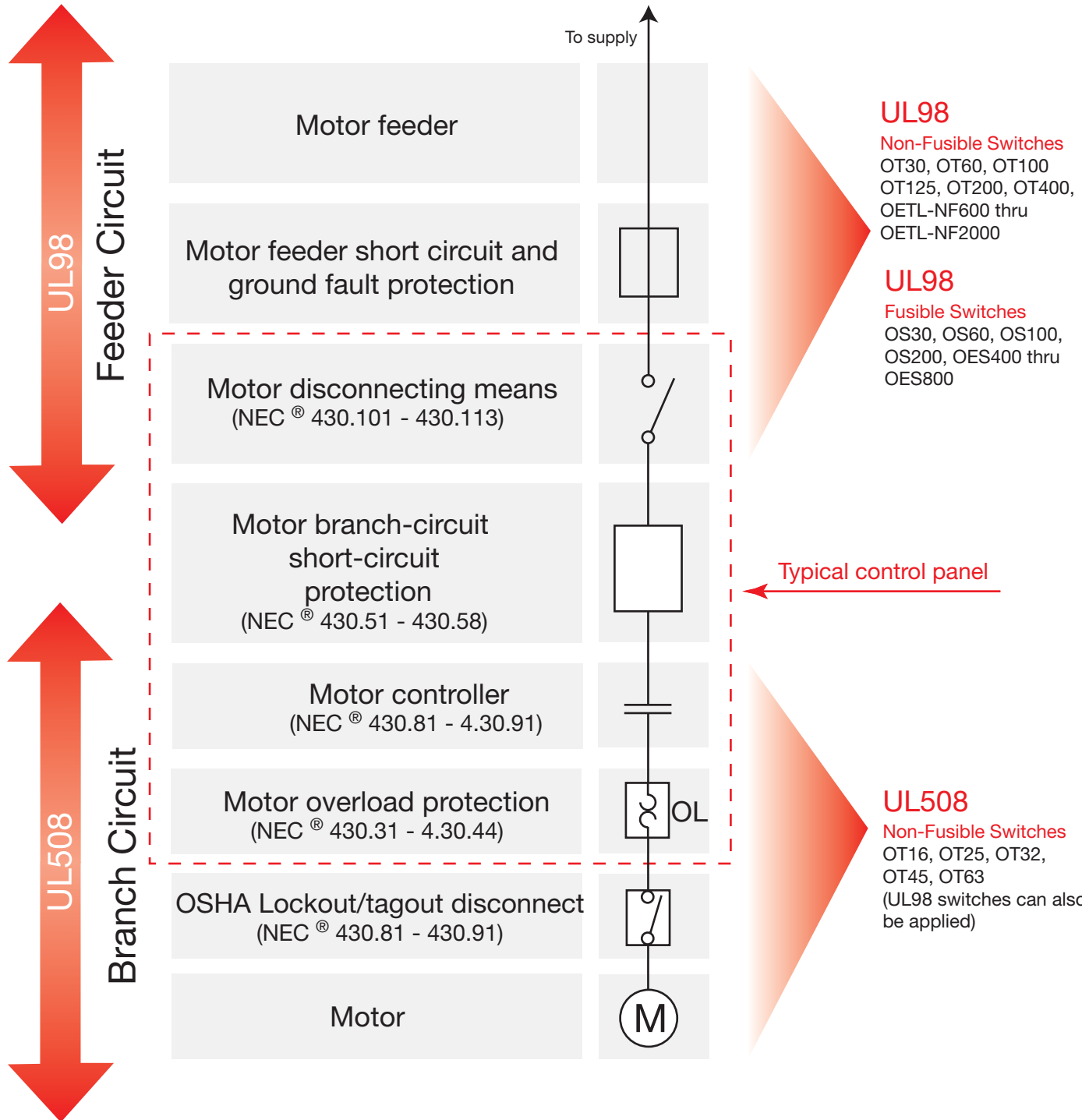
Selecting switches per IEC

Utilization categories

Nature of current	Utilization category		Typical applications
	Frequent operation	Infrequent operation	
Alternating current	AC-20A	AC-20B	<ul style="list-style-type: none"> Connecting and disconnecting under no-load conditions Switching of resistive loads including moderate overloads (PF > 0.95) Switching of mixed resistive and inductive loads, including moderate overloads (PF > 0.65) Switching of motor loads or other highly inductive loads (PF > 0.45 below 100A; PF > .35 above 100A)
	AC-21A	AC-21B	
	AC-22A	AC-22B	
	AC-23A	AC-23B	
Direct current	DC-20A	DC-20B	<ul style="list-style-type: none"> Connecting and disconnecting under no-load conditions Switching of resistive loads including moderate overloads (L/R < 1ms) Switching of mixed resistive and inductive loads, including moderate overloads, e.g., shunt motors (L/R < 2.5ms) Switching of highly inductive loads, e.g., series motors (L/R < 15ms)
	DC-21A	DC-21B	
	DC-22A	DC-22B	
	DC-23A	DC-23B	
Mechanical endurance	Number of operations	Number of operations	
100A	10,000	2000	
315A	8000	1600	
>315A	2000	400	

- Category AC-23 includes occasional switching of individual motors. The switching of capacitors of tungsten filament lamps shall be subject to agreement between manufacturer and user.

Use of UL98 & UL508 Disconnects



AC – Alternating current — Current that reverses its direction of flow twice per cycle.

Ambient temperature — Temperature of the air surrounding the unit.

Amp rating — The basic unit of measurement for electric current (columbs / seconds).

Conventional thermal current I_{th} — Value of the current the disconnect switch can withstand with poles in closed position, in free air for an eight hour duty, without the temperature rise of its various parts exceeding the limits specified by the standards.

Cycle duration — Total time of the on-load + off-load period.

DC – Direct current — Current that flows in only one direction.

Electrical endurance — Number of on-load operating cycles.

IEC environmental protection type — see page 18.52.

Full load amp current FLA — The current required by a motor to produce full-load torque at the motor's rated speed.

Inductive load — An electrical load characterized by having significant inrush (5 to 6 times FLA for typical design-B AC induction motors).

kW — Kilowatts (1000 watts)

Lockout/Tagout — Means of removing power from electrical equipment during inspection, service or repair.

Make / Break — ON / OFF

Mechanical endurance — Number of off-load operating cycles.

Poles in series — Means of connection poles using wires or bus bars to increase breaking capacity of load.

Power factor — The relationship between working power and total power consumed. Power factor measures how effectively electrical power is being used.

Rated insulation U_i — Voltage value which designates the unit and to which dielectric tests, clearance and creepage distances are referred.

Rated operating current I_e — Current value stated by the manufacturer and taking into account the rated operating voltage U_e , the rated frequency, the rated duty, the utilization category, the electrical contact life and the type of protective enclosure.

Rated operating voltage U_e — Voltage value to which utilization characteristics of the disconnect switch are referred, i.e. phase-to-phase voltage in 3 phase circuits.

Rated short circuit making capacity I_{cm} — The rated short-circuit making capacity of a disconnect switch, a disconnect or a switch-disconnector is the value assigned to equipment at the rated operational voltage, frequency (if any) and specified power-factor for AC or time constant for DC. It is expressed as the maximum prospective peak current under prescribed conditions.

Rated short time withstand current I_{cw} — The rated short-time withstand current of a disconnect switch, a disconnect or a switch-disconnector is the value that the equipment can carry without damage, under the test conditions specified in the relevant product standard. The value of the rated short-time withstand current shall be not less than twelve times the maximum rated operational current unless otherwise stated by manufacturer and the duration of the current shall be 1 s.

Resistive load — An electrical load characterized by not having any significant inrush current.

Short circuit protection co-ordination — Co-ordination types "1" and "2" are defined in IEC 947-4-1.

Type 1 co-ordination — There has to be no discharge of parts beyond the enclosure. Damage to the contactor and the overload is acceptable.

Type 2 co-ordination — No damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated.

Time constant — Ratio of inductance to the resistance:
 $L/R = \text{mH}/\text{Ohm} = \text{ms}$.

Torque — The force that produces rotation. It is commonly measured in pound-feet (lb-ft). Torque applies to such things as motor operations, handle rotations, wire tightening.

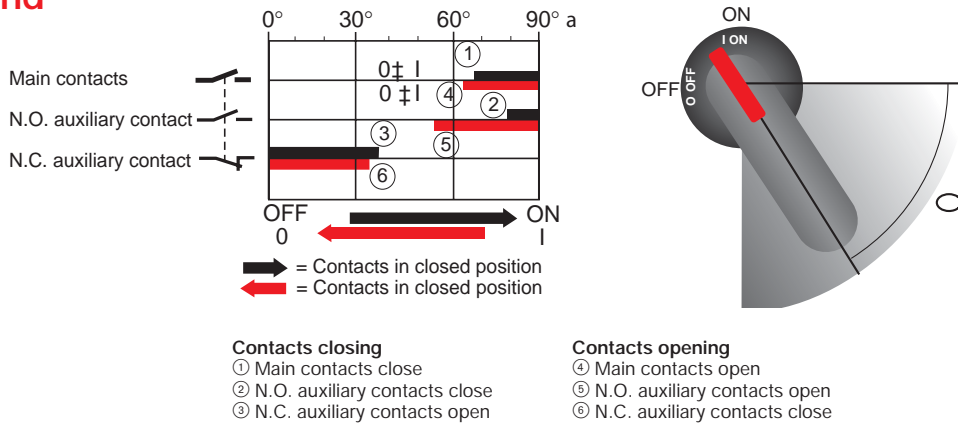
UL environmental protection type — see page 18.51.

Volt — The unit of electrical potential difference and electromotive force.

Auxiliary contact timing diagrams OS30_ – OS100

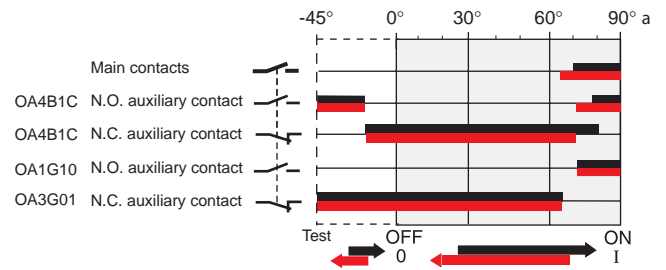
Disconnect
switches
Fusible

Legend



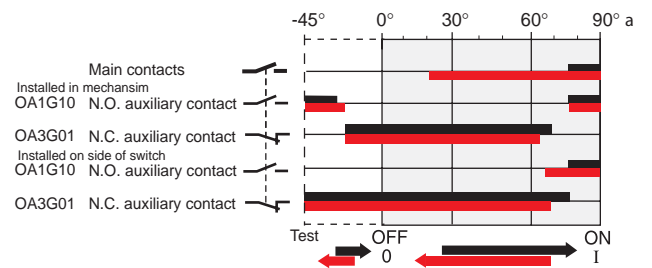
OS30_

Catalog number	Auxiliary contact	Contact configuration
OS30_	OA4B1C OA1G10 OA3G01	1 N.O. & 1 N.C. 1 N.O. 1 N.C.



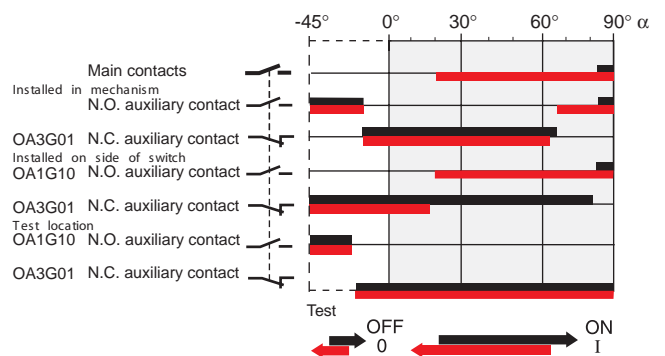
OS60

Catalog number	Auxiliary contact	Contact configuration
OS60	OA1G10 OA3G01	1 N.O. 1 N.C.



OS100

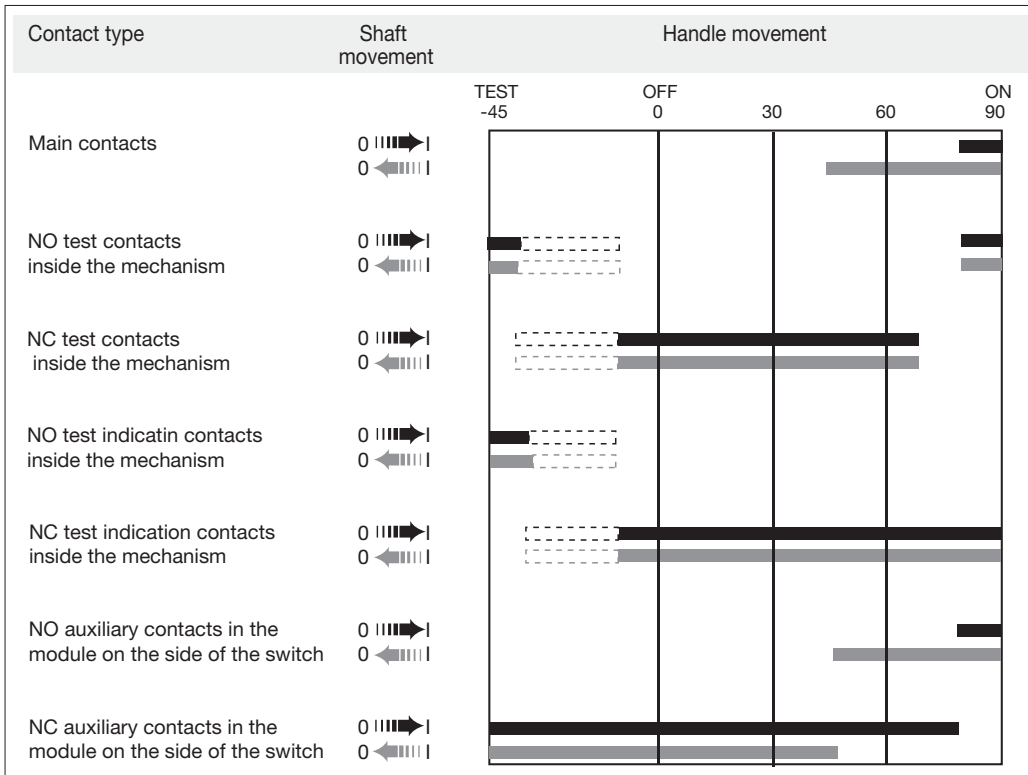
Catalog number	Auxiliary contact	Contact configuration
OS100	OA1G10 OA3G01	1 N.O. 1 N.C.



18

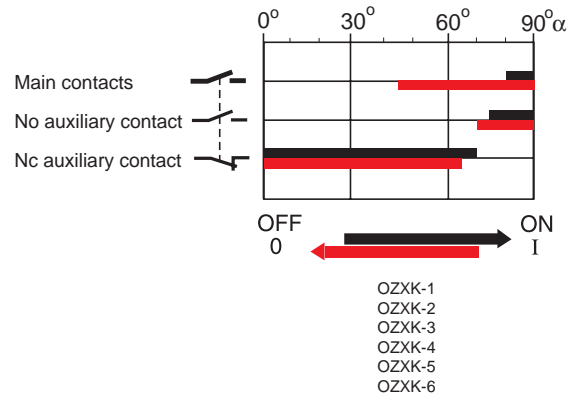
Auxiliary contact timing diagrams OS200 – OES800

OS200



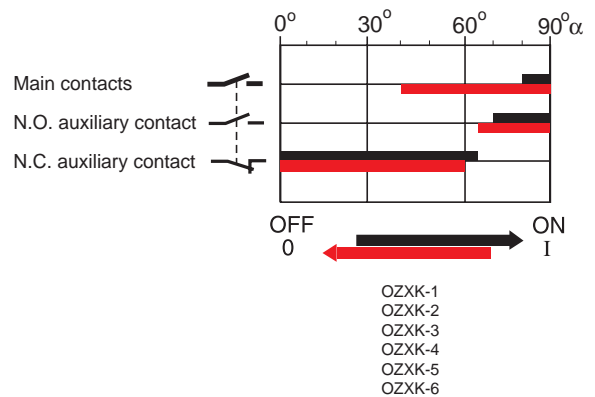
OES400

Catalog number	Auxiliary contact	Contact configuration
OES400	OZ XK-1	1 N.O. & 1 N.C.
	OZ XK-2	2 N.O. & 2 N.C.
	OZ XK-3	4 N.O. & 4 N.C.
	OZ XK-4	2 N.O.
	OZ XK-5	4 N.O.
	OZ XK-6	8 N.O.



OES600 & OES800

Catalog number	Auxiliary contact	Contact configuration
OES600 – OES800	OZ XK-1	1 N.O. & 1 N.C.
	OZ XK-2	2 N.O. & 2 N.C.
	OZ XK-3	4 N.O. & 4 N.C.
	OZ XK-4	2 N.O.
	OZ XK-5	4 N.O.
	OZ XK-6	8 N.O.

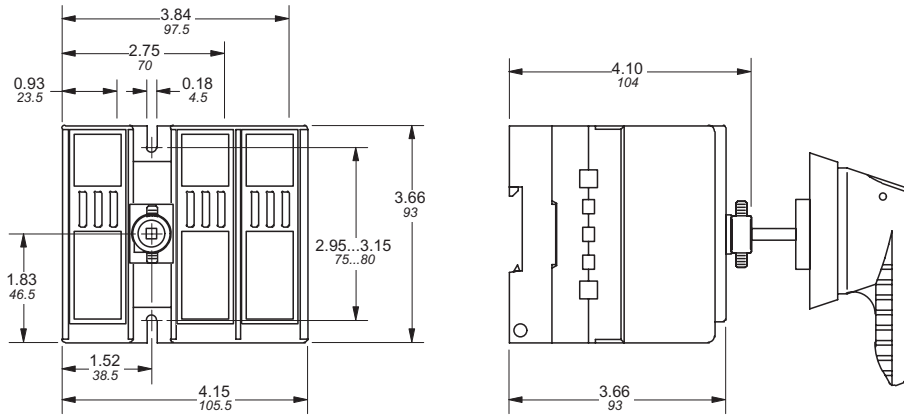


Approximate dimensions OS30A_ - OS60_

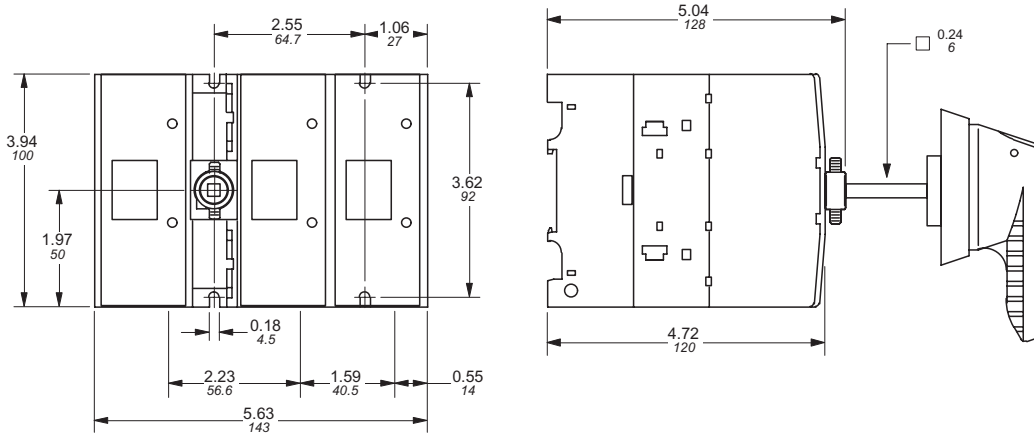
Disconnect
switches
Fusible

00.00 Inches
00.00 [Millimeters]

OS30AJ12 & OS30ACC12



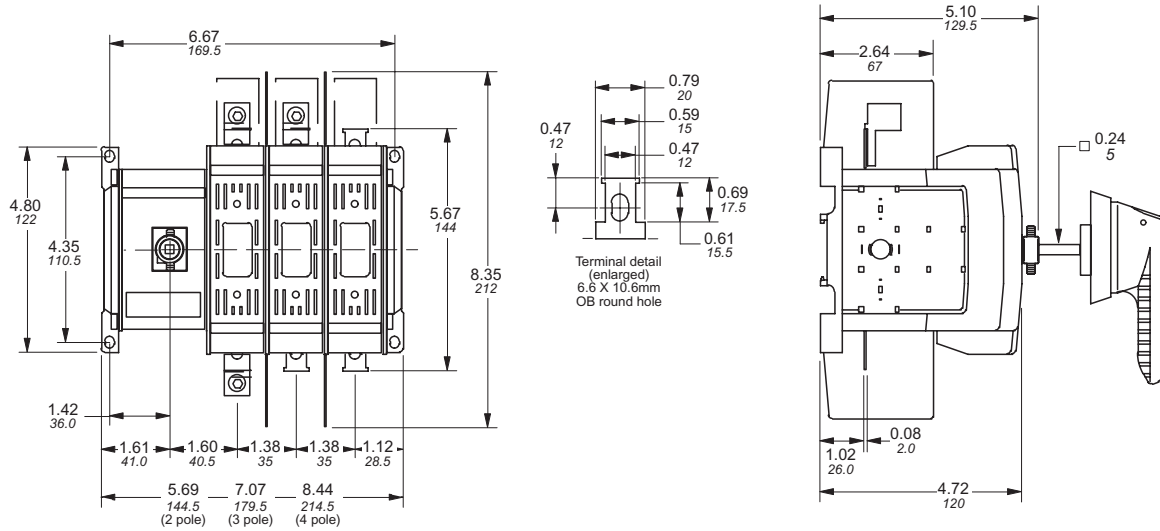
OS60J12



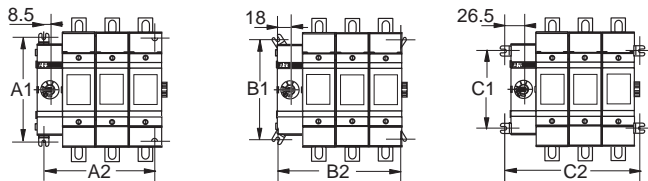
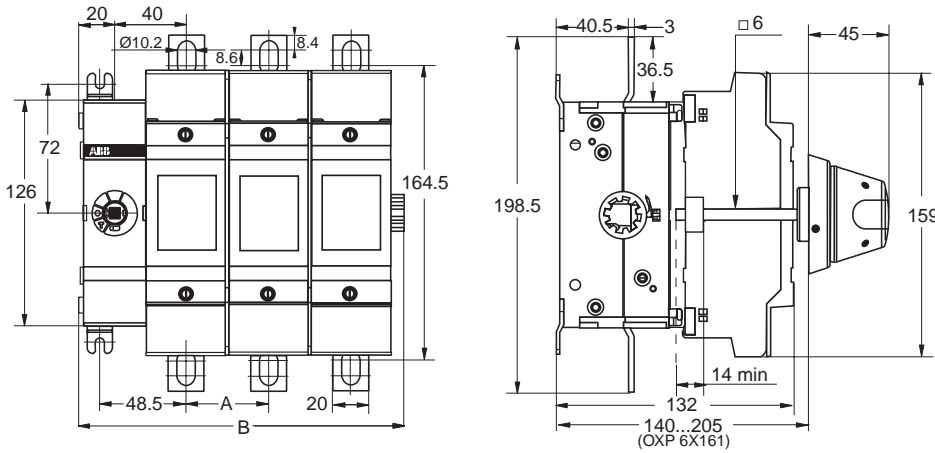
Approximate dimensions OS100_ - OS200_

00.00 Inches
00.00 [Millimeters]

OS100J03



OS200J02, -03, -04



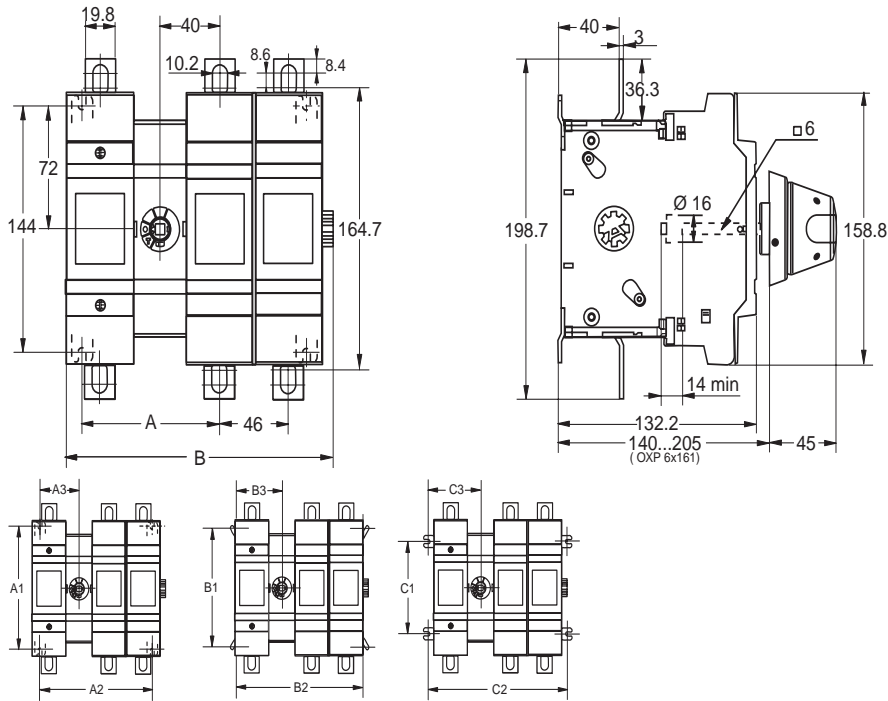
	OS200 (mm)		
	J02	J03	J04
A	46	46	46
B	135.5	181.5	222.75
A1	144	144	144
A2	106.5	152.5	198.5
B1	138.5	138.5	138.5
B2	125.5	171.5	217.5
C1	108	108	108
C2	142.5	188.5	234.5

Approximate dimensions OS200_ - OES200_

Disconnect
switches
Fusible

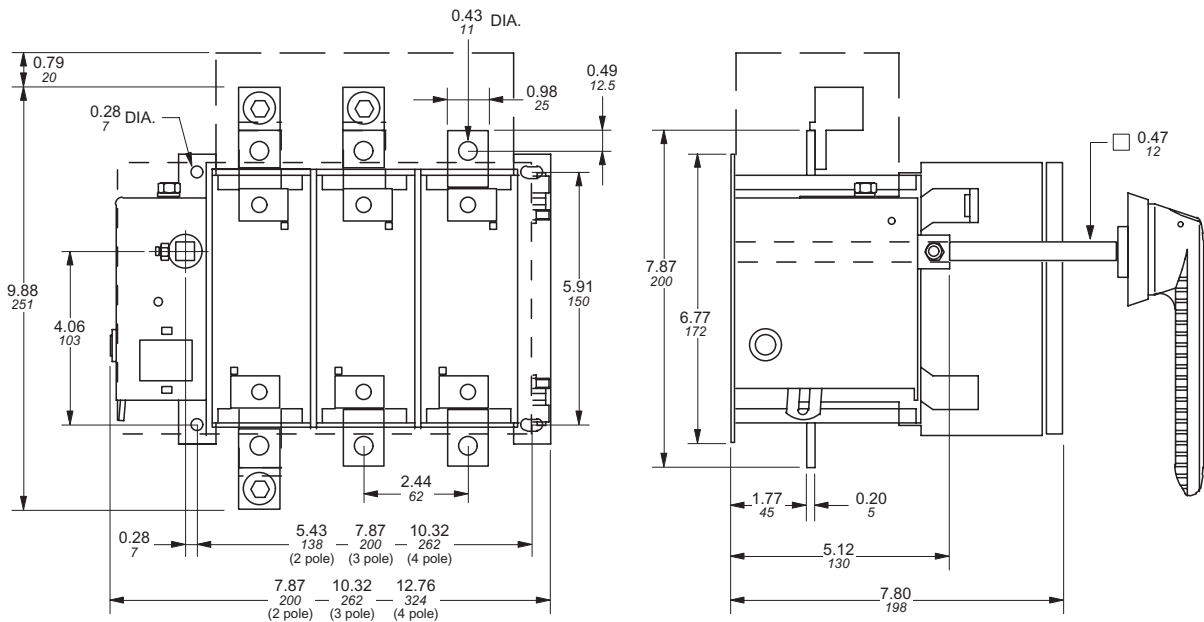
← 00.00 → Millimeters

OS200J11, -12, -13, -22



	OS200 (mm)			
	J11	J12	J13	J22
A	92	92	92	138
B	132.1	178.1	224.1	224.1
A1	144	144	144	144
A2	104	150	196	196
A3	52	52	52	98
B1	109.4	109.4	109.4	109.4
B2	105.9	140.9	140.9	175.9
B3	61.5	61.5	61.5	107.5
C1	108	108	108	108
C2	140	186	232	232
C3	70	70	70	116

OES200R03

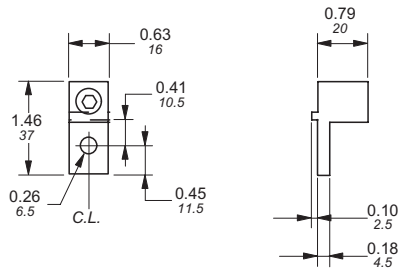


Approximate dimensions for Terminal lugs

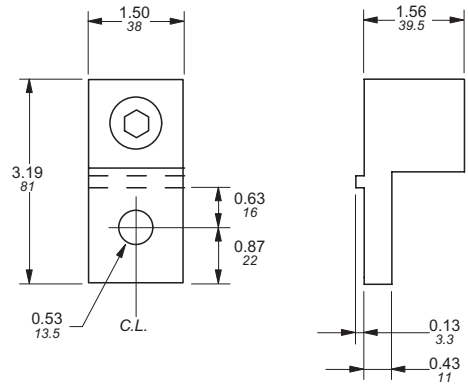
Disconnect
switches
Fusible

00.00 Inches
00.00 [Millimeters]

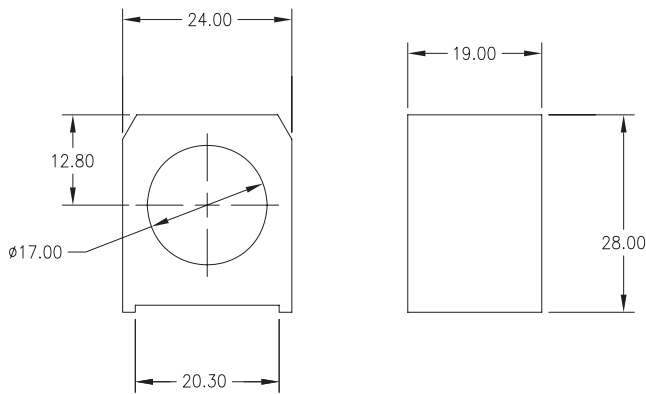
OZXA-24 — for use with 100A switches



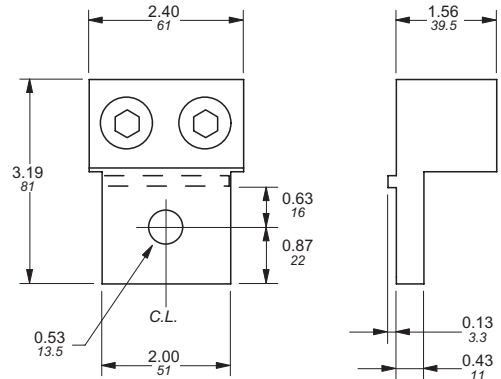
OZXA-26 — for use with 400A switches



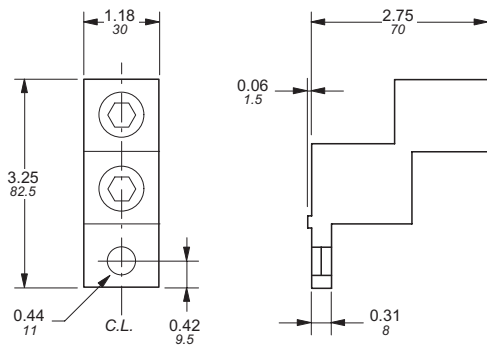
OZXA-200 — for use with 200A switches



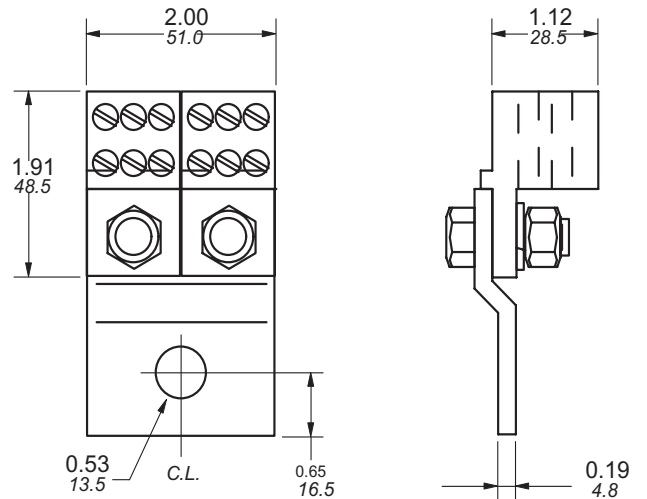
OZXA-27 — for use with 600A switches



OZXA-33 — for use with 400A switches



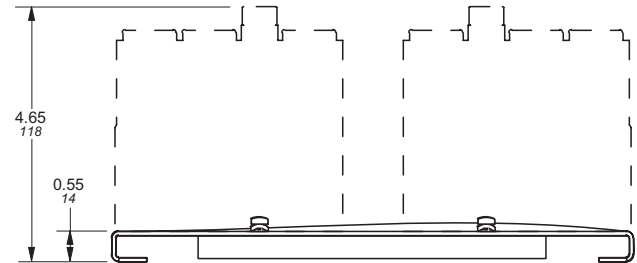
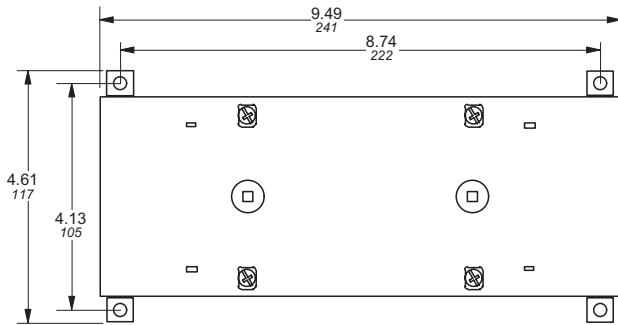
OZXA-175/400 — for use with 600-800A switches



Approximate dimensions for 30A Conversion mechanisms

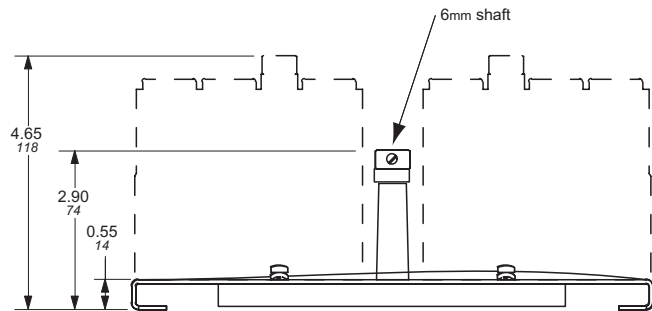
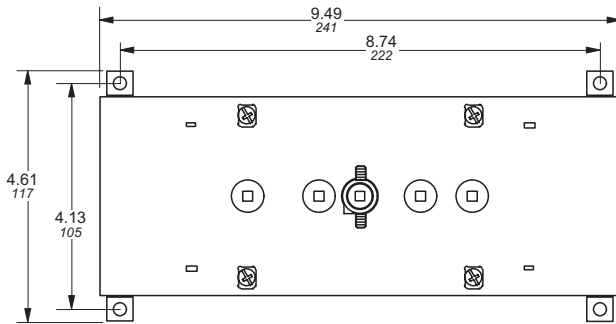
00.00 Inches
00.00 [Millimeters]

6 pole — OWP5DS1



OWP5DS1 in combination with:	Minimum inches/mm	Maximum ① inches/mm
OS30_	5.51 / 140	n/a

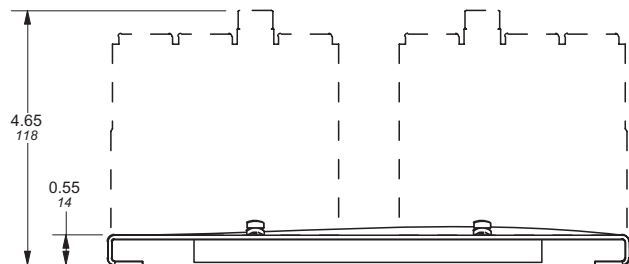
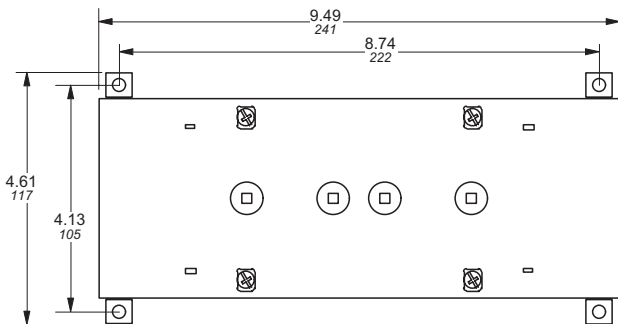
3 pole transfer switch — OWC5DSH1, OWC5DSH1X



OWC5DSH1_	Minimum inches/mm	Maximum ① inches/mm
OS30_	5.51 / 140	n/a

Mechanical interlock — OWM5DS1

18

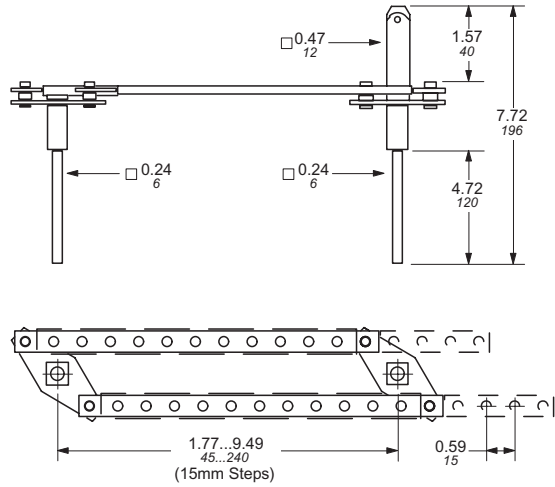


OWM5DS1 in combination with:	Minimum inches/mm	Maximum inches/mm
OS30_	5.51 / 140	n/a

Approximate dimensions for 60A – 100A conversion mechanisms

00.00 Inches
00.00 [Millimeters]

6 or 8 pole — OESA-ZW2

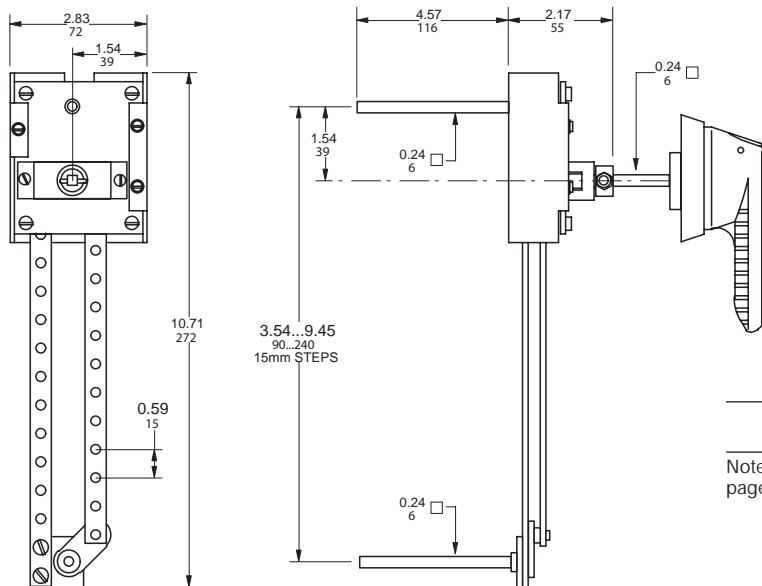


For installation of 6 or 8 pole and transfer mechanisms, the following minimum and maximum mounting dimensions are given below.

OESA-ZW2 in combination with:	Minimum inches/mm	Maximum ① inches/mm
OS60	6.89/175	10.83/275
OS100	6.89/175	10.83/275

Note: Deeper enclosures will require a longer shaft, please select a 12mm shaft from page 18.92, and an OETL-ZX95 shaft extension coupler from page 18.94.

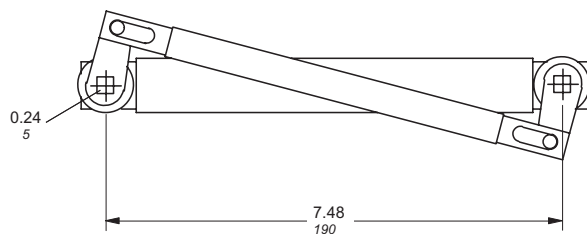
Transfer switch — OESA-ZW1 & OESA-ZW1X



OESA-ZW1 in combination with:	Minimum inches/mm	Maximum ① inches/mm
OS60	7.87/200	13.23/336
OS100	8.27/210	13.23/336

Note: Deeper enclosures will require a longer shaft, please select a 6mm shaft from page 18.87.

Mechanical interlock — OTZW10



OTZW10 in combination with:	Minimum inches/mm	Maximum ① inches/mm
OS60 - OS 200	6.3 / 160	—

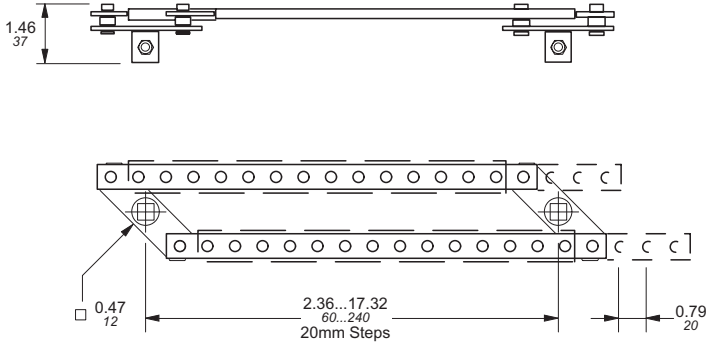
Note: Deeper enclosures will require a longer shaft, please select a 6mm shaft from page 18.87.

Approximate dimensions for 400A – 800A conversion mechanisms

← 00.00 → Inches
00.00 [Millimeters]

6 or 8 pole — OETL-ZW9

For installation of 6 or 8 pole and transfer mechanisms, the following minimum and maximum mounting dimensions are given below.

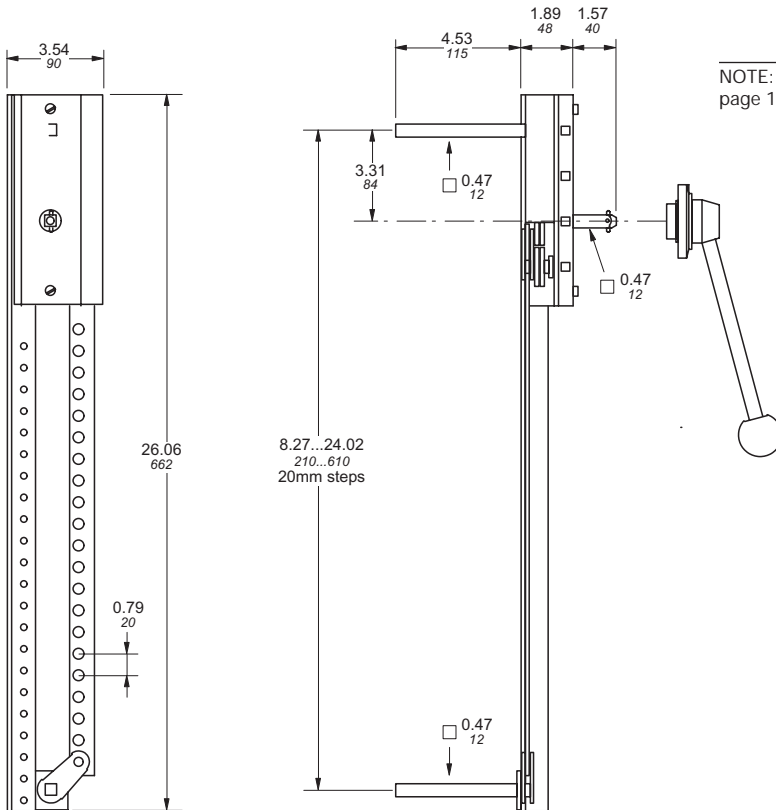


OETL-ZW9 in combination with:	Minimum inches/mm	Maximum ^① inches/mm
OES400	9.84/250	N/A
OES600	11.02/280	N/A
OES800	11.02/280	N/A

Transfer switch — OETL-ZW12

OETL-ZW12 in combination with:	Minimum inches/mm	Maximum ^① inches/mm
OES400	10.82/275	N/A
OES600	11.81/300	N/A
OES800	11.81/300	N/A

NOTE: Deeper enclosures require a longer shaft. Select a 12mm shaft from page 18.92 and an OETLZX95 shaft extension coupler from page 18.94.



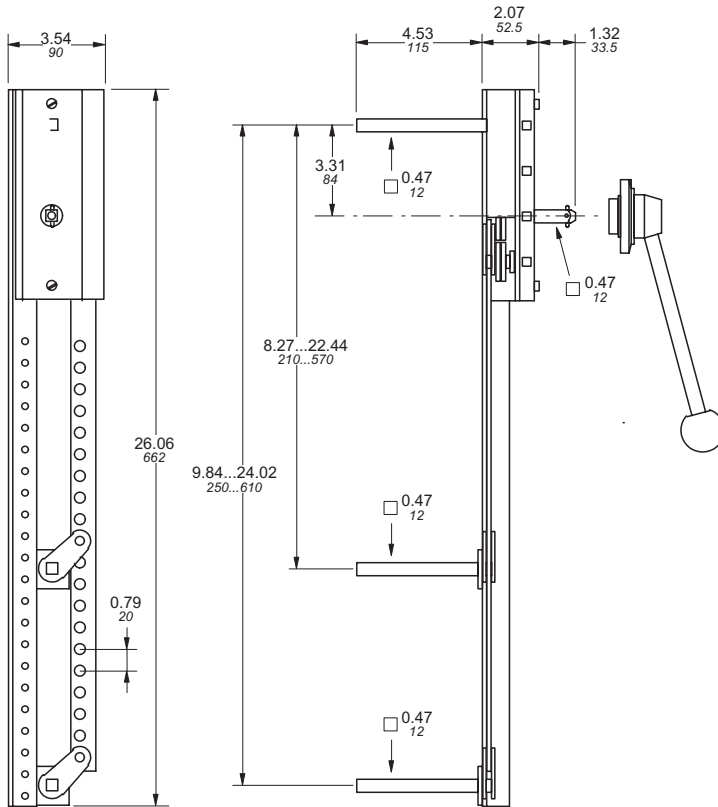
Approximate dimensions for 400A – 800A conversion mechanisms

Disconnect
switches
Fusible

← 00.00 Inches
00.00 [Millimeters] →

Bypass switch — OETL-ZW13

For installation of bypass and mechanical interlock mechanisms, the following minimum and maximum mounting dimensions are given below.

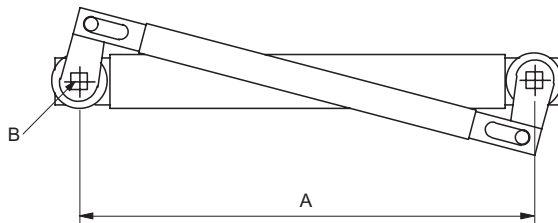


OETL-ZW13 in combination with:	Minimum inches/mm	Maximum ① inches/mm
OES400	11.61/295	N/A
OES600	12.80/325	N/A
OES800	12.80/325	N/A

Includes YASDA-21 handle.

NOTE: Deeper enclosures require a longer shaft. Select a 12mm shaft from page 18.92 and an OETLZX95 shaft extension coupler from page 18.94.

Mechanical interlock — OETL-ZW3, OETL-ZW14 & OETL-ZW15



OETL-ZW3, 14, 15 in combination with:	Minimum inches/mm	Maximum ① inches/mm
OES400	9.45/240	N/A
OES600	10.43/265	N/A
OES800	10.43/265	N/A

Handle(s) not included.

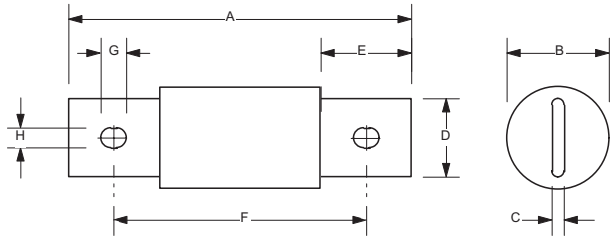
Dimensions in Inches
& mm

	A	B
OETL-ZW3	11.81 300.0	0.47 12.0
OETL-ZW14	9.84 250.0	0.47 12.0
OETL-ZW15	19.69 500.0	0.47 12.0

Approximate dimensions for Fuses

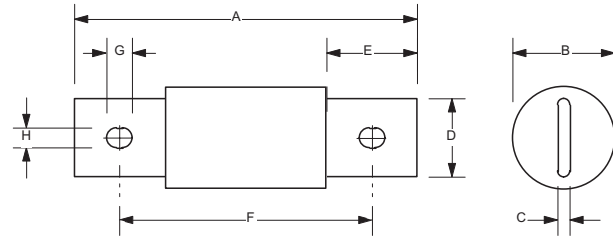
00.00 Inches
00.00 [Millimeters]

Class J (600V)



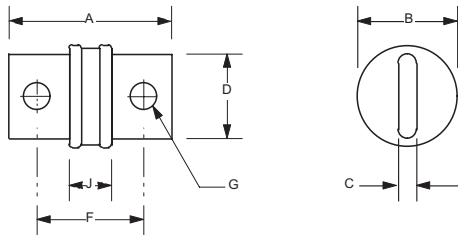
Amperage rating	A	B	C	D	E	F	G	H
1 - 30	2.25	.81	—	—	—	—	—	—
31 - 60	2.38	1.06	—	—	—	—	—	—
61 - 100	4.62	1.12	.12	.75	1	3.62	.38	.28
101 - 200	5.75	1.62	.19	1.12	1.38	4.38	.38	.28
201 - 400	7.12	2.12	.25	1.62	1.88	5.25	.53	.41
401 - 600	8.00	2.5	.38	2.00	2.12	6.00	.69	.53

Class L (600V)



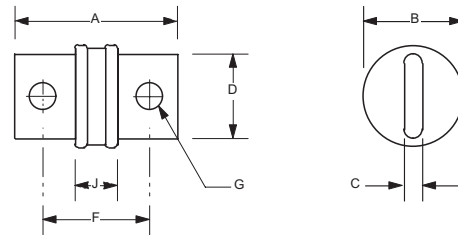
Amperage rating	A	B	C	D	E	F	G	H
200 - 600	8.62	2.00	.31	1.62	2.41	6.25	1.12	.62
601 - 800	8.62	2.50	.38	2.00	2.41	6.25	1.12	.62

Class T (300V)



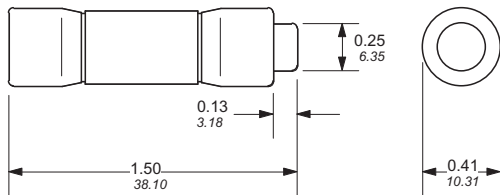
Amperage rating	A	B	C	D	F	G	J
1 - 30	.88	.41	—	—	—	—	—
31 - 60	.88	.56	—	—	—	—	—
61 - 100	2.16	.81	.12	.75	1	3.62	.38
101 - 200	2.45	1.06	.19	1.12	1.38	4.38	.38
201 - 400	2.75	1.33	.25	1.62	1.88	5.25	.53
401 - 600	3.06	1.62	.31	2.00	2.12	6.00	.69
601 - 800	3.38	2.08	.38	1.75	2.22	.55	.88

Class T (600V)



Amperage rating	A	B	C	D	F	G	J
1 - 30	1.50	.56	—	—	—	—	—
35 - 60	1.56	.81	—	—	—	—	—
70 - 100	2.95	—	.12	.75	2.36	.28	1.64
110 - 200	3.25	—	.19	.88	2.50	.34	1.66
225 - 400	3.62	—	.25	1.00	2.69	.41	1.64
450 - 600	3.98	—	.31	1.25	2.95	.48	1.78
601 - 800	4.37	—	.38	1.75	3.17	.55	1.88

Class CC (600V) — Rejection type

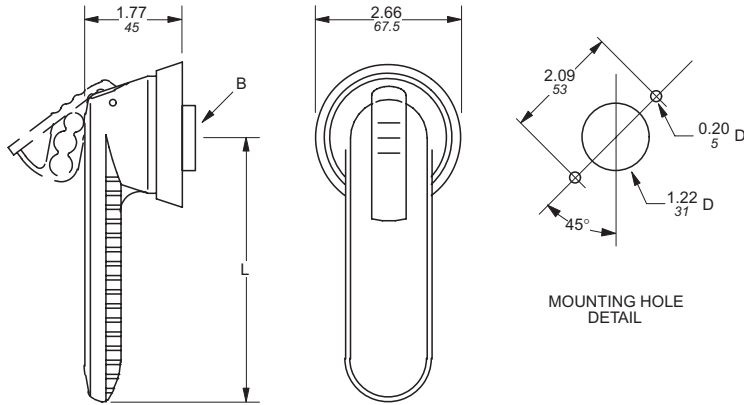


Approximate dimensions Handles

Disconnect
switches
Fusible

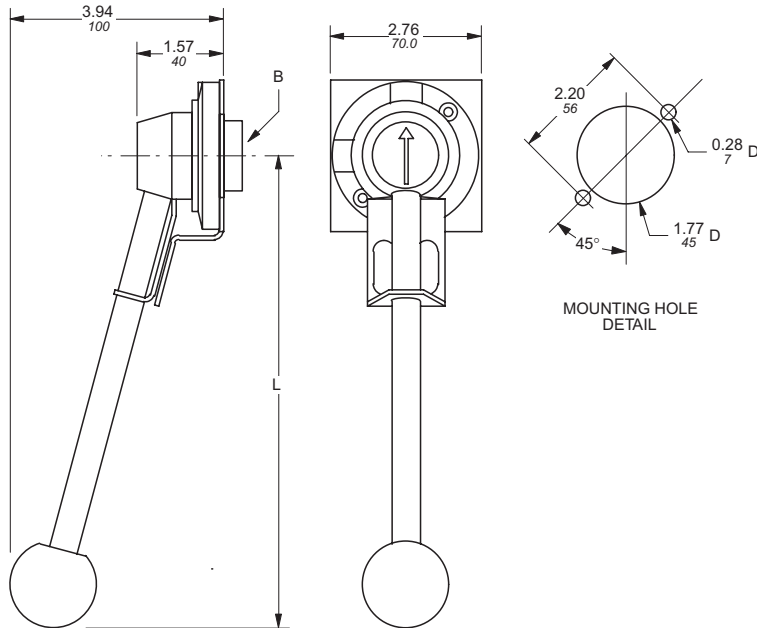
00.00 Inches
00.00 [Millimeters]

Pistol handles



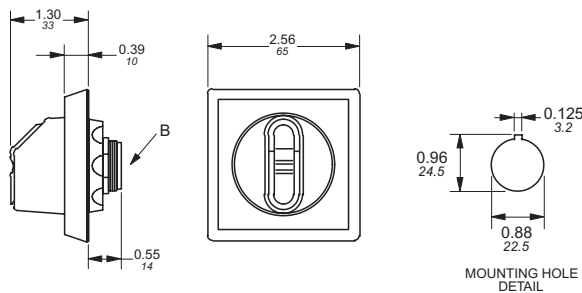
L Catalog number	Inches/ mm	□ B Shaft size Inches/ mm	UL / NEMA Type
OH_45J5	1.8/45	0.20/5	1, 3R, 12
OH_65J5	2.6/65	0.20/5	1, 3R, 12
OH_45J6	1.8/45	0.24/6	1, 3R, 12
OH_65J6	2.6/65	0.24/6	1, 3R, 12
OH_80J6	3.1/80	0.24/6	1, 3R, 12
OH_65J8	2.6/65	0.31/8	1, 3R, 12
OH_80J8	3.1/80	0.31/8	1, 3R, 12
OH_125J12	4.9/125	0.47/12	1, 3R, 12
OH_145J12	5.7/145	0.47/12	1, 3R, 12
OH_175J12	6.9/175	0.47/12	1, 3R, 12
OH_65L5	2.6/65	0.20/5	1, 3R, 4, 4X, 12
OH_80L6	3.1/80	0.24/6	1, 3R, 4, 4X, 12
OH_80L8	3.1/80	0.31/8	1, 3R, 4, 4X, 12
OH_145L12	5.7/145	0.47/12	1, 3R, 4, 4X, 12
OH_175L12	6.9/175	0.47/12	1, 3R, 4, 4X, 12

— = Handle color, B (Black) or Y (Red/Yellow)



Catalog number	L Inches/ mm	□ B Shaft size Inches/ mm	UL / NEMA Type
YASDA-7	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-8	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-21	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-6	12.60/320	0.47/12	1, 3R, 4, 4X, 12

OH_2A_



Catalog number UL Type	Defeatable	□ B Shaft size Inches/ mm
1, 3R, 12		
OHB2AJ1	No	0.20/5
OHY2AJ1	No	0.20/5
OHB2AJ	Yes	0.20/5
OHY2AJ	Yes	0.20/5

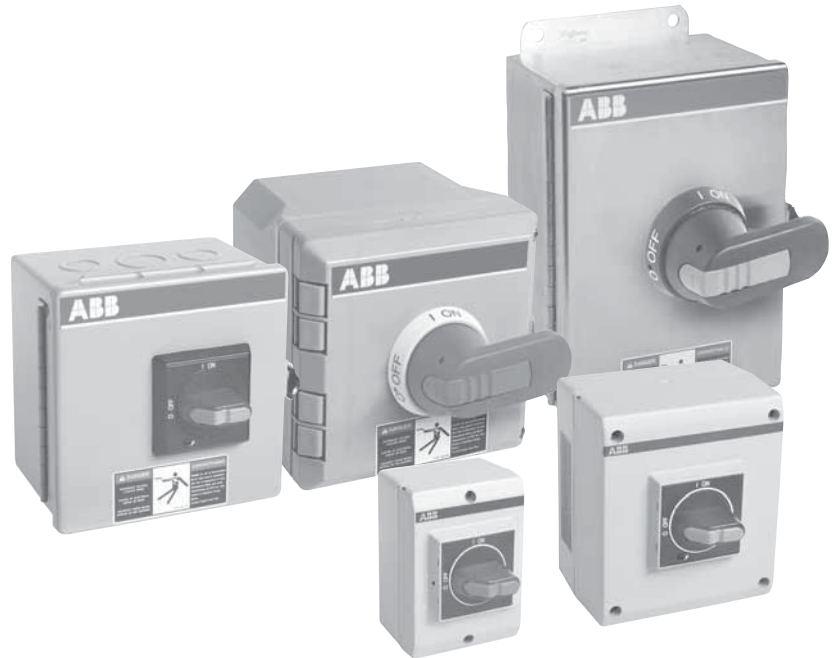
Notes

SafeLine Enclosed Disconnect switches



SafeLine

Compact, heavy duty
Enclosed disconnect switches
16A – 3150A Non-fusible
30A – 3000A Fusible



SafeLine enclosed disconnect switches are designed to meet customer requirements in terms of safety, ease of installation, space savings and operational convenience. They are available in a wide range of amperage ratings, are UL approved and NEMA rated to satisfy rugged industrial environments.

- Suitable for use as:**
- OSHA Lockout/Tagout disconnects
 - Safety switches
 - Load break switches
 - Isolators

General information Non-fusible

NF 16 E - 3P BJ A 11

Disconnect switch type

- NF = Non-fusible
- FC = UL Fused Class CC, (30A)
- FJ = UL Fused Class J, (30A – 600A)
- FL = UL Fused Class L, (800A)
- FT = UL Fused Class T, (100A – 800A)
- F* = Fused Class *special customer requirements

Disconnect switch frame size

Non-Fusible switches

16	25	30	32	45	60
63	100	125	200	400	600
800	1200	1600	2000	3150	

Fusible switches

30	60	100	200	400	600
800	1200 - 3000 – consult factory				

Environmental rating

- 1 = Type 1
- 2 = Type 12
- 3 = Type 3R
- 4 = Type 4
- X = Type 4, 4X stainless steel
- P = Type 3R, 4, 4X plastic
- K = Type 3R, 12 plastic
- E = European rated IP65,
- 7 = Type 7 & 9 Class I; Div. 1 & 2; Group C, & D
Class II; Div. 1 & 2; Group E, F, & G
- 74 = Type 4, 7, & 9
- * = Special customer requirements

Accessories

- 10 = 1 N.O. auxiliary contact
- 01 = 1 N.C. auxiliary contact
- 11 = 1 N.O. & 1 N.C. auxiliary contacts
- 22 = 2 N.O. & 2 N.C. auxiliary contacts
- A = Start/Stop pushbuttons
- C = 2 Position selector switch
- D = 3 Position selector switch
- E = Pilot light, "Red/Run"
- N = Neutral terminal
- G = Ground terminal, isolated ①
- U = Service entrance, 3-wire ②
- V = Service entrance, 4-wire
- * = Special customer requirements

Series

Handle type

the appropriate handle is provided for each enclosure in accordance with the application.

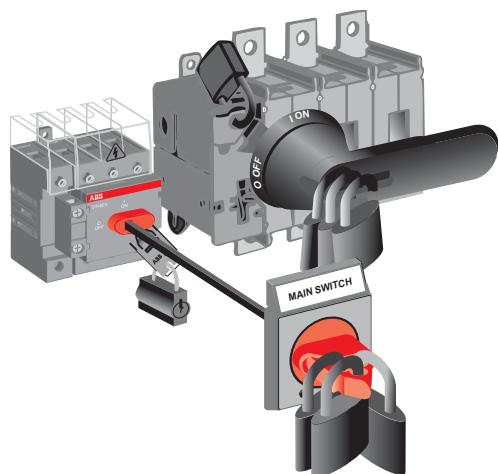
- B_ = black
- Y_ = Red/Yel

Poles or conversion mechanisms

- 2P = 2 poles
- 3P = 3 poles
- 4P = 4 poles
- 6P = 6 poles
- 3T = 3 pole transfer
- 4T = 4 pole transfer
- 3B = 3 pole by-pass
- 3M = 3 pole mechanical interlock

OSHA

Suitable for use as OSHA Lockout/tagout disconnect when applied in accordance with part IV, Department of Labor Occupational Safety and Health Administrations, 29 CFR Part 1910, Control of Hazardous Energy Source (Lockout/Tagout): Final Rule.



Handle and mechanism padlocked OFF

Padlockable

Handles can be padlocked in the "OFF" position with up to three padlocks: Additionally, the switch mechanism can be directly padlocked in the "OFF" position when the door is open. NOTE: Some handles can be ordered with the ability to padlock in both the "ON" & "OFF" positions, please consult your ABB sales office. When the handle is padlocked, the enclosure cannot be opened.

① All enclosed switches are provided with a ground lug. See page 18.143.

② Only for UL 98 switches

General information

Non-fusible and fusible

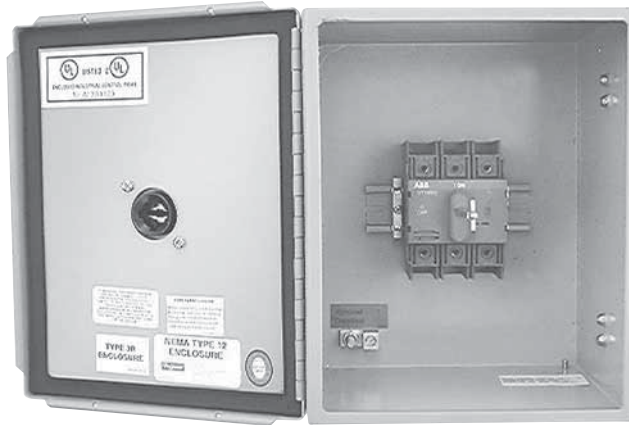
Disconnect
switches
Non-fusible
Enclosed

Non-Fusible

UL Listed to UL 508 and UL 98.
CSA approved
IEC rated
CE marked

Snap on accessories include additional poles, auxiliary contacts, etc.

Enclosures available in plastic, metal, or stainless steel in NEMA 1, 3R, 12, 4X, 7 & 9 environmental categories



Modern appearance

Quick make, quick brake mechanism

Heavy duty disconnect, 600VAC

Extremely compact size

Finger-proof construction. No hazardous exposed parts

3/4/6/8 pole constructions; transfer switches and by-pass switches available

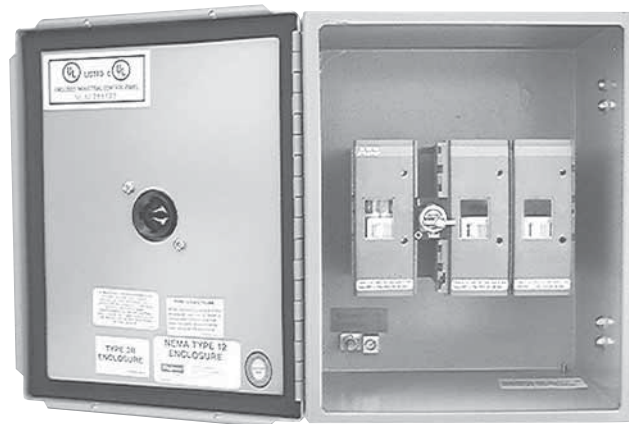
Fusible

UL Listed to UL 98 standards.
CSA approved
IEC rated
CE marked

Snap on accessories include fuse monitors, auxiliary contacts, etc.

Enclosures available in plastic, metal, or stainless steel in NEMA 1, 3R, 12, 4X, 7 & 9 environmental categories

Fuse carriers available for US standards, BS, DIN, NFC standard and for various high speed fuse patterns



Modern appearance

Quick make, quick brake mechanism

Heavy duty disconnect, 600VAC, 200kA, I_{sc}

Extreme compact size as fuse carriers are decked above contacts

Double contacts enabling feed from any direction and preventing back feed

Finger-proof construction. No hazardous exposed parts

3/4/6/8 pole constructions; transfer switches and by-pass switches available

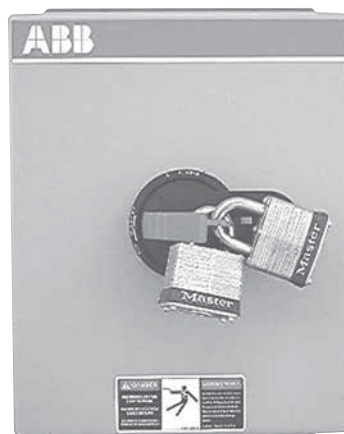
Lockable

Clear position indications:

I-ON
O-OFF

Door interlocked when handle padlocked to OFF position

Handle padlockable with up to three padlocks



Door interlocked when handle is in ON position. Door interlock can be defeated by authorized personnel.

Pilot devices can be added

General information

NEMA Environmental ratings

Introduction

An enclosure is a surrounding case constructed to provide a degree of protection to personnel against accidental contact with the enclosed equipment and to provide a degree of protection to the enclosed equipment against specified environmental conditions.

A brief description of the more common types of enclosures used by the electrical industry relating to their environmental capabilities follows.

Refer to NEMA Standards Publication for more information regarding applications, features and design tests.

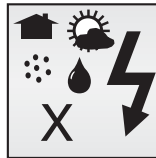
Individual NEMA product Standards Publications or third party certification standards may contain additional requirements for product testing and performance.

Definitions pertaining to nonhazardous locations



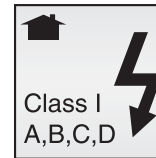
Type 1

Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt. (NEMA Standard 7-15-1991.)



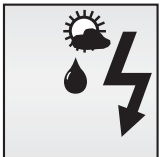
Type 4X

Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979)



Type 7

Enclosures are intended for indoor use in locations classified as Class I, Groups, A, B, C, or D, as defined in the National Electrical Code. (NEMA Standard 7-15-1991.)



Type 3R

Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet and damage from external ice formation. (NEMA Standard 7-15-1991.)



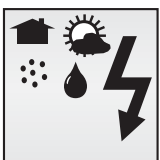
Type 12

Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids. (NEMA Standard 7-15-1991.)



Type 9

Enclosures are intended for indoor use in locations classified as Class II, Groups E, F, or G, as defined in the National Electrical Code. (NEMA Standard 7-15-1991.)



Type 4






Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979.)



Type 13

Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil and noncorrosive coolant. (NEMA Standard 1-10-1979.)

Legend

-  – Indoors
-  – Outdoors
-  – Water
-  – Dirt/dust
-  – Corrosion









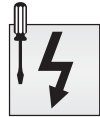











General information

IP Environmental ratings

Disconnect
switches
Non-fusible
Enclosed

IP ratings

indicate the degree of protection against dust, liquids and impacts. The IP degrees of protection are defined by the French standard NFC 20-010. To rate a device's degrees of protection, the letters IP are followed by up to three numbers. These numbers are defined as follows:

first number protection against solid objects	second number protection against liquids	third number protection against mechanical impacts
<p>IP 0  no protection</p>	<p>IP 0  no protection</p>	<p>IP 0  no protection</p>
<p>1  protected against solid objects over 50mm (e.g. accidental touch by hands.)</p>	<p>1  protected against vertically falling rain or condensation</p>	<p>1  impact 0.225 joule 150g falling from 15cm</p>
<p>2  protected against solid objects over 12mm (e.g. fingers)</p>	<p>2  protected against direct sprays of water up to 15° from vertical</p>	<p>2  impact 0.375 joule 250g falling from 15cm</p>
<p>3  protected against solid objects over 2.5mm (tools & wires)</p>	<p>3  protected against sprays to 60° from vertical</p>	<p>3  impact 0.50 joule 250g falling from 20cm</p>
<p>4  protected against solid objects over 1mm (small tools & small wires)</p>	<p>4  protected against water sprayed from all directions</p>	<p>5  impact 2.00 joule 500g falling from 40cm</p>
<p>5  protected against dust (no harmful deposit)</p>	<p>5  protected against low pressure jets of water from all directions</p>	<p>7  impact 6.00 joule 1.5kg falling from 40cm</p>
<p>6  totally protected against dust</p>	<p>6  protected from strong jets of water (e.g. for use on ship decks)</p>	<p>9  impact 20.00 joule 5 kg falling from 40cm</p>
	<p>7  protected against the effects of immersion between 15cm and 1m</p>	

Disconnect
switches
Non-fusible
Enclosed

3 pole 16A – 3150A



NF32X-3PB6C



NF63X-3PB6A

3 Pole, 600V, 16A – 80A Selector handle

UL general purpose amp rating		NEMA Enclosure type							
		1		3R		4		4X Stainless	
		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL 508	16	NF161-3PBJC	\$ 185	NF163-3PBJC	\$ 259	Not available with selector handle		Not available with selector handle	
	25	NF251-3PBJC	190	NF253-3PBJC	264				
	40	NF321-3PBJC	205	NF323-3PBJC	279				
	60	NF451-3PBJB	245	NF453-3PBJB	320				
	80	NF631-3PBJA	280	NF633-3PBJA	354				

3 Pole, 600V, 16A – 3150A Pistol handle

UL general purpose amp rating		NEMA Enclosure type							
		1		3R		4		4X Stainless	
		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL 508	16	NF161-3PB6C	\$ 235	NF163-3PB6C	\$ 309	NF164-3PB6A	\$ 475	NF16X-3PB6C ②	\$ 585
	25	NF251-3PB6C	240	NF253-3PB6C	314	NF254-3PB6A	480	NF25X-3PB6C ②	590
	40	NF321-3PB6C	255	NF323-3PB6C	329	NF324-3PB6A	495	NF32X-3PB6C ②	605
	60	NF451-3PB6B	295	NF453-3PB6B	370	NF454-3PB6B	525	NF45X-3PB6B	635
	80	NF631-3PB6A	330	NF633-3PB6A	404	NF634-3PB6A	550	NF63X-3PB6A	660
UL 98	30	NF301-3PB6B	510	NF303-3PB6B	780	NF304-3PB6B	1090	NF30X-3PB6B	1200
	60	NF601-3PB6B	560	NF603-3PB6B	830	NF604-3PB6B	1140	NF60X-3PB6B	1250
	100	NF1001-3PB6B	610	NF1003-3PB6B	880	NF1004-3PB6B	1190	NF100X-3PB6B	1300
	125	NF1251-3PB6A	1100	NF1253-3PB6A	1400	NF1254-3PB8A	2800	NF125X-3PB8A	3500
	200	NF2001-3PB8B	1300	NF2003-3PB8B	1650	NF2004-3PB8B	3520	NF200X-3PB8B	4400
	400	NF4001-3PB4B	2600	NF4003-3PB4B	2800	NF4004-3PB4B	6400	NF400X-3PB4B	8000
	600	NF6001-3PB4A	4800	NF6003-3PB4A	5000	NF6004-3PB4A	9600	NF600X-3PB4A	12,000
	800	NF8001-3PB4A	8000	NF8003-3PB4A	9400	NF8004-3PB4A	15,200	NF800X-3PB4A	19,000
	1200	NF12001-3PB4A	10,000	NF12003-3PB4A	11,800	NF12004-3PB4A	18,000	NF1200X-3PB4A	22,500
	1600	NF16001-3P8A	19,000	NF16003-3P8A	20,800	NF16004-3P8A	30,400	NF1600X-3P8A	38,000
	2000	NF20001-3P8A	23,000	NF20003-3P8A	25,000	NF20004-3P8A	35,200	NF2000X-3P8A	44,000
	3150 ①	NF31501-3P8A	28,000	NF31503-3P8A	30,000	NF31504-3P8A	39,200	NF3150X-3P8A	49,000

NOTE: All enclosed switches are provided with a black handle; however, most handles can be substituted with a red and yellow handle if desired. Please substitute the handle suffix code (2nd and 3rd from last characters) with the red/yellow handle catalog number suffix from page 18.130. There is no additional price adder for changing to a red/yellow handle of equal ratings and style.

EXAMPLE: A red/yellow selector handle for an NF161-3PBJA can be substituted for the black selector handle by using the "YJ" suffix instead of the "BJ" suffix, new catalog #NF161-3PYJA.

① IEC rated only.
② New Washdown.

3 Pole 16A – 3150A

Disconnect
switches
Non-fusible
Enclosed



NF25P-3PY6A



NF16E-3PBJA



NF16E-3PBJB

3 Pole, 600V, 16A – 80A Selector handle

UL general purpose amp rating	NEMA Enclosure type						IEC Enclosure type	
	12 Plastic		12		7 & 9		IP65 Plastic	
	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
	16	NF16P-3PBJA	\$ 295	NF162-3PBJC	\$ 259	—	NF16E-3PBJA	\$ 185
	16, oversize	—	—	—	—	—	NF16E-3PBJB	210
	25	NF25P-3PBJA	300	NF252-3PBJC	264	—	NF25E-3PBJA	190
	25, oversize	—	—	—	—	—	NF25E-3PBJB	215
	40	NF32P-3PBJA	315	NF322-3PBJC	279	—	NF32E-3PBJA	225
	40, oversize	—	—	—	—	—	NF32E-3PBJB	230
	60	NF45P-3PBJB	350	NF452-3PBJB	320	—	NF45E-3PBJA	245
	80	NF63P-3PBJA	380	NF632-3PBJA	354	—	NF63E-3PBJA	275

3 Pole, 600V, 16A – 3150A Pistol handle

UL general purpose amp rating	NEMA Enclosure type						IEC Enclosure type		
	4X Plastic		12		7 & 9		IP65 Plastic		
	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
	16	NF16P-3PB6A	\$ 345	NF162-3PB6C	\$ 309	NF167-3P	\$ 1900	NF16E-3PB4B	\$ 235
	25	NF25P-3PB6A	350	NF252-3PB6C	314	NF257-3P	1925	NF25E-3PB4B	240
	40	NF32P-3PB6A	365	NF322-3PB6C	329	NF327-3P	1950	NF32E-3PB4B	255
	60	NF45P-3PB6B	400	NF452-3PB6B	370	NF457-3P	3600	NF45E-3PB4B	295
	80	NF63P-3PB6A	430	NF632-3PB6A	400	NF637-3P	3630	NF63E-3PB4B	325
	30	NF30P-3PB6B	875	NF302-3PB6B	780	NF307-3P	4150	NF30E-3PB6A	560
	60	NF60P-3PB6B	925	NF602-3PB6B	830	NF607-3P	4200	NF60E-3PB6A	610
	100	NF100P-3PB6B	975	NF1002-3PB6B	880	NF1007-3P	4250	NF100E-3PB6A	660
	125	NF125P-3PB8A	3000	NF1252-3PB6A	1400	—	—	NF125E-3PB6A	1100
	200	NF200P-3PB8B	4000	NF2002-3PB8B	1600	—	—	—	—
	400	NF400P-3PB4B	6000	NF4002-3PB4B	2900	—	—	—	—
	600	NF600P-3PB4A	10,000	NF6002-3PB4A	5100	—	—	—	—
	800	NF800P-3PB4A	16,000	NF8002-3PB4A	8400	—	—	—	—
	1200	NF1200P-3PB4A	19,000	NF12002-3PB4A	10,400	—	—	—	—
	1600	NF1600P-3P8A	31,000	NF16002-3P8A	19,400	—	—	—	—
	2000	NF2000P-3P8A	37,000	NF20002-3P8A	23,400	—	—	—	—
	3150 ②	NF3150P-3P8A	42,000	NF31502-3P8A	28,400	—	—	—	—

① Please consult factory for pricing and availability
② IEC rated only.

Disconnect
switches
Non-fusible
Enclosed

Switch ratings, handle ratings 16A – 3150A

Switch ratings, 16 – 3150 Amps, 600V

UL General purpose amp rating	Maximum horsepower rating							Wire size for terminal lugs	For wire type	Approval
	Single phase			Three phase						
	120V	200V	240V	200V – 208V	240V	480V	600V			
UL 508 ↑ 16 25 40 ↓	1	2	2	3	5	10	10	#18 – 8	Cu	CSA, UL
	1.5	3	3	7.5	7.5	15	20	#18 – 8	Cu	CSA, UL
	2	5	5	10	10	20	25	#18 – 8	Cu	CSA, UL
UL 98 ↑ 60 80 30 60 100 125 200 400 600 800 1200 1600 2000 3150 ① ↓	2	5	5	15	15	30	30	#14 – 1	Cu	CSA, UL
	2	5	5	20	20	40	40	#14 – 1	Cu	CSA, UL
	2	5	5	10	10	20	30	#14 – 4	Cu	CSA, UL
	3	7.5	7.5	20	20	40	40	#14 – 4	Cu	CSA, UL
	5	15	15	25	30	50	50	#8 – 1/0	Cu	CSA, UL
	7.5	20	20	30	30	75	100	#8 – 1/0	Cu	CSA, UL
	—	—	—	60	75	150	200	#6 – 300 kcmil	Cu	CSA, UL
	—	—	—	100	125	250	350	#2 – 600 kcmil	Cu	CSA, UL
	—	—	—	150	200	400	500	(2) #2 – 600 kcmil	Cu	CSA, UL
	—	—	—	200	250	500	600	(2) #2 – 600 kcmil	Cu/Al	CSA, UL
	—	—	—	—	—	—	—	(4) #2 – 600 kcmil	Cu/Al	CSA, UL
	—	—	—	—	—	—	—	(4) #2 – 600 kcmil	Cu/Al	CSA, UL
—	—	—	—	—	—	—	(8) #2 – 600 kcmil	Cu/Al	CSA, UL	
—	—	—	—	—	—	—	(8) #2 – 600 kcmil	Cu/Al	IEC	

Handle ratings, 16 – 3150 Amps, 600V


Amperage range	Style type	NEMA	Color	Marking	Defeatable	Padlockable	Catalog number suffix	Catalog number
16 – 100	Selector	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	BJ	OHB2AJ
	Selector	1,3R,12	Red/Yel				YJ	OHY2AJ
	Pistol	1,3R,12	Black				B6	OHB65J5
	Pistol	1,3R,12	Red/Yel				Y6	OHY65J5
	Pistol	1,3R,4,4X,12	Black				B6	OHB65L5
	Pistol	1,3R,4,4X,12	Red/Yel				Y6	OHY65L5
125 - 200	Pistol	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	B6	OHB65J6
		1,3R,12	Red/Yel				Y6	OHY65J6
		1,3R,4,4X,12	Black				B8	OHB80L6
		1,3R,4,4X,12	Red/Yel				Y8	OHY80L6
400 – 3150	Pistol	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	B4	OHB145J12
		1,3R,12	Red/Yel				Y4	OHY145J12
		1,3R,12	Black				B7	OHB175J12
		1,3R,12	Red/Yel				Y7	OHY175J12
		1,3R,4,4X,12	Black				B4	OHB145L12
		1,3R,4,4X,12	Red/Yel				Y4	OHY145L12
		1,3R,4,4X,12	Black				B7	OHB175L12
		1,3R,4,4X,12	Red/Yel				Y7	OHY175L12
		1,3R,4,4X,12	Metal				8	YASDA-8
		16 – 200	Pistol				1,3R,12 1,3R,4,4X,12	Black
400	Pistol	1,3R,12 1,3R,4,4X,12	Black	I/O/II	Yes	Yes	B4	OHB145J12E011 OHB145L12E011
400 – 3150	Pistol	1,3R,12	Black	I/O/II	Yes	Yes	B7	OHB175J12E011
	Pistol	1,3R,4,4X,12	Black				B7	OHB175L12E011
	Metallic	1,3R,4,4X,12	Metal				21	YASDA-21
	Metallic	1,3R,4,4X,12	Metal				6	YASDA-6

① IEC rated only.


2 pole 125A – 3150A

Disconnect
switches
Non-fusible
Enclosed

2 Pole, 600V, 125A – 3150A

		NEMA Enclosure type								
		1		3R		4		4X Stainless		
UL general purpose amp rating		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
UL 98		125	NF1251-2PB6A	\$ 825	NF1253-2PB6A	\$ 1050	NF1254-2PB8A	\$ 2100	NF125X-2PB8A	\$ 2625
		200	NF2001-2PB8B	1170	NF2003-2PB8B	1485	NF2004-2PB8B	3170	NF200X-2PB8B	3960
		400	NF4001-2PB4B	2340	NF4003-2PB4B	2520	NF4004-2PB4B	5750	NF400X-2PB4B	7200
		600	NF6001-2PB4A	4320	NF6003-2PB4A	4500	NF6004-2PB4A	8640	NF600X-2PB4A	10,800
		800	NF8001-2PB4A	7200	NF8003-2PB4A	8460	NF8004-2PB4A	13,680	NF800X-2PB4A	17,100
		1200	NF12001-2PB4A	9000	NF12003-2PB4A	10,620	NF12004-2PB4A	16,200	NF1200X-2PB4A	20,250
		1600	NF16001-2P8A	17,100	NF16003-2P8A	18,720	NF16004-2P8A	27,360	NF1600X-2P8A	34,200
		2000	NF20001-2P8A	20,700	NF20003-2P8A	22,500	NF20004-2P8A	31,680	NF2000X-2P8A	39,600
		3150	NF31501-2P8A	25,200	NF31503-2P8A	27,000	NF31504-2P8A	35,280	N3150X-2P8A	44,100

2 Pole, 600V, 125A – 3150A

		NEMA Enclosure type				
		4X Plastic		12		
UL general purpose amp rating		Catalog number	List price	Catalog number	List price	
UL 98		125	NF125P-2PB8A	\$ 2250	NF1252-2PB6A	\$ 1050
		200	NF200P-2PB8B	3600	NF2002-2PB8B	1440
		400	NF400P-2PB4B	5400	NF4002-2PB4B	2610
		600	NF600P-2PB4A	9000	NF6002-2PB4A	4590
		800	NF800P-2PB4A	14,400	NF8002-2PB4A	7560
		1200	NF1200P-2PB4A	17,100	NF12002-2PB4A	9360
		1600	NF1600P-2P8A	28,000	NF16002-2P8A	17,460
		2000	NF2000P-2P8A	33,300	NF20002-2P8A	21,060
		3150 ①	NF3150P-2P8A	37,800	NF31502-2P8A	25,560

16A – 100A switches are not available in 2 pole versions, use 3 pole.

① IEC rated only.

Disconnect
switches
Non-fusible
Enclosed

4 pole 16A – 3150A

4 Pole, 600V, 16A – 3150A

UL general purpose amp rating		NEMA Enclosure type							
		1		3R		4		4X Stainless	
		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL508	16	NF161-4PB6C	\$ 295	NF163-4PB6C	\$ 369	NF164-4PB6A	\$ 530	NF16X-4PB6C	\$ 665
	25	NF251-4PB6C	300	NF253-4PB6C	374	NF254-4PB6A	535	NF25X-4PB6C	670
	40	NF321-4PB6C	310	NF323-4PB6C	384	NF324-4PB6A	545	NF32X-4PB6C	680
UL98	60	NF451-4PB6B	360	NF453-4PB6B	434	NF454-4PB6B	570	NF45X-4PB6B	700
	80	NF631-4PB6A	410	NF633-4PB6A	484	NF634-4PB6A	595	NF63X-4PB6A	740
	30	NF301-4PB6B	650	NF303-4PB6B	988	NF304-4PB6B	1200	NF30X-4PB6B	1525
	60	NF601-4PB6B	700	NF603-4PB6B	1038	NF604-4PB6B	1250	NF60X-4PB6B	1575
	100	NF1001-4PB6B	750	NF1003-4PB6B	1088	NF1004-4PB6B	1300	NF100X-4PB6B	1625
	125	NF1251-4PB6A	1375	NF1253-4PB6A	1675	NF1254-4PB6A	3500	NF125X-4PB8A	4375
	200	NF2001-4PB8B	1625	NF2003-4PB8B	2063	NF2004-4PB8B	4400	NF200X-4PB8B	5500
	400	NF4001-4PB4B	3250	NF4003-4PB4B	3500	NF4004-4PB4B	8000	NF400X-4PB4B	10,000
	600	NF6001-4PB4A	6000	NF6003-4PB4A	6250	NF6004-4PB4A	12,000	NF600X-4PB4A	15,000
	800	NF8001-4PB4A	10,000	NF8003-4PB4A	11,750	NF8004-4PB4A	19,000	NF800X-4PB4A	23,750
	1200	NF12001-4PB4A	12,500	NF12003-4PB4A	14,750	NF12004-4PB4A	22,500	NF1200X-4PB4A	28,125
	1600	NF16001-4P8A	23,750	NF16003-4P8A	26,000	NF16004-4P8A	38,800	NF1600X-4P8A	47,500
	2000	NF20001-4P8A	28,750	NF20003-4P8A	31,250	NF20004-4P8A	44,000	NF2000X-4P8A	55,000
	3150 ①	NF31501-4P8A	35,000	NF31503-4P8A	37,500	NF31504-4P8A	49,000	NF3150X-4P8A	61,250

4 Pole, 600V, 16A – 3150A

UL general purpose amp rating		NEMA Enclosure type							
		4X Plastic		12		7 & 9		IP65 Plastic	
		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL508	16	NF16P-4PB6A	\$ 405	NF162-4PB6C	\$ 369	NF167-4P	\$ 2025	NF16E-4PBJB	\$ 245
	25	NF25P-4PB6A	410	NF252-4PB6C	374	NF257-4P	2050	NF25E-4PBJB	250
	40	NF32P-4PB6A	420	NF322-4PB6C	384	NF327-4P	2075	NF32E-4PBJB	265
UL-98	60	NF45P-4PB6B	465	NF452-4PB6B	434	NF457-4P	3700	NF45E-4PBJA	300
	80	NF63P-4PB6A	510	NF632-4PB6A	484	NF637-4P	3730	NF63E-4PBJA	410
	30	NF30P-4PB6B	1100	NF302-4PB6B	925	NF307-4P	4300	NF30E-4PB4B	650
	60	NF60P-4PB6B	1150	NF602-4PB6B	975	NF607-4P	4350	NF60E-4PB4B	700
	100	NF100P-4PB6B	1200	NF1002-4PB6B	1025	NF1007-4P	4400	NF100E-4PB4B	750
	125	NF125P-4PB8A	3750	NF1252-4PB6A	1750	—	—	—	—
	200	NF200P-4PB8B	5000	NF2002-4PB8B	2000	—	—	—	—
	400	NF400P-4PB4B	7500	NF4002-4PB4B	3625	—	—	—	—
	600	NF600P-4PB4A	12,500	NF6002-4PB4A	6375	—	—	—	—
	800	NF800P-4PB4A	20,000	NF8002-4PB4A	10,500	—	—	—	—
	1200	NF1200P-4PB4A	23,750	NF12002-4PB4A	13,000	—	—	—	—
	1600	NF1600P-4P8A	38,500	NF16002-4P8A	24,250	—	—	—	—
	2000	NF2000P-4P8A	46,250	NF20002-4P8A	29,240	—	—	—	—
	3150 ①	NF3150P-4P8A	52,500	NF31502-4P8A	35,500	—	—	—	—

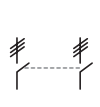
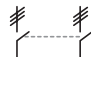
① IEC rated only.

6 pole 16A – 1200A

Disconnect
switches
Non-fusible
Enclosed

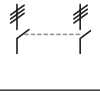
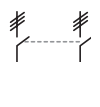
6 Pole, 600V, 16A – 1200A

NEMA Enclosure type

UL general purpose amp rating	1		3R		4		4X Stainless	
	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL508 	16	NF161-6PB6C \$ 580	NF163-6PB6C \$ 728	NF164-6PB6A \$ 1080	NF16X-6PB6C \$ 1350			
	25	NF251-6PB6C 590	NF253-6PB6C 738	NF254-6PB6A 1090	NF25X-6PB6C 1360			
	40	NF321-6PB6C 610	NF323-6PB6C 758	NF324-6PB6A 1110	NF32X-6PB6C 1380			
UL98 	60	NF451-6PB6B 690	NF453-6PB6B 838	NF454-6PB6B 1140	NF45X-6PB6B 1430			
	80	NF631-6PB6A 770	NF633-6PB6A 918	NF634-6PB6A 1185	NF63X-6PB6A 1480			
	30	NF301-6PB6B 1230	NF303-6PB6B 1770	NF304-6PB6B 2110	NF30X-6PB6B 2660			
	60	NF601-6PB6B 1280	NF603-6PB6B 1820	NF604-6PB6B 2160	NF60X-6PB6B 2710			
	100	NF1001-6PB6B 1330	NF1003-6PB6B 1870	NF1004-6PB6B 2210	NF100X-6PB6B 2760			
	125	NF1251-6PB2A 2200	NF1253-6PB2A 2800	NF1254-6PB4A 5600	NF125X-6PB4A 7000			
	200	NF2001-6PB4B 2950	NF2003-6PB4B 3650	NF2004-6PB4B 7320	NF200X-6PB4B 9150			
	400	NF4001-6P8B 5860	NF4003-6P8B 5960	NF4004-6P8B 13,090	NF400X-6P8B 16,360			
	600	NF6001-6P8A 9960	NF6003-6P8A 10,360	NF6004-6P8A 19,490	NF600X-6P8A 24,360			
	800	NF8001-6P8A 16,360	NF8003-6PB4A 19,800	NF8004-6P8A 30,690	NF800X-6P8A 38,360			
	1200	NF12001-6P8A 20,360	NF12003-6PB4A 23,960	NF12004-6P8A 36,290	NF1200X-6P8A 45,360			

6 Pole, 600V, 16A – 1200A

NEMA Enclosure type

UL general purpose amp rating	4X Plastic		12		7 & 9		IP65 Plastic	
	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL508 	16	NF16P-6PB6A \$ 800	NF162-6PB6C \$ 728	NF167-6P \$ 3750	NF16E-6PBJB \$ 410			
	25	NF25P-6PB6A 810	NF252-6PB6C 738	NF257-6P 3775	NF25E-6PBJB 420			
	40	NF32P-6PB6A 830	NF322-6PB6C 758	NF327-6P 3800	NF32E-6PBJB 450			
UL98 	60	NF45P-6PB6B 930	NF452-6PB6B 838	NF457-6P 4275	NF45E-6PBJB 520			
	80	NF63P-6PB6A 1030	NF632-6PB6A 918	NF637-6P 4325	NF63E-6PBJB 770			
	30	NF30P-6PB6B 1900	NF302-6PB6B 1670	—	NF30E-6PB6B 1230			
	60	NF60P-6PB6B 1950	NF602-6PB6B 1720	—	NF60E-6PB6B 1280			
	100	NF100P-6PB6B 2000	NF1002-6PB6B 1770	—	NF100E-6PB6B 1330			
	125	NF125P-6PB4A 6000	NF1252-6PB4A 2800	—	—			
	200	NF200P-6PB4B 8350	NF2002-6PB4B 3550	—	—			
	400	NF400P-6P8B 12,360	NF4002-6P8B 6160	—	—			
	600	NF600P-6P8A 20,360	NF6002-6P8A 10,560	—	—			
	800	NF800P-6P8A 32,360	NF8002-6P8A 17,800	—	—			
	1200	NF1200P-6P8A 38,360	NF12002-6P8A 21,800	—	—			

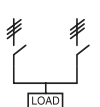
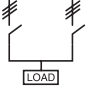
①  = Three poles

**Disconnect
switches**
Non-fusible
Enclosed

3 pole transfer switches 16A – 1200A

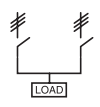
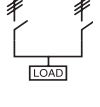
3 Pole, 600V, 16A – 1200A

NEMA Enclosure type

UL general purpose amp rating	1		3R		4		4X Stainless	
	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL508 	16	NF161-3TB8A \$ 760	NF163-3TB8A \$ 908	NF164-3TB8A \$ 1200	NF16X-3TB8A \$ 1850			
	25	NF251-3TB8A 770	NF253-3TB8A 918	NF254-3TB8A 1230	NF25X-3TB8A 1880			
	40	NF321-3TB8A 790	NF323-3TB8A 954	NF324-3TB8A 1260	NF32X-3TB8A 1950			
UL98 	60	NF451-3TB8B 870	NF453-3TB8B 1018	NF454-3TB8B 1340	NF45X-3TB8B 3500			
	80	NF631-3TB8A 950	NF633-3TB8A 1098	NF634-3TB8A 1420	NF63X-3TB8A 3600			
	30	NF301-3TB8B 1410	NF303-3TB8B 1830	NF304-3TB8B 2400	NF30X-3TB8B 3900			
	60	NF601-3TB8B 1460	NF603-3TB8B 1880	NF604-3TB8B 2450	NF60X-3TB8B 3950			
	100	NF1001-3TB8B 1510	NF1003-3TB8B 1930	NF1004-3TB8B 2500	NF100X-3TB8B 4000			
	125	NF1251-3TB8A 2380	NF1253-3TB8A 2980	NF1254-3TB8A 3500	NF125X-3TB8A 5000			
	200	NF2001-3TB4B 3150	NF2003-3TB4B 3850	NF2004-3TB4B 7480	NF200X-3TB4B 9350			
	400	NF4001-3TB4B 5960	NF4003-3TB4B 6160	NF4004-3TB4B 13,250	NF400X-3TB4B 16,560			
	600	NF6001-3TB4A 10,260	NF6003-3TB4A 10,660	NF6004-3TB4A 19,730	NF600X-3TB4A 24,660			
	800	NF8001-3TB4A 16,660	NF8003-3TB4A 19,460	NF8004-3TB4A 30,920	NF800X-3TB4A 38,660			
1200	NF12001-3TB4A 20,660	NF12003-3TB4A 24,260	NF12004-3TB4A 36,530	NF1200X-3TB4A 45,660				

3 Pole, 600V, 16A – 1200A

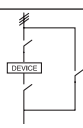
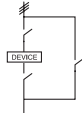
NEMA Enclosure type

UL general purpose amp rating	4X Plastic		12	
	Catalog number	List price	Catalog number	List price
UL508 	16	NF16P-3TB8A \$ 1000	NF162-3TB8A \$ 908	NF252-3TB8A 918
	25	NF25P-3TB8A 1040	NF322-3TB8A 938	
	40	NF32P-3TB8A 1100		
UL 98 	60	NF45P-3TB8B 1180	NF452-3TB8B 1018	NF632-3TB8A 1098
	80	NF63P-3TB8A 1260		
	30	NF30P-3TB8B 2000	NF302-3TB8B 1730	
	60	NF60P-3TB8B 2050	NF602-3TB8B 1830	
	100	NF100P-3TB8B 2100	NF1002-3TB8B 1930	
	125	NF125P-3TB8A 3200	NF1252-3TB8A 2980	
	200	NF200P-3TB4B 8550	NF2002-3TB4B 3750	
	400	NF400P-3TB4B 12,560	NF4002-3TB4B 6460	
	600	NF600P-3TB4A 20,660	NF6002-3TB4A 10,760	
	800	NF800P-3TB4A 32,660	NF8002-3TB4A 17,460	
1200	NF1200P-3TB4A 38,660	NF12002-3TB4A 21,460		

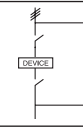
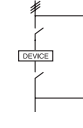
3 pole bypass switches 16A – 1200A

Disconnect
switches
Non-fusible
Enclosed

3 Pole, 600V, 16A – 1200A

		NEMA Enclosure type								
		1		3R		4		4X Stainless		
UL general purpose amp rating		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
UL508		16	NF161-3BB8A	\$ 1045	NF163-3BB8A	\$ 1267	NF164-3BB8A	\$ 1480	NF16X-3BB8A	\$ 3740
		25	NF251-3BB8A	1060	NF253-3BB8A	1282	NF254-3BB8A	1540	NF25X-3BB8A	3820
		40	NF321-3BB8A	1090	NF323-3BB8A	1297	NF324-3BB8A	1600	NF32X-3BB8A	3900
		60	NF451-3BB8B	1215	NF453-3BB8B	1312	NF454-3BB8B	1750	NF45X-3BB8B	4050
UL98		80	NF631-3BB8A	1340	NF633-3BB8A	1432	NF634-3BB8A	1850	NF63X-3BB8A	4150
		30	NF301-3BB8B	1970	NF303-3BB8B	2300	NF304-3BB8B	2800	NF30X-3BB8B	4800
		60	NF601-3BB8B	2070	NF603-3BB8B	2400	NF604-3BB8B	2900	NF60X-3BB8B	4900
		100	NF1001-3BB8B	2170	NF1003-3BB8B	2500	NF1004-3BB8B	3000	NF100X-3BB8B	5000
		125	—	—	—	—	—	—	—	—
		200	—	—	—	—	—	—	—	—
		400	NF4001-3B6B	8460	NF4003-3B6B	9060	NF4004-3B6B	19,750	NF400X-3B6B	24,660
		600	NF6001-3B6A	15,060	NF6003-3B6A	15,660	NF6004-3B6A	29,330	NF600X-3B6A	36,660
		800	NF8001-3B6A	24,660	NF8003-3B6A	28,860	NF8004-3B6A	46,130	NF800X-3B6A	57,660
		1200	NF12001-3B6A	30,660	NF12003-3B6A	36,060	NF12004-3B6A	55,040	NF1200X-3B6A	68,800

3 Pole, 600V, 16A – 1200A



		NEMA Enclosure type				
		4X Plastic		12		
UL general purpose amp rating		Catalog number	List price	Catalog number	List price	
UL508		16	NF16P-3BB8A	\$ 1300	NF162-3BB8A	\$ 1267
		25	NF25P-3BB8A	1325	NF252-3BB8A	1282
		40	NF32P-3BB8A	1350	NF322-3BB8A	1297
		60	NF45P-3BB8B	1420	NF452-3BB8B	1312
UL98		80	NF63P-3BB8A	1550	NF632-3BB8A	1432
		30	NF30P-3BB8B	2400	NF302-3BB8B	2300
		60	NF60P-3BB8B	2500	NF602-3BB8B	2400
		100	NF100P-3BB8B	2600	NF1002-3BB8B	2500
		125	—	—	—	—
		200	—	—	—	—
		400	NF400P-3B6B	18,660	NF4002-3B6B	9360
		600	NF600P-3B6A	30,660	NF6002-3B6A	15,960
		800	NF800P-3B6A	48,660	NF8002-3B6A	25,860
		1200	NF1200P-3B6A	57,660	NF12002-3B6A	31,860

Disconnect
switches
Non-fusible
Enclosed

3 pole mechanically interlocked switches 16A – 1200A



3 Pole, 600V, 16A – 1200A

NEMA Enclosure type

UL general purpose amp rating	NEMA Enclosure type								
	1		3R		4		4X Stainless		
	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
UL508 	16	NF161-3MB6A	\$ 640	NF163-3MB6A	\$ 788	NF164-3MB6A	\$ 1120	NF16X-3MB6A	\$ 1410
	25	NF251-3MB6A	650	NF253-3MB6A	798	NF254-3MB6A	1160	NF25X-3MB6A	1420
	40	NF321-3MB6A	670	NF323-3MB6A	818	NF324-3MB6A	1170	NF32X-3MB6A	1440
	60	NF451-3MB6B	750	NF453-3MB6B	908	NF454-3MB6B	1200	NF45X-3MB6B	1490
UL98 	80	NF631-3MB6A	830	NF633-3MB6A	978	NF634-3MB6A	1245	NF63X-3MB6A	1540
	30	NF301-3MB6B	1290	NF303-3MB6B	1830	NF304-3MB6B	2170	NF30X-3MB6B	2700
	60	NF601-3MB6B	1340	NF603-3MB6B	1880	NF604-3MB6B	2210	NF60X-3MB6B	2770
	100	NF1001-3MB6B	1390	NF1003-3MB6B	1930	NF1004-3MB6B	2270	NF100X-3MB6B	2800
	125	NF1251-3MB6A	2260	NF1253-3MB6A	2860	NF1254-3MB8A	5660	NF125X-3MB8A	7060
	200	NF2001-3MB8B	3010	NF2003-3MB8B	3710	NF2004-3MB8B	7380	NF200X-3MB8B	9210
	400	NF4001-3MB4B	5920	NF4003-3MB4B	6030	NF4004-3MB4B	13,150	NF400X-3MB4B	16,420
	600	NF6001-3MB4A	10,020	NF6003-3MB4A	10,420	NF6004-3MB4A	19,550	NF600X-3MB4A	24,420
	800	NF8001-3MB4A	16,420	NF8003-3MB4A	19,860	NF8004-3MB4A	30,750	NF800X-3MB4A	38,420
	1200	NF12001-3MB4A	20,420	NF12003-3MB4A	24,020	NF12004-3MB4A	36,350	NF1200X-3MB4A	45,420

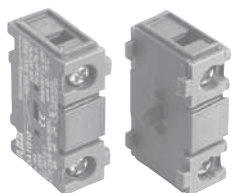
3 Pole, 600V, 16A – 1200A

NEMA Enclosure type

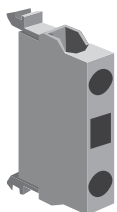
UL general purpose amp rating	NEMA Enclosure type				
	4X Plastic		12		
	Catalog number	List price	Catalog number	List price	
UL508 	16	NF16P-3MB6A	\$ 860	NF162-3MB6A	\$ 788
	25	NF25P-3MB6A	870	NF252-3MB6A	798
	40	NF32P-3MB6A	890	NF322-3MB6A	818
	60	NF45P-3MB6B	990	NF452-3MB6B	908
UL 98 	80	NF63P-3MB6A	1090	NF632-3MB6A	978
	30	NF30P-3MB6B	1900	NF302-3MB6B	1830
	60	NF60P-3MB6B	1950	NF602-3MB6B	1880
	100	NF100P-3MB6B	2000	NF1002-3MB6B	1930
	125	NF125P-3MB8A	6000	NF1252-6PB6A	2860
	200	NF200P-3MB8B	8350	NF2002-3MB8B	3710
	400	NF400P-3MB4B	12,360	NF4002-3MB4B	6030
	600	NF600P-3MB4A	20,360	NF6002-3MB4A	10,420
	800	NF800P-3MB4A	32,360	NF8002-3MB4A	19,860
	1200	NF1200P-3MB4A	38,360	NF12002-3MB4A	24,020

Accessories ①

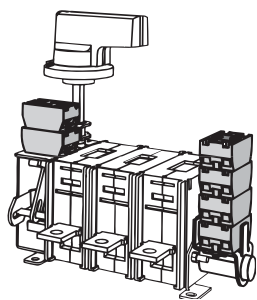
Disconnect
switches
Non-fusible
Enclosed



OA1G_



OBEA_



OZXK_



3 Position selector switch



Pilot light

Auxiliary contacts

For use on:	Contact configuration	Catalog number	Installation suffix	Installed list price adder
16A – 100A	1 N.O.	OA1G10	add "10" suffix	\$ 30
	1 N.C.	OA1G01	add "01" suffix	30
	1 N.O. & 1 N.C.	OA2G11	add "11" suffix	60
125A	1 N.O.	OBEA10	add "10" suffix	50
	1 N.C.	OBEA01	add "01" suffix	50
200A	1 N.O. & 1 N.C.	OZXK-12	add "11" suffix	102
	2 N.O. & 2 N.C.	OZXK-13	add "22" suffix	160
400A – 3150A	1 N.O. & 1 N.C.	OZXK-1	add "11" suffix	130
	2 N.O. & 2 N.C.	OZXK-2	add "22" suffix	200

Accessories ①

For use on:	Description	Installation suffix	Installed list price adder
OT16, 25,32 OT45, 63 OT30, 60, 100 OT160 200A – 1200A 1600A – 3150A	Neutral or isolated ground block	N or G	\$ 30
	Neutral or isolated ground block	N or G	54
	Neutral or isolated ground block	N or G	75
	Neutral or isolated ground block	N or G	150
	Neutral block	N	210
30A – 1200A 30A – 1200A	Service entrance, 3 wire	U	100
	Service entrance, 4 wire	V	200
16A – 3150A	Start/stop pushbuttons	A	68
	2 position selector switch	C	68
	3 position selector switch	D	78
	Pilot light "red/run"	E	110
	Ammeter 1 phase ②	AM	940
	Voltmeter ②	VM	2300

Ground lugs

All enclosed switches are provided with a standard integral ground lug.

Switch size	Ground lug Wire size
16A – 100A	(2) #14
200A – 400A	#6 – 250 mcm
600A – 1200A	#2 – 600 mcm
2000A – 3150A	(2) #2 – 600 mcm

① Please consult factory for special customer requirements.

② Current transformers included.

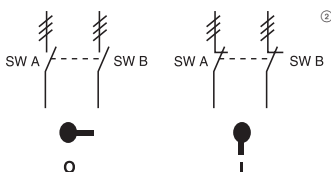
Technical data

Other configuration descriptions

Conversion mechanisms

6 or 8 pole

6 (8) pole mechanism allows two switches controlled by one handle to open or close simultaneously.

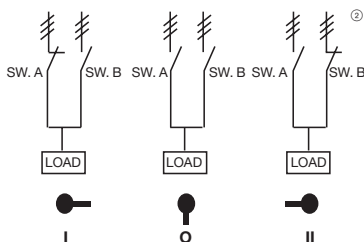


	POS. O	POS. I
SW. A	O	X
SW. B	O	X

X = Closed
O = Open

Transfer^①

Transfer mechanism manually transfers between two power sources using two switches and a center "OFF" position.

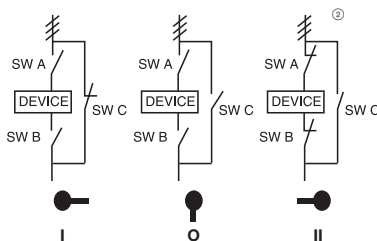


	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

X = Closed
O = Open

Bypass^①

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass.

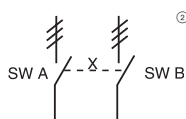


	POS. I	POS. O	POS. II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

X = Closed
O = Open

Mechanical interlock

Mechanical interlock mechanism prevents both switches from being in the ON position at the same time.



	SW. A POS. I	SW. B POS. O
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

① Transfer and bypass enclosed switches include the load side bussed or cabled together, and all switches come standard with ground lugs.

② = Three poles

Approximate dimensions 2, 3, & 4 Pole ③ 16A – 3150A NF

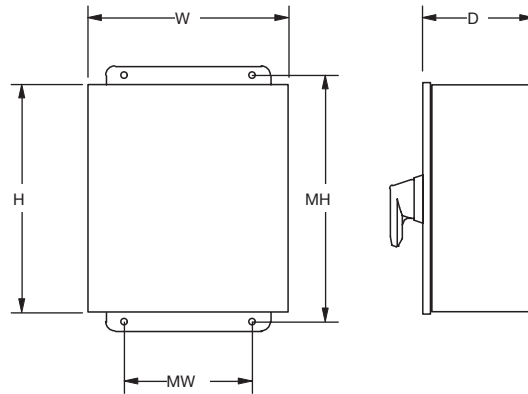
**Disconnect
switches
Non-fusible
Enclosed**

Non-Fusible

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight
OT16 OT25 OT32	1	7.0	5.0	3.0	4.0	4.0	4.0
	3R	7.0	5.0	3.0	7.75	3.0	4.0
	4	6.0	6.0	4.0	6.75	4.0	4.0
	4X SS	7.0	5.0	3.0	7.75	3.0	4.0
	4X Plastic	6.0	6.0	5.9	6.75	4.0	4.0
	12	7.0	5.0	3.0	7.75	3.0	4.0
	IP65 (A)	4.8	3.4	2.4	4.17	2.80	1.0
	IP65 (B)	5.9	5.1	2.4	5.35	4.57	1.0
OT45 OT63 OT30 OT60	1	8.0	6.0	4.0	7.0	5.0	6.0
	3R	8.0	6.0	4.0	8.75	4.0	6.0
	4	8.0	6.0	4.0	8.75	4.0	6.0
	4X SS	8.0	6.0	4.0	8.75	4.0	6.0
	4X Plastic	8.0	6.0	5.9	8.75	4.0	6.0
	12	8.0	6.0	4.0	8.75	4.0	6.0
	IP65 (A)	7.9	5.7	3.6	7.24	5.16	4.0
	IP65 (B)	15.8	7.9	5.5	14.8	6.93	4.0
OT100	1	10.0	8.0	6.0	7.0	7.0	9.0
	3R	10.0	8.0	6.0	10.75	6.0	9.0
	4	10.0	8.0	6.0	10.75	6.0	9.0
	4X SS	10.0	8.0	6.0	10.75	6.0	9.0
	4X Plastic	10.0	8.0	5.9	10.75	6.0	9.0
	12	10.0	8.0	6.0	10.75	6.0	9.0
	IP65 (A)	7.9	5.7	3.6	7.24	5.16	4.0
	IP65 (B)	15.8	7.9	5.5	14.8	6.93	4.0
OT160	1	14.0	12.0	8.0	11.0	9.0	20
	3R	14.0	12.0	8.0	14.75	10.0	20
	4	14.0	12.0	8.0	14.75	10.0	20
	4X SS	14.0	12.0	8.0	14.75	10.0	20
	4X Plastic	14.0	12.0	8.0	14.75	10.0	12
	12	14.0	12.0	8.0	14.75	10.0	20

Frame size	Enclosure type	H height	W width	D depth	mtg. height	MW mtg. width	Weight
OT200	1	24.0	16.0	8.0	25.5	14.5	50
	3R	24.0	16.0	8.0	25.5	14.5	50
	4	24.0	16.0	8.0	25.5	14.5	50
	4X SS	24.0	16.0	8.0	25.5	14.5	50
	4X Plastic	24.0	16.0	10.0	25.5	14.5	40
	12	24.0	16.0	8.0	25.5	14.5	50
OT400 – OETL-NF600	1	44.0	22.0	11.0	45.5	20.5	120
	3R	44.0	22.0	11.0	45.5	20.5	120
	4	1	1	1	1	1	1
	4X SS	42.0	36.0	12.0	43.5	34.5	130
	4X Plastic	1	1	1	1	1	1
	12	44.0	22.0	11.0	45.5	20.5	120
OETL-NF800A OETL-NF1200	1	60.0	36.0	12.0	61.5	34.5	200
	3R	60.0	36.0	12.0	61.5	34.5	200
	4	60.0	36.0	12.0	61.5	34.5	200
	4X SS	60.0	36.0	12.0	61.5	34.5	200
	4X Plastic	1	1	1	1	1	1
	12	60.0	36.0	12.0	61.5	34.5	200
OETL-NF1600 OETL-NF2000 OETL-NF3150	1	90.0	36.0	24.0	(2)	(2)	600
	3R	90.0	36.0	24.0	(2)	(2)	600
	4	1	1	1	1	1	1
	4X SS	1	1	1	1	1	1
	4X Plastic	1	1	1	1	1	1
	12	90.0	36.0	24.0	2	2	600

- 1 Please consult factory, enclosures are sized to suit specific customer needs.
- 2 Enclosure is free standing.
- 3 Some 4-pole switches require larger enclosures. Please consult factory.



Disconnect
switches
Non-fusible
Enclosed

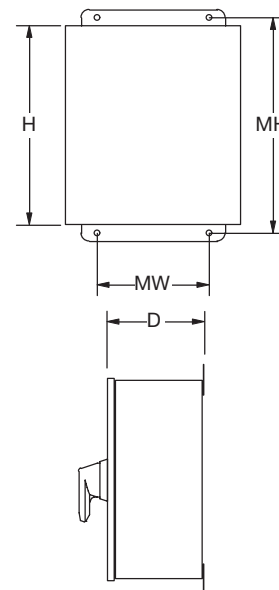
Approximate dimensions for enclosed 6-pole transfer & mechanical interlock switches 16A – 3150A NF

Non-fusible – 6 Pole

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight (lbs.)
OT16 OT25 OT32	1	7.0	5.0	3.0	4.0	4.0	4.0
	3R	7.0	5.0	3.0	7.75	3.0	4.0
	4	6.0	6.0	4.0	6.75	4.0	4.0
	4X SS	7.0	5.0	3.0	7.75	3.0	4.0
	4X Plastic	6.0	6.0	5.9	6.75	4.0	4.0
	12	7.0	5.0	3.0	7.75	3.0	4.0
	IP65 (A)	5.9	5.1	3.4	5.35	4.57	1.2
IP65 (B)	–	–	–	–	–	–	
OT45 OT63	1	10.0	8.0	5.0	7.0	7.0	6.0
	3R	10.0	8.0	5.0	10.75	6.0	6.0
	4	10.0	8.0	6.0	10.75	6.0	6.0
	4X SS	10.0	8.0	5.0	10.75	6.0	6.0
	4X Plastic	10.0	8.0	7.9	10.75	6.0	6.0
	12	10.0	8.0	5.0	10.75	6.0	6.0
	IP65 (A)	7.9	5.7	4.0	7.18	5.10	1.5
IP65 (B)	–	–	–	–	–	–	
OT30 OT60 OT100	1	10.0	8.0	5.0	7.0	7.0	9.0
	3R	10.0	8.0	5.0	10.75	6.0	9.0
	4	10.0	8.0	6.0	10.75	6.0	9.0
	4X SS	10.0	8.0	5.0	10.75	6.0	9.0
	4X Plastic	10.0	8.0	7.9	0.0	0.0	9.0
	12	10.0	8.0	5.0	10.75	6.0	9.0
	IP65 (A)	–	–	–	–	–	–
IP65 (B)	–	–	–	–	–	–	
OT160	1	14.0	12.0	8.0	11.0	9.0	20
	3R	14.0	12.0	8.0	14.75	10.0	20
	4	14.0	12.0	8.0	14.75	10.0	20
	4X SS	14.0	12.0	8.0	14.75	10.0	20
	4X Plastic	14.0	12.0	8.0	0.0	0.0	20
	12	14.0	12.0	8.0	14.75	10.0	20
OT200	3R	24.0	24.0	10.0	25.5	22.5	60
	4	24.0	24.0	10.0	25.5	22.5	60
	4X SS	24.0	24.0	10.0	25.5	22.5	60
	4X Plastic	24.0	16.0	10.0	25.5	22.5	60
	12	24.0	24.0	10.0	25.5	22.5	60
OT400 – OETL-NF600A	1	48.0	36.0	12.0	49.5	34.5	160
	3R	48.0	36.0	12.0	49.5	34.5	160
	4	48.0	36.0	12.0	49.5	34.5	160
	4X SS	48.0	36.0	12.0	49.5	34.5	160
	4X Plastic	①	①	①	①	①	①
	12	48.0	36.0	12.0	49.5	34.5	160
OETL-NF800A OETL-NF1200	1	60.0	36.0	12.0	61.5	34.5	240
	3R	60.0	36.0	12.0	61.5	34.5	240
	4	60.0	36.0	12.0	61.5	34.5	240
	4X SS	60.0	36.0	12.0	61.5	34.5	240
	4X Plastic	①	①	①	①	①	①
	12	60.0	36.0	12.0	61.5	34.5	240
OETL-NF1600 OETL-NF2000 OETL-NF3150	1	90.0	36.0	24.0	2	2	600
	3R	90.0	36.0	24.0	2	2	600
	4	①	①	①	①	①	①
	4X SS	①	①	①	①	①	①
	4X Plastic	①	①	①	①	①	①
	12	90.0	36.0	24.0	②	②	600

Transfer and mechanical interlock

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight (lbs.)
OT16 OT25 OT32	1	6.0	6.0	4.0	3.0	5.0	4.0
	3R	6.0	6.0	4.0	6.75	4.0	4.0
	4	6.0	6.0	4.0	6.75	4.0	4.0
	4X SS	6.0	6.0	4.0	6.75	4.0	4.0
	4X Plastic	6.0	6.0	5.9	6.75	4.0	4.0
	12	6.0	6.0	4.0	6.75	4.0	4.0
	IP65 (A)	5.9	5.1	3.4	5.35	4.57	1.2
IP65 (B)	–	–	–	–	–	–	
OT45 OT63	1	10.0	8.0	5.0	7.0	7.0	6.0
	3R	10.0	8.0	5.0	10.75	6.0	6.0
	4	10.0	8.0	6.0	10.75	6.0	6.0
	4X SS	10.0	8.0	5.0	10.75	6.0	6.0
	4X Plastic	10.0	8.0	7.9	10.75	6.0	6.0
	12	10.0	8.0	5.0	10.75	6.0	6.0
	IP65 (A)	7.9	5.7	4.0	7.18	5.10	1.5
IP65 (B)	–	–	–	–	–	–	
OT30 OT60 OT100	1	10.0	8.0	5.0	7.0	7.0	9.0
	3R	10.0	8.0	5.0	10.75	6.0	9.0
	4	10.0	8.0	6.0	10.75	6.0	9.0
	4X SS	10.0	8.0	5.0	10.75	6.0	9.0
	4X Plastic	10.0	8.0	7.9	0.0	0.0	9.0
	12	10.0	8.0	5.0	10.75	6.0	9.0
	IP65 (A)	–	–	–	–	–	–
IP65 (B)	–	–	–	–	–	–	
OT160	1	14.0	12.0	8.0	11.0	9.0	20
	3R	14.0	12.0	8.0	14.75	10.0	20
	4	14.0	12.0	8.0	14.75	10.0	20
	4X SS	14.0	12.0	8.0	14.75	10.0	20
	4X Plastic	14.0	12.0	8.0	0.0	0.0	20
	12	14.0	12.0	8.0	14.75	10.0	20
OT200	3R	24.0	24.0	10.0	25.5	22.5	60
	4	24.0	24.0	10.0	25.5	22.5	60
	4X SS	24.0	24.0	10.0	25.5	22.5	60
	4X Plastic	24.0	16.0	10.0	25.5	22.5	60
	12	24.0	24.0	10.0	25.5	22.5	60
OT400 – OETL-NF600A	1	48.0	36.0	12.0	49.5	34.5	160
	3R	48.0	36.0	12.0	49.5	34.5	160
	4	48.0	36.0	12.0	49.5	34.5	160
	4X SS	48.0	36.0	12.0	49.5	34.5	160
	4X Plastic	①	①	①	①	①	①
	12	48.0	36.0	12.0	49.5	34.5	160
OETL-NF800A OETL-NF1200	1	60.0	36.0	12.0	61.5	34.5	240
	3R	60.0	36.0	12.0	61.5	34.5	240
	4	60.0	36.0	12.0	61.5	34.5	240
	4X SS	60.0	36.0	12.0	61.5	34.5	240
	4X Plastic	①	①	①	①	①	①
	12	60.0	36.0	12.0	61.5	34.5	240
OETL-NF1600 OETL-NF2000 OETL-NF3150	1	90.0	36.0	24.0	②	②	600
	3R	90.0	36.0	24.0	②	②	600
	4	①	①	①	①	①	①
	4X SS	①	①	①	①	①	①
	4X Plastic	①	①	①	①	①	①
	12	90.0	36.0	24.0	②	②	600



① Please consult factory; enclosures can be custom sized to suit specific needs
② Enclosure is free standing.

① Please consult factory; enclosures can be custom sized to suit specific needs
② Enclosure is free standing.

3 Pole 30A – 800A

Disconnect
switches
Fusible
Enclosed



FJ30X-3PB6B



3 Pole^①, 600V, 30A – 800A

NEMA Enclosure type

UL general purpose amp rating	Fuse type	NEMA Enclosure type								
		1		3R		4		4X Stainless		
		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
	30	J	FJ301-3PB6B	\$ 560	FJ303-3PB6B	\$ 600	FJ304-3PB6B	\$ 1100	FJ30X-3PB6B	\$ 1400
	30	CC	FC301-3PB6B		FC303-3PB6B		FC304-3PB6B		FC30X-3PB6B	
	60	J ^②	FJ601-3PB6B	660	FJ603-3PB6B	860	FJ604-3PB8B	1300	FJ60X-3PB8B	1800
	100	J ^②	FJ1001-3PB8B	960	FJ1003-3PB8B	1140	FJ1004-3PB8B	2800	FJ100X-3PB8B	3800
	200	J ^②	FJ2001-3PB8C	2200	FJ2003-3PB8C	2400	FJ2004-3PB8C	3900	FJ200X-3PB8C	5000
	400	J ^②	FJ4001-3PB4B	3800	FJ4003-3PB4B	4200	FJ4004-3PB4B	7700	FJ400X-3PB4B	10,800
	600	J ^②	FJ6001-3PB4B	5300	FJ6003-3PB4B	6800	FJ6004-3PB4B	11,000	FJ600X-3PB4B	16,000
	800	L	FL8001-3PB4B	9500	FL8003-3PB4B	11,200	FL8004-3PB4B	16,000	FL800X-3PB4B	21,000

3 Pole^①, 600V, 30A – 800A

NEMA Enclosure type

UL general purpose amp rating	Fuse type	NEMA Enclosure type				
		4X Plastic		12		
		Catalog number	List price	Catalog number	List price	
	30	J	FJ30P-3PB6B	\$ 1040	FJ302-3PB6B	\$ 600
	30	CC	FC30P-3PB6B		FC302-3PB6B	
	60	J ^②	FJ60P-3PB8B	1300	FJ602-3PB6B	860
	100	J ^②	FJ100P-3PB8B	2800	FJ1002-3PB8B	1140
	200	J ^②	FJ200P-3PB8C	4400	FJ2002-3PB8C	2400
	400	J ^②	FJ400P-3PB4B	8400	FJ4002-3PB4B	4200
	600	J ^②	FJ600P-3PB4B	13,600	FJ6002-3PB4B	6200
	800	L	FL800P-3PB4B	17,400	FL8002-3PB4B	9800

NOTE: All enclosed switches are provided with a black handle; however, most handles can be substituted with a red / yellow handle if desired. Please substitute the handle suffix code (2nd and 3rd from last characters) with the red/yellow handle catalog number suffix from page 18.130. There is no additional price adder for changing to a red/yellow handle of equal ratings and style.

EXAMPLE: A red/yellow pistol handle for an FJ301-3PB6B can be substituted for the black pistol handle by using the "Y6" suffix instead of the "B6" suffix, new catalog number: FJ301-3PY6B.

^① Fusible switches are UL listed to the UL98 standard.
^② 600V T type fuse clips may be substituted at no charge. Please change the second character of the catalog number from "J" to "T."



Switch and handle ratings 30A – 800A

Switch ratings

UL general purpose amp rating	Maximum horsepower rating								Wire size for terminal lugs	For wire type	Approval ①
	Single phase			Three phase							
	120V	200V	240V	200V	208V	240V	480V	600V			
30	2	3	5	5	7.5	7.5	15	20	#18 – 8	Cu	CSA, UL
60	3	7.5	10	15	15	15	30	50	#14 – 4	Cu	CSA, UL
100	5	10	15	25	25	30	60	75	#14 – 2/0	Cu/Al	CSA, UL
200	—	—	—	50	50	60	125	150	#6 – 300 kcmil	Cu/Al	CSA, UL
400	—	—	—	100	125	125	250	350	#2 – 600 kcmil	Cu/Al	CSA, UL
600	—	—	—	150	150	200	400	500	(2) #2 – 600 kcmil	Cu/Al	CSA, UL
800	—	—	—	200	200	250	500	600	(2) #2 – 600 kcmil	Cu/Al	CSA, UL

Handle ratings


Amperage range	Style type	NEMA	Color	Marking	Defeatable	Padlockable	Catalog number suffix	Catalog number
30	Selector	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	BJ	OHB2AJ
	Selector	1,3R,12	Red/Yel				YJ	OHY2AJ
	Pistol	1,3R,12	Black				B6	OHB65J5
	Pistol	1,3R,12	Red/Yel				Y6	OHY65J5
	Pistol	1,3R,4,4X,12	Black				B6	OHB65L5
	Pistol	1,3R,4,4X,12	Red/Yel	Y6	OHY65L5			
60 – 200	Pistol	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	B6	OHB65J6
		1,3R,12	Red/Yel				Y6	OHY65J6
		1,3R,12	Black				B8	OHB80J6
		1,3R,12	Red/Yel				Y8	OHB80J6
		1,3R,4,4X,12	Black				B8	OHB80L6
		1,3R,4,4X,12	Red/Yel	Y8	OHY80L6			
400 – 800	Pistol	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	B4	OHB145J12
		1,3R,12	Red/Yel				Y4	OHY145J12
		1,3R,12	Black				B7	OHB175J12
		1,3R,12	Red/Yel				Y7	OHY175J12
		1,3R 4,4X,12	Black				B4	OHB145L12
		1,3R,4,4X,12	Red/Yel				Y4	OHY145L12
		1,3R 4,4X,12	Black				B7	OHB175L12
		1,3R,4,4X,12	Red/Yel				Y7	OHY175L12
		1,3R,4,4X,12	Metal	No	8	YASDA-8		
30	Pistol	1,3R,12	Black	I/O/II	Yes	Yes	B6	OHB65J6E011
		1,3R,4,4X,12					Y6	OHY65L6E011
60 – 200	Pistol	1,3R,12	Black	I/O/II	Yes	Yes	B8	OHB80J6E011
		1,3R,4,4X,12					Y8	OHY80L6E011
400 – 800	Pistol	1,3R,12	Black	I/O/II	Yes	Yes	B4	OHB145J12E011
	Pistol	1,3R,4,4X,12	Black				B4	OHB145L12E011
	Pistol	1,3R,12	Black				B7	OHB175J12E011
	Pistol	1,3R,4,4X,12	Black				B7	OHB175L12E011
	Metallic	1,3R,4,4X,12	Metal				21	YASDA-21
	Metallic	1,3R,4,4X,12	Metal				6	YASDA-6


① Fusible switches are UL listed to the UL98 standard.

2 & 4 Pole 30 – 800A

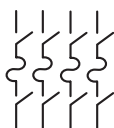
Disconnect
Switches
Fusible
Enclosed

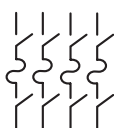
2 Pole, 600V, 30A – 800A

UL general purpose amp rating		Fuse type	NEMA Enclosure type							
			1		3R		4		4X Stainless	
			Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
	30	J	—	—	—	—	—	—	—	—
	30	CC	—	—	—	—	—	—	—	—
	60	J	—	—	—	—	—	—	—	—
	100	J	FJ1001-2PB8B	\$ 864	FJ1003-2PB8B	\$ 1026	FJ1004-2PB8B	\$ 2735	FJ100X-2PB8B	\$ 3420
	200	J	FJ2001-2PB8C	1980	FJ2003-2PB8C	2160	FJ2004-2PB8C	3600	FJ200X-2PB8C	4500
	400	J	FJ4001-2PB4B	3420	FJ4003-2PB4B	3780	FJ4004-2PB4B	7775	FJ400X-2PB4B	9720
	600	J	FJ6001-2PB4B	4770	FJ6003-2PB4B	6120	FJ6004-2PB4B	11,520	FJ600X-2PB4B	14,400
800	L	FL8001-2PB4B	8550	FL8003-2PB4B	10,080	FL8004-2PB4B	15,120	FL800X-2PB4B	18,900	

UL general purpose amp rating		Fuse type	NEMA Enclosure type			
			4X Plastic		12	
			Catalog number	List price	Catalog number	List price
	30	J	—	—	—	—
	30	CC	—	—	—	—
	60	J	—	—	—	—
	100	J	FJ100P-2PB8B	\$ 2520	FJ1002-2PB8B	\$ 1026
	200	J	FJ200P-2PB8C	3960	FJ2002-2PB8C	2160
	400	J	FJ400P-2PB4B	7560	FJ4002-2PB4B	3780
	600	J	FJ600P-2PB4B	12,240	FJ6002-2PB4B	5580
800	L	FL800P-2PB4B	15,660	FL8002-2PB4B	8820	

4 Pole, 600V, 30A – 800A

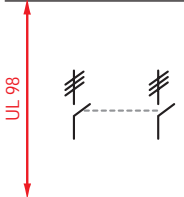
UL general purpose amp rating		Fuse type	NEMA Enclosure type							
			1		3R		4		4X Stainless	
			Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
	30	J	FJ301-4PB6B	\$ 700	FJ303-4PB6B	\$ 750	FJ304-4PB6B	\$ 1375	FJ30X-4PB6B	\$ 1750
	30	CC	FC301-4PB6B		FC303-4PB6B		FC304-4PB6B		FC30X-4PB6B	
	60	J	FJ601-4PB6B	825	FJ603-4PB6B	1075	FJ604-4PB8B	1800	FJ60X-4PB8B	2250
	100	J	FJ1001-4PB8B	1200	FJ1003-4PB8B	1425	FJ1004-4PB8B	3800	FJ100X-4PB8B	4750
	200	J	FJ2001-4PB8C	2750	FJ2003-4PB8C	3000	FJ2004-4PB8C	5000	FJ200X-4PB8C	6250
	400	J	FJ4001-4PB4B	4750	FJ4003-4PB4B	5250	FJ4004-4PB4B	10,800	FJ400X-4PB4B	13,500
	600	J	FJ6001-4PB4B	6625	FJ6003-4PB4B	8500	FJ6004-4PB4B	16,000	FJ600X-4PB4B	20,000
800	L	FL8001-4PB4B	11,875	FL8003-4PB4B	14,000	FL8004-4PB4B	21,000	FL800X-4PB4B	26,250	

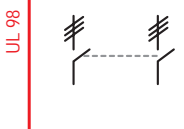
UL general purpose amp rating		Fuse type	NEMA Enclosure type			
			4X Plastic		12	
			Catalog number	List price	Catalog number	List price
	30	J	FJ30P-4PB6B		FJ302-4PB6B	
	30	CC	FC30P-4PB6B	\$ 1300	FC302-4PB6B	\$ 750
	60	J	FJ60P-4PB8B	1625	FJ602-4PB6B	1075
	100	J	FJ100P-4PB8B	3500	FJ1002-4PB8B	1425
	200	J	FJ200P-4PB8C	5500	FJ2002-4PB8C	3000
	400	J	FJ400P-4PB4B	10,500	FJ4002-4PB4B	5250
	600	J	FJ600P-4PB4B	17,000	FJ6002-4PB4B	7750
800	L	FL800P-4PB4B	21,750	FL8002-4PB4B	12,250	

Disconnect
switches
Fusible
Enclosed

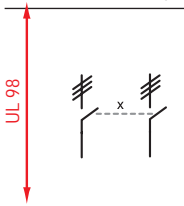
6 Pole & Mechanically interlocked switches 30 – 800A

6 Pole, 600V, 30A – 800A

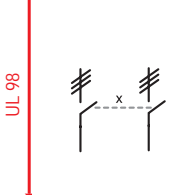
		NEMA Enclosure type								
		1		3R		4		4X Stainless		
UL general purpose amp rating	Fuse type	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
	30	J	FJ301-6PB6B	\$ 1300	FJ303-6PB6B	\$ 1400	FJ304-6PB6B	\$ 2150	FJ30X-6PB6B	\$ 3020
	30	CC	FC301-6PB6B		FC303-6PB6B		FC304-6PB6B		FC30X-6PB6B	
	60	J	FJ601-6PB4B	1450	FJ603-6PB4B	1600	FJ604-6PB4B	2450	FJ60X-6PB4B	3820
	100	J	FJ1001-6PB4B	2000	FJ1003-6PB4B	2200	FJ1004-6PB4B	3375	FJ100X-6PB4B	7820
	200	J	—	—	—	—	—	—	—	—
	400	J	FJ4001-6P8B	7350	FJ4003-6P8B	8050	FJ4004-6P8B	15,950	FJ400X-6P8B	22,160
	600	J	FJ6001-6P8B	10,050	FJ6003-6P8B	13,000	FJ6004-6P8B	23,450	FJ600X-6P8B	32,560
	800	L	FL8001-6P8B	17,600	FL8003-6P8B	20,600	FL8004-6P8B	30,650	FL800X-6P8B	42,560

		NEMA Enclosure type			
		4X Plastic		12	
UL general purpose amp rating	Fuse type	Catalog number	List price	Catalog number	List price
	30	J	FJ30P-6PB6B	FJ302-6PB6B	\$ 1480
	30	CC	FC30P-6PB6B	FC302-6PB6B	
	60	J	FJ60P-6PB4B	FJ602-6PB4B	1850
	100	J	FJ100P-6PB4B	FJ1002-6PB4B	2350
	200	J	—	—	—
	400	J	FJ400P-6P8B	FJ4002-6P8B	8050
	600	J	FJ600P-6P8B	FJ6002-6P8B	11,600
	800	L	FL800P-6P8B	FL8002-6P8B	18,150

Mechanically interlocked, 600V, 30A — 800A

		NEMA Enclosure type								
		1		3R		4		4X Stainless		
UL general purpose amp rating	Fuse type	Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
	30	J	FJ301-3MB6B	\$ 1420	FJ303-3MB6B	\$ 1560	FJ304-3MB6B	\$ 2400	FJ30X-3MB6B	\$ 3500
	30	CC	FC301-3MB6B		FC303-3MB6B		FC304-3MB6B		FC30X-3MB6B	
	60	J	FJ601-3MB6B	1620	FJ603-3MB6B	1780	FJ604-3MB8B	2750	FJ60X-3MB8B	4050
	100	J	FJ1001-3MB8B	2220	FJ1003-3MB8B	2440	FJ1004-3MB8B	3750	FJ100X-3MB8B	5500
	200	J	FJ2001-3MB8C	4960	FJ2003-3MB8C	5360	FJ2004-3MB8C	8450	FJ200X-3MB8C	10,560
	400	J	FJ4001-3MB4B	8160	FJ4003-3MB4B	8960	FJ4004-3MB4B	17,730	FJ400X-3MB4B	22,160
	600	J	FJ6001-3MB4B	11,160	FJ6003-3MB4B	14,460	FJ6004-3MB4B	26,050	FJ600X-3MB4B	32,560
	800	L	FL8001-3MB4B	19,560	FL8003-3MB4B	22,960	FL8004-3MB4B	34,050	FL800X-3MB4B	42,560

18

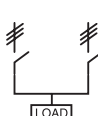
		NEMA Enclosure type			
		4X Plastic		12	
UL general purpose amp rating	Fuse type	Catalog number	List price	Catalog number	List price
	30	J	FJ30P-3MB6B	FJ302-3MB6B	\$ 1650
	30	CC	FC30P-3MB6B	FC302-3MB6B	
	60	J	FJ60P-3MB8B	FJ602-3MB6B	2020
	100	J	FJ100P-3MB8B	FJ1002-3MB8B	2580
	200	J	FJ200P-3MB8C	FJ2002-3MB8C	5360
	400	J	FJ400P-3MB4B	FJ4002-3MB4B	8960
	600	J	FJ600P-3MB4B	FJ6002-3MB4B	12,960
	800	L	FL800P-3MB4B	FL8002-3MB4B	20,160

Transfer and bypass switches 30 – 800A

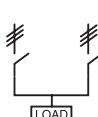
Disconnect
switches
Fusible
Enclosed

3 Pole Transfer switch, 600V, 30A – 800A

NEMA Enclosure type

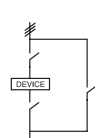
UL general purpose amp rating	Fuse type	1		3R		4		4X Stainless	
		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price
	30	FJ301-3TB6B	\$ 1420	FJ303-3TB6B	\$ 1560	FJ304-3TB6B	\$ 2400	FJ30X-3TB6B	\$ 3500
	30	FC301-3TB6B		FC303-3TB6B		FC304-3TB6B		FC30X-3TB6B	
	60	FJ601-3TB8B	1620	FJ603-3TB8B	1780	FJ604-3TB8B	2750	FJ60X-3TB8B	4050
	100	FJ1001-3TB8B	2220	FJ1003-3TB8B	2440	FJ1004-3TB8B	3750	FJ100X-3TB8B	5500
	200	FJ2001-3TB8C	4960	FJ2003-3TB8C	5360	FJ2004-3TB8C	8450	FJ200X-3TB8C	10,560
	400	FJ4001-3TB4B	8160	FJ4003-3TB4B	8960	FJ4004-3TB4B	17,730	FJ400X-3TB4B	22,160
	600	FJ6001-3TB4B	11,160	FJ6003-3TB4B	14,460	FJ6004-3TB4B	26,050	FJ600X-3TB4B	32,560
	800	FL8001-3TB4B	19,560	FL8003-3TB4B	22,960	FL8004-3TB4B	34,050	FL800X-3TB4B	42,560

NEMA Enclosure type

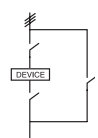
UL general purpose amp rating	Fuse type	4X Plastic		12	
		Catalog number	List price	Catalog number	List price
	30	FJ30P-3TB6B	\$ 1750	FJ302-3TB6B	\$ 1650
	30	FC30P-3TB6B		FC302-3TB6B	
	60	FJ60P-3TB8B	2020	FJ602-3TB8B	2020
	100	FJ100P-3TB8B	2750	FJ1002-3TB8B	2580
	200	FJ200P-3TB8C	9300	FJ2002-3TB8C	5360
	400	FJ400P-3TB4B	17,360	FJ4002-3TB4B	8960
	600	FJ600P-3TB4B	27,760	FJ6002-3TB4B	12,960
	800	FL800P-3TB4B	35,360	FL8002-3TB4B	20,160

3 Pole Bypass switch, 600V, 30A – 800A

NEMA Enclosure type

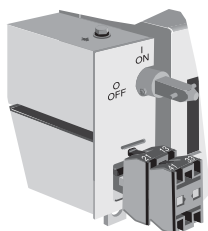
UL general purpose amp rating	Fuse type	1		3R		4		4X Stainless		
		Catalog number	List price	Catalog number	List price	Catalog number	List price	Catalog number	List price	
	30	FJ301-3BB8B	\$ 1850	FJ303-3BB8B	\$ 2050	FJ304-3BB8B	\$ 3150	FJ30X-3BB8B	\$ 4550	
	30	FC301-3BB8B		FC303-3BB8B		FC304-3BB8B		FC30X-3BB8B		
	60	J	—	—	—	—	—	—	—	
	100	J	—	—	—	—	—	—	—	
	200	J	FJ2001-3B8C	9000	FJ2003-3B8C	9800	FJ2004-3B8C	16,000	FJ200X-3B8C	19,950
	400	J	FJ4001-3B6B	15,300	FJ4003-3B6B	16,800	FJ4004-3B6B	34,000	FJ400X-3B6B	42,500
	600	J	FJ6001-3B6B	21,100	FJ6003-3B6B	27,000	FJ6004-3B6B	50,300	FJ600X-3B6B	62,800
	800	L	FL8001-3B6B	37,500	FL8003-3B6B	44,100	FL8004-3B6B	65,800	FL800X-3B6B	82,300

NEMA Enclosure type

UL general purpose amp rating	Fuse type	4X Plastic		12		
		Catalog number	List price	Catalog number	List price	
	30	FJ30P-3BB6B	\$ 2250	FJ302-3BB6B	\$ 2150	
	30	FC30P-3BB6B		FC302-3BB6B		
	60	J	—	—	—	
	100	J	—	—	—	
	200	J	FJ200P-3B8C	17,600	FJ2002-3B8C	9800
	400	J	FJ400P-3B6B	33,100	FJ4002-3B6B	16,800
	600	J	FJ600P-3B6B	53,500	FJ6002-3B6B	24,600
	800	L	FL800P-3B6B	73,500	FL8002-3B6B	38,700



OESA-ZX157



OZXK-1
OZXK-2



3 Position selection switch



Pilot light

Auxiliary contacts

For use on:	Contact configuration	Catalog number	Installation suffix	Installed list price adder
30A	1 N.O. + 1 N.C.	OA4B1C	add "11" suffix	\$ 70
	2 N.O. + 2 N.C.		add "22" suffix	110
60A – 100A	1 N.O.	OA1G10 OA3G01	add "10" suffix	30
	1 N.C.		add "01" suffix	
200A – 800A	1 N.O. & 1 N.C.	OZXK-1 OZXK-2	add "11" suffix	130
	2 N.O. & 2 N.C.		add "22" suffix	200

Accessories ①②

For use on:	Description	Installation suffix	Installed list price adder
30A 60A – 100A 200A – 400A 600A – 800A	Neutral block	N	\$ 40
	Neutral block	N	50
	Neutral block	N	150
	Neutral block	N	160
30A – 200A	Service entrance, 3 wire	U	75
	Service entrance, 4 wire	V	125
400A – 800A	Service entrance, 3 wire	U	150
	Service entrance, 4 wire	V	200
30A – 800A	Start/stop pushbuttons	A	68
	2 position selector switch	C	68
	3 position selector switch	D	78
	Pilot light "red/run"	E	110
	Ammeter 1 phase ③	AM	940
	Voltmeter ③	VM	2300

Ground lugs

All enclosed switches are provided with a standard integral ground lug.

Switch size	Ground lug wire size
30 – 100	#14 – 1
200 – 800	#6 – 250 MCM

① Additional accessories can be found on pages 18.83 – 18.95.
 ② Please consult factory for special customer requirements.
 ③ Current transformers included.

Technical data

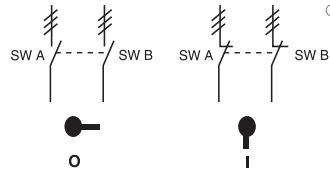
Other configuration descriptions

Disconnect
switches
Fusible
Enclosed

Conversion mechanisms

6 or 8 pole

6 (8) pole mechanism allows two switches controlled by one handle to open or close simultaneously.

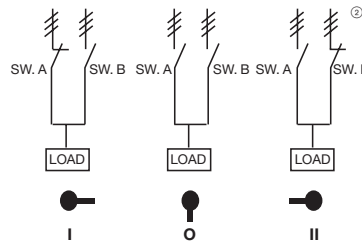


	POS. O	POS. I
SW. A	O	X
SW. B	O	X

X = Closed
O = Open

Transfer^①

Transfer mechanism manually transfers between two power sources using two switches and a center "OFF" position.

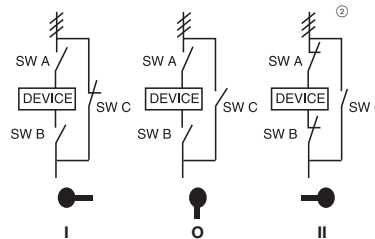


	POS. I	POS.O	POS.II
SW. A	X	O	O
SW. B	O	O	X

X = Closed
O = Open

Bypass^①

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass.

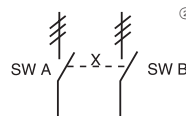


	POS. I	POS.O	POS.II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

X = Closed
O = Open

Mechanical interlock

Mechanical interlock mechanism prevents both switches from being in the ON position at the same time.



	SW. A POS. I	SW. B POS. O
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

^① Transfer and bypass enclosed switches include the load side bussed or cabled together, and all switches come standard with ground lugs.

^② ≡ = Three poles

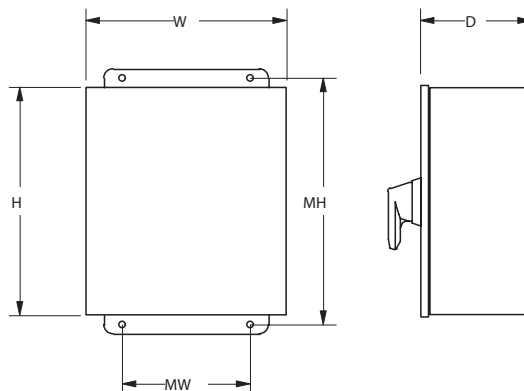
Approximate dimensions 2, 3, & 4 Pole ③ 30A – 800A F

Fusible

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight (lbs.)
OS30_	1	10.0	8.0	6.0	7.0	7.0	12
	3R	10.0	8.0	6.0	10.75	6.0	12
	4	10.0	8.0	6.0	10.75	6.0	12
	4X SS	10.0	8.0	6.0	10.75	6.0	12
	4X Plastic	10.0	8.0	5.9	10.75	6.0	8.0
12	10.0	8.0	6.0	10.75	6.0	12	
OS60_	1	10.0	8.0	6.0	7.0	7.0	13
	3R	10.0	8.0	6.0	10.75	6.0	13
	4	10.0	8.0	6.0	10.75	6.0	13
	4X SS	10.0	8.0	6.0	10.75	6.0	13
	4X Plastic	10.0	8.0	5.9	10.75	6.0	9.0
12	10.0	8.0	6.0	10.75	6.0	13	
OS100_	1	14.0	12.0	8.0	11.0	9.0	22
	3R	14.0	12.0	8.0	14.75	10.0	22
	4	14.0	12.0	8.0	14.75	10.0	22
	4X SS	14.0	12.0	8.0	14.75	10.0	22
	4X Plastic	14.0	12.0	8.0	14.75	10.0	16
12	14.0	12.0	8.0	14.75	10.0	22	
OS200_	1	24.0	20.0	10.0	25.5	18.5	75
	3R	24.0	20.0	10.0	25.5	18.5	75
	4	24.0	20.0	10.0	25.5	18.5	75
	4X SS	24.0	20.0	10.0	25.5	18.5	75
	4X Plastic	①	①	①	①	①	①
12	24.0	20.0	10.0	25.5	18.0	75	

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight (lbs.)
OES400_	1	44.0	22.0	11.0	45.5	20.5	150
	3R	44.0	22.0	11.0	49.5	20.5	150
	4	48.0	24.0	12.0	49.5	22.5	150
	4X SS	48.0	24.0	12.0	49.5	22.5	150
	4X Plastic	①	①	①	①	①	①
12	44.0	22.0	11.0	45.5	20.5	150	
OES600_	1	44.0	22.0	11.0	45.5	20.5	150
	3R	44.0	22.0	11.0	49.5	20.5	150
	4	48.0	24.0	12.0	49.5	22.5	150
	4X SS	48.0	24.0	12.0	49.5	22.5	150
	4X Plastic	①	①	①	①	①	①
12	44.0	22.0	11.0	45.5	20.5	150	
OES800_	1	48.0	24.0	12.0	49.5	22.5	170
	3R	48.0	24.0	12.0	49.5	22.5	170
	4	48.0	24.0	12.0	49.5	22.5	170
	4X SS	48.0	24.0	12.0	49.5	22.5	170
	4X Plastic	①	①	①	①	①	①
12	48.0	24.0	12.0	49.5	22.5	170	

- ① Please consult factory, enclosures are sized to suit specific customer needs.
 ② Enclosure is free standing.
 ③ Some 4-pole switches require larger enclosures. Please consult factory.



Approximate dimensions for enclosed 6-pole transfer & mechanical interlock switches, 30A – 800A F

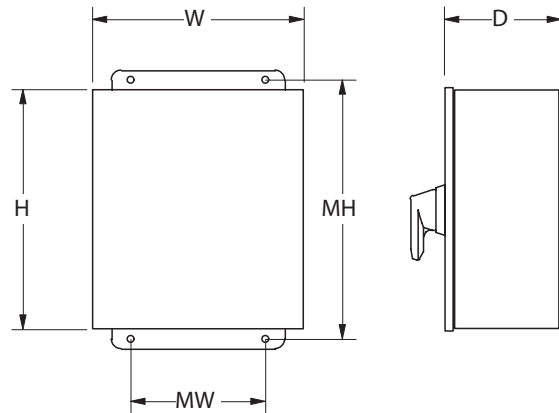
Disconnect
switches
Fusible
Enclosed

Fusible

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight (lbs.)
OS30_	1	14.0	12.0	8.0	11.0	9.0	22
	3R	14.0	12.0	8.0	14.75	10.0	22
	4	14.0	12.0	8.0	14.75	10.0	22
	4X SS	14.0	12.0	8.0	14.75	10.0	22
	4X Plastic	14.0	12.0	8.0	14.75	10.0	16
	12	14.0	12.0	8.0	14.75	10.0	22
OS60_	1	20.0	20.0	8.0	21.5	18.5	60
	3R	20.0	20.0	8.0	21.5	18.5	60
	4	20.0	20.0	8.0	21.5	18.5	60
	4X SS	20.0	20.0	8.0	21.5	18.5	60
	4X Plastic	24.0	16.0	10.0	-	-	60
	12	20.0	20.0	8.0	21.5	18.5	60
OS100_	1	20.0	20.0	8.0	21.5	18.5	60
	3R	20.0	20.0	8.0	21.5	18.5	60
	4	20.0	20.0	8.0	21.5	18.5	60
	4X SS	20.0	20.0	8.0	21.5	18.5	60
	4X Plastic	24.0	16.0	10.0	21.5	18.5	60
	12	20.0	20.0	8.0	21.5	18.5	60
OS200_	1	36.0	30.0	12.0	37.5	28.5	100
	3R	36.0	30.0	12.0	37.5	28.5	100
	4	36.0	30.0	12.0	37.5	28.5	100
	4X SS	36.0	30.0	12.0	37.5	28.5	100
	4X Plastic	①	①	①	①	①	①
	12	36.0	30.0	12.0	37.5	28.5	100

① Please consult factory; enclosures can be custom sized to suit specific needs
② Enclosure is free standing.

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight (lbs.)
OES400_	1	48.0	36.0	16.0	49.5	34.5	220
	3R	48.0	36.0	16.0	49.5	34.5	220
	4	48.0	36.0	16.0	49.5	34.5	220
	4X SS	48.0	36.0	16.0	49.5	34.5	220
	4X Plastic	①	①	①	①	①	①
	12	48.0	36.0	16.0	49.5	34.5	220
OES600_	1	48.0	36.0	16.0	49.5	34.5	230
	3R	48.0	36.0	16.0	49.5	34.5	230
	4	48.0	36.0	16.0	49.5	34.5	230
	4X SS	48.0	36.0	16.0	49.5	34.5	230
	4X Plastic	①	①	①	①	①	①
	12	48.0	36.0	16.0	49.5	34.5	230
OES800_	1	48.0	36.0	16.0	49.5	34.5	230
	3R	48.0	36.0	16.0	49.5	34.5	230
	4	48.0	36.0	16.0	49.5	34.5	230
	4X SS	48.0	36.0	16.0	49.5	34.5	230
	4X Plastic	①	①	①	①	①	①
	12	48.0	36.0	16.0	49.5	34.5	230



Disconnect
switches
Fusible
Enclosed

Notes

Arc Guard Systems	18.1 - 18.12
Arc monitor	18.2
Circuit diagrams	18.5 - 18.10
Current sensing unit	18.2
Detectors	18.2
Dimensions	18.11
Flush mounting set	18.2
General description	18.3 - 18.5
General information	18.1
Mounting bracket	18.2
Optical fiber cable	18.2
Technical data	18.6 - 18.7



Notes

Arc monitor • Current sensing unit

Arc Guard Systems

ABB Arc Guard Systems
Arc monitor
Current sensing unit
Accessories



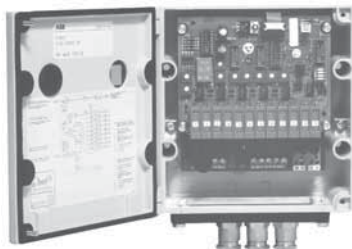
Arc monitor

- Available for AC and DC power
- Photodiodes for sensing light
- The two output stages are triacs triggered via a pulse transformer
- Two separate relay outputs
- A switch is included for selection of automatic relay resetting
- A digital display, visible through the window in the door, is lighted when the triac outputs are activated and shows which detector has caused tripping
- Terminals are provided for connection of the arc monitor's own power supply and for connections to the circuit-breaker trip coil
- The power consumption of the unit is approximately 6 watts

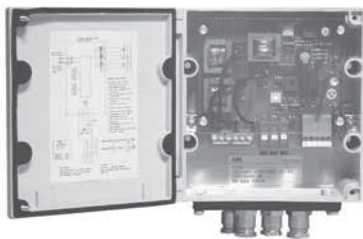
Current sensing unit

- Has terminals for a number of different supply voltages
- Connects to current transformers located at suitable positions in the busbar system of the installation to be monitored
- Incorporates a selector switch and potentiometer for testing and checking purposes
- Power consumption approximately 11 W
- Optical signal transmission
- Can be connected in series using optical cables
- LEDs indicate when the current exceeds approximately 70% and 100% of the set value
- The unit can be either 1, 2 or 3-phase connected (to one, two or three current transformers)
- Imposes insignificant load on the current transformers, approximately 0.7 VA, so current transformers that are also applied for other purposes can often be used

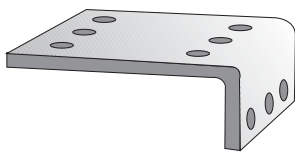
Ordering information



AGS-AM240



AGS-CS240



AGS-MB



AGS-FMS

Arc monitor

Power supply voltage	Catalog number	List price
60 – 220 VDC and 60 – 240 VAC, 50 – 60 Hz 24 – 48 VDC	AGS-AM240 AGS-AM48	\$ 3843

Receives the light signal sent by the detector via fiberoptic cables and sends a trip signal to the upstream circuit breaker within 1-2 ms. The DC powered design has reverse polarity protection.

Current sensing unit

Power supply voltage	Catalog number	List price
24, 48, 60, 110, 125 and 220 VDC 110 – 125 VAC and 240 VAC, 50 – 60 Hz	AGS-CS240	\$ 2452

Provides a safeguard against nuisance tripping by requiring both a rapid change in current as well as a signal from the light detector before a trip signal can be transmitted to the upstream circuit.

Detectors with optical plastic cable ①

Cable length	Catalog number	List price
2m	AGS-DP2	\$ 212
4m	AGS-DP4	235
6m	AGS-DP6	260
8m	AGS-DP8	289
10m	AGS-DP10	314
15m	AGS-DP15	381
20m	AGS-DP20	448
30m	AGS-DP30	591

The detectors transfer light from the arc via the fiberoptic cable to the Arc Monitor.

Optical fiber cable — plastic (provided with plug-in socket terminals) ①

Cable length	Catalog number	List price
0.5m	AGS-CP.5	\$ 84
1m	AGS-CP1	92
2m	AGS-CP2	105
4m	AGS-CP4	134
6m	AGS-CP6	160
8m	AGS-CP8	189
10m	AGS-CP10	214
15m	AGS-CP15	281
20m	AGS-CP20	356

For connection between units: • current sensing unit to arc monitor • arc monitor to arc monitor.

Mounting bracket

Application	Catalog number	List price
For mounting detectors. Detectors are secured to the bracket by means of cable straps.	AGS-MB	\$ 10

Flush mounting set

Application	Catalog number	List price
For arc monitor and current sensing unit mounting in switchgear front.	AGS-FMS	\$ 128

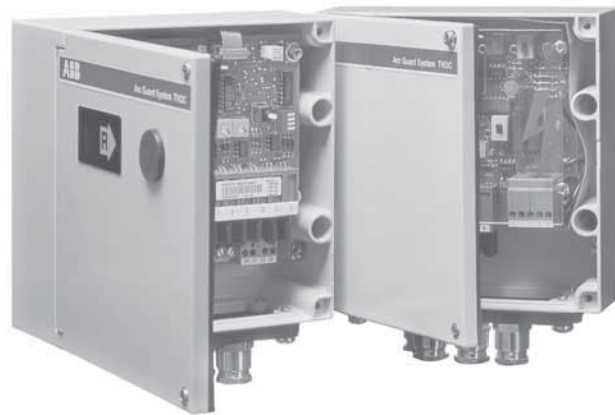
① Detectors and optical cables using fiber glass can be supplied upon request — consult factory for pricing.

ABB General description

Arc Guard System

Arc monitor

Current sensing unit



Function

The purpose of the arc guard system is to quickly disconnect the energy source if an arcing fault should occur. The watchful eye of the arc monitor detects any large increase in light intensity. The detector transfers light from the arc through a state-of-the-art solid state electronics package. Within an interval of one to two milliseconds, the detector sends a trip signal to the disconnecting upstream circuit breaker located in the switchgear, bypassing delays caused by the selective features of relaying schemes. This protects your equipment and personnel.

Current sensing unit

The detectors can also be sensitive to other forms of intense light, such as camera flashes, lightning, direct sunlight, switching arcs in circuit breakers and other large apparatus. By combining the arc monitor with a current sensing unit set just over the normal operating level, a current dependent condition is introduced which prevents triggering from irrelevant light sources. This prevents nuisance tripping the switchgear and causing an unintentional power outage.

Insensitivity to interference

A switchgear environment is often subjected to extreme electromagnetic interference, especially during an arcing fault. High currents in the busbars and cables, switching arcs in contactors and circuit breakers generate fields that interfere with communication between

relays and meters. Fiber optic cables eliminate the risk of electromagnetic interference. All communication between the detectors, arc monitor and the current sensing unit are through fiber optics. Fiber optic signal transmission makes the systems immune to interference.

System security

The arc guard system is a product that seldom (or never!) has to take action, but which must then always operate with absolute dependability. Its performance should be checked after installation and subsequently at certain intervals, e.g. once a year. The design of the system makes it easy to check. The procedure is described in the instructions provided with the equipment.

Approvals

- Underwriters Laboratories
File #E155370
- Factory Mutual system
Reference FMRC J.I. 1B1A4.AF
- Lloyds Register of Shipping
Cert. #97/00189
- Det Norske Veritas
Cert. #A-6702
- Germanischer Lloyd
Cert. #99.342-97
- CE Marked
- Earthquake tested according to ANSI / IEEE
C37.98 – 1987
- Y2K compliant
- US Coast Guard ①
- American Bureau of Shipping ①

① Certificate number pending. Call factory for more information.

General description

Arc monitor with detectors

Introduction

The two units of the Arc Guard System™, arc monitor, and the current sensing unit are each built into a light-alloy enclosure provided with a hinged door.

Communication between the units and between arc monitor and detectors is through optical cables.

Optical fiber cables

The optical fiber cables cannot be cut or joined and they must be run in smooth curves during installation. Optical fiber cables and detectors with optical fiber cables are available in certain standard lengths, see page 2. Greater lengths than these can be quoted on request.

Detectors

Each detector consists of a lens arrangement for collecting light. An optical fiber cable is connected to the lens. The detector monitors a large space angle. The polar diagram should be regarded as three-dimensional since the detector is sensitive to light from all directions, with the exception of a small area behind the detector.

Factory testing has shown that arc light reflected between metallic surfaces is also sufficient to cause tripping. However, we do recommend one detector per each enclosed switchgear compartment.

The detectors are connected to the arc monitor by means of plug-in sleeve terminals.

A maximum of nine detectors can be connected to an arc monitor. If more detectors are required, up to twelve units may be connected in parallel.

Arc monitor

- Available for AC and DC power
- Photodiodes are used for sensing light.
- The two output stages are triacs triggered via a pulse transformer. In this way, detectors and output stage are electrically isolated from other electronic equipment.
- The arc monitor has two separate relay outputs. Each relay has one change-over (Form C) contact function. Relay K1 is used for EXTERNAL TRIP indication and relay K2 is used for POWER ON indication.
- A switch is included for selection of automatic relay resetting (after approximately 200 ms) or manual resetting of relay K1.
- A digital display, visible through the window in the door, is lighted when the triac outputs are activated and shows which detector has caused tripping. The display and relay are

reset using a pushbutton accessible from the outside. The arc monitor can trip even if it is not reset.

- Terminals are provided for connection of the arc monitor's own power supply and for connections to the circuit-breaker trip coil. There are units for plug-in connection of optical fiber cables from the detectors and for communication with any current sensing unit.
- The power consumption of the unit is approximately 6 watts. Energy is stored in the unit for operation up to 200ms should the supply voltage fail, which is sufficient to activate the output even if voltage disappears in conjunction with the short circuit for which the arc monitor operates.

Tripping of several breakers

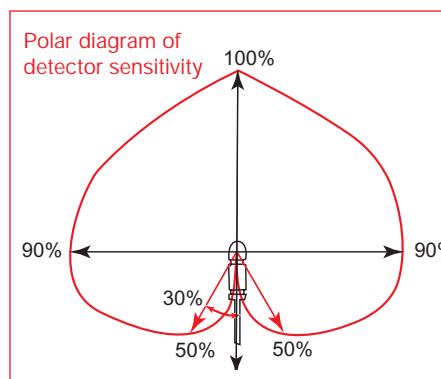
For tripping several breakers an additional relay is often required. This must be as fast as possible so as not to delay tripping and thus make damage worse.

For DC supply, ABB's relay type RXMS (Cat. No. RK 216 263-...) with 4 ms pickup time is suitable. Where a greater load capacity is required this relay can be connected in parallel with relay type RXMH (Cat. No. RK 223 067-...).

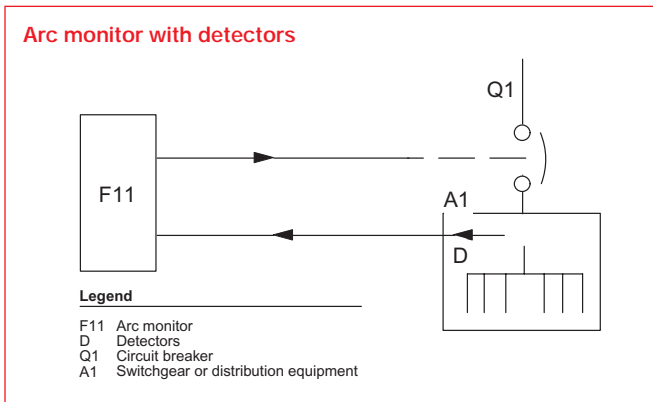
The current to the intermediate relay must be interrupted since the triacs of the arc monitor have no breaking capacity for DC. This can be done by having a pushbutton or time-lag relay break the circuit or by connecting the signal relay contact K1 of the arc monitor in parallel with the triacs. Then activate automatic reset inside arc monitor (DIP-switch S1.2).



Arc monitor



Polar diagram of detector sensitivity



General description

Current sensing unit

Description

- Has terminals for a number of different supply voltages.
- Connects to current transformers located at suitable positions in the busbar system of the installation to be monitored.
- The unit incorporates a selector switch and potentiometer for testing and checking purposes.
- Power consumption is approximately 11 W.
- Optical signal transmission
- If several current sensing units are needed, these can be connected in series using optical cables.
- LEDs indicate when the current exceeds approximately 70% and 100% of the set value.

Connection to current transformers

The unit is to be connected to current transformers with a rated secondary current of 1, 2 or 5 A .

Note that current transformers for relay protection are to be used since these do not saturate as quickly as ordinary current transformers. To minimize the operating time, the current transformers should not saturate until twice the set current has been reached.

The unit can be either 1, 2 or 3-phase connected (to one, two or three current transformers). However, in three-phase systems single-phase connection should be avoided. Even though arcs generally spread to all three phases, valuable time may be lost before the current rises to the trip value if the arc is struck in one of the phases in which the current is not sensed by the unit.

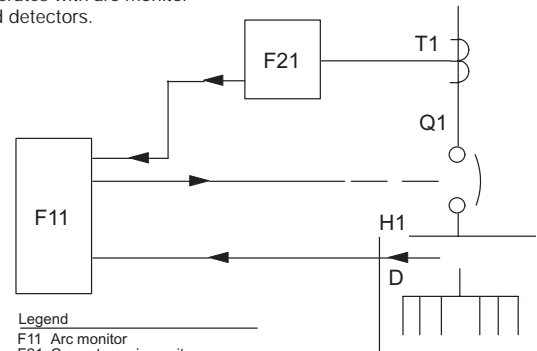
The unit imposes insignificant load on the current transformers, approximately 0.7 VA, so current transformers that are also applied for other purposes can often be used.



Current sensing unit

Current sensing unit

Operates with arc monitor and detectors.



Legend

- F11 Arc monitor
- F21 Current sensing unit
- T1 Current transformers, 3 CTs
- Q1 Circuit breaker
- H1 Switchgear or equipment
- D Detectors

Technical data

Arc monitor

Current sensing unit

Arc monitor

Triac outputs (Static outputs)	disconnectible terminals
Largest load current:	
Continuously	0.7 A
For 200 ms	30 A
Smallest recommended load current	
(temperature $\geq 25^\circ\text{C}$)	DC 45 mA at stated polarity AC 80 mA
(temperature $\geq -25^\circ\text{C}$)	DC 80 mA at stated polarity
Residual current, I_r at 220	8 mA
at DC	0.5 mA
	The output is connected in parallel with 10 ohm in series with 0.1 μF
For other voltages	$I_r = V \times f \times 0.0006$ (mA) V = voltage f = frequency
Peak withstand voltage	600 V
Power supply voltage	Max. 250 V
Signal relay outputs	
Thermal rated current, I_{th}	5 A
Rated operational current, I_e	
Utilization category per IEC 947-5-1:	
AC 15 $V_e = 250\text{ V}$	1.5 A
DC 13 $V_e = 48\text{ V}$	1.0 A
110 V	0.4 A
220 V	0.2 A
Optical inputs	Quantity
For light detectors	9
From Current Sensing Unit or other Arc Monitor	1
Optical outputs	
To other Arc Monitor	1
Indications	
Operating voltage available	Decimal point on digital display lights up relay K2 energizes.
Upon tripping	Digital display lights up. The display shows which detector was activated (1 – 9). Relay K1 energizes
Control devices/settings:	
<i>External (on door)</i>	
Pushbutton	
- Reset button	Manual resetting
<i>Internal (on the printed circuit board)</i>	
Change-over switch	
- Switching on and off of Current sensing unit	On/Off
- Manual reset of signal relay	On/Off
Trimming potentiometers	
- Sensitivity setting	<i>Normally not to be adjusted</i>
Supply voltage:	See ordering information
Permitted variation	+/-20 % at DC +/-10 % at AC
Internal fuse	0.8 A delayed (5 x 20 mm)
Main fuse	max 10 A fast
Power consumption	6 W
Ambient temperature	-25°C thru +55 °C
Operating times:	
From detection to switched on triac outputs	approx. 1 ms (dependent on light intensity)
From detection to making relay contact	< 10 ms
Current conditions from input to output	< 0.3 ms (with 1 m optical cable)
Degree of protection	NEMA 1 / IP54
Start-up time for power on	< 50 ms at 60V for AGS-AM240 < 50 ms at 24V for AGS-AM48

Current sensing unit

Rated current	
Reconnectible, for connection of external current transformers with secondary rated current	1, 2 or 5 A
Load on the external current transformers	0.2 VA connected for 1 A 0.7 VA connected for 5 A
The current sensing unit withstands a maximum of:	
Continuously	1 x rated current
For 1 second	15 x rated current
Optical outputs:	
To arc monitor/current sensing unit	Quantity: 2
Optical inputs:	
From other current sensing unit	Quantity: 1
Indications:	
• Signal to arc monitor or current sensing unit	Green LED lights up for normal current level (< set overcurrent level)
• Pre-warning	Yellow LED lights up for normal current, switched off at > 70% of set overcurrent level
• Test position	Red LED
Control devices/settings:	
(on the printed circuit board)	
Change-over switch	
Test position	On/Off
Optical input is used or not	On/Off
Trimming potentiometers	
Setting of overcurrent level	0.5 – 4.5 x rated current
Simulation of overcurrent level in test position	
Supply voltage	See ordering information
Permitted variation	+/-20 % at DC +/-10 % at 110-127 VAC +10 % -15 % at 230 VAC
Power consumption	1 W at 24 V 11 W at 220 V
Ambient temperature	-25°C thru + 55 °C
Operating times	
From overcurrent occurring to actuating optical outputs:	
At currents $\geq 2 \times$ set overcurrent level	
3-phase supply.	< 2 ms
1-phase supply.	< 8 ms
Current conditions from optical input to optical outputs	< 0.3 ms
Degree of protection	NEMA 1 / IP54
Detector spectrum	400 – 850 nm, short plastic fiber 400 – 720 nm, long plastic fiber
Interference testing	According to EMC publications IEC1000 and Low Voltage Directive 73/23/EEC, the product is CE-marked.

Technical data

Detector and optical fiber cable



Detector and optical fiber cable

Ambient temperature

Continuous	-25...+70 °C
Short-time	-25...+85 °C

Smallest bending radius

Optical cable of plastic fiber	
after installation	45 mm
while handling	10 mm

Material

PMMA with a sheath of PE and PVC

Terminals

	Terminal	Cross section of connectible cables AWG ① / mm ²
Arc monitor	13, 14, 25 – 30 20 – 23	10 / 4 12 / 2.5
Current sensing unit	1 – 6 10 – 14	10 / 4 12 / 2.5

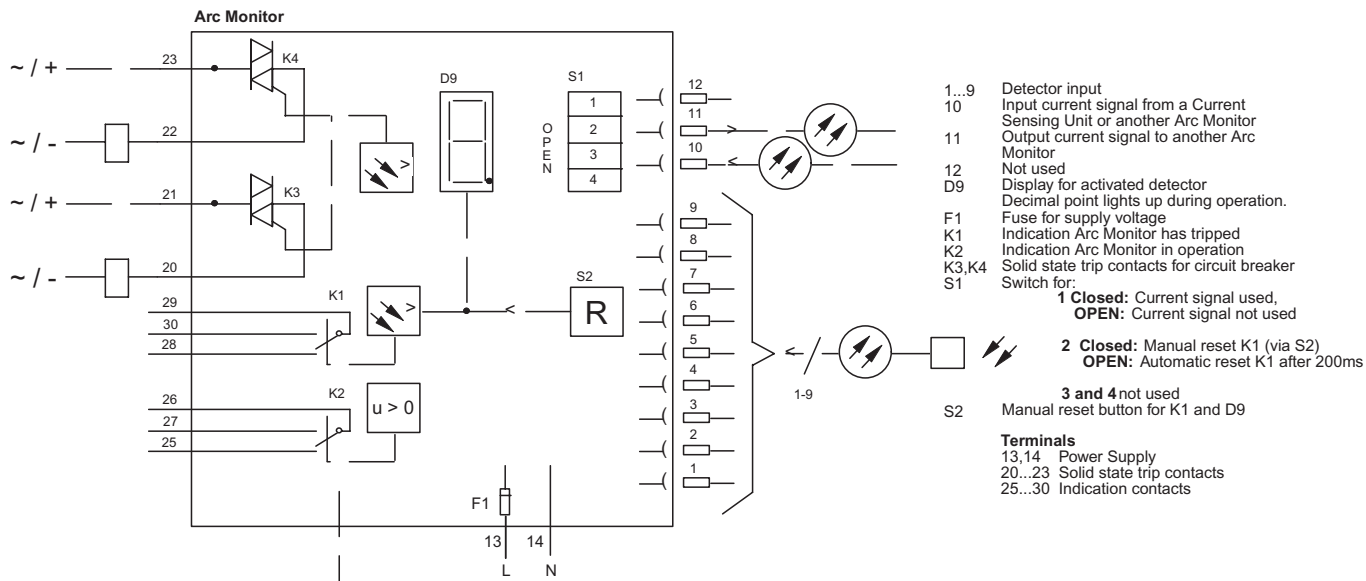
① AWG estimated.

Circuit diagrams

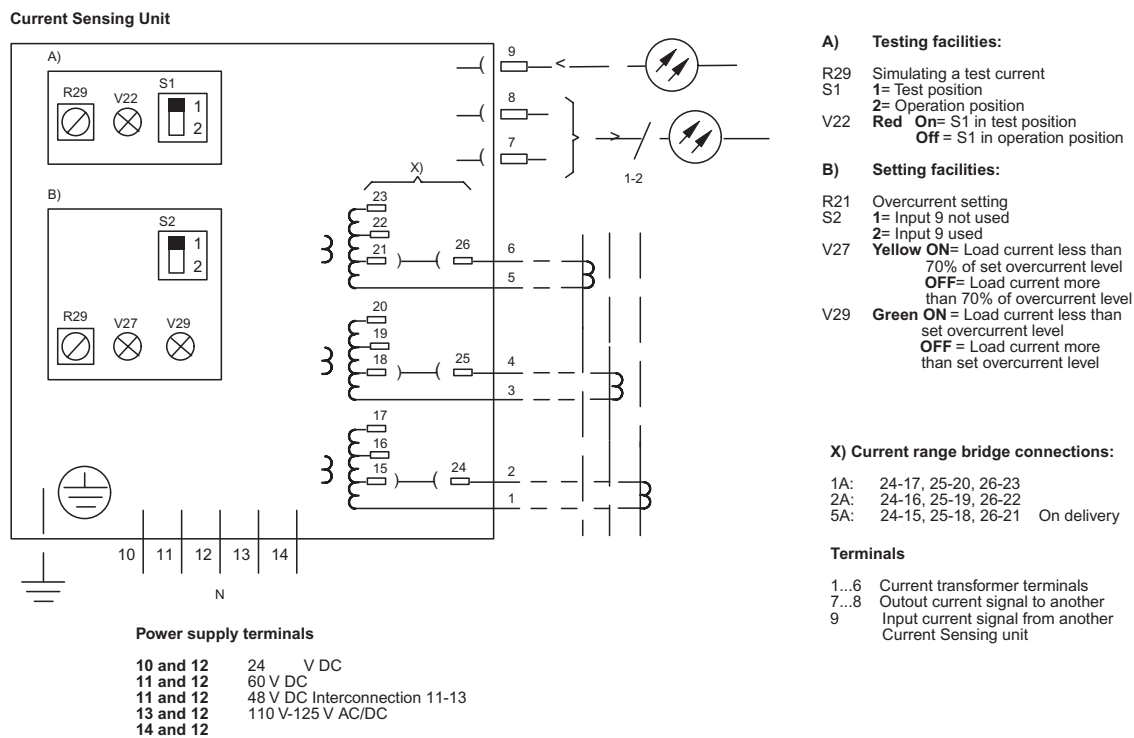
Arc monitor

Current sensing unit

Arc monitor



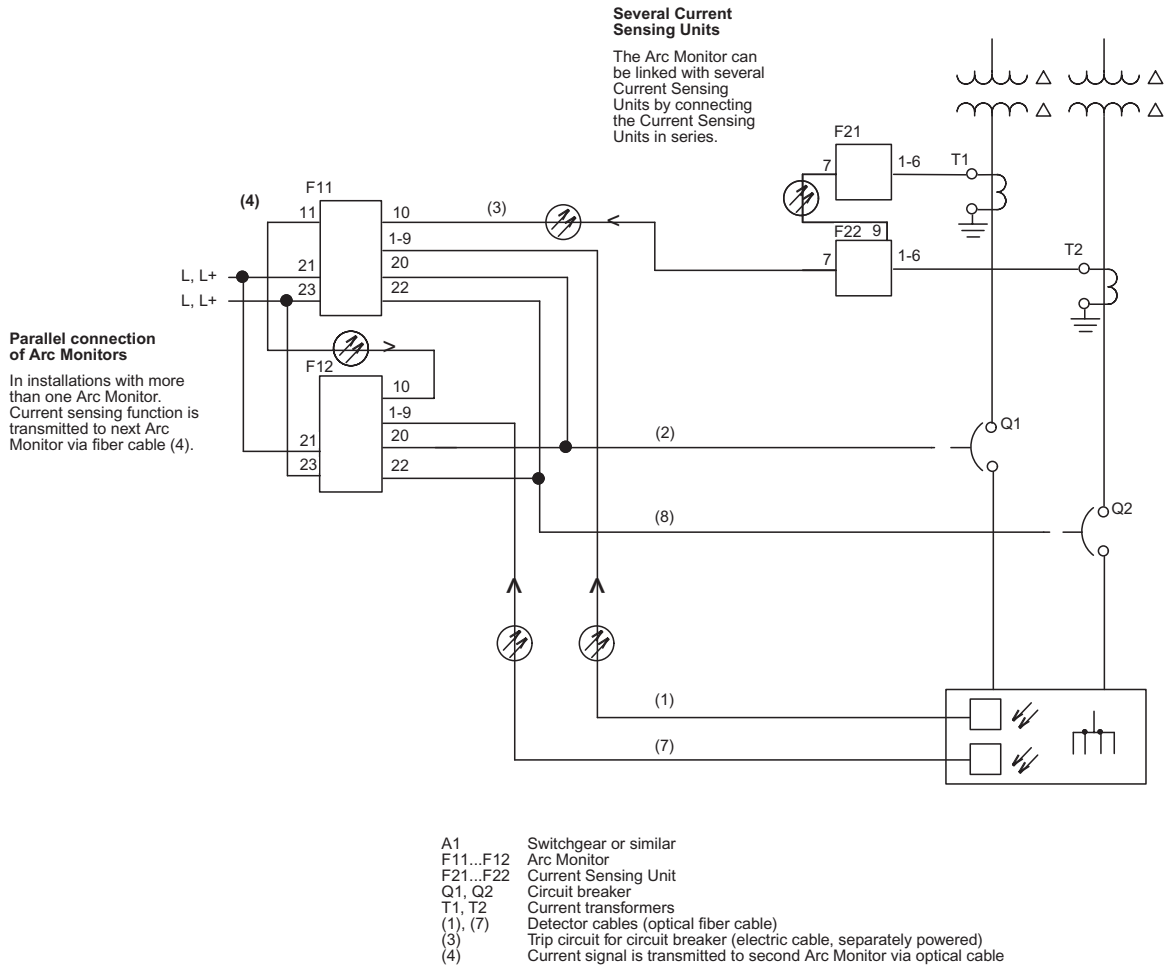
Current sensing unit



Circuit diagrams

Arc Guard System application

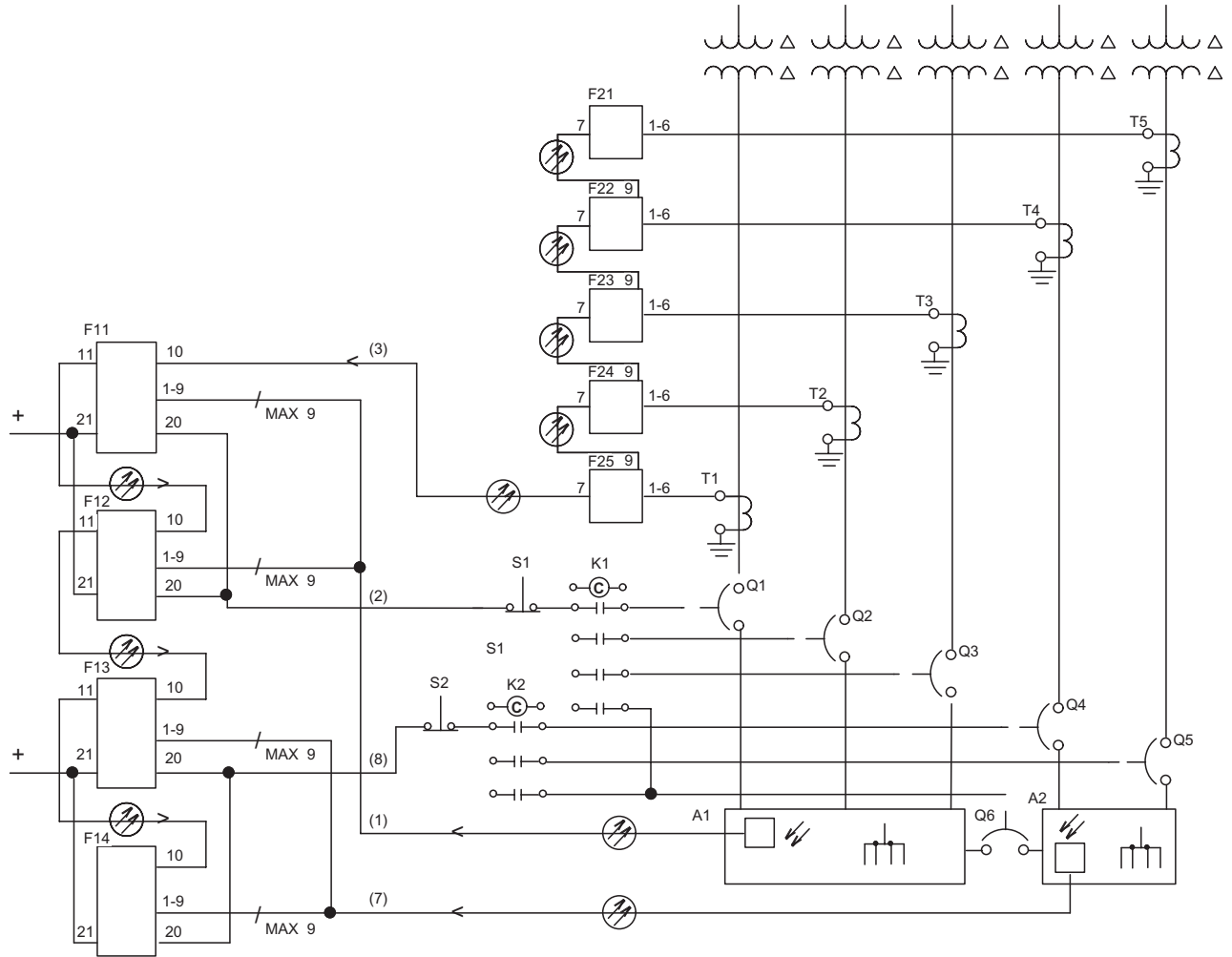
Arc Guard System with two separated circuit-breakers



Circuit diagrams

Arc Guard System application

Arc Guard System with current measuring in five incoming feeders

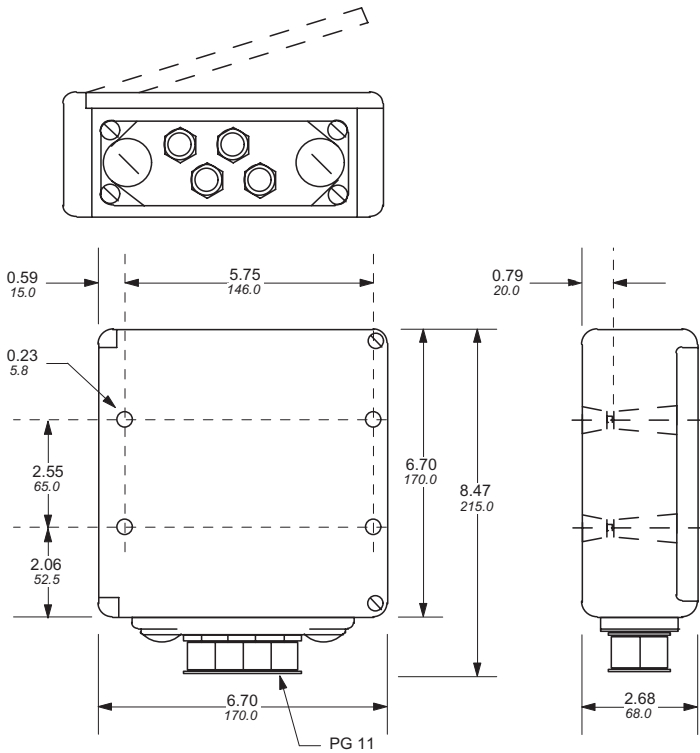


- | | | | |
|-----------|-----------------------|----------|---|
| A1, A2 | Switchgear or similar | Q6 | Bus coupler |
| F11...F14 | Arc monitor | (1), (7) | Detector cables (optical fiber cable) |
| F21...F25 | Current sensing unit | (2), (8) | Trip circuit for circuit breaker (electric cable, separately powered) |
| K1, K2 | Fast tripping relay | (3) | Current signal to Arc monitor (optical fiber cable) |
| T1...T5 | Current transformers | | |
| Q1...Q5 | Circuit breaker | | |

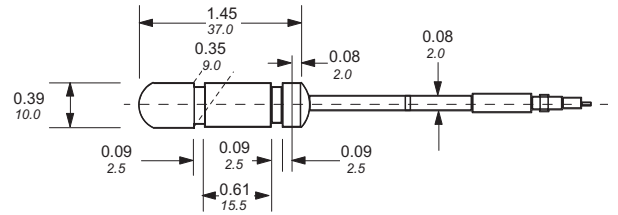
Approximate dimensions Arc Guard System

Arc monitor Current sensing unit

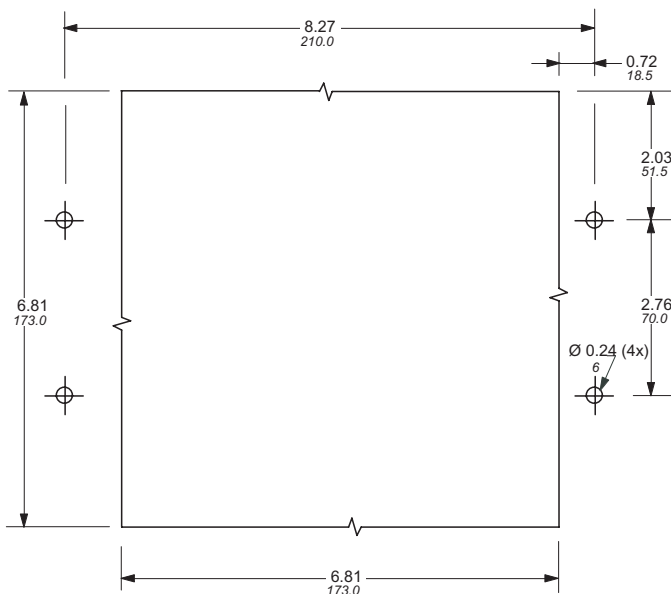
A flange with 6 tapped holes (size 18.6 mm) 4 cable glands (sealing diameter 5.5 – 8.5 mm) and 2 plastic blank plugs are supplied.



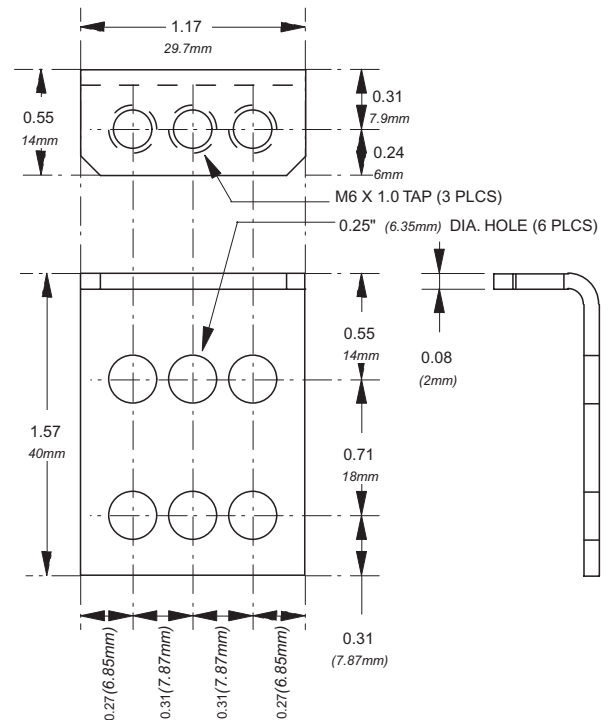
Detector with optical cable



Front panel cut-out



Bracket for fiber optic sensors





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Low Voltage Network Quality



Low Voltage Network Quality

Power factor correction

Harmonic filtering

Dynamic flicker compensation



General information

General description & capacitor construction



Large terminals for easy cable connections

Built-in discharge resistors

Heavy duty enclosure

Metallized film design

Internally Protected Elements (IPE) & self-healing design

Low losses

Thermal equalizer for low element temperature

Dry granulated vermiculite insulation

Easy mounting, low weight



Principal Components of a 3-Phase Capacitor

The principal components of a 3-phase ABB capacitor include:

1. Sequential Protection System:

• Self-Healing Capacitor Elements

One or more self-healing capacitor elements are installed for each phase. These elements are connected in Y or Δ. In case of dielectric breakdown, the fault is cleared by evaporation of the metallized layer around the breakdown with negligible loss of capacitance and continued operation of the capacitor!

• Internally Protected Elements

A unique Sequential Protection System including the IPE design (IPE - internally protected elements) ensures that each individual element can be disconnected from the circuit at the end of the element's life.

• Nonflammable Dry Vermiculite Filler

Vermiculite is a dry, granulated insulating material that is solid, inert and fire proof. This material fills all open spaces in the enclosure to isolate the capacitor elements and exclude free oxygen.

2. Discharge Resistors

Discharge resistors (one for each phase) are sized to ensure safe discharge of the capacitor to less than 50 volts in one minute or less as required by the NEC.

3. Terminal Studs

Large terminal studs are located inside the enclosure at the top of the capacitor for quick and easy cable connections.

4. Enclosure

All ABB enclosures are made of welded heavy gauge steel. Available enclosure types include Indoor NEMA 1, Outdoor Raintight, and Indoor Dusttight. (RAL 7032, Beige)

What is a Metallized-Film Element?

Metallized-film is a microscopically thin layer of conducting material (called an electrode), usually aluminum or zinc on an underlying layer of insulating film. The electrode thickness averages only .01 microns while insulating (polypropylene) film ranges from 5 to 10 microns in thickness depending upon the design voltage of the capacitor (the higher the voltage rating, the thicker the insulating film).

Advantages of Metallized-Film Elements

There are two electrode layers separated by one layer of insulating film. Thousands of these layers are tightly wound around a core in such a manner that the edge of one electrode is exposed on one side of the element and the edge of the other electrode is exposed on the other side of the element. See Fig. 1 & 2.



Fig. 1

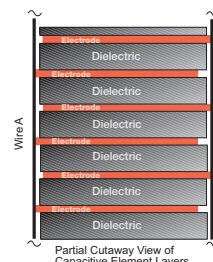


Fig. 2

Wires are then connected to each side of the element. The element is enclosed in a container and then filled with a hardening protective sealant.

General information

General description & capacitor construction

1. Self-Healing Design

Self-healing refers to a process where a short circuit between electrodes vaporizes the electrode around the fault (see Fig. 14) until the fault is eliminated. The element continues to function with negligible loss of performance (see Fig. 15).

2. Low Internal Losses

Due to the high dielectric efficiency of the metallized-film, the internal losses are extremely low. ABB metallized-film design losses are limited to .5 watts per kvar including the losses across the discharge resistors.

3. Small Element Size

Due to the thin electrode and dielectric, metallized-film elements are small and compact in size resulting in smaller, more powerful capacitors.

The capacitance of any element design is inversely proportional to the separation between electrodes. In other words, if the separation between conducting surfaces is cut in half, the effective capacitance is doubled in addition to reducing the physical size of the element by half.

More About Self Healing Elements

"Self-healing" is a characteristic which is unique to metallized electrode capacitors. All capacitors normally experience insulation breakdown as a result of the accumulated effect of temperature, voltage stress, impurities in the insulating medium, etc. When this happens in a non-"metallized" design,

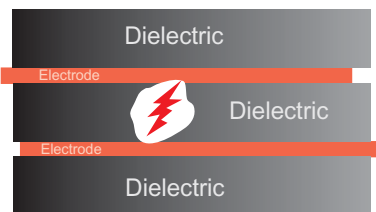


Fig. 3. Two electrodes short circuit through a fault in a dielectric layer.

the electrodes are short-circuited and the capacitor ceases its production of reactive power. In an ABB metallized-film unit, however, these individual insulation breakdowns do not mean the shutdown of the capacitor. The faults self-heal themselves and the capacitor continues operation.

The conducting electrode is very thin; when a short circuit develops as a result of a fault in the insulating dielectric, the thin electrode vaporizes around the area of the fault. This vaporization continues until sufficient separation exists between the faulted electrodes to overcome the voltage level. Fig. 15 illustrates the process of self-healing.

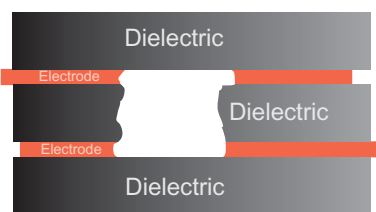


Fig. 4 illustrates "self-healing". The electrode layers in the area where they were short circuiting have been vaporized, thereby eliminating the short circuit.

The entire process of self-healing takes "microseconds" and the amount of electrode which is lost is negligible in comparison to the total surface area of the element. The result is the metallized-film unit may self-heal hundreds of times during its long life and still retain virtually all of its rated capacitance.

The IPE Sequential Protection System

ABB's metallized-film self healing capacitor elements will have a longer life than their conventional foil design counterparts for the above reason. However, accumulated effects of time, temperature, voltage stress, etc., eventually effect capacitor life.

ABB's sequential protection system featuring patented Internally Protected Elements (IPE) design provides increased protection to facilities and personnel not available from other capacitor designs. This proven design allows for self-healing throughout the life of the capacitor to insure the maximum length of reliable service and still provide short circuit protection in each element when self-healing can no longer continue. This is accomplished by a combination of unique winding construction and an internal fuse link (See Fig. 5) within each element which

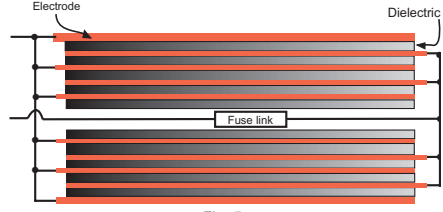


Fig. 5

safely and selectively disconnects each individual element. ABB capacitors do not rely on mechanical pressure interrupters and additional line fuses have disadvantages associated with that kind of construction.

What are Discharge Resistors?

As all the capacitor elements store electrical power like a battery, the capacitor will maintain a near full charge even when not energized. As this is a potentially dangerous condition to unsuspecting plant personnel that might be inspecting the capacitor terminals and wiring, discharge resistors are connected between all of the terminals. When the capacitor is shut off, these discharge resistors drain the capacitor elements of their stored electrical charge. It is recommended, however, that capacitor terminals should ALWAYS be short-circuited before touching the terminals.

What is the Significance of Dry Type Design?

ABB low voltage capacitors contain no free liquids and are filled with a unique nonflammable granular material called vermiculite. Environmental and personnel concerns associated with leakage or flammability of conventional oil-filled units are eliminated; and kvar for kvar, vermiculite filled units weigh 30% to 60% less than their oil filled counterparts.

Vermiculite is routinely used in the United States as an insulating material in the walls and ceilings of new buildings. Its properties have been extensively documented and recognized as an ideal material for safety and environmental considerations.

General information

Options for correcting power factor

Options for Correcting Power Factor

There are three primary methods of correcting power factor:

- **Individual Capacitor Units** - One capacitor unit for each inductive load.
- **Banks of Capacitor Units** - Large Capacitor System connected to the line at some central point in the distribution system.
- **Combination of Above** - Where individual capacitors are installed on the larger inductive loads and banks are installed on main feeders or switchboards, etc.

Individual Capacitor Units

Power factor correction is best achieved with individual capacitor units located directly at the inductive load (in most cases a motor). This has many of the advantages of capacitor bank installations including some advantages capacitor bank installations cannot offer.

Advantages of individual capacitor units:

- **Increased Distribution System Capacity** - Only individual capacitor units can improve power consumption efficiency throughout the entire distribution system all the way to the load! Therefore, where wiring is being overloaded by induction motors, increased system capacity can be obtained by reducing the load and adding individual power factor correction units.
- **Stabilized Voltage Levels** - Voltage drops to individual inductive load are reduced thereby decreasing heat damage caused by excessive currents.
- **Lower Losses** - When individual capacitor units are installed directly at the terminals of an inductive load such as a motor or transformer, the line losses are reduced.
- **Capacitor & Load Can Be Switched ON/OFF Together** This ensures that the motor cannot operate without the capacitor; and also ensures that the capacitor only operates when needed.

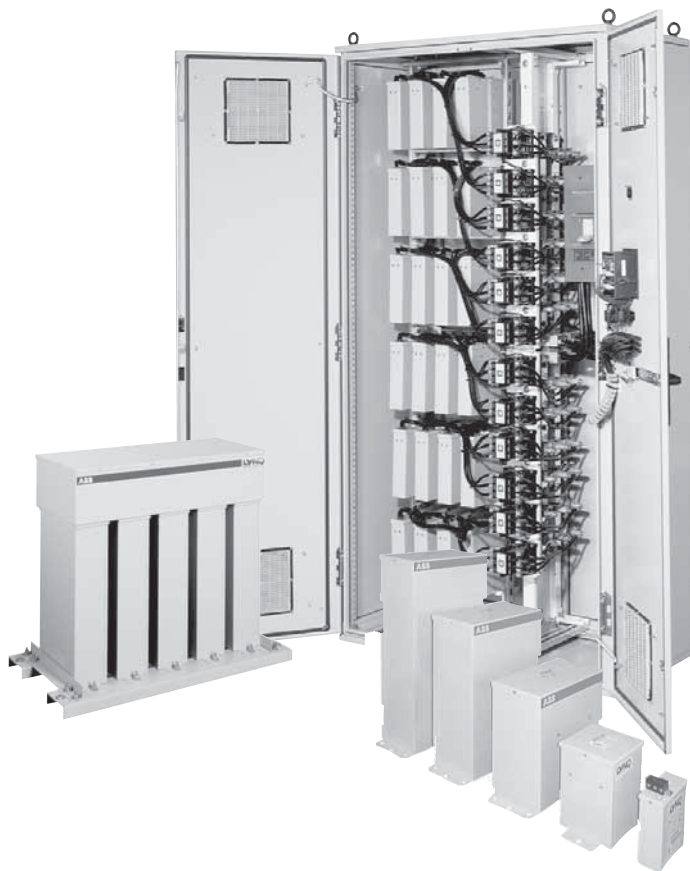
Fixed and Automatic Capacitor Banks

Group installation of capacitors is achieved in two ways:

- **Fixed Capacitor Banks** - Individual capacitors racked in a common enclosure with no switching or stepping capability.
- **Automatic Capacitor Banks** - Individual capacitors racked in a common enclosure with switching capability. The capacitors are turned on and off by a micro-processor based controller. The controller also provides network data and alarm conditions to the user. Network data consists of power factor, volts, amps and harmonic distortion.

Advantages of fixed or automatic bank systems

- **More Economical** - Capacitor banks are more economical than individual capacitor units when the main reason for power factor correction is to reduce utility power bills and/or reduce the current in primary feeders from a main generator or transformer. Large banks or racks of capacitors are installed at the main switchboard or at the substation thereby increasing power factor and obtaining the advantages of lower power consumption.
- **Lower Installation Costs** - The cost of installing one fixed or automatic capacitor bank unit will be less than installing a number of individual capacitors at inductive loads.



- **Switching** - Automatic capacitor banks can switch all or part of the capacitance automatically depending on load requirements. This way, only as much power factor correction as needed for the given load is provided. (This switching capability is a primary advantage over fixed capacitor banks where over-capacitance, leading power factor and resulting overvoltages can occur should the load decrease.)
- **Monitoring** - Automatic capacitor bank controllers provide network data and alarm conditions to the user. Network data consists of power factor, volts, amps and harmonic distortions.

General information

Sizing capacitors at the motor load

Sizing Capacitors at the Motor Load

When the determination is made that power factor correction capacitors ARE a good investment for a particular electrical system, you need to know:

- How many capacitors are needed?
- What sizes are appropriate?

The capacitor provides a local source of reactive current. With respect to inductive motor load, this reactive power is the magnetizing or "no-load current" which the motor requires to operate.

A capacitor is properly sized when its full load current rating is 90% of the no-load current of the motor. This 90% rating avoids overcorrection and the accompanying problems such as overvoltages.

One Selection Method: Using Formulas

If no-load current is known . . .

The most accurate method of selecting a capacitor is to take the no-load current of the motor, and multiply by .90 (90%). Take this resulting figure, turn to the appropriate catalog page, and determine which kvar size is needed, catalog number, enclosure type, and price.

EXAMPLE: Size a capacitor for a 100hp, 460V 3-phase motor which has a full load current of 124 amps and a no-load current of 37 amps.

1. Multiply the no-load current figure of 37 amps by 90%.

$$37 \text{ no load amps} \times 90\% = 33 \text{ no load amps}$$

2. Turning to the catalog page for 480 volt, 3-phase capacitors, find the closest amp rating to, but NOT OVER 33 amps. See Table 1, sample catalog pricing chart. Per the sample chart the closest amperage is 32.5 amps. The proper capacitor unit, then is 27 kvar and the appropriate catalog number depends on the type enclosure desired.

NOTE: The formula method corrects power factor to approximately .95

If the no load current is not known . . .

If the no-load current is unknown, a reasonable estimate for 3-phase motors is to take the full load amps and multiply by 30%. Then take that figure and multiply times the 90% rating figure being used to avoid overcorrection and overvoltages. EXAMPLE: Size a capacitor for a 75hp, 460V 3-phase motor which has a full load current of 92 amps and an unknown no-load current.

1. First, find the no-load current by multiplying the full load current times 30%.
 $92 \text{ (full load amps)} \times 30\% = 28 \text{ estimated no-load amps}$
2. Multiply 28 no-load amps by 90%.
 $28 \text{ no-load amps} \times 90\% = 25 \text{ no-load amps}$
3. Now examine the capacitor pricing and selection chart for 480 volt, 3-phase capacitors. Refer again to Table 1. Here it will be seen that the closest capacitor to 25 amps full load current without going over is a 20 kvar unit, rated at 24.1 amps.
4. The correct selection, then, is 20 kvar!

TABLE 1
480 VOLT, 60 Hz., 3-Phase

Enclosure Size	kvar Rating	Rated Current Per Phase	Approx. Shipping Weight (Lbs.)	Indoor - Nema 1	Outdoor - Nema 3R	Indoor - Nema 12
				Catalog Number	Catalog Number	Catalog Number
	1.5	1.8	8	C484G1.5	C484R1.5	C484D1.5
	2	2.4	8	C484G2	C484R2	C484D2
	2.5	3.0	8	C484G2.5	C484R2.5	C484D2.5
	3	3.6	8	C484G3	C484R3	C484D3
	4	4.8	8	C484G4	C484R4	C484D4
	13	15.7	13	C484G13	C484R13	C484D13
	18	21.7	13	C484G18	C484R18	C484D18
	19	22.8	13	C484G19	C484R19	C484D19
	20	24.1	13	C484G20	C484R20	C484D20
	21	25.3	13	C484G21	C484R21	C484D21
	22	26.5	13	C484G22	C484R22	C484D22
	22.5	27.1	13	C484G22.5	C484R22.5	C484D22.5
	24	28.9	13	C484G24	C484R24	C484D24
	25	30.0	13	C484G25	C484R25	C484D25
	27	32.5	13	C484G27	C484R27	C484D27

General information

Sizing capacitors at the motor load

Using charts

An Alternate Selection Method — Using Charts

TABLE 2: Suggested Maximum Capacitor Ratings for T-Frame NEMA Class B Motors

Induction motor rating (HP)	NOMINAL MOTOR SPEED											
	3600 R/MIN		1800 R/MIN		1200 R/MIN		900 R/MIN		720 R/MIN		600 R/MIN	
	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reductions (%)	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)
3	1.5	14	1.5	23	2.5	28	3	38	3	40	4	40
5	2	14	2.5	22	3	26	4	31	4	40	5	40
7.5	2.5	14	3	20	4	21	5	28	5	38	6	45
10	4	14	4	18	5	21	6	27	7.5	36	8	38
15	5	12	5	18	6	20	7.5	24	8	32	10	34
20	6	12	6	17	7.5	19	9	23	12	25	18	30
25	7.5	12	7.5	17	8	19	10	23	12	25	18	30
30	8	11	8	16	10	19	14	22	15	24	22.5	30
40	12	12	13	15	16	19	18	21	22.5	24	25	30
50	15	12	18	15	20	19	22.5	21	24	24	30	30
60	18	12	21	14	22.5	17	26	20	30	22	35	28
75	20	12	23	14	25	15	28	17	33	14	40	19
100	22.5	11	30	14	30	12	35	16	40	15	45	17
125	25	10	36	12	35	12	42	14	45	15	50	17
150	30	10	42	12	40	12	52.5	14	52.5	14	60	17
200	35	10	50	11	50	10	65	13	68	13	90	17
250	40	11	60	10	62.5	10	82	13	87.5	13	100	17
300	45	11	68	10	75	12	100	14	100	13	120	17
350	50	12	75	8	90	12	120	13	120	13	135	15
400	75	10	80	8	100	12	130	13	140	13	150	15
450	80	8	90	8	120	10	140	12	160	14	160	15
500	100	8	120	9	150	12	160	12	180	13	180	15

Applies to three-phase, 60Hz motors when switched with capacitors as a single unit.

Another method of selecting the proper capacitor employs the use of only a selection chart shown in Table 2 or 3. These tables take other variables such as motor RPM into consideration in making recommendations for capacitor applications. They are convenient because they only require that the user know the horsepower and RPM of the motor. Both tables estimate the percentage reduction in full load current drawn by the motor as a result of the capacitor's installation.

TABLE 3: Suggested Maximum Capacitor Ratings for U-Frame NEMA Class B Motors

NEMA Motor Design A or B
Normal Starting Torque
Normal Running Current

H.P. Rating	3600 RPM		1800 RPM		1200 RPM		900 RPM		720 RPM		600 RPM	
	kvar	%AR	kvar	%AR	kvar	%AR	kvar	%AR	kvar	%AR	kvar	%AR
3	1.5	14	1.5	15	1.5	20	2	27	2.5	35	3.5	41
5	2	12	2	13	2	17	3	25	4	32	4.5	37
7.5	2.5	11	2.5	13	2	15	4	22	5.5	30	6	34
10	3	10	3	11	3.5	14	5	21	6.5	27	7.5	31
15	4	9	4	10	5	13	6.5	18	8	23	9.5	27
20	5	9	5	10	5	11	7.5	18	10	20	10	25
25	5	6	5	8	7.5	11	7.5	13	10	20	10	21
30	5	5	5	8	7.5	11	10	15	15	22	15	25
40	7.5	8	10	8	10	10	15	16	15	18	15	20
50	10	7	10	8	10	9	15	12	20	15	25	22
60	10	6	10	8	15	10	15	11	20	15	25	20
75	15	7	15	8	15	9	20	11	30	15	40	20
100	20	8	20	8	25	9	30	11	40	14	45	18
125	20	6	25	7	30	9	30	10	45	14	50	17
150	30	6	30	7	35	9	40	10	50	17	60	17
200	40	6	40	7	45	8	55	11	60	12	75	17
250	45	5	45	6	60	9	70	10	75	12	100	17
300	50	5	50	6	75	9	75	9	80	12	105	17

Applies to three-phase, 60Hz motors when switched with capacitors as a single unit.

WARNING!

Never oversize capacitors or exceed 1.0 power factor or resulting problems with the motor can occur!!

If calculations or a kvar determination chart indicate a kvar rating not found in a pricing and selection chart, always refer to the next lower kvar rating!

EXAMPLE: A manufacturer needs to determine the proper capacitors required for a 1200 RPM, 75HP T-Frame NEMA class B motor.

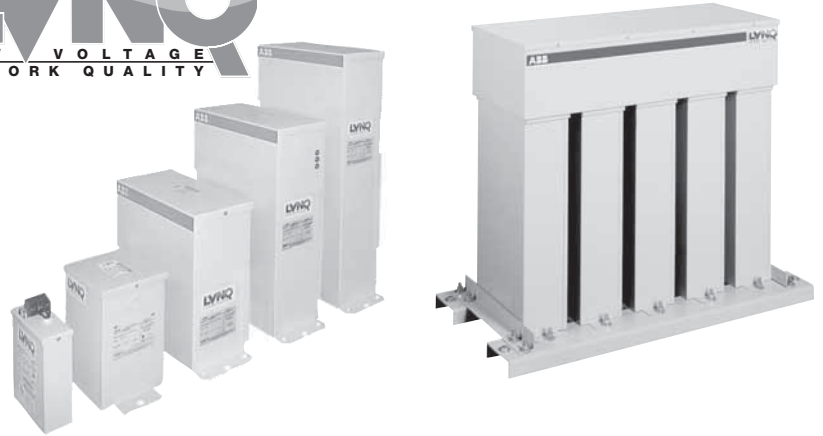
1. First find 75 in the horsepower column of the chart.
2. Locate the 1200 RPM capacitor rating (kvar) column. Note the figure of 25 kvar.
3. Now refer to the appropriate pricing and selection chart Table 1, page 19.5. The appropriate kvar rating is 25 kvar. Depending on the desired enclosure, the price and catalog number can then be easily determined.

NOTE

Using the above charts for selecting capacitors will correct power factor to approximately .95.



LYNO
LOW VOLTAGE
NETWORK QUALITY



Individual & fixed bank Capacitors

Description

- **High reliability**
Well proven features of ABB dry type power factor correction capacitor technology are incorporated into individual and fixed bank designs.
- **Very low losses**
Capacitor total losses are less than 0.5 watts per kvar.
- **Discharge mechanism**
Carbon filament or wire-wound resistors sized to automatically discharge the capacitor to less than 50 volts in under one minute.
- **Tolerance on capacitance**
0%, +15%
- **Overcurrent tolerance**
135% of rated current, continuously
- **Overvoltage tolerance**
110% of rated voltage, continuously
- **Standard ambient temperature range**
-40°C to +40°C (-40°F to +104°F)
- **Internal cables and insulation**
All internal conductors utilize stranded, tin plated copper wire. Insulation is fire-retardant, rated 105°C (220°F).
- **Complete environmental acceptability**
ABB capacitors have a dry type dielectric with no free liquid and do not pose any risk of leakage or pollution of the environment. Therefore, employee safety training and maintenance of Material Safety Data Sheets are not required with these capacitors.
- **Unique sequential protection system**
Patented system ensures that each individual capacitor element is selectively and reliably disconnected from the circuit at the end of its life.

continued next page

General information

Catalog numbering explanation

Fuse protection

- ABB capacitors are provided with patented IPE (Internally Protected Elements) which is an integral and important part of the Sequential Protection System. Additional fuses are NOT required for protection of ABB capacitor elements, but external overcurrent protection may be needed for the installation in order to meet the National Electric Code requirements concerning protection of the conductors feeding the capacitors.

Long life

Low losses and the self-healing properties of ABB capacitor elements help to guarantee the long operating life of individual and fixed capacitor banks from ABB.

Safety

Vermiculite, a nonflammable and nontoxic material, safely absorbs any energy produced within the capacitor enclosure.

Approvals

- UL, CE and CSA approved
 - UL File #E135667
 - CSA File #LR88616
- Complies with applicable requirements of IEC, NEC®, NEMA CP-1, ANSI and IEEE std. 18.

Factory modifications

- Mounting brackets
- Terminal connected fuses & blown fuse indication
- State indication

NOTE: National Electric Code® and NEC® are registered trademarks of the National Fire Protection Association, Inc., Quincy, MA 02269

C 48 4 G 2.5 - 2LF

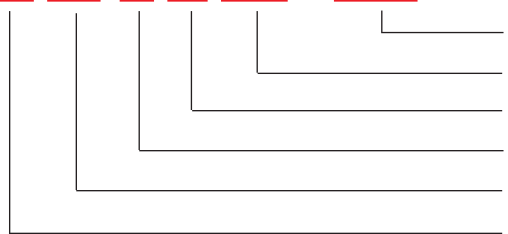


ABB Capacitor catalog numbering system

Factory modifications

kvar rating

Enclosure type – **G**=NEMA 1, **R**=NEMA 3R, **D**=NEMA 12

Enclosure size – **4**=43, **5**=53, **6**=63, **8**=83, **9**=93

Voltage – **20**=208V, **24**=240V, **48**=480V, **60**=600V

Capacitor type – **C**=Individual, **F**=Fixed bank, **P**=Pump jack

Individual capacitors

3 phase ①

240 Volt, 60 Hz



ABB's standard capacitor is suitable for general power factor correction applications, for connection directly at the reactive source.

Features include:

- Dry, environmentally safe construction
- Self healing capability
- Patented Internal Protected Elements
- NEMA 1, 3R, 12
- Easy electrical connection to large terminals
- Convenient grounding lug
- Mounting feet for easy installation
- Suitable for floor or wall mounting

240 Volt, 60 Hz — 3-Phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
43	1	2.4	8	C244G1	\$ 134	C244R1	\$ 145	C244D1	\$ 145
	1.5	3.6	8	C244G1.5	139	C244R1.5	150	C244D1.5	150
	2	4.8	8	C244G2	144	C244R2	155	C244D2	155
	2.5	6.0	8	C244G2.5	161	C244R2.5	172	C244D2.5	172
	3	7.2	8	C244G3	168	C244R3	179	C244D3	179
	3.5	8.4	8	C244G3.5	177	C244R3.5	188	C244D3.5	188
	4	9.6	8	C244G4	193	C244R4	204	C244D4	204
	5	12.0	8	C244G5	203	C244R5	214	C244D5	214
	6	14.4	8	C244G6	225	C244R6	236	C244D6	236
	7	16.8	8	C244G7	257	C244R7	268	C244D7	268
	7.5	18.0	8	C244G7.5	263	C244R7.5	274	C244D7.5	274
	8	19.2	8	C244G8	268	C244R8	279	C244D8	279
	9	21.7	8	C244G9	278	C244R9	289	C244D9	289
	10	24.1	8	C244G10	289	C244R10	300	C244D10	300
	11	26.5	13	C244G11	305	C244R11	316	C244D11	316
	12	28.9	13	C244G12	332	C244R12	343	C244D12	343
	12.5	30.1	13	C244G12.5	342	C244R12.5	353	C244D12.5	353
	14	33.7	8	C244G14	353	C244R14	364	C244D14	364
	15	36.1	8	C244G15	375	C244R15	386	C244D15	386
	17	40.8	22	C244G17	407	C244R17	418	C244D17	418
20	48.1	22	C244G20	449	C244R20	460	C244D20	460	
53	22.5	54.1	23	C245G22.5	471	C245R22.5	482	C245D22.5	482
	25	60.1	23	C245G25	503	C245R25	514	C245D25	514
	30	72.2	23	C245G30	556	C245R30	568	C245D30	568
	35	84.2	25	C245G35	610	C245R35	621	C245D35	621
	40	96.2	25	C245G40	696	C245R40	707	C245D40	707
63	45	108.3	34	C246G45	813	C246R45	825	C246D45	825
	50	120.3	34	C246G50	888	C246R50	899	C246D50	899
	55	132.3	37	C246G55	1124	C246R55	1135	C246D55	1135
	60	144.3	37	C246G60	1177	C246R60	1188	C246D60	1188
	70	168.4	39	C246G70	1298	C246R70	1309	C246D70	1309
	80	192.6	43	C246G80	1435	C246R80	1446	C246D80	1446

Capacitor state indication system

240V kvar	LEDs catalog number suffix	List price
1 – 15		\$ 91
17 – 30	-2LE	102
35 – 60	-2LF	113
70 – 80		225

The capacitor state indication system consists of two yellow LED lights which illuminate only when the capacitor is energized and functioning at 65% or more of its rated kvar capacity.

The two light system will indicate a failure in any one of the three phases of the capacitor.

208 Volt availability

For 208 volt applications, derate the 240V capacitors. The kvar at 208V will be .75 times the kvar at 240V.

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

Optional mounting for individual capacitors

Type	Enclosure sizes	Catalog number
Wall mounting kit ②	43-93	WM83K
Rack mounting style enclosure	53-93	Cat # suffix -RM

① For single phase capacitors, please consult your ABB representative.

② When the wall mounting kit is used with enclosure sizes 63, 83 & 93, it is recommended to order the rack style enclosure.



Individual capacitors

3-phase ①

480 Volt, 60 Hz

480 Volt, 60 Hz — 3-Phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
43	1.5	1.8	8	C484G1.5	\$ 134	C484R1.5	\$ 145	C484D1.5	\$ 145
	2	2.4	8	C484G2	139	C484R2	150	C484D2	150
	2.5	3.0	8	C484G2.5	144	C484R2.5	155	C484D2.5	155
	3	3.6	8	C484G3	150	C484R3	161	C484D3	161
	4	4.8	8	C484G4	152	C484R4	163	C484D4	163
	5	6.0	8	C484G5	161	C484R5	172	C484D5	172
	6	7.2	8	C484G6	171	C484R6	182	C484D6	182
	7.5	9.0	8	C484G7.5	187	C484R7.5	198	C484D7.5	198
	8	9.6	8	C484G8	193	C484R8	204	C484D8	204
	9	10.8	8	C484G9	203	C484R9	214	C484D9	214
	10	12.0	8	C484G10	214	C484R10	225	C484D10	225
	12	14.4	13	C484G12	225	C484R12	236	C484D12	236
	12.5	15.0	13	C484G12.5	230	C484R12.5	241	C484D12.5	241
	13	15.6	13	C484G13	241	C484R13	252	C484D13	252
	13.5	16.2	13	C484G13.5	246	C484R13.5	257	C484D13.5	257
	14	16.8	8	C484G14	251	C484R14	262	C484D14	262
	15	18.0	8	C484G15	257	C484R15	268	C484D15	268
	16	19.2	13	C484G16	262	C484R16	273	C484D16	273
	17	20.4	13	C484G17	268	C484R17	279	C484D17	279
	17.5	21.0	13	C484G17.5	273	C484R17.5	284	C484D17.5	284
	18	21.7	13	C484G18	278	C484R18	289	C484D18	289
	19	22.8	13	C484G19	284	C484R19	295	C484D19	295
	20	24.1	13	C484G20	294	C484R20	305	C484D20	305
	21	25.3	13	C484G21	310	C484R21	321	C484D21	321
	22	26.5	13	C484G22	316	C484R22	327	C484D22	327
	22.5	27.1	13	C484G22.5	321	C484R22.5	332	C484D22.5	332
	24	28.9	13	C484G24	332	C484R24	343	C484D24	343
	25	30.1	13	C484G25	337	C484R25	348	C484D25	348
	27	32.5	13	C484G27	353	C484R27	364	C484D27	364
	30	36.1	13	C484G30	369	C484R30	380	C484D30	380
53	32.5	39.1	14	C485G32.5	385	C485R32.5	397	C485D32.5	397
	35	42.1	23	C485G35	412	C485R35	423	C485D35	423
	37.5	45.1	23	C485G37.5	428	C485R37.5	439	C485D37.5	439
	40	48.1	23	C485G40	444	C485R40	456	C485D40	456
	42.5	51.1	23	C485G42.5	460	C485R42.5	472	C485D42.5	472
	45	54.1	25	C485G45	476	C485R45	588	C485D45	588
	47.5	57.1	25	C485G47.5	487	C485R47.5	498	C485D47.5	498
	50	60.1	25	C485G50	492	C485R50	504	C485D50	504
63	52.5	63.1	37	C486G52.5	514	C486R52.5	525	C486D52.5	525
	55	66.2	37	C486G55	530	C486R55	541	C486D55	541
	57.5	69.2	37	C486G57.5	551	C486R57.5	562	C486D57.5	562
	60	72.2	37	C486G60	562	C486R60	573	C486D60	573
	62.5	75.2	37	C486G62.5	578	C486R62.5	589	C486D62.5	589
	65	78.2	37	C486G65	599	C486R65	610	C486D65	610
	70	84.2	39	C486G70	621	C486R70	632	C486D70	632
	75	90.2	39	C486G75	685	C486R75	696	C486D75	696
77.5	93.2	39	C486G77.5	728	C486R77.5	739	C486D77.5	739	
83	80	96.2	56	C488G80	749	C488R80	760	C488D80	760
	85	102.2	56	C488G85	792	C488R85	803	C488D85	803
	87.5	105.2	56	C488G87.5	835	C488R87.5	846	C488D87.5	846
	90	108.3	56	C488G90	872	C488R90	883	C488D90	883
	95	114.3	56	C488G95	904	C488R95	915	C488D95	915
	100	120.3	56	C488G100	920	C488R100	931	C488D100	931
	105	126.3	59	C488G105	1030	C488R105	1041	C488D105	1041
	110	132.3	61	C488G110	1033	C488R110	1053	C488D110	1093
115	138.3	76	C488G115	1105	C488R115	1116	C488D115	1116	
120	144.3	76	C488G120	1128	C488R120	1139	C488D120	1139	

20 Mounting options

For mounting options, see page 20.9. Base mounting is standard.

Capacitor state indication

See page 20.11.

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

① For single phase capacitors, please consult your ABB representative.

Individual capacitors

3 phase ①

600 Volt, 60 Hz



600 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
43	2.2	1.9	8	C604G2.2	\$ 144	C604R2.2	\$ 155	C604D2.2	155
	3	2.9	8	C604G3	150	C604R3	161	C604D3	161
	4	3.8	8	C604G4	155	C604R4	166	C604D4	166
	5	4.8	8	C604G5	166	C604R5	177	C604D5	177
	7.5	7.2	8	C604G7.5	203	C604R7.5	214	C604D7.5	214
	10	9.6	8	C604G10	225	C604R10	236	C604D10	236
	14	13.5	8	C604G14	246	C604R14	257	C604D14	257
	15	14.4	8	C604G15	251	C604R15	262	C604D15	262
	17.5	16.8	13	C604G17.5	289	C604R17.5	300	C604D17.5	300
	20	19.2	13	C604G20	305	C604R20	316	C604D20	316
	25	24.1	13	C604G25	332	C604R25	343	C604D25	343
	30	28.9	13	C604G30	364	C604R30	375	C604D30	375
53	35	33.7	25	C605G35	417	C605R35	428	C605D35	428
	40	38.5	25	C605G40	449	C605R40	460	C605D40	460
	45	43.3	25	C605G45	492	C605R45	503	C605D45	503
	50	48.1	35	C605G50	535	C605R50	546	C605D50	546
63	60	57.7	37	C606G60	589	C606R60	600	C606D60	600
	70	67.4	39	C606G70	642	C606R70	653	C606D70	653
	75	72.2	39	C606G75	696	C606R75	707	C606D75	707
	80	77.0	39	C606G80	770	C606R80	781	C606D80	781
83	90	86.6	54	C608G90	877	C608R90	888	C608D90	888
	95	91.4	54	C608G95	910	C608R95	921	C608D95	921
	100	96.2	56	C608G100	963	C608R100	974	C608D100	974
	105	101.0	59	C608G105	992	C608R105	1003	C608D105	1003
	110	105.8	61	C608G110	1050	C608R110	1061	C608D110	1061
	115	110.7	76	C608G115	1074	C608R115	1085	C608D115	1085
	120	115.5	76	C608G120	1092	C608R120	1103	C608D120	1103
	125	120.3	76	C608G125	1275	C608R125	1286	C608D125	1286
	130	125.1	76	C608G130	1342	C608R130	1353	C608D130	1353
	135	129.9	76	C608G135	1355	C608R135	1366	C608D135	1366

Capacitor state indication system

480V & 600V kvar	LEDs catalog number suffix	List price
1 – 30		\$ 91
32.5 – 60	-2LE	102
62.5 – 100	-2LF	112
105 – 135		225

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

The capacitor state indication system consists of two yellow LED lights which illuminate only when the capacitor is energized and functioning at 65% or more of its rated kvar capacity.

The two light system will indicate a failure in any one of the three phases of the capacitor.

Mounting options

For mounting options, see page 20.9. Base mounting is standard.

① For single phase capacitors, please consult your ABB representative

Individual capacitors with fuses and blown fuse indicators, 3 phase 240 Volt, 60 Hz



ABB low voltage capacitors are fully protected by the three levels of protection offered by the patented Sequential Protection System which includes dry self-healing capacitors, internally protected elements and the dry non-flammable vermiculite filler. However, some users have traditionally requested external fuses and blown fuse indicators, so these modified units are offered for those applications.

Features include:

- Dry, environmentally safe construction
- Self healing capability
- Patented **Internal Protected Elements**
- NEMA 1, 3R, 12
- Easy electrical connection to large terminals
- Convenient grounding lug
- Mounting feet for easy installation
- Suitable for floor or wall mounting
- Includes three fuses and three blown fuse indication lamps

240 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Fuse amps/type	Approx. shipping weight (lbs.)	Enclosure type					
					Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
					Catalog number	List price	Catalog number	List price	Catalog number	List price
43	1	2.4	6/CC	8	C244G1-3FI	\$ 203	C244R1-3FI	\$ 214	C244D1-3FI	\$ 214
	1.5	3.6	10/CC	8	C244G1.5-3FI	219	C244R1.5-3FI	230	C244D1.5-3FI	230
	2	4.8	12/CC	8	C244G2-3FI	225	C244R2-3FI	236	C244D2-3FI	236
	2.5	6.0	15/CC	8	C244G2.5-3FI	230	C244R2.5-3FI	241	C244D2.5-3FI	241
	3	7.2	20/CC	8	C244G3-3FI	235	C244R3-3FI	246	C244D3-3FI	246
	3.5	8.4	20/CC	8	C244G3.5-3FI	246	C244R3.5-3FI	257	C244D3.5-3FI	257
	4	9.6	25/CC	8	C244G4-3FI	268	C244R4-3FI	279	C244D4-3FI	279
	5	12.0	30/CC	8	C244G5-3FI	289	C244R5-3FI	300	C244D5-3FI	300
	6	14.4	45/T	8	C244G6-3FI	300	C244R6-3FI	311	C244D6-3FI	311
	7	16.8	50/T	8	C244G7-3FI	321	C244R7-3FI	332	C244D7-3FI	332
	7.5	18.0	60/T	8	C244G7.5-3FI	332	C244R7.5-3FI	343	C244D7.5-3FI	343
	8	19.2	60/T	8	C244G8-3FI	353	C244R8-3FI	364	C244D8-3FI	364
	9	21.7	50/KGJ	14	C245G9-3FI	375	C245R9-3FI	386	C245D9-3FI	386
	10	24.1	50/KGJ	14	C245G10-3FI	396	C245R10-3FI	407	C245D10-3FI	407
11	26.5	60/KGJ	14	C245G11-3FI	417	C245R11-3FI	428	C245D11-3FI	428	
12	28.9	60/KGJ	14	C245G12-3FI	449	C245R12-3FI	460	C245D12-3FI	460	
12.5	30.1	60/KGJ	14	C245G12.5-3FI	471	C245R12.5-3FI	482	C245D12.5-3FI	482	
14	33.7	75/KGJ	14	C245G14-3FI	492	C245R14-3FI	503	C245D14-3FI	503	
53	15	36.1	80/KGJ	14	C246G15-3FI	503	C246R15-3FI	514	C246D15-3FI	514
	17	40.9	80/KGJ	23	C246G17-3FI	556	C246R17-3FI	567	C246D17-3FI	567
	20	48.1	125/KGJ	23	C246G20-3FI	589	C246R20-3FI	600	C246D20-3FI	600
	22.5	54.2	125/KGJ	23	C246G22.5-3FI	642	C246R22.5-3FI	653	C246D22.5-3FI	653
	25	60.1	150/KGJ	23	C246G25-3FI	696	C246R25-3FI	707	C246D25-3FI	707
	30	72.2	175/KGJ	23	C246G30-3FI	803	C246R30-3FI	814	C246D30-3FI	814
	35	84.2	200/KGJ	23	C246G35-3FI	883	C246R35-3FI	894	C246D35-3FI	894
	40	96.2	225/KGJ	25	C246G40-3FI	1017	C246R40-3FI	1028	C246D40-3FI	1028
63	45	108.3	250/KGJ	34	C248G45-3FI	1124	C248R45-3FI	1135	C248D45-3FI	1135
	50	120.3	250/KGJ	34	C248G50-3FI	1231	C248R50-3FI	1242	C248D50-3FI	1242
	55	132	250/KGJ	37	C248G55-3FI	1311	C248R55-3FI	1322	C248D55-3FI	1322
	60	144.3	250/KGJ	37	C248G60-3FI	1418	C248R60-3FI	1429	C248D60-3FI	1429

208 Volt availability

For 208 volt applications, derate the 240V capacitors. The kvar at 208V will be .75 times the kvar at 240V.

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

Optional mounting for individual capacitors

Type	Enclosure sizes	Catalog number
Wall mounting kit ①	43-93	WM83K
Rack mounting style enclosure ①	53-93	Cat # suffix -RM

① When the wall mounting kit is used with enclosure sizes 63, 83 & 93, it is recommended to order the rack style enclosure.

Individual capacitors with fuses and blown fuse indicators, 3 phase 480 Volt, 60 Hz



480 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Fuse amps/ type	Approx. shipping weight (lbs.)	Enclosure type					
					Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
					Catalog number	List price	Catalog number	List price	Catalog number	List price
43	1.5	1.8	5/CC	8	C484G1.5-3FI	\$ 209	C484R1.5-3FI	\$ 220	C484D1.5-3FI	\$ 220
	2	2.4	6/CC	8	C484G2-3FI	211	C484R2-3FI	222	C484D2-3FI	222
	2.5	3.0	8/CC	8	C484G2.5-3FI	214	C484R2.5-3FI	225	C484D2.5-3FI	225
	3	3.6	10/CC	8	C484G3-3FI	216	C484R3-3FI	227	C484D3-3FI	227
	4	4.8	12/CC	8	C484G4-3FI	219	C484R4-3FI	230	C484D4-3FI	230
	5	6.0	15/CC	8	C484G5-3FI	221	C484R5-3FI	232	C484D5-3FI	232
	6	7.2	20/CC	8	C484G6-3FI	230	C484R6-3FI	241	C484D6-3FI	241
	7.5	9.0	25/CC	8	C484G7.5-3FI	257	C484R7.5-3FI	268	C484D7.5-3FI	268
	8	9.6	25/CC	8	C484G8-3FI	273	C484R8-3FI	284	C484D8-3FI	284
	9	10.8	30/CC	8	C484G9-3FI	284	C484R9-3FI	295	C484D9-3FI	295
	10	12.0	30/CC	8	C484G10-3FI	294	C484R10-3FI	305	C484D10-3FI	305
	12	14.4	45/T	13	C484G12-3FI	300	C484R12-3FI	311	C484D12-3FI	311
	12.5	15.0	45/T	13	C484G12.5-3FI	305	C484R12.5-3FI	316	C484D12.5-3FI	316
	13	15.6	50/T	13	C484G13-3FI	310	C484R13-3FI	321	C484D13-3FI	321
	13.5	16.2	50/T	13	C484G13.5-3FI	312	C484R13.5-3FI	323	C484D13.5-3FI	323
	14	16.8	50/T	8	C484G14-3FI	316	C484R14-3FI	327	C484D14-3FI	327
15	18.0	60/T	8	C484G15-3FI	326	C484R15-3FI	337	C484D15-3FI	337	
16	19.2	60/T	13	C484G16-3FI	332	C484R16-3FI	343	C484D16-3FI	343	
53	17	20.4	50/KGJ	14	C485G17-3FI	342	C485R17-3FI	353	C485D17-3FI	353
	17.5	21.0	50/KGJ	14	C485G17.5-3FI	353	C485R17.5-3FI	364	C485D17.5-3FI	364
	18	21.7	50/KGJ	14	C485G18-3FI	364	C485R18-3FI	375	C485D18-3FI	375
	19	22.8	50/KGJ	14	C485G19-3FI	375	C485R19-3FI	386	C485D19-3FI	386
	20	24.1	50/KGJ	14	C485G20-3FI	385	C485R20-3FI	396	C485D20-3FI	396
	21	25.3	60/KGJ	14	C485G21-3FI	391	C485R21-3FI	402	C485D21-3FI	402
	22	26.5	60/KGJ	14	C485G22-3FI	396	C485R22-3FI	407	C485D22-3FI	407
	22.5	27.1	60/KGJ	14	C485G22.5-3FI	407	C485R22.5-3FI	418	C485D22.5-3FI	418
	24	28.9	60/KGJ	14	C485G24-3FI	417	C485R24-3FI	428	C485D24-3FI	428
	25	30.1	75/KGJ	14	C485G25-3FI	428	C485R25-3FI	439	C485D25-3FI	439
27	32.5	75/KGJ	14	C485G27-3FI	449	C485R27-3FI	460	C485D27-3FI	460	
63	30	36.1	80/KGJ	14	C486G30-3FI	482	C486R30-3FI	493	C486D30-3FI	493
	32.5	39.1	100/KGJ	14	C486G32.5-3FI	508	C486R32.5-3FI	519	C486D32.5-3FI	519
	35	42.1	100/KGJ	23	C486G35-3FI	535	C486R35-3FI	546	C486D35-3FI	546
	37.5	45.1	100/KGJ	23	C486G37.5-3FI	546	C486R37.5-3FI	557	C486D37.5-3FI	557
	40	48.1	125/KGJ	23	C486G40-3FI	556	C486R40-3FI	567	C486D40-3FI	567
	42.5	51.1	125/KGJ	23	C486G42.5-3FI	589	C486R42.5-3FI	600	C486D42.5-3FI	600
	45	54.1	125/KGJ	25	C486G45-3FI	621	C486R45-3FI	632	C486D45-3FI	632
	47.5	57.1	125/KGJ	25	C486G47.5-3FI	642	C486R47.5-3FI	653	C486D47.5-3FI	653
	50	60.1	150/KGJ	25	C486G50-3FI	663	C486R50-3FI	674	C486D50-3FI	674
	83	52.5	63.1	150/KGJ	37	C488G52.5-3FI	685	C488R52.5-3FI	696	C488D52.5-3FI
55		66.2	150/KGJ	37	C488G55-3FI	706	C488R55-3FI	717	C488D55-3FI	717
57.5		69.2	150/KGJ	37	C488G57.5-3FI	728	C488R57.5-3FI	739	C488D57.5-3FI	739
60		72.2	175/KGJ	37	C488G60-3FI	738	C488R60-3FI	749	C488D60-3FI	749
62.5		75.2	175/KGJ	37	C488G62.5-3FI	765	C488R62.5-3FI	776	C488D62.5-3FI	776
65		78.2	175/KGJ	37	C488G65-3FI	770	C488R65-3FI	781	C488D65-3FI	781
70		84.2	200/KGJ	39	C488G70-3FI	792	C488R70-3FI	803	C488D70-3FI	803
75		90.2	200/KGJ	41	C488G75-3FI	813	C488R75-3FI	824	C488D75-3FI	824
77.5		93.2	200/KGJ	41	C488G77.5-3FI	829	C488R77.5-3FI	840	C488D77.5-3FI	840
93		80	96.2	225/KGJ	56	C489G80-3FI	856	C489R80-3FI	867	C489D80-3FI
	85	102.2	225/KGJ	56	C489G85-3FI	910	C489R85-3FI	921	C489D85-3FI	921
	87.5	105.2	225/KGJ	56	C489G87.5-3FI	936	C489R87.5-3FI	948	C489D87.5-3FI	948
	90	108.3	225/KGJ	56	C489G90-3FI	963	C489R90-3FI	974	C489D90-3FI	974
	95	114.3	250/KGJ	56	C489G95-3FI	1000	C489R95-3FI	1012	C489D95-3FI	1012
	100	120.3	250/KGJ	56	C489G100-3FI	1033	C489R100-3FI	1044	C489D100-3FI	1044
	105	126.3	250/KGJ	59	C489G105-3FI	1376	C489R105-3FI	1387	C489D105-3FI	1387
	110	132.3	250/KGJ	61	C489G110-3FI	1410	C489R110-3FI	1421	C489D110-3FI	1421
	115	138.3	250/KGJ	76	C489G115-3FI	1451	C489R115-3FI	1462	C489D115-3FI	1462
	120	144.3	300/KGJ	76	C489G120-3FI	1495	C489R120-3FI	1506	C489D120-3FI	1506

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

Mounting options

For mounting options, see page 20.12. Base mounting is standard.

Individual capacitors with fuses and blown fuse indicators, 3 phase 600 Volt, 60 Hz

600 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Fuse amps/type	Approx. shipping weight (lbs.)	Enclosure type					
					Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
					Catalog number	List price	Catalog number	List price	Catalog number	List price
43	2.2	2.1	6/CC	8	C604G2.2-3FI	\$ 225	C604R2.2-3FI	\$ 236	C604D2.2-3FI	\$ 236
	3	2.9	8/CC	8	C604G3-3FI	230	C604R3-3FI	241	C604D3-3FI	241
	4	3.8	10/CC	8	C604G4-3FI	235	C604R4-3FI	246	C604D4-3FI	246
	5	4.8	12/CC	8	C604G5-3FI	246	C604R5-3FI	257	C604D5-3FI	257
	7.5	7.2	20/CC	8	C604G7.5-3FI	278	C604R7.5-3FI	289	C604D7.5-3FI	289
	10	9.6	25/CC	8	C604G10-3FI	300	C604R10-3FI	311	C604D10-3FI	311
	14	13.5	40/T	13	C604G14-3FI	321	C604R14-3FI	332	C604D14-3FI	332
	15	14.4	45/T	13	C604G15-3FI	332	C604R15-3FI	343	C604D15-3FI	343
	17.5	16.8	50/T	13	C604G17.5-3FI	375	C604R17.5-3FI	386	C604D17.5-3FI	386
	20	19.2	60/T	13	C604G20-3FI	428	C604R20-3FI	439	C604D20-3FI	439
53	25	24.1	50/KGJ	14	C605G25-3FI	449	C605R25-3FI	460	C605D25-3FI	460
	30	28.9	60/KGJ	14	C605G30-3FI	503	C605R30-3FI	514	C605D30-3FI	514
63	35	33.7	75/KGJ	25	C606G35-3FI	556	C606R35-3FI	567	C606D35-3FI	567
	40	38.5	80/KGJ	25	C606G40-3FI	615	C606R40-3FI	626	C606D40-3FI	626
	45	43.3	100/KGJ	25	C606G45-3FI	642	C606R45-3FI	653	C606D45-3FI	653
	50	48.1	125/KGJ	35	C606G50-3FI	696	C606R50-3FI	707	C606D50-3FI	707
83	60	57.7	125/KGJ	37	C608G60-3FI	749	C608R60-3FI	760	C608D60-3FI	760
	70	67.4	150/KGJ	39	C608G70-3FI	803	C608R70-3FI	814	C608D70-3FI	814
	75	72.3	175/KGJ	39	C608G75-3FI	829	C608R75-3FI	840	C608D75-3FI	840
	80	77.0	175/KGJ	39	C608G80-3FI	910	C608R80-3FI	921	C608D80-3FI	921
93	90	86.6	200/KGJ	56	C609G90-3FI	1000	C609R90-3FI	1011	C609D90-3FI	1011
	95	91.4	200/KGJ	56	C609G95-3FI	1022	C609R95-3FI	1033	C609D95-3FI	1033
	100	96.2	225/KGJ	56	C609G100-3FI	1043	C609R100-3FI	1054	C609D100-3FI	1054
	105	101.0	250/KGJ	59	C609G105-3FI	1421	C609R105-3FI	1432	C609D105-3FI	1432
	110	105.8	250/KGJ	61	C609G110-3FI	1461	C609R110-3FI	1472	C609D110-3FI	1472
	115	110.7	250/KGJ	76	C609G115-3FI	1510	C609R115-3FI	1521	C609D115-3FI	1521
	120	115.5	250/KGJ	76	C609G120-3FI	1548	C609R120-3FI	1559	C609D120-3FI	1559
	125	120.3	250/KGJ	76	C609G125-3FI	1688	C609R125-3FI	1699	C609D125-3FI	1699
	130	125.1	250/KGJ	76	C609G130-3FI	1758	C609R130-3FI	1769	C609D130-3FI	1769
	135	129.1	250/KGJ	76	C609G135-3FI	1774	C609R135-3FI	1785	C609D135-3FI	1785

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

Mounting options

For mounting options, see page 20.12. Base mounting is standard.

Individual capacitors Pump jack 240 & 480 Volt, 60 Hz



The CLMD-PJ capacitor is ideally suited for oil-field pumping units and other outdoor applications. Standard features include:

- Outdoor, weatherproof enclosure
- 4 feet of 10 gauge, 4-conductor wire for ease of installation
- Convenient pole-mounting design
- Lightweight, totally dry construction

Steel enclosure — 240 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Approx. weight (lbs.)	Catalog number	List price
43	2.5	8	P244R2.5	\$ 219
	3.5	8	P244R3.5	241
	5	8	P244R5	283
	10	8	P244R10	305
	12.5	13	P244R12.5	364
	14	8	P244R14	412
	15	8	P244R15	433

208 Volt availability

For 208 volt applications, derate the 240V capacitors. The kvar at 208V will be .75 times the kvar at 240V.

Steel enclosure – 480 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Approx. weight (lbs.)	Catalog number	List price
43	1.5	8	P484R1.5	\$ 193
	2	8	P484R2	198
	3	8	P484R3	209
	4	8	P484R4	219
	5	8	P484R5	230
	6	8	P484R6	241
	7.5	8	P484R7.5	246
	10	8	P484R10	257
	15	8	P484R15	289
	20	13	P484R20	369
	21	13	P484R21	380
	22.5	13	P484R22.5	401
	25	13	P484R25	423
	27	13	P484R27	444
	30	13	P484R30	476

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

Individual capacitors

Type CLMD-13

208, 240, 480 & 600 Volt, 60 Hz



The CLMD-13 capacitor is ideally suited for use in motor control centers, control panels and other indoor applications. Standard features include:

- Indoor, steel enclosure
- Easy electrical connection by means of a terminal block mounted on top of the capacitor enclosure (#4 — #18GA)
- Convenient ground lug mounted on top of the capacitor enclosure
- Mounting feet for easy installation
- Lightweight, small dimensions, totally dry construction
- Options and accessories include remote state indication

208 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	0.8	2.2	6	C201G0.8	\$ 123
	1.1	3.1	6	C201G1.1	128
	2	5.6	6	C201G2	150
	2.5	6.9	6	C201G2.5	161
	3	8.3	6	C201G3	177
	4	11.1	6	C201G4	198
	5	13.9	6	C201G5	241
	7.5	20.8	6	C201G7.5	273

600 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	2	1.9	6	C601G2	\$ 144
	3	2.9	6	C601G3	150
	4	3.8	6	C601G4	156
	5	4.8	6	C601G5	166
	7.5	7.2	6	C601G7.5	177
	10	9.6	6	C601G10	193
	15	14.4	6	C601G15	219

240 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	1	2.4	6	C241G1	\$ 118
	1.5	3.6	6	C241G1.5	123
	2	4.8	6	C241G2	128
	2.5	6.0	6	C241G2.5	144
	3.5	8.4	6	C241G3.5	161
	5	12.0	6	C241G5	171
	7.5	18.0	6	C241G7.5	219
	10	24.1	6	C241G10	257

Options

Type	Catalog number suffix ①	List price adder
Remote state indication two LEDs	-2L	\$ 65

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

480 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	0.9	1.1	6	C481G0.9	\$ 118
	1.5	1.8	6	C481G1.5	128
	2	2.4	6	C481G2	134
	2.5	3.0	6	C481G2.5	139
	3.5	4.2	6	C481G3.5	155
	4	4.8	6	C481G4	157
	5	6.0	6	C481G5	166
	6	7.2	6	C481G6	171
	7.5	9.0	6	C481G7.5	177
	8	9.6	6	C481G8	182
	9	10.8	6	C481G9	187
	10	12.0	6	C481G10	193
	14	16.8	6	C481G14	203
	15	18.0	6	C481G15	214
	17	20.4	6	C481G17	225

① Add suffix to end of catalog number.

Individual capacitors

Type CLMD-13SC, Stud connected

208, 240, 480 & 600 Volt, 60 Hz



The CLMD-13SC (Stud Connected) capacitor is ideally suited for use in motor control centers, control panels and other indoor applications. Standard features include:

- Indoor, steel enclosure with cover
- Three stud terminals for electrical connection or capacitor parallel bus bar connection
- Mounting feet for easy capacitor installation
- Lightweight, small dimensions, totally dry construction

208 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	0.8	2.2	6	C201G0.8SC	\$ 136
	1.1	3.1	6	C201G1.1SC	141
	2	5.6	6	C201G2SC	152
	2.5	6.9	6	C201G2.5SC	163
	3	8.3	6	C201G3SC	179
	4	11.1	6	C201G4SC	211
	5	13.9	6	C201G5SC	254
	7.5	20.8	6	C201G7.5SC	286

600 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	2	1.9	6	C601G2SC	\$ 147
	3	2.9	6	C601G3SC	163
	4	3.8	6	C601G4SC	168
	5	4.8	6	C601G5SC	179
	7.5	7.2	6	C601G7.5SC	189
	10	9.6	6	C601G10SC	205
	15	14.4	6	C601G15SC	232

240 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	1	2.4	6	C241G1SC	\$ 130
	1.5	3.6	6	C241G1.5SC	147
	2	4.8	6	C241G2SC	141
	2.5	6.0	6	C241G2.5SC	157
	3.5	8.4	6	C241G3.5SC	173
	5	12.0	6	C241G5SC	184
	7.5	18.0	6	C241G7.5SC	232
	10	24.1	6	C241G10SC	270

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

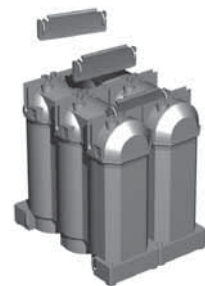
480 Volt, 60 Hz, 3 phase

Enclosure size	kvar rating	Rated current per phase (amps)	Approx. shipping weight (lbs)	Enclosure type	
				Indoor — NEMA 1	
				Catalog number	List price
13	0.9	1.1	6	C481G0.9SC	\$ 130
	1.5	1.8	6	C481G1.5SC	141
	2	2.4	6	C481G2SC	147
	2.5	3.0	6	C481G2.5SC	152
	3.5	4.2	6	C481G3.5SC	168
	4	4.8	6	C481G4SC	170
	5	6.0	6	C481G5SC	179
	6	7.2	6	C481G6SC	184
	7.5	9.0	6	C481G7.5SC	189
	8	9.6	6	C481G8SC	195
	9	10.8	6	C481G9SC	200
	10	12.0	6	C481G10SC	205
	14	16.8	6	C481G14SC	216
	15	18.0	6	C481G15SC	227
	17	20.4	6	C481G17SC	238

Individual capacitors Type LVCS 240, 480 & 600 Volt, 60 Hz



20.032.86349



20.910.86783

Description

The LVCS is a compact and powerful capacitor ready for connection. It offers high modularity, unmatched performances and a state of the art integrated protection system. The LVCS wide power and voltage ranges allow its use for all power factor correction systems with or without reactors.

- High power density – small dimensions
- Modular design for easy and quick assembly of power modules
- Indoor enclosure
- Innovative integrated protection system
- Double casing insulation
- Built-in discharge devices
- Fully automated manufacturing process
- Complies with international standards, CE marked, UL recognized and CSA certified

Interconnection bars

Item	Catalog number	List price
Set of 3	20.910.86783	\$ 10
Set of 30	20.910.86784	30

240 Volt, 60 Hz, 3 phase

kvar rating	Rated current per phase (amps)	Approx. weight unpacked (lbs.)	Catalog number	List price
6.3	15.2	5.5	20.032.86349	\$ 192
10.0	24.1	5.5	20.032.86350	249
12.5	30.1	5.5	20.032.86351	295

480 Volt, 60 Hz, 3 phase

kvar rating	Rated current per phase (amps)	Approx. weight unpacked (lbs.)	Catalog number	List price
10.0	12.0	5.5	20.032.86363	\$ 187
12.5	15.0	5.5	20.032.86364	204
15.0	18.0	5.5	20.032.86365	198
20.0	24.1	5.5	20.032.86366	237
25.0	30.1	5.5	20.032.86367	269

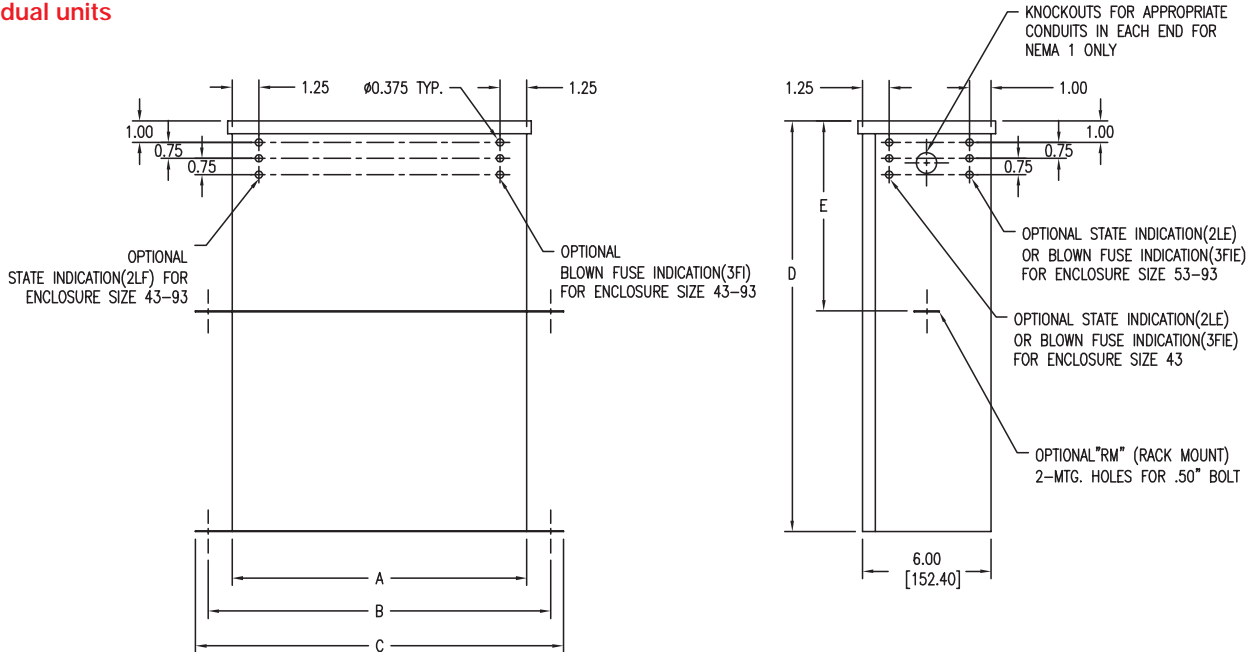
600 Volt, 60 Hz, 3 phase

kvar rating	Rated current per phase (amps)	Approx. weight unpacked (lbs.)	Catalog number	List price
10.0	9.6	5.5	20.032.86370	\$ 200
12.5	12.0	5.5	20.032.86371	219
20.0	19.2	5.5	20.032.86372	238
25.0	24.1	5.5	20.032.86373	286

Approximate dimensions Individual capacitors

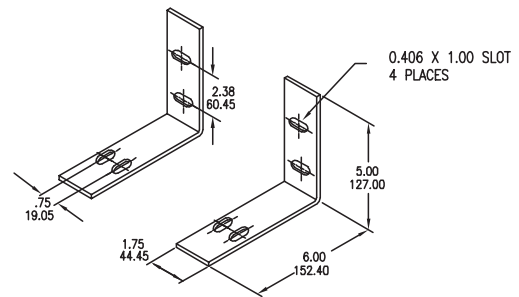
← 00.00 → Inches

Individual units

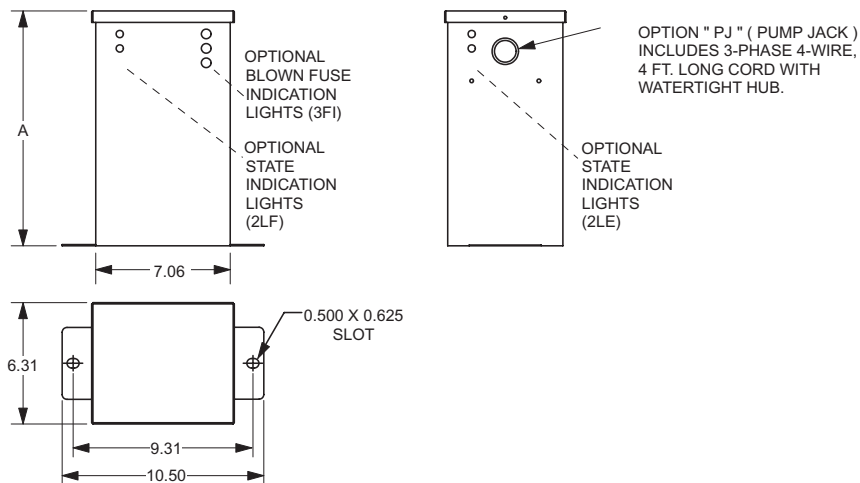


ENCLOSURE SIZE	INDIVIDUAL CAPACITOR UNITS				CONDUIT KNOCKOUT SIZES	RM E
	A	B	C	D		
43	7.06 179.0	9.31 236.5	10.50 267.0	10.93 278.0	.50 - .75 12.7 - 19.0	N/A
53	13.75 349.0	16.00 406.0	17.18 436.0	12.31 312.0	.75 - 1.0 19.05 - 25.4	5.00 127.0
63	13.75 349.0	16.00 406.0	17.18 436.0	19.18 487.0	1.0 - 1.25 25.4 - 31.75	8.87 225.0
83	13.75 349.0	16.00 406.0	17.18 436.0	26.56 675.0	1.25 - 1.50 31.75 - 38.0	8.87 225.0
93	13.75 349.0	16.00 406.0	17.18 436.0	30.56 776.0	-	8.87 225.0

WALL MOUNTING BRACKET KIT (WM83K)
FOR ENCLOSURE SIZES 43, 53, 63, 83, 93



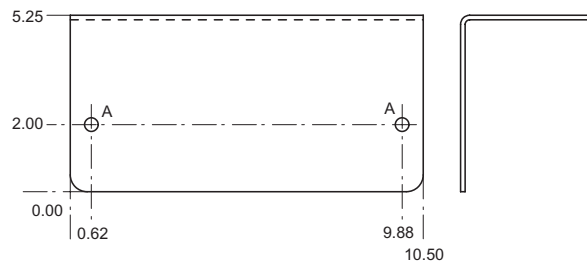
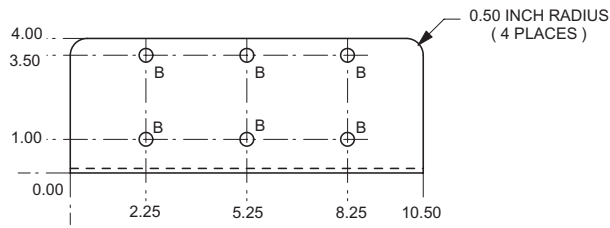
Pump jack capacitor – Steel, enclosure size 43



Approximate dimensions Individual capacitors

← 00.00 → Inches

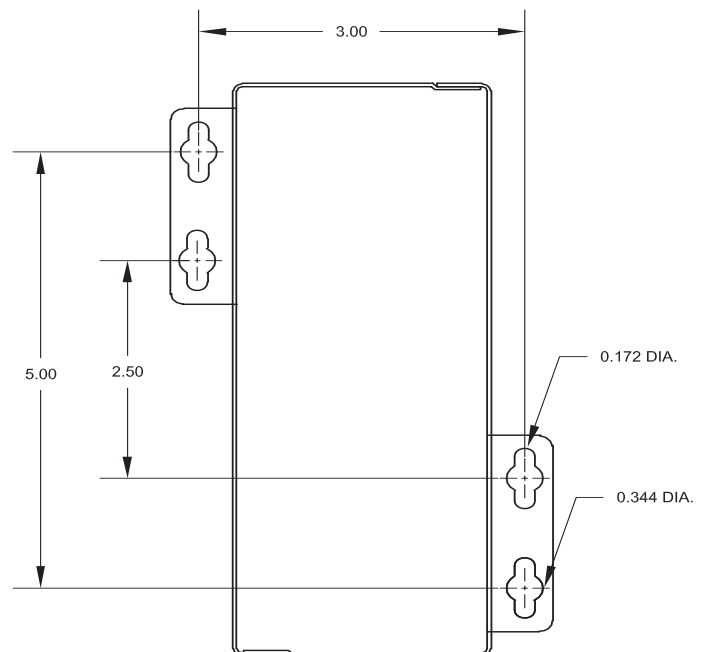
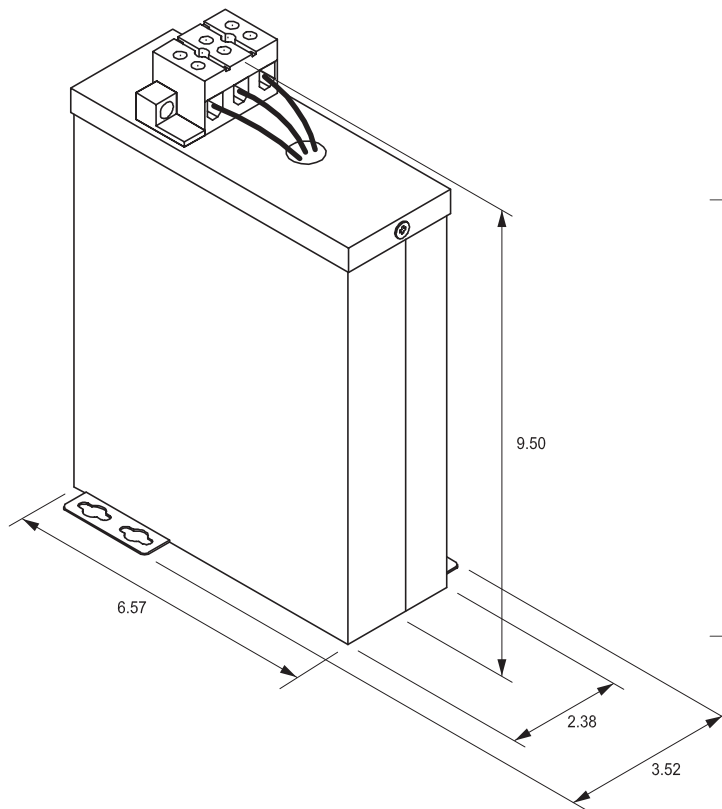
Pole mounting bracket for "PJ" (pump jack) capacitors



HOLE CHART		
SYMBOL	SIZE	USAGE
A	0.406	CAPACITOR MTG.
B	0.406	BRACKET MTG.

CLMD-13

CLMD-13 Drill plan

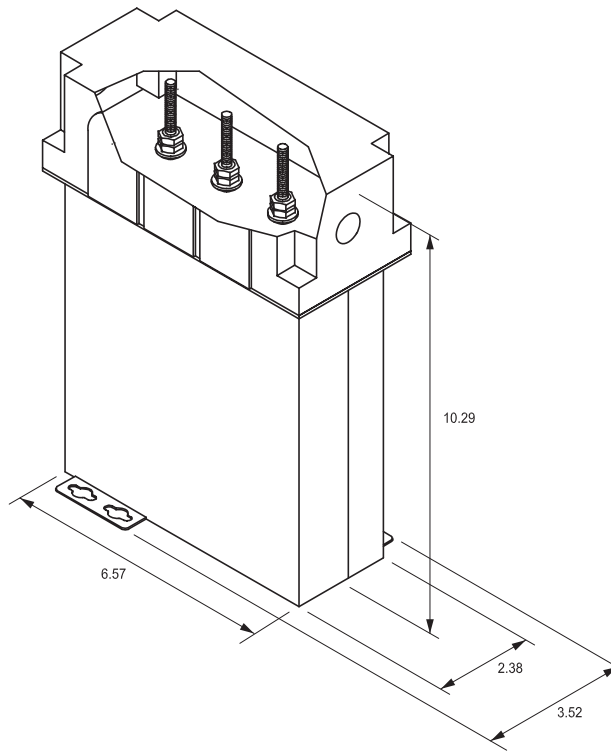


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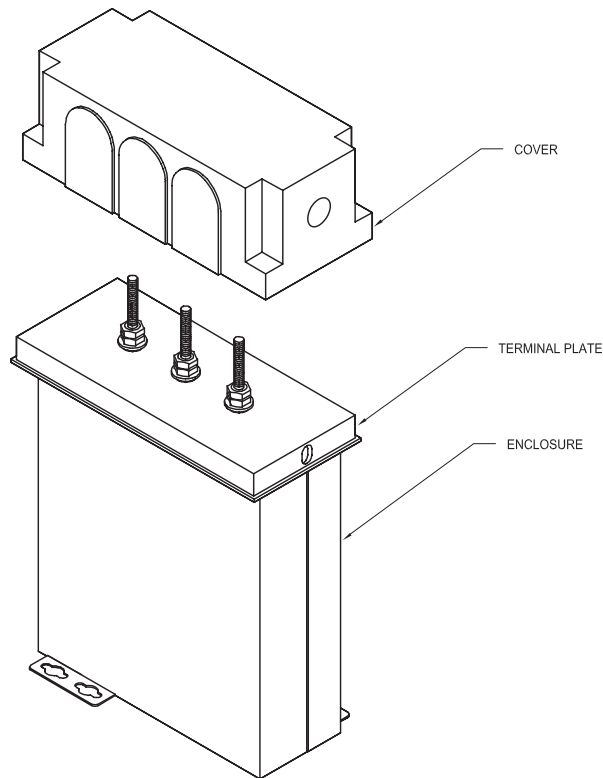
Approximate dimensions Individual capacitors

← 00.00 → Inches

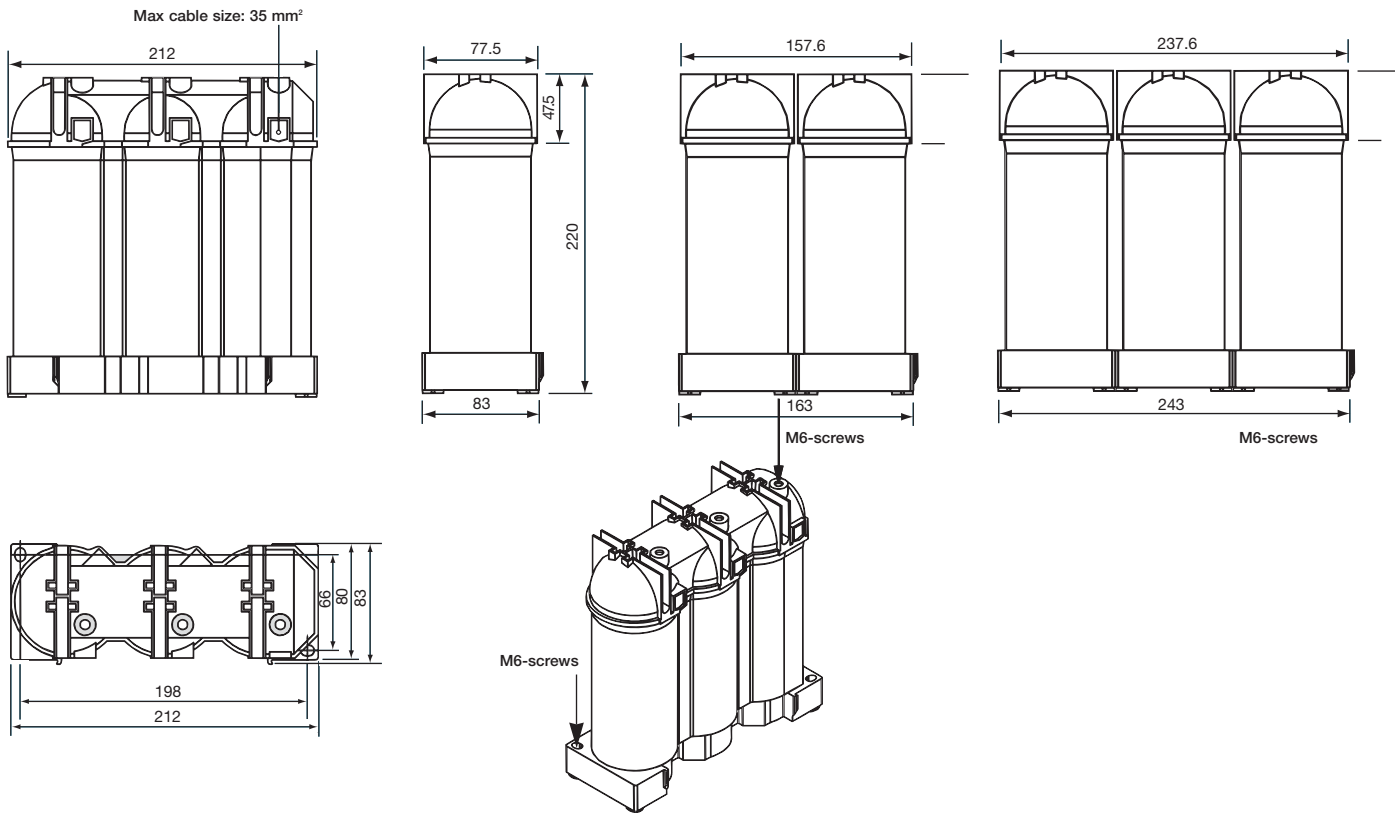
CLMD-13SC — stud connected



CLMD-13SC — expanded view



Approximate dimensions Individual capacitors Type LVCS



Fixed capacitor banks

3 phase, Internally Protected Elements

240 & 480 Volt, 60 Hz

Low Voltage
Network Quality



F26G250

Suitable for direct compensation where fixed power factor correction is desired.

Features include:

- Dry environmentally safe construction
- Self healing capability
- Patented Internal Protected Elements
- Individual capacitors connected by bus bar
- Indoor, dusttight or raintight enclosure
- NEMA 1, 3R, 12
- Easy mounting
- Easy electrical connection to large terminals
- Convenient grounding lug

240 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating ①	Qty / kvar	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
63	70	2/35	155	F246G70	\$ 1375	F246R70	\$ 1815	F246D70	\$ 1424
	80	1/35, 1/40	155	F246G80	1552	F246R80	1600	F246D80	1600
	90	2/45	155	F246G90	1766	F246R90	1815	F246D90	1815
	100	2/50	155	F246G100	1873	F246R100	1922	F246D100	1922
	110	2/55	155	F246G110	2087	F246R110	2136	F246D110	2136
	120	2/60	155	F246G120	2247	F246R120	2296	F246D120	2296
	130	1/40, 2/45	235	F246G130	2461	F246R130	2510	F246D130	2510
	150	3/50	235	F246G150	2622	F246R150	2671	F246D150	2671
	160	1/50, 3/55	155	F246G160	2996	F246R160	3045	F246D160	3045
	180	3/60	235	F246G180	3210	F246R180	3259	F246D180	3259
	200	4/50	310	F246G200	3745	F246R200	3794	F246D200	3794
	250	5/50	370	F246G250	4815	F246R250	4864	F246D250	4864
	300	5/60	370	F246G300	5457	F246R300	5506	F246D300	5506

480 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating ①	Qty / kvar	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
63	125	1/55, 1/70	125	F486G125	\$ 1300	F486R125	\$ 1349	F486D125	\$ 1349
	130	2/65	125	F486G130	1375	F486R130	1424	F486D130	1424
	140	2/70	125	F486G140	1428	F486R140	1476	F486D140	1476
	150	2/75	125	F486G150	1450	F486R150	1499	F486D150	1499
83	160	2/80	155	F488G160	1519	F488R160	1567	F488D160	1567
	175	2/87.5	155	F488G175	1621	F488R175	1669	F488D175	1669
	180	2/90	155	F488G180	1733	F488R180	1781	F488D180	1781
	200	2/100	155	F488G200	1840	F488R200	1888	F488D200	1888
63	220	1/70, 2/75	200	F486G220	1980	F486R220	2029	F486D220	2029
	225	3/75	200	F486G225	2081	F486R225	2129	F486D225	2129
83	240	3/80	235	F488G240	2161	F488R240	2209	F488D240	2209
	250	1/90, 2/80	235	F488G250	2327	F488R250	2375	F488D250	2375
	260	2/90, 1/80	235	F488G260	2461	F488R260	2510	F488D260	2510
	280	1/00, 2/90	235	F488G280	2568	F488R280	2617	F488D280	2617
	300	3/100	235	F488G300	2675	F488R300	2724	F488D300	2724
	350	4/87.5	310	F488G350	2996	F488R350	3045	F488D350	3045
	360	4/90	310	F488G360	3210	F488R360	3259	F488D360	3259
	400	4/100	310	F488G400	3638	F488R400	3687	F488D400	3687
	450	5/90	370	F488G450	4334	F488R450	4383	F488D450	4383
	475	5/95	370	F488G475	4601	F488R475	4650	F488D475	4650
	500	5/100	370	F488G500	4815	F488R500	4864	F488D500	4864
	600	6/100	450	F488G600	5457	F488R600	5506	F488D600	5506

208 Volt availability

For 208 volt applications, derate the 240V capacitors. The kvar at 208V will be .75 times the kvar at 240V.

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

① For additional kvar ratings not listed above, please consult factory.

Fixed capacitor banks

3 Phase, Internally Protected Elements

600Volt, 60Hz

600 volt, 60Hz — 3 phase

Enclosure size	kvar rating ①	Qty / kvar	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
63	160	2/80	155	F606G160	\$ 1605	F606R160	\$ 1653	F606D160	\$ 1653
83	200	2/100	155	F608G200	1926	F608R200	1974	F608D200	1974
63	240	3/80	195	F606G240	2354	F606R240	2402	F606D240	2402
83	270	3/90	230	F608G270	2675	F608R270	2723	F608D270	2723
	300	3/100	230	F608G300	2889	F608R300	2937	F608D300	2937
63	320	4/80	250	F606G320	3050	F606R320	3098	F606D320	3098
83	350	4/87.5	275	F608G350	3210	F608R350	3258	F608D350	3258
	360	4/90	275	F608G360	3371	F608R360	3419	F608D360	3419
	400	4/100	275	F608G400	3959	F608R400	4007	F608D400	4007
	500	5/100	375	F608G500	5564	F608R500	5612	F608D500	5612
	600	6/100	450	F608G600	6420	F608R600	6468	F608D600	6468

Capacitor state indication system

240V kvar	480V & 600V kvar	Catalog number suffix	List price adder
90 – 120	125 – 200	-2LE	\$ 225
130 – 180	210 – 300		338
200	320 – 400		449
250 – 300	450 – 500		562
—	600		674

The capacitor state indication system consists of two yellow LED lights which illuminate only when the capacitor is energized and functioning at 65% or more of its rated kvar capacity.

The two light system will indicate a failure in any one of the three phases of the capacitor.

Wall mounting assemblies

Type	Catalog number	List price adder
Wall mounting kit, 2 – 6 units per bank	FBWM	\$ 500

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

Fixed capacitor banks

3 Phase, 240 & 480 Volt, 60 Hz

with three fuses and blown fuse indicators



ABB low voltage capacitors are fully protected by the three levels of protection offered by the patented Sequential Protection System which includes dry self-healing capacitors, internally protected elements and the dry non-flammable vermiculite filler. However, some users have traditionally requested external fuses and blown fuse indicators, so these modified units are offered for those applications.

Features include:

- Dry, environmentally safe construction
- Self healing capability
- Patented Internal Protected Elements
- Individual capacitors connected by bus bar
- NEMA 1, 3R, 12
- Easy mounting
- Easy electrical connection to large terminals
- Convenient grounding lug
- Each individual capacitor includes three fuses and three blown fuse indication lamps

240 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating ^①	Qty / kvar	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
63	70	2/35	135	F246G70-3FI	\$ 1625	F246R70-3FI	\$ 1673	F246D70-3FI	\$ 1673
	80	2/40	135	F246G80-3FI	1846	F246R80-3FI	1894	F246D80-3FI	1894
	90	2/45	135	F246G90-3FI	2087	F246R90-3FI	2135	F246D90-3FI	2135
	100	2/50	135	F246G100-3FI	2408	F246R100-3FI	2456	F246D100-3FI	2456
	110	2/55	135	F246G110-3FI	2568	F246R110-3FI	2616	F246D110-3FI	2616
	120	2/60	135	F246G120-3FI	2729	F246R120-3FI	2777	F246D120-3FI	2777
	130	1/40, 2/45	235	F246G130-3FI	2943	F246R130-3FI	2991	F246D130-3FI	2991
	150	3/50	235	F246G150-3FI	3210	F246R150-3FI	3258	F246D150-3FI	3258
	160	1/50, 3/55	155	F246G160-3FI	3424	F246R160-3FI	3472	F246D160-3FI	3472
	180	3/60	235	F246G180-3FI	3745	F246R180-3FI	3793	F246D180-3FI	3793
	200	4/50	310	F246G200-3FI	4173	F246R200-3FI	4221	F246D200-3FI	4221
	250	5/50	370	F246G250-3FI	5243	F246R250-3FI	5291	F246D250-3FI	5291
	300	5/60	370	F246G300-3FI	5778	F246R300-3FI	5826	F246D300-3FI	5826

480 Volt, 60 Hz — 3 phase

Enclosure size	kvar rating ^①	Qty / kvar	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
63	125	1/55, 1/70	135	F486G125-3FI	\$ 1525	F486R125-3FI	\$ 1573	F486D125-3FI	\$ 1573
	130	2/65	135	F486G130-3FI	1578	F486R130-3FI	1626	F486D130-3FI	1626
	140	2/70	135	F486G140-3FI	1605	F486R140-3FI	1653	F486D140-3FI	1653
	150	2/75	135	F486G150-3FI	1685	F486R150-3FI	1733	F486D150-3FI	1733
83	160	2/80	155	F488G160-3FI	1766	F488R160-3FI	1814	F488D160-3FI	1814
	175	2/87.5	155	F488G175-3FI	1873	F488R175-3FI	1921	F488D175-3FI	1921
	180	2/90	155	F488G180-3FI	1926	F488R180-3FI	1974	F488D180-3FI	1974
	200	2/100	155	F488G200-3FI	2033	F488R200-3FI	2081	F488D200-3FI	2081
63	220	1/70, 2/75	200	F486G220-3FI	2274	F486R220-3FI	2322	F486D220-3FI	2322
	225	3/75	200	F486G225-3FI	2434	F486R225-3FI	2482	F486D225-3FI	2482
83	240	3/80	235	F488G240-3FI	2515	F488R240-3FI	2563	F488D240-3FI	2563
	250	1/90, 2/80	235	F488G250-3FI	2675	F488R250-3FI	2723	F488D250-3FI	2723
	260	2/90, 1/80	235	F488G260-3FI	2782	F488R260-3FI	2830	F488D260-3FI	2830
	280	1/100, 2/90	235	F488G280-3FI	2889	F488R280-3FI	2937	F488D280-3FI	2937
	300	3/100	235	F488G300-3FI	2996	F488R300-3FI	3044	F488D300-3FI	3044
	350	4/87.5	310	F488G350-3FI	3531	F488R350-3FI	3579	F488D350-3FI	3579
	360	4/90	310	F488G360-3FI	3692	F488R360-3FI	3740	F488D360-3FI	3740
	400	4/100	310	F488G400-3FI	4173	F488R400-3FI	4221	F488D400-3FI	4221
	450	5/90	370	F488G450-3FI	4869	F488R450-3FI	4917	F488D450-3FI	4917
	475	5/95	370	F488G475-3FI	5243	F488R475-3FI	5291	F488D475-3FI	5291
	500	5/100	370	F488G500-3FI	5564	F488R500-3FI	5612	F488D500-3FI	5612
	600	6/100	450	F488G600-3FI	6099	F488R600-3FI	6147	F488D600-3FI	6147

208 Volt availability

For 208 volt applications, derate the 240V capacitors. The kvar at 208V will be .75 times the kvar at 240V.

NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

① For additional kvar ratings not listed above, please consult factory.

Fixed capacitor banks

3 phase, 600 Volt, 60 Hz

with three fuses and blown fuse indicators

600 volt, 60Hz — 3 phase

Enclosure size	kvar rating ^①	Qty / kvar	Approx. shipping weight (lbs.)	Enclosure type					
				Indoor – NEMA 1		Outdoor – NEMA 3R		Indoor – NEMA 12	
				Catalog number	List price	Catalog number	List price	Catalog number	List price
63	160	2/80	155	F606G160-3FI	\$ 1819	F606R160-3FI	\$ 1867	F606D160-3FI	\$ 1867
83	200	2/100	155	F608G200-3FI	2140	F608R200-3FI	2188	F608D200-3FI	2188
63	240	3/80	195	F606G240-3FI	2675	F606R240-3FI	2723	F606D240-3FI	2723
83	270	3/90	230	F608G270-3FI	2943	F608R270-3FI	2991	F608D270-3FI	2991
	300	3/100	230	F608G300-3FI	3210	F608R300-3FI	3258	F608D300-3FI	3258
63	320	4/80	250	F606G320-3FI	3424	F606R320-3FI	3472	F606D320-3FI	3472
83	350	4/87.5	275	F608G350-3FI	3745	F608R350-3FI	3793	F608D350-3FI	3793
	360	4/90	275	F608G360-3FI	4013	F608R360-3FI	4061	F608D360-3FI	4061
	400	4/100	275	F608G400-3FI	4280	F608R400-3FI	4328	F608D400-3FI	4328
	500	5/100	375	F608G500-3FI	6420	F608R500-3FI	6468	F608D500-3FI	6468
	600	6/100	450	F608G600-3FI	7490	F608R600-3FI	7538	F608D600-3FI	7538

Capacitor state indication system

240V kvar	480V & 600V kvar	Catalog number suffix	List price adder
90 – 120	125 – 200	-2LE	\$ 225
130 – 180	210 – 300		337
200	320 – 400		449
250 – 300	450 – 500		562
—	600		674

The capacitor state indication system consists of two yellow LED lights which illuminate only when the capacitor is energized and functioning at 65% or more of its rated kvar capacity.

The two light system will indicate a failure in any one of the three phases of the capacitor.

Wall mounting assemblies ^②

Type	Catalog number	List price adder
Wall mounting kit, 2 – 6 units per bank	FBWM	\$ 500

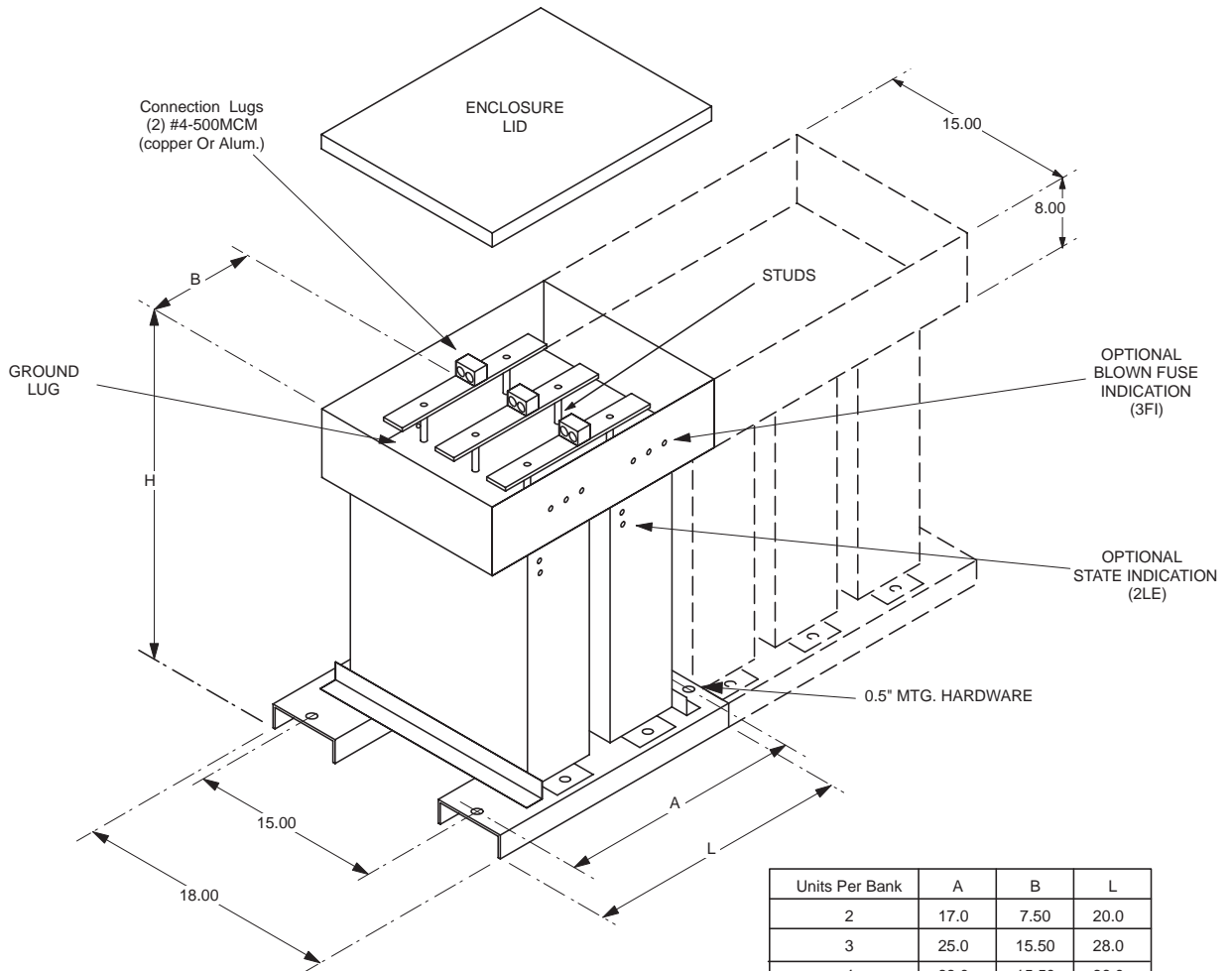
NOTE: ABB's patented IPE design eliminates the need for additional overcurrent protection when capacitors are electrically connected on the load side of a motor starter circuit breaker or fusible disconnect switch.

^① For additional kvar ratings not listed above, please consult factory.

Approximate dimensions Fixed capacitor banks

← 00.00 → Inches

Fixed capacitor banks



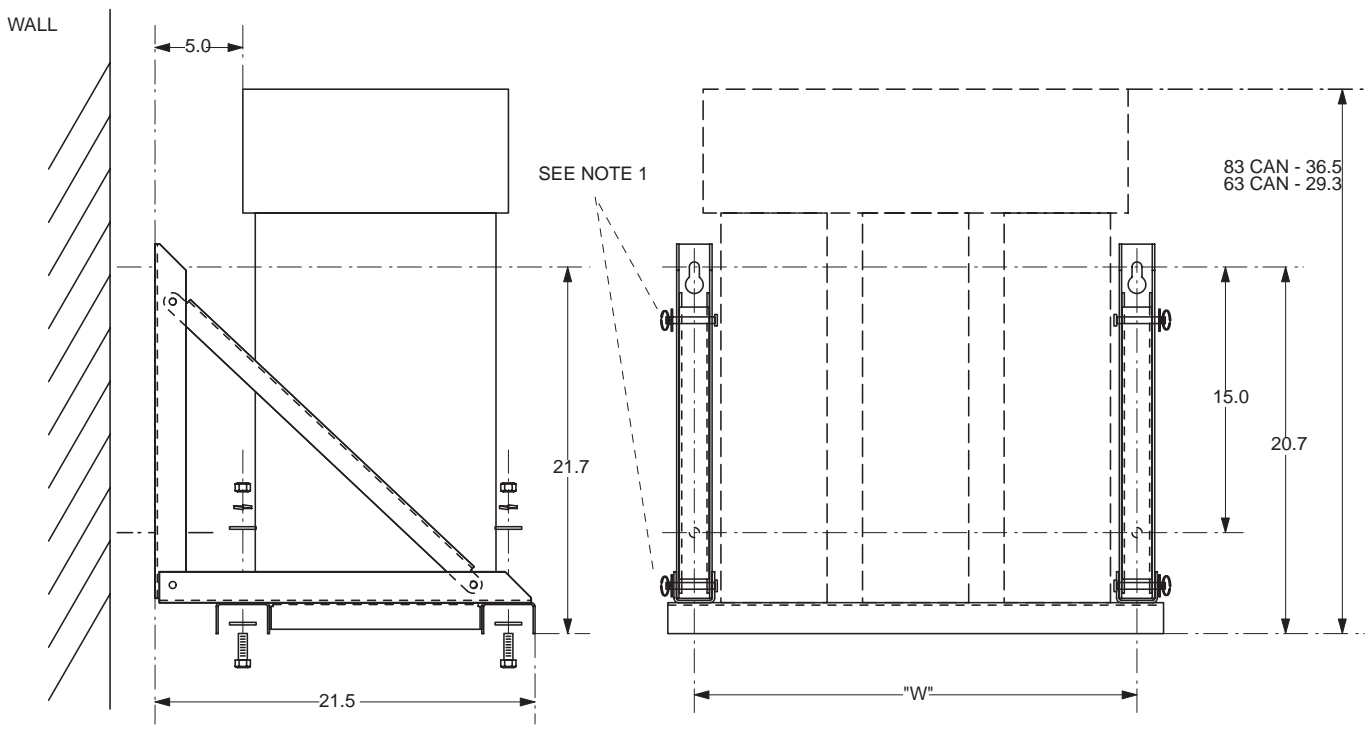
Units Per Bank	A	B	L
2	17.0	7.50	20.0
3	25.0	15.50	28.0
4	33.0	15.50	36.0
5	41.0	15.50	44.0
6	49.0	22.50	52.0

Unit Size	H
CLMD-53	22.50
CLMD-63	29.50
CLMD-83	36.50

Approximate dimensions Fixed capacitor banks

← 00.00 → Inches

Fixed bank wall mounting



NOTE 1: POSITION SPLIT RINGS TOWARD OUTSIDE OF BANK

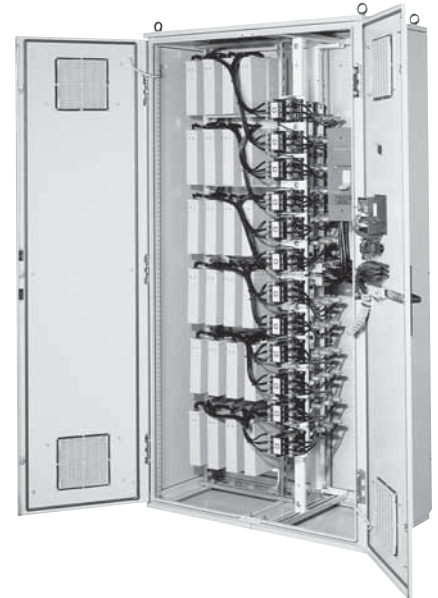
NO. OF CAPS	MTG WIDTH "W"
2	17.0
3	25.0
4	33.0
5	41.0
6	49.0

MOUNT CAPACITOR ASSEMBLY TO WALL USING FOUR (4) 1/2" BOLTS. "KEY HOLE" MOUNTING HOLES ARE PROVIDED AT TOP OF MOUNTING BRACKETS.

WALL MOUNTING BRACKETS ARE ATTACHED TO FIXED BANK USING FOUR (4) 1/2-13 X 1.25" BOLTS AS SHOWN. TORQUE HARDWARE TO 50 LBS-FT.



AutoBank 300 & 1200



300 & 1200 AutoBank

ABB 300 & 1200 Automatic banks

ABB provides the complete solution to automatic power factor correction by packaging proven ABB components. ABB capacitors, contactors, power factor controllers, circuit breakers, fusible disconnects, and ABB pushbuttons together provide a system of the highest quality. ABB capacitors provide exceptional performance using an environmentally safe dry type design. ABB provides a complete range of contactors designed for capacitor switching. ABB's power factor controller offers an easy-to-use microprocessor-based controller with built-in power factor meter. A variety of disconnect options are available, including ABB circuit breakers, fusible and non-fusible switches.

• Modularity

The modular design allows for the installation of additional power and switch modules as well as various options. Additional units may be connected in parallel. The number of capacitors and contactors included in the power modules depends on the automatic capacitor bank total power and the possible requirement for anti-resonance reactors.

• Options

Anti-resonance reactors, filters, blown fuse indication, push to test blown fuse indication, non-fused and fused disconnect switches and circuit breakers are optional equipment items that can be factory installed in the automatic capacitor bank.

• Approvals

ABB AutoBanks can be UL Panel Listed (UL File # E105450) per application.

• High reliability

The ABB AutoBank incorporates the well-proven features of ABB dry type power factor correction capacitor technology. The use of an ABB power factor controller and endurance-tested ABB contactors ensure the highest reliability of the equipment.

• Very low losses

Capacitor total losses are less than 0.5 watts per kvar. AutoBank total losses (without reactors), including accessories such as power factor controller and contactors are less than 1.5 watts per kvar.

• Complete environmental acceptability

ABB capacitors have a dry type dielectric with no free liquid and do not pose any risk of leakage or pollution of the environment.

• Unique sequential protection system

3 phase ABB capacitors are included with AutoBank products. These ABB capacitors utilize a patented Sequential protection System which ensures that each individual capacitor element is selectively and reliably disconnected from the circuit at the end of its life.

• Long life

Low losses and the self-healing properties of ABB capacitor elements help to ensure long operating life.

General information

Autobanks

Catalog number explanation

• Safety

ABB capacitors are manufactured with vermiculite, a nonflammable and nontoxic material. The dry vermiculite safely absorbs any energy produced within the capacitor enclosure and prevents any fire hazard in case of failure. Unique cooling fins are fitted to surround each capacitor element providing effective heat dissipation.

• ABB power factor controller

ABB microprocessor-based and programmable Power Factor Controllers (PFCs) provide for the setting of the target power factor and the sensitivity of the system regulation. The PFCs maintain the selected power factor by switching on or off one or more capacitor steps depending on the load conditions of the system.

• Compact design ensures quick installation

The AutoBank has compact overall dimensions, top or bottom cable entry access, and lifting eyes aid in fast, efficient handling and installation.

Harmonic effect on capacitors

Combinations of capacitors and system reactances form series and parallel tuned circuits at certain frequencies. When harmonic sources are added to the system, this can result in higher than rated currents or higher than rated voltages on the system components.

AutoBanks can be designed to operate in harmonic environments. Tuning reactors are added to keep the capacitor currents within rated values and keep system voltages to desired levels. Tuning frequencies of the AutoBank can be designed to suit your system requirements. Please consult factory.

Contents

Standard ABB AutoBank products include:

- 1 to 12 capacitor steps, three phase
- Incoming line termination (unless other disconnecting means is specified)
- Capacitor stage indicator lights
- Power on light
- One ABB power factor controller equipped with:
 - Programmable thresholds which allow protection of the capacitor bank from over and undervoltage, overtemperature and excessive harmonic distortion
 - Full graphics LCD display
 - Manual/automatic control
 - Indication of capacitive or inductive load and the number of steps energized
 - Measures and monitors kW, kVA, kVAr, Vrms, Arms, Temperature, THDV(%), THDI(%), Hz, power factor, voltage harmonics V2-V49(%), current harmonics I2-I49(%), alarm
 - Customizable switching sequence, linear or circular - normal or integral - direct or progressive switching strategies available
 - Automatic adaptation to network phase rotation and C.T. terminals
- ABB contactors
- Discharge resistors
- Power fuses
- Control fuses
- Multi-tap CT range 500/5 – 4000/5 in 500/5 increments. Window size 4" x 7"

Technical data

Rated voltage: 240 – 600V, 50/60 Hz, 3 phase

Standard kvar steps: 25, 50 & 100 kvar (other kvar step sizes available)

Control voltage: 120V, 60 Hz

Power factor setting: Between 0.70 capacitive and 0.7 inductive

C/k setting: Between 0.05 and 1A

Operation: Automatic or manual with step indication. LED indication of the number of capacitors energized and the capacitive or inductive demand.

Discharge resistors included

Dielectric losses: Less than 0.2 watt/kvar

Capacitor total losses: Less than 0.5 watt/kvar

Automatic bank total losses (without reactors) including accessories such as contactors and PF controller: Less than 1.5 watt/kvar

ABB dry type self-healing capacitors

Capacitor dielectric test:

- Between terminals and container: 3.0 kV, 60 seconds.

Capacitor automatic bank test:

- Functional test
- Dielectric test

Enclosures:

- NEMA 1, 3R and Dustproof (RAL 7032, Beige)

Top or bottom cable entry

Dimensions: Per application

Ambient temperature: -40°C to +40°C

Installation: Lifting eyes are provided. Installation instructions are supplied with each unit.

NOTICE

Placement and orientation of the current transformer are very important for the correct operation of the automatic capacitor bank.

A 4 G 600 C 6 A 2 P

ABB capacitor catalog numbering system

F = blown fuse indication, P = BFI with push to test

Harmonic tuning (Consult factory)

Switching sequence: A 1:1:1:1, B 1:2:2:2, C 1:2:4:4, D-1:1:2:2

Number of capacitors

Disconnecting means – B = terminal, C = circuit breaker,

D = non-fused disconnect switch, F = fused disconnect switch

kvar rating

Enclosure type – G = indoor, R = outdoor, D = dust proof

Voltage – 2 = 240, 4 = 480, 6 = 600

Model – A = 1200, AA = 300

AutoBank 300

240, 480 & 600 Volt, 60 Hz

Low Voltage
Network Quality

Description

Automatic power factor correction system in a compact design.

- Ratings: 240V: 25 – 150 kvar
480V: 50 – 300 kvar
600V: 100 – 300 kvar
- Size: 66"H x 32"W x 20"D
- Fusing: Each step and each phase
- Proven ABB Components:
ABB dry-type capacitors
ABB micro-processor based controller
ABB contactors rated for capacitive switches
- CT Split core multi-tap CT provided with each AutoBank
- Options: ABB main circuit breaker
Blown fuse indication
Push-to-test blown fuse indication
Outdoor enclosure
Dustproof enclosure



240 Volt

kvar	Approximate weight (lbs)	Indoor		Outdoor		Dustproof	
		Catalog number	List price	Catalog number	List price	Catalog number	List price
25	600	AA2G25B5A	Consult factory	AA2R25B5A	Consult factory	AA2D25B5A	Consult factory
50	600	AA2G50B5A		AA2R50B5A		AA2D50B5A	
75	600	AA2G75B6A		AA2R75B6A		AA2D75B6A	
100	600	AA2G100B8A		AA2R100B8A		AA2D100B8A	
125	600	AA2G125B10A		AA2R125B10A		AA2D125B10A	
150	600	AA2G150B12A		AA2R150B12A		AA2D150B12A	

480 Volt

kvar	Approximate weight (lbs)	Indoor		Outdoor		Dustproof	
		Catalog number	List price	Catalog number	List price	Catalog number	List price
50	600	AA4G50B3B	Consult factory	AA4R50B3B	Consult factory	AA4D50B3B	Consult factory
75	600	AA4G75B5A		AA4R75B5A		AA4D75B5A	
100	600	AA4G100B5A		AA4R100B5A		AA4D100B5A	
125	600	AA4G125B5A		AA4R125B5A		AA4D125B5A	
150	600	AA4G150B6A		AA4R150B6A		AA4D150B6A	
175	600	AA4G175B7A		AA4R175B7A		AA4D175B7A	
200	600	AA4G200B8A		AA4R200B8A		AA4D200B8A	
225	600	AA4G225B9A		AA4R225B9A		AA4D225B9A	
250	600	AA4G250B10A		AA4R250B10A		AA4D250B10A	
300	600	AA4G300B12A		AA4R300B12A		AA4D300B12A	

600 Volt

kvar	Approximate weight (lbs)	Indoor		Outdoor		Dustproof	
		Catalog number	List price	Catalog number	List price	Catalog number	List price
100	600	AA6G100B5A	Consult factory	AA6R100B5A	Consult factory	AA6D100B5A	Consult factory
125	600	AA6G125B5A		AA6R125B5A		AA6D125B5A	
150	600	AA6G150B6A		AA6R150B6A		AA6D150B6A	
175	600	AA6G175B7A		AA6R175B7A		AA6D175B7A	
200	600	AA6G200B8A		AA6R200B8A		AA6D200B8A	
225	600	AA6G225B9A		AA6R225B9A		AA6D225B9A	
250	600	AA6G250B10A		AA6R250B10A		AA6D250B10A	
300	600	AA6G300B12A		AA6R300B12A		AA6D300B12A	

For other kvar sizes, number of steps, or options, please consult your local ABB Control representative.

NOTE: ABB automatic banks can be designed for harmonic environments. Please consult the factory concerning harmonic issues.

AutoBank 1200

480 & 600 Volt, 60 Hz

Description

Modular design delivers sought after features:

- 480V & 600V units
- Compact size
- Easy installation & start-up
 - Bottom & top cable entry
 - Simple to operate ABB controller
- Copper bus bar
- Fusing of each step and in each phase
- Proven ABB components
 - ABB dry type capacitors
 - ABB micro-processor based controller
 - ABB contactors rated for capacitor switching
- Options
 - ABB circuit breakers or fusible & non-fusible disconnect switches
 - Blown fuse indication
 - Push to test
 - Outdoor enclosures
 - Dustproof enclosures
- Consult factory for other sizes
- CT: split core, multi-tap current transformers provided with each AutoBank



480 Volt

kvar	Approximate weight (lbs)	Indoor		Outdoor		Dustproof	
		Catalog number	List price	Catalog number	List price	Catalog number	List price
100	1000	A4G100B2A	Consult factory	A4R100B2A	Consult factory	A4D100B2A	Consult factory
125	1000	A4G125B3B		A4R125B3B		A4D125B3B	
150	1000	A4G150B3A		A4R150B3A		A4D150B3A	
175	1000	A4G175B4B		A4R175B4B		A4D175B4B	
200	1000	A4G200B4A		A4R200B4A		A4D200B4A	
225	1000	A4G225B5B		A4R225B5B		A4D225B5B	
250	1000	A4G250B5A		A4R250B5A		A4D250B5A	
300	1000	A4G300B6A		A4R300B6A		A4D300B6A	
350	1000	A4G350B7A		A4R350B7A		A4D350B7A	
400	1200	A4G400B8A		A4R400B8A		A4D400B8A	
450	1200	A4G450B9A		A4R450B9A		A4D450B9A	
500	1200	A4G500B10A		A4R500B10A		A4D500B10A	
550	1200	A4G550B11A	A4R550B11A	A4D550B11A			
600	1200	A4G600B12A	A4R600B12A	A4D600B12A			
650	1900	A4G650B7B	A4R650B7B	A4D650B7B			
700	1900	A4G700B7A	A4R700B7A	A4D700B7A			
800	1900	A4G800B8A	A4R800B8A	A4D800B8A			
900	1900	A4G900B9A	A4R900B9A	A4D900B9A			
1000	2100	A4G1000B10A	A4R1000B10A	A4D1000B10A			
1100	2100	A4G1100B11A	A4R1100B11A	A4D1100B11A			
1200	2100	A4G1200B12A	A4R1200B12A	A4D1200B12A			

600 Volt

kvar	Approximate weight (lbs)	Indoor		Outdoor		Dustproof	
		Catalog number	List price	Catalog number	List price	Catalog number	List price
100	1000	A6G100B2A	Consult factory	A6R100B2A	Consult factory	A6D100B2A	Consult factory
125	1000	A6G125B3B		A6R125B3B		A6D125B3B	
150	1000	A6G150B3A		A6R150B3A		A6D150B3A	
175	1000	A6G175B4B		A6R175B4B		A6D175B4B	
200	1000	A6G200B4A		A6R200B4A		A6D200B4A	
225	1000	A6G225B5B		A6R225B5B		A6D225B5B	
250	1000	A6G250B5A		A6R250B5A		A6D250B5A	
300	1000	A6G300B6A		A6R300B6A		A6D300B6A	
350	1000	A6G350B7A		A6R350B7A		A6D350B7A	
400	1200	A6G400B8A		A6R400B8A		A6D400B8A	
450	1200	A6G450B9A		A6R450B9A		A6D450B9A	
500	1200	A6G500B10A		A6R500B10A		A6D500B10A	
550	1200	A6G550B11A	A6R550B11A	A6D550B11A			
600	1200	A6G600B12A	A6R600B12A	A6D600B12A			
650	1800	A6G650B7B	A6R650B7B	A6D650B7B			
700	1800	A6G700B7A	A6R700B7A	A6D700B7A			
800	1800	A6G800B8A	A6R800B8A	A6D800B8A			
900	1800	A6G900B9A	A6R900B9A	A6D900B9A			
1000	2100	A6G1000B10A	A6R1000B10A	A6D1000B10A			
1100	2100	A6G1100B11A	A6R1100B11A	A6D1100B11A			
1200	2100	A6G1200B12A	A6R1200B12A	A6D1200B12A			

Factory modifications Approximate dimensions AutoBank

← 00.00 → Inches

Current transformers (split core)

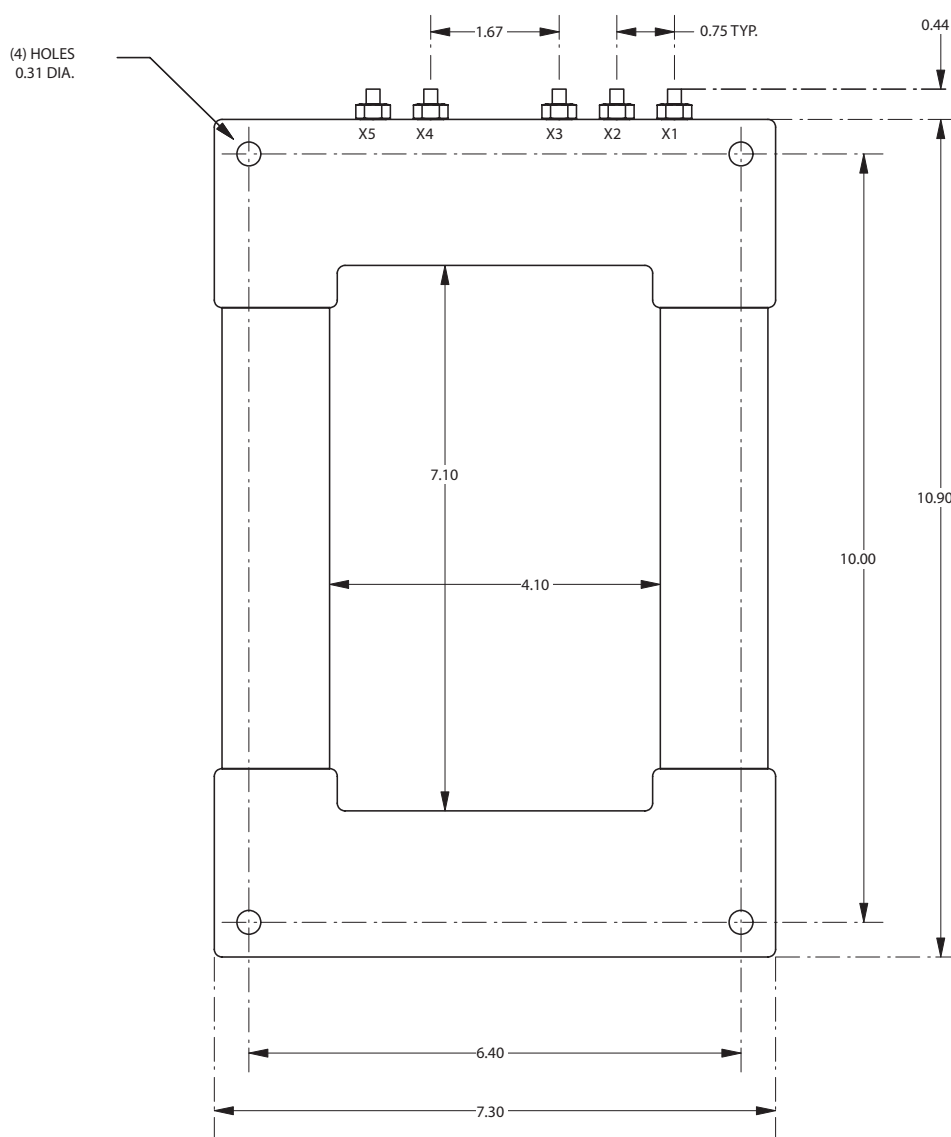
This split core current transformer is designed for use with automatic capacitor banks. The primary current will be determined by:

$$I = \frac{kVA \times 1000}{V \times 1.732}$$

The kVA value should represent the peak quarterhour demand. Split core current transformers are designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables. The portion of the transformer marked "this end removable" can be disassembled and then reassembled around the conductors that require current monitoring. The current transformer must have its secondary terminals short-circuited or the load connected before energizing the primary circuit.

Multi-tap split core current transformers provided with each AutoBank.

Approximate dimensions

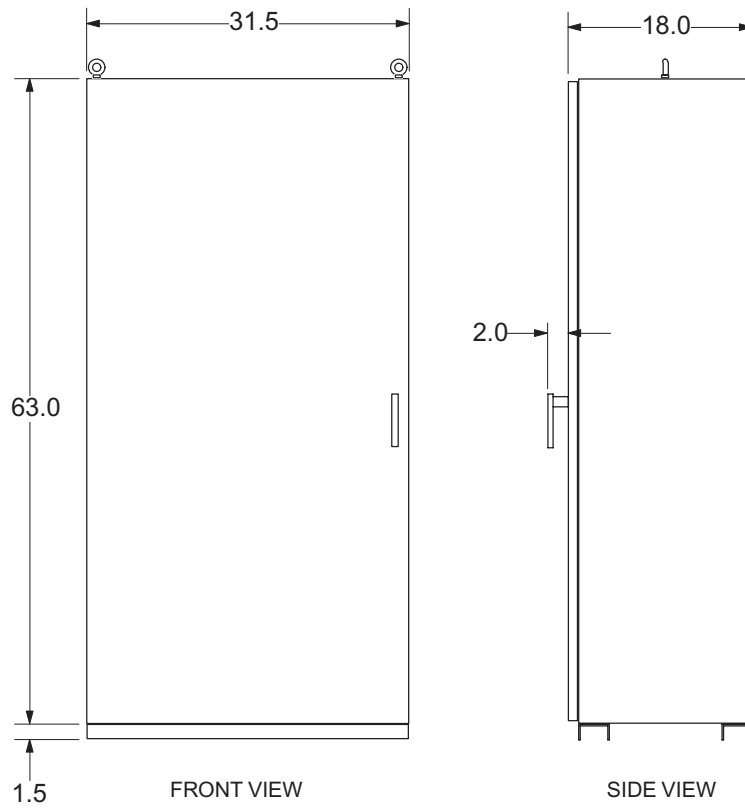


OVERALL DIMENSIONS: HEIGHT = 11.34, WIDTH = 7.30, DEPTH = 1.63

RATIO	TAPS
500:5	X1 - X2
1000:5	X3 - X4
1500:5	X2 - X3
2000:5	X1 - X3
2500:5	X2 - X4
3000:5	X1 - X4
3500:5	X2 - X5
4000:5	X1 - X5

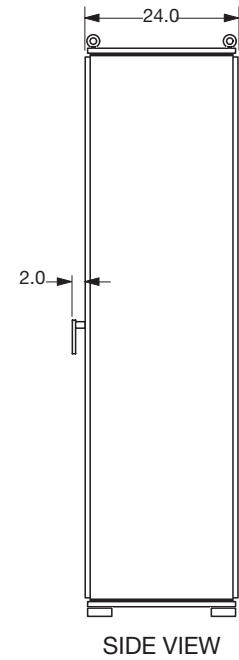
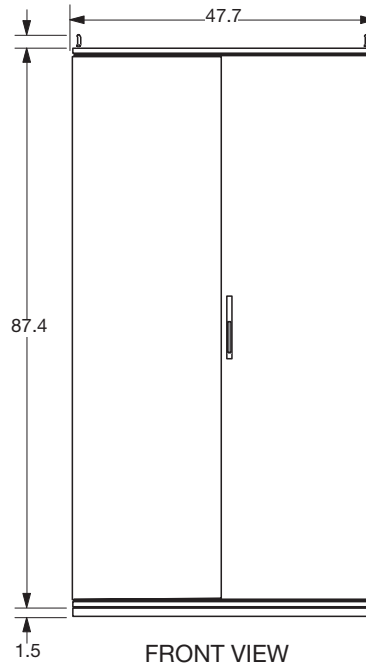
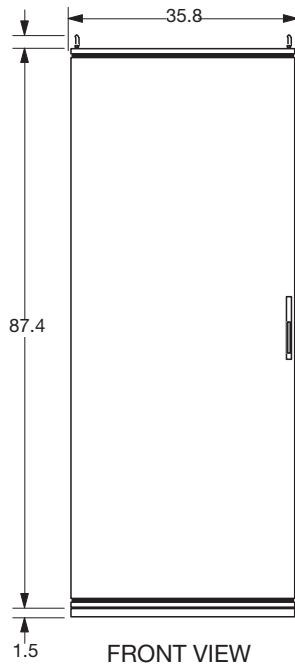
Approximate dimensions AutoBank 300

← 00.00 → Inches



Approximate dimensions AutoBank 1200

← 00.00 → Inches



KVAR	OVERALL WIDTH			
	MAIN LUGS	CIRCUIT BREAKER	FUSED SWITCH	NON-FUSED SWITCH
100	36	36	36	36
125	36	36	36	36
150	36	36	36	36
175	36	36	36	36
200	36	36	36	36
225	36	36	36	36
250	36	36	36	36
300	36	36	36	36
350	36	36	48	48
400	36	36	48	48
450	48	48	72	72
500	48	48	—	72
550	48	48	—	72
600	48	48	—	72
650	72	72	—	84
700	72	84	—	84
800	72	84	—	84
900	84	96	—	96
1000	84	96	—	96
1100	84	96	—	120
1200	84	96	—	120

DynaComp



DynaComp

One cycle response, transient-free capacitor switching with no limit to the number of operations

Typical Applications

- Any critical loads which cannot be interrupted by transients:
 - Hospitals
 - Airports
 - Computer networking centers
 - High technology manufacturing operations
 - Others
- Loads which require extremely rapid switching (less than one cycle, 16.7 ms) reactive compensation:
 - Welders
 - Elevators
 - DC winches (off-shore oil platforms)
 - Mining drag lines
 - Mining conveyors
 - Rolling mills
 - Cranes (Port Authority)
 - Ski lift drives
 - Stamping
 - Saw mills
 - Light rail transit systems
 - Others

Product Description

The ABB Dynamic Response Compensator or DynaComp is a capacitor or filter circuit switched by solid state power electronic devices without any moving parts. It is the ultimate solution to the most demanding applications in rapid power factor compensation, filtering or transient control.

Reactive load switching which causes disturbances on the network or where very rapid compensation or filtering is required are major applications for DynaComp.



DynaComp's solid state switching concept, combined with the well proven features of ABB power capacitor technology, provides the following exceptional advantages:

• Dynamic response time and ultra-rapid switching

DynaComp's solid state switching allows it to achieve dynamic response times in the range of one cycle. A typical application of DynaComp is for lifting devices requiring rapidly varying amounts of reactive power. By installing a DynaComp close to a crane or an elevator, voltage drops can be minimized and disturbances on other equipment avoided. Simultaneously, the reactive power will be efficiently compensated locally, an impossible task with conventional equipment. The principle applies to many other types of equipment with sudden large reactive power requirements such as large motors, welders, large injection molding machines, etc.

General information DynaComp

• Transient free switching

DynaComp does not disturb sensitive networks or sensitive equipment. The switching operation is executed by solid state devices, whose main advantage is to enable transient free switching with no wearing parts.

• Frequent switching capability

The absence of moving parts ensures DynaComp a high reliability without limitation of the number of switching applications. Welding and lifting devices are typical applications of loads requiring large amounts of reactive power with a frequent switching cycle. Switching events in the range of over 100,000 times per day are achievable with DynaComp

• High reliability

DynaComp incorporates the well proven features of ABB dry type power factor capacitor technology. Thyristor switching uses no moving parts. The DynaComp can be UL panel listed per application.

• Versatility & Options

DynaComp's electronic solid state switching is applicable to capacitor banks and detuned or tuned filter banks. An important advantage with filter applications is the improvement in rapidly switching of the filter bank. The DynaComp can be provided with an ABB main breaker or main fused or non-fused disconnect switch.

• Modularity & Expansion

Although DynaComp products must be designed for individual applications, they can be constructed rapidly due to their modular design. Additional units may be connected in parallel, allowing for the same reliable switching functions.

• Safety

ABB capacitors are filled with vermiculite, a nonflammable and nontoxic material. The dry vermiculite safely absorbs any energy produced within the capacitor enclosure and

prevents any fire hazard in case of failure.

Unique cooling fins are fitted to surround each capacitor element and to provide effective heat dissipation.

• Long life

The absence of moving parts and the self-healing properties of ABB capacitor elements ensure the DynaComp's long life.

• Unique Sequential Protection System

The ABB patented Sequential Protection System ensures that each individual capacitor element is selectively and reliably disconnected from the circuit at the end of its life.

• Complete environmental acceptability

ABB capacitors have a dry type dielectric with no free liquid and do not pose any risk of leakage or pollution of the environment.

• ABB VAR controller

ABB microprocessor-based and programmable VAR controller maintains VAR flows to desired levels.

• Compact design ensures quick installation

DynaComp's compact overall dimensions, standard top entry cable access, and lifting eyes aid in fast, efficient handling and installation.

Harmonic Effect on Capacitors

Combinations of capacitors and system reactances form series and parallel tuned circuits at certain frequencies. When harmonic sources are added to the system, this can result in higher than rated currents or higher than rated voltages on the system components.

DynaComp can be designed to operate in harmonic environments. Tuning reactors are added to keep the capacitor currents within rated values and keep system voltages to desired levels. Tuning frequencies of the DynaComp can be designed to suit your system requirements. Please consult factory.

Contents

DynaComp products include:

- Incoming line termination (unless other disconnecting means is specified.)
- One or more capacitor steps, single or three phase
- One ABB RVT-D controller equipped with:
 - Automatic no-voltage release
 - Menu driven interface w/LCD display
 - Icon indicating a capacitive or inductive load add the number of steps energized.
 - Circular or linear switching
- ABB capacitors
- One DynaSwitch per capacitor step
- Discharge resistors
- Power fuses
- Control fuses
- Multi-tap CT range: 500/5 – 4000/5 in 500/5 increments. Window size 4" x 7".

Technical Data

Rated voltage

Up to 240-600V, 50/60Hz, single or 3 phase

Capacitor step rating

Up to 400 kvar at 480V

Operation: Automatic or manual with step indication. LED indication of the number of capacitors energized and the capacitive or inductive demand.

Discharge resistors included.

ABB dry type self-healing capacitors.

Enclosures:

NEMA 1, 3R &
Dustproof

Dimensions: Per application

Ambient temp.: -40°C to +40°C

Installation: Lifting eyes are provided. Installation instructions are supplied with each unit.

D 4 G 500 C 10 A 2

Catalog Numbering System

Harmonic tuning (consult factory)

Switching sequence - A 1:1:1:1 B 1:2:2:2 C 1:2:4:4 D 1:2:4:8:8

Number of capacitors

Disconnect means - C=Circuit Breaker, D=Non-fused disconnect switch, F=Fused disconnect switch

kvar rating

Enclosure type - G=NEMA 1, R=NEMA 3R, D=Dust proof

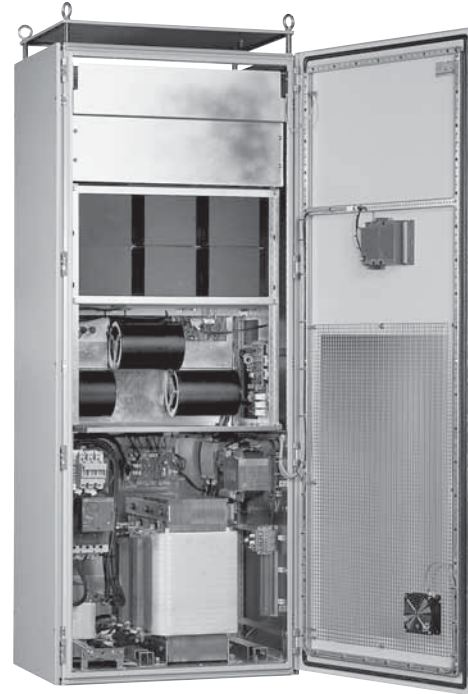
Voltage - 2 = 240V, 4 = 480V, 6 = 600V

Model - D=DynaComp

Type PQF Power^{IT} LV Active Filter



Power^{IT} Active Filter
Type PQF



Typical application

Power distribution systems which require multiple harmonic elimination or power factor correction.

Product description

The power quality filters developed by ABB are active filters offering unprecedented ability to eliminate harmonics from the network. The PQF eliminates harmonics in a controlled way. It is easy to expand and adapt to changes in the network. The PQF monitors the line current in real time and processes the measured harmonics as digital signals in

a high-power DSP (Digital Signal Processor). The output of the DSP controls PWM (Pulse Width Modulated) power modules that through line reactors inject harmonic currents with exactly the opposite phase to those that are to be filtered. The net effect is an elimination of the harmonics and a clean sine-wave as seen by the feeding transformer. The PQF is UL approved (UL File # E254288).

PQF sizing information

Consult your local ABB representative or the factory for assistance in sizing your PQF filter.

General information Power quality filter

Harmonics and power quality

Harmonics caused by non-linear electrical loads such as variable speed drives, rectifiers, UPS's, computers, etc., are a growing problem both for electricity suppliers and users.

Harmonics can lead to serious problems:

- overheating of cables, motors and transformers
- damage to sensitive equipment
- tripping of circuit breakers
- blowing of fuses
- premature aging of the installation

The ABB solution: PQF power quality filters

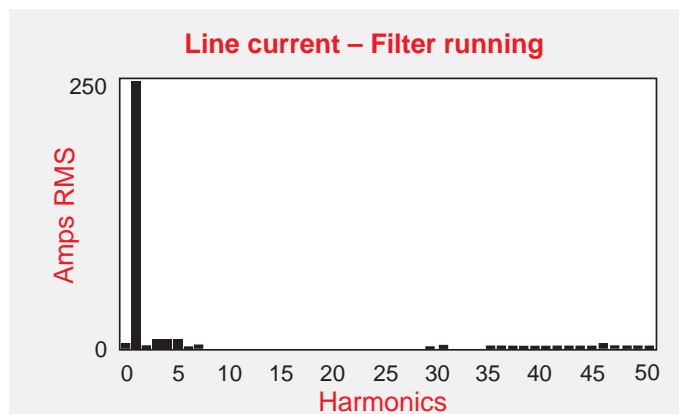
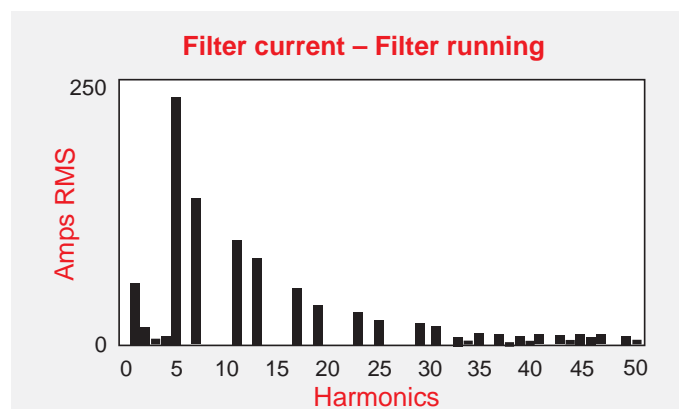
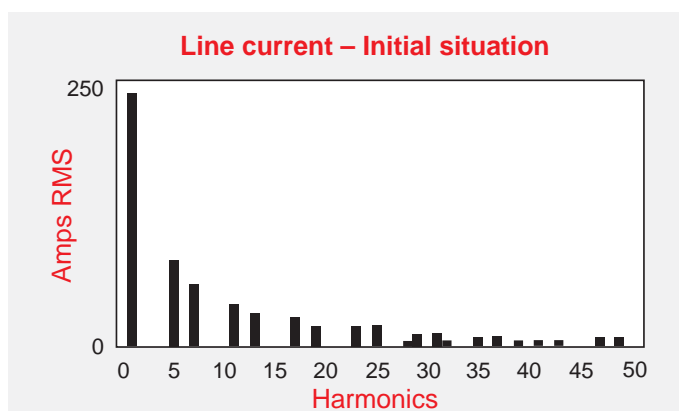
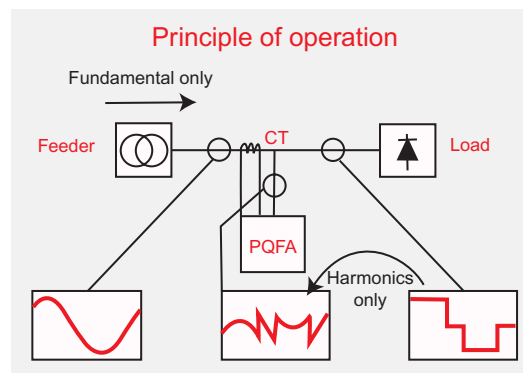
The ABB Power Quality Filter offers unprecedented ability to clean the network from harmonics. The PQF actively eliminates the harmonics present in the supply system in a controlled way. It is insensitive to large network impedance changes due to change in network topology like paralleling of sources, or switching between mains supply and generator operation.

The PQF monitors the line current in real time and processes the measured harmonics as digital signals in a high-power multi-DSP (Digital Signal Processor) based system. The digital controller generates Pulse Width Modulated (PWM) signals that drive IGBT power modules which through line reactors inject harmonic currents in the network with exactly the opposite phase to the components that are to be filtered.

The PQF also offers communication facilities with the customer's existing communication network. This feature which uses Modbus RTU, allows the PQF to be easily monitored and controlled from a remote location. The Modbus communication feature can be used by means of an RS-232 to RS-485 converter (optional).

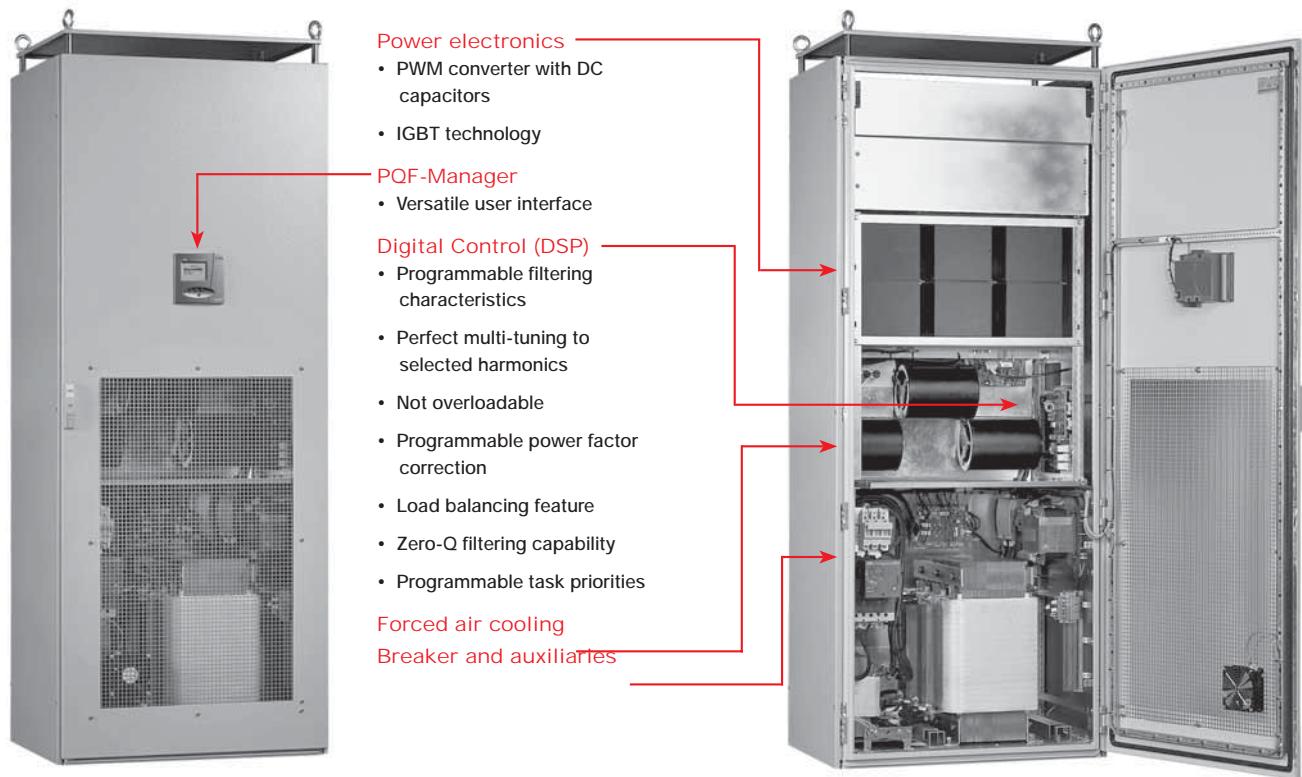
Advantages of the PQF

- Filters up to 20 harmonics simultaneously
- Filters up to the 50th harmonic
- Harmonic attenuation factor better than 97%
- Fulfilment of International Guidelines like G5/4, IEEE 519, etc
- Filters with closed loop control for best accuracy
- Is not overloadable
- Has a programmable filtering strategy and free choice of harmonics selection
- Fault and event logging with real time stamp
- Direct connection up to 690V
- Top or bottom cable entry (optional for PQFI)
- Easy commissioning – Auto-detection of CT Polarity
- May filter without generation of reactive power
- May generate reactive power and control power factor
- May balance the load current across the phases
- Has programmable task priorities
- Does not require detailed network analysis
- Does not require special CTs
- Is easy to extend on site
- Comes factory tested
- Auto-adaptation to network impedance changes
- Optical fibre isolation between power and control stages
- Programmable stand-by and re-start functions
- Programmable digital I/O interface
- Modbus RTU communication compatible
- Two sets of compensation parameters for different load type compensation.



General information

Power quality filter



PQF ratings and capabilities

Power modules for the PQF are available with voltage ratings up to 600V for 50 or 60 Hz. The maximum thermal rating of a single cubicle is 450 A rms. Absolute harmonic filtering capability also depends on the content of higher harmonics with the filtering capability following common load spectra. The reactive power compensation capacity per module is given by the thermal rating.

On site extensions are easily made by adding cubicle sections to a maximum of eight cubicles. Several PQF may operate together on the same network.

Systems for 50 Hz and 60 Hz applications can filter 20 different harmonics from the 2nd to the 50th harmonic.

Selected harmonics can be filtered completely, or to a prescribed level defined in absolute or relative terms.

Reactive power compensation may be chosen and controlled to a desired power factor.

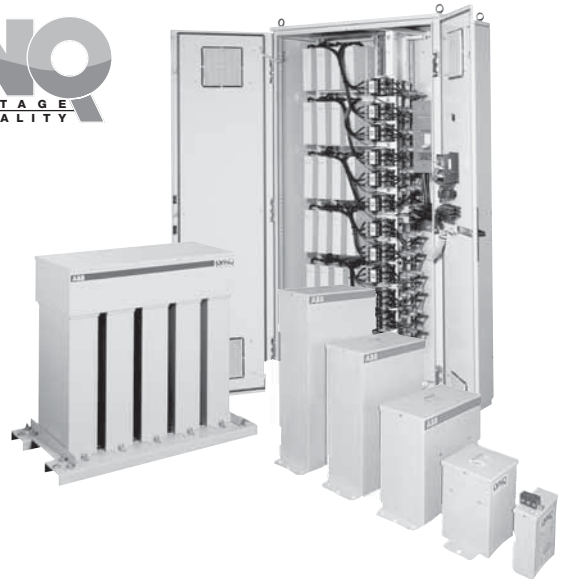
The PQF is programmed through the PQF-Manager graphical user interface. Optional PQF-Link software enables users to program the active filter through an RS232 port using a standard PC.

UL File # E254288

The PQF-Manager

The PQF-Manager is the Graphical User Interface provided in all the PQF types as a standard accessory. It offers direct control, programming, monitoring capabilities without a PC, communication facilities and detailed fault and event logging with real time stamp. The PQF-Manager (144 x 144 mm), fitted in the front panel of the PQF with its large LCD screen display (64 x 132 pixel) makes operating the filter very convenient.





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Basic Concepts

Most loads on an electrical distribution system can be categorized into three types:

- Resistive
- Inductive
- Capacitive

On modern systems, the most common is the inductive load. Typical examples include transformers, fluorescent lighting and AC induction motors.

A common characteristic of these inductive loads is that they utilize a winding in order to operate. This winding produces an electromagnetic field which allows the motor or transformer to function and requires a certain amount of electrical power to maintain this electromagnetic field.

All inductive load require two kinds of power to function properly:

- Active power (kW) - actually performs the work
- Reactive power (kvar) - sustains the electro-magnetic field

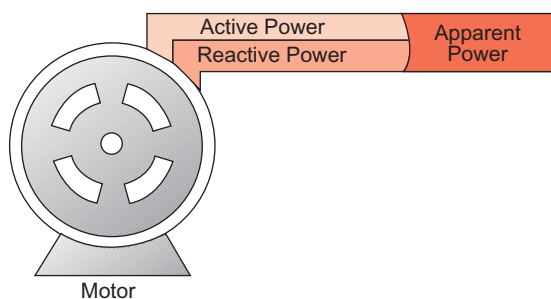


Fig. 1

One common example of reactive power can be seen in an unloaded AC motor. When all load is removed from the motor, one might expect the no-load current to drop near zero. In truth, however, the no-load current will generally show a value between 25% and 30% of full load current. This is because of the continuous demand for magnetizing current by any inductive load.

Active power is the total power indicated on a wattmeter. Apparent power is the combination of reactive and active power.

What is Power Factor?

Power factor is the relationship between working (active) power and total power consumed (apparent power). Essentially, power factor is a measurement of how effectively electrical power is being used. The higher the power factor, the more effectively electrical power is being used.

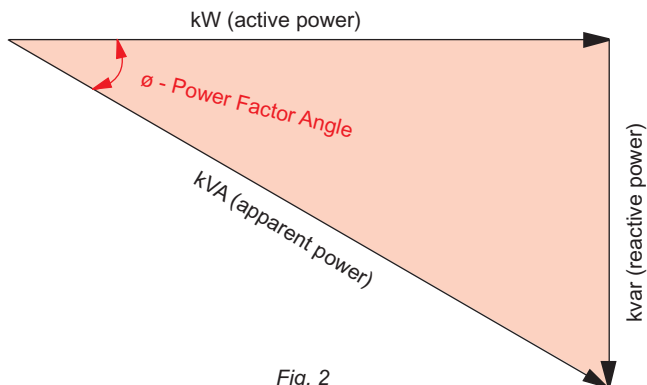


Fig. 2

Fig. 2

A distribution system's operating power is composed of two parts: Active (working) power and reactive (non-working magnetizing) power. The ACTIVE power performs the useful work . . . the REACTIVE power does not. It's only function is to develop magnetic fields required by inductive devices.

Generally, power factor decreases (phi increases) with increased motor load. This geometric relationship of apparent power to active power is traditionally expressed by the right triangle relationship of:

$$\text{Cos phi} = \text{p.f.} = \text{kW/kVA}$$

Why Improve Low Power Factor?

Low power factor means poor electrical efficiency. The lower the power factor, the higher the apparent power drawn from the distribution network.

When low power factor is not corrected, the utility must provide the nonworking reactive power IN ADDITION to the working active power. This results in the use of larger generators, transformers, bus bars, wires, and other distribution system devices that otherwise would not be necessary. As the utility's capital expenditures and operating costs are going to be higher, they are going to pass these higher expenses to industrial users in the form of power factor penalties.

Advantages of Improving Low Power Factor — Saving Money!!

- High power factor eliminates utility power factor penalties.
- High power factor reduces the heating losses of transformers and distribution equipment, prolonging life of the equipment.
- High power factor stabilizes voltage levels.
- Increased system capacity

Figure 3 illustrates the relationship of power factor to total current consumed. With a power factor of 1.0 given a constant load, the 100% figure represents the required useful current.

As the power factor drops from 1.0 to .9, power is used less effectively. Therefore, 10% more current is required to handle the same load.

A power factor of .7 requires approximately 43% more current; and a power factor of .5 requires approximately 100% (twice as much!!) to handle the same load.

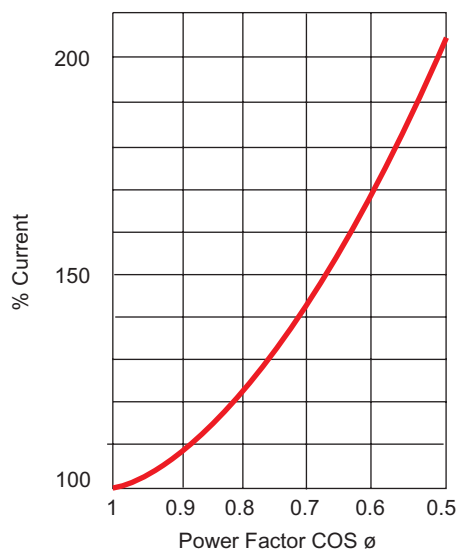


Fig. 3

How Power Factor Correction Capacitors Solve the Problem of Low Power Factor

Lower power factor is a problem that can be solved by adding power factor correction capacitors to the plant distribution system. As illustrated in Fig. 4, power factor correction capacitors work as reactive current generators "providing" needed reactive power (kvar) to the power supply. By supplying their own source of reactive power, the industrial user frees the utility from having to supply it; therefore, the total amount of apparent power (kVA) supplied by the utility will be less.

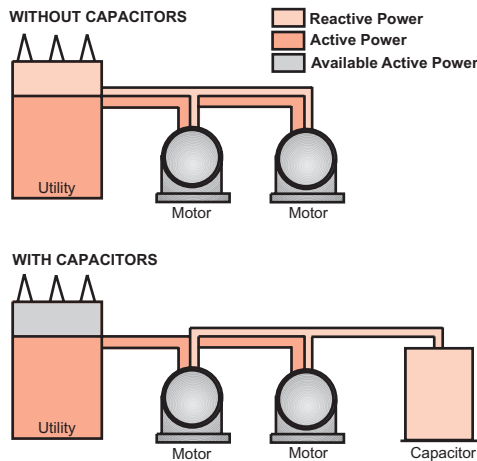


Fig. 4

Power factor correction capacitors reduce the total current drawn from the distribution system and subsequently increase system capacity by raising the power factor level.

Capacitor Rating

Power factor correction capacitors are rated in electrical units called "vars". One var is equivalent to one volt ampere of reactive power. Vars are units of measurement for indicating how much reactive power the capacitor will supply.

As reactive power is usually measured in thousands of vars, the letter "k" (abbreviation for "kilo", meaning thousands) precedes the var creating the more familiar "kvar" term.

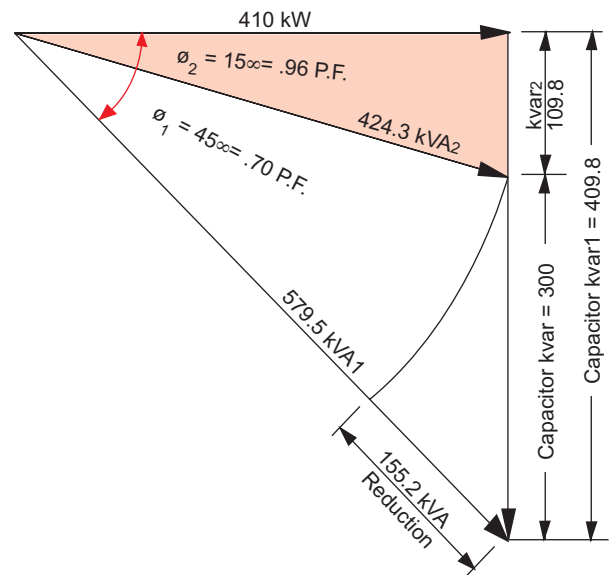


Fig. 5

The capacitor kvar rating shows how much reactive power the capacitor will supply. Each unit of the capacitor's kvar will decrease the inductive reactive power demand (magnetizing demand) by the same amount.

EXAMPLE:

A low voltage network requires 410 kW active power at full load, and the power factor is measured to be .70. Therefore, the system's full load consumption of apparent power is 579.5 kVA. If 300 kvar of capacitive reactive power is installed, the power factor will rise to .96 and the kVA demand will be reduced from 579.5 to 424.3 kVA. See Fig. 5.

Capacitor installation locations

Where Should Power Factor Correction Capacitors Be installed in a distribution system?

As shown in Fig. 6, several options exist for the connection of power factor correction capacitors on the low voltage distribution system.

Option A: On the secondary of the overload relay

Advantages: This is the most efficient location since the reactive power (kvar) is produced at the same spot where it is consumed. Line losses and voltage drop are minimized. The capacitor is switched automatically by the motor starter, so it is only energized when the motor is running. No separate switching device or overcurrent protection is required because of the presence of the motor starter components.

Care must be taken in setting the overload relay since the capacitor will bring about a reduction in amps through the overload. Therefore, to give the same protection to the motor, the overload relay's trip setting should be readjusted or the heater elements should be resized. Refer to page 6.12 for line current reduction in percent of FLA.

Option B: Between the contactor and the overload relay

The advantages are the same as Option A except the overload relay can now be set to the full load amps as shown on the motor nameplate. This mounting location is normally preferred by motor control center and switchgear builders since the overload setting is simplified.

Option C: Between the circuit breaker and the contactor

Advantages: Since the capacitor is not switched by the contactor, it can act as a central kvar source for several motors fed by the same circuit breaker. This location is recommended for jogging, plugging and reversing applications.

Since the capacitor remains energized even when the motor or motors are not running, there exists the possibility of overcorrection and leading power factor during lightly loaded periods. Losses are higher than with Options A & B as the reactive current must be carried further.

LOCATIONS FOR CAPACITORS IN MOTOR CIRCUITS

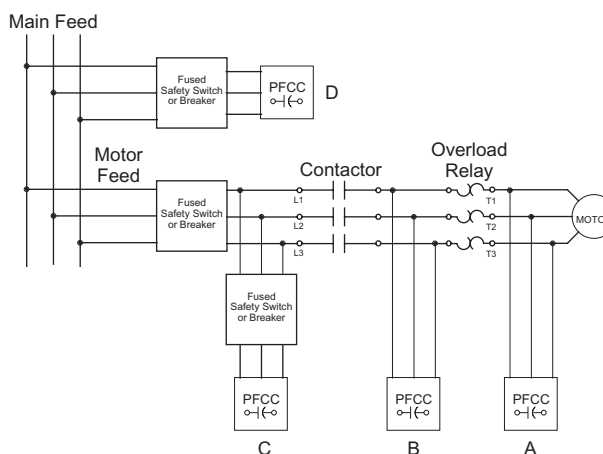


Fig. 6

Option D: As a central compensation source connected to the main distribution bus

Advantages: Of the four options, this is the most cost efficient because it uses a few large kvar capacitors rather than many small units.

A primary disconnect must be provided for switching and overcurrent protection. As with Option C, a real possibility of overcompensation exists during lightly loaded periods unless some form of automatic control is incorporated. Automatic control can be provided by ABB automatic capacitor banks.

Application and Installation

Temperature and Ventilation

Capacitors should be located in areas where the surrounding ambient temperature does not exceed 40° C and where there is adequate ventilation. As capacitors always operate at full load and generate heat of their own, maximum heat dissipation must be provided to ensure long operating life.

Line frequency and operating voltage are factors that can cause capacitor temperature to rise.

- **Line Frequency** - Assuming the line frequency of the capacitor matches the frequency of the incoming service, line frequency is not a concern since it is constant in modern power systems.
- **Operating Voltage** - Capacitor overheating at a normal operating voltage and with adequate ventilation seldom occurs. However, when the voltage exceeds 110% of the capacitor rating, overheating and resultant damage can happen.

When the operating voltage exceeds 110% of the capacitor's rated voltage, the line voltage should be reduced or the capacitor taken off line.

This overvoltage problem is exactly why, when determining the required kvar capacitance for a distribution system, a person should always "undersize" a capacitor's kvar rating... too much capacitance means overvoltage... too much overvoltage means excessive heat... and excessive heat can be damaging to the capacitor unit!!!

Special Applications

Care should be taken when power factor correction capacitors are used in the following applications:

- Plugging and jogging applications
- Frequent starts
- Crane or elevator motors where the load may drive the motor
- Multi-speed motors
- Motors involving open transition reduced voltage starting
- Reversing starters if they reverse more frequently than once per minute

ABB contactor kvar ratings

Contactors	208V	240V	480V	600V	Max amps
UA26	3.5	4.0	8.0	10.0	10
UA30	7.0	8.0	16.5	20.5	20
UA50	10.5	12.5	25.0	31.0	30
UA75	21.5	25.0	50.0	62.0	60
UA95	25.0	29.0	58.0	72.0	70
UA110	28.5	33.0	66.0	83.0	80
A145	43	50	100	125	120
A185	57	66	133	166	160
A210	66	77	153	192	185
A260	75	87	174	218	210
A300	88	101	203	254	245
AF400	119	137	274	343	330
AF460	142	164	329	410	396
AF580	178	205	411	514	495
AF750	214	247	495	618	595

Discharging Time

Power factor capacitors need a minimum of one minute to discharge. Afterwards, it is always recommended that the terminals be short-circuited to ground before touching.

Typical Capacitor Specifications

The following guidelines can be used when specifying capacitors.

SPECIFICATIONS FOR CAPACITORS

600 Volts and Below

Furnish and install where indicated power factor correction capacitors of the size, voltage rating, and enclosure type shown on the drawings.

(OPTIONAL) All motors of _____ horsepower and above shall have individual power factor correction capacitors energized with the motor.

All capacitors shall be the self healing metallized-film type filled with vermiculite, a dry NONFLAMMABLE filler material; oil-filled capacitors will not be acceptable. Discharge resistors shall be provided to automatically discharge the capacitor to less than 50 volts within one minute after de-energization. An internal ground lug shall be provided. The capacitors shall withstand 135% of rated current continuously, 110% of rated voltage continuously; and an ambient temperature range of -40°C to +40°C.

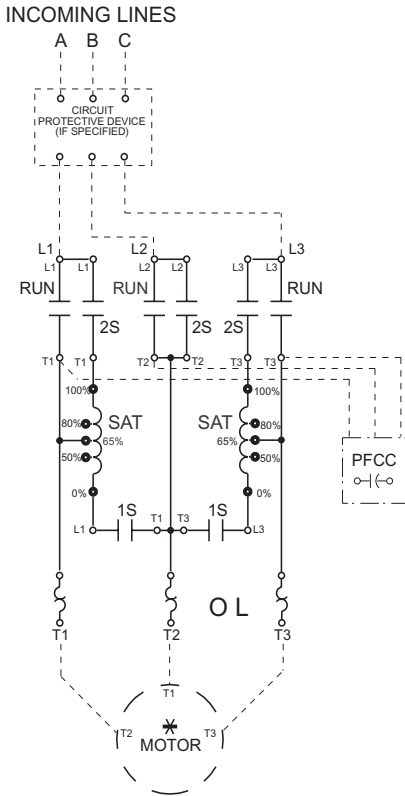
Losses shall be less than 0.5 watts per kvar. Each element shall be individually protected and the enclosure shall be filled with a dry, non-toxic, nonflammable insulating material. The capacitors shall be UL Listed and CSA approved. Capacitors shall be ABB or equivalent.

Application and installation

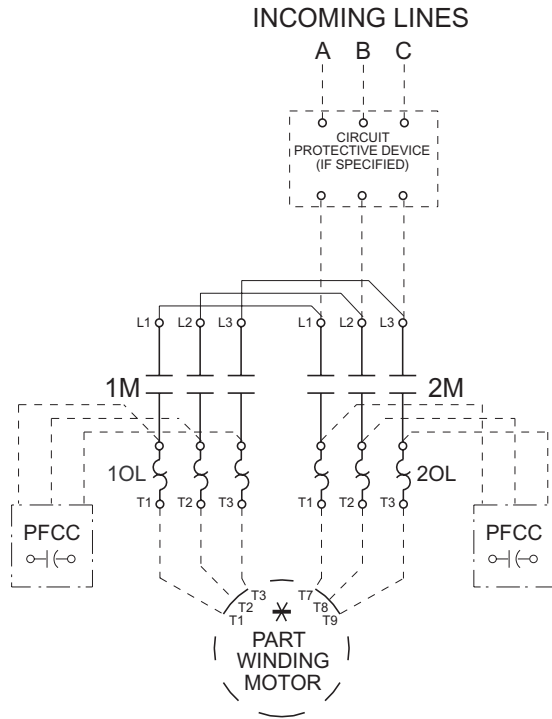
Wiring diagrams for Autotransformer, part-winding, wye-delta, multi-speed

Power Factor Correction Capacitor connection locations

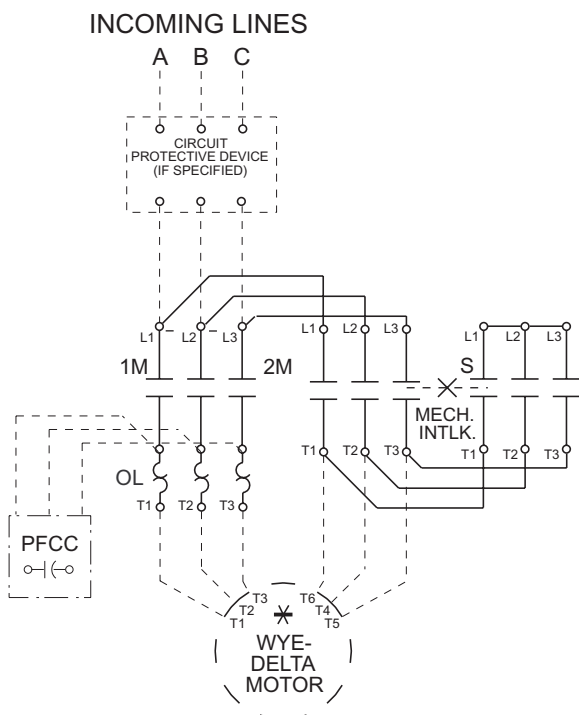
Autotransformer



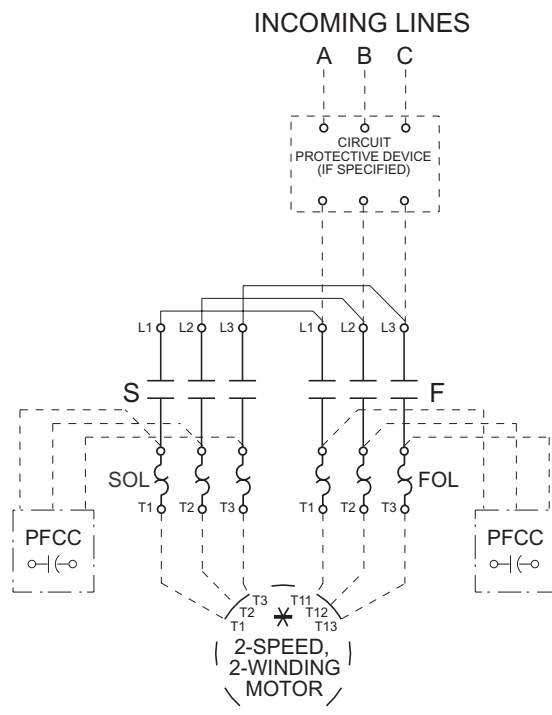
Part-winding



Wye-delta



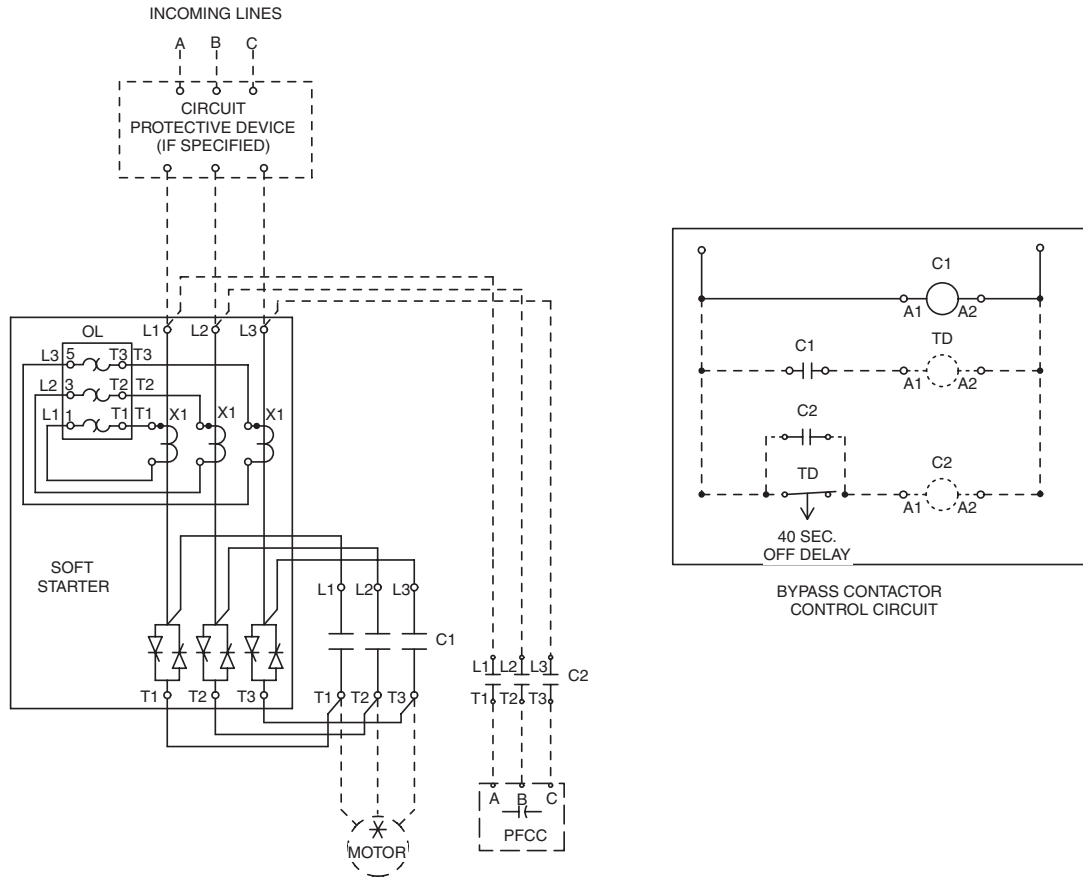
2 Speed, 2 winding



Application and installation

Wiring diagrams for Softstarters

Softstarter



Problems Created by Harmonics

- Excessive heating and failure of capacitors, capacitor fuses, transformers, motors, fluorescent lighting ballasts, etc.
- Nuisance tripping of circuit breaker or blown fuses
- Presence of the third harmonic & multiples of the 3rd harmonic in neutral grounding systems may require the derating of neutral conductors
- Noise from harmonics that lead to erroneous operation of control system components
- Damage to sensitive electronic equipment
- Electronic communications interference

Any device with non-linear operating characteristics can produce harmonics in your power system. If you are currently using equipment that can cause harmonics or have experienced harmonic related problems, capacitor reactor or filter bank equipment may be the solution. The following is a discussion of harmonics; the characteristics of the problem; and a discussion of our solution.

Origins of Harmonic Distortion

The ever increasing demand of industry and commerce for stability, adjustability and accuracy of control in electrical equipment led to the development of relatively low cost power diodes, thyristors, SCRs and other power semi-conductors. Now used widely in rectifier circuits for U.P.S. systems, static converters and A.C. & D.C. motor control, these modern devices replace the mercury arc rectifiers of earlier years and create new and challenging conditions for the power engineer of today.

Although solid state devices, such as the thyristor, have brought significant improvements in control designs and efficiency, they have the disadvantage of producing harmonic currents.

Harmonic currents can cause a disturbance on the supply network and adversely affect the operation of other electrical equipment including power factor correction capacitors.

We are concentrating our discussions on harmonic current sources associated with solid state power electronics but there are actually many other sources of harmonic currents. These sources can be grouped into three main areas:

1. Power electronic equipment: Variable speed drives (AC VFD's, DC drives, PWM drives, etc.); UPS systems, rectifiers, switch mode power supplies, static converters, thyristor systems, diode bridges, SCR controlled induction furnaces and SCR controlled systems.
2. Arcing equipment: Arc furnaces, welders, lighting (mercury vapor, fluorescent)
3. Saturable devices: Transformers, motors, generators, etc. The harmonic amplitudes on these devices are usually insignificant compared to power electronic and arcing equipment, unless saturation occurs.

Waveform

Harmonics are sinusoidal waves that are integral multiples of the fundamental 60 Hz waveform (i.e., 1st harmonic =

60 Hz; 5th harmonic = 300 Hz). All complex waveforms can be resolved into a series of sinusoidal waves of various frequencies, therefore any complex waveform is the sum of a number of odd or even harmonics of lesser or greater value. Harmonics are continuous (steady-state) disturbances or distortions on the electrical network and are a completely different subject or problem from line spikes, surges, sags, impulses, etc., which are categorized as transient disturbances.

Transient problems are usually solved by installing suppression or isolation devices such as surge capacitors, isolation transformers or M.O.V.s. These devices will help solve the transient problems but will not affect the mitigation of low order harmonics or solve harmonic resonance problems.

Harmonic Content

Thyristor and SCR converters are usually referred to by the number of DC current pulses they produce each cycle. The most commonly used are 6 pulse and 12 pulse.

There are many factors that can influence the harmonic content but typical harmonic currents, shown as a percentage of the fundamental current, are given in the below table. Other harmonics will always be present, to some degree, but for practical reasons they have been ignored.

Order of harmonic	Typical percentage of harmonic current	
	6 Pulse	12 pulse
1	100	100
5	20	-
7	14	-
11	9	9
13	8	8
17	6	-
19	5	-
23	4	4
25	4	4

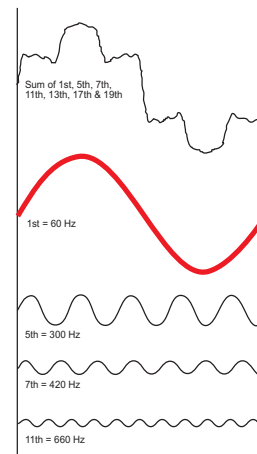


Fig. 7

Harmonic Overloading of Capacitors

The impedance of a circuit dictates the current flow in that circuit. As the supply impedance is generally considered to be inductive, the network impedance increases with frequency while the impedance of a capacitor decreases. This causes a greater proportion of the currents circulating at frequencies above the fundamental supply frequency to be absorbed by the capacitor, and all equipment associated with the capacitor.

In certain circumstances, harmonic currents can exceed the value of the fundamental (60 Hz) capacitor current. These harmonic problems can also cause an increased voltage across the dielectric of the capacitor which could exceed the maximum voltage rating of the capacitor, resulting in premature capacitor failure.

Harmonic Resonance

The circuit or selective resonant frequency is reached when the capacitor reactance and the supply reactance are equal.

Whenever power factor correction capacitors are applied to a distribution network, which combines capacitance and inductance, there will always be a frequency at which the capacitors are in parallel resonance with the supply.

If this condition occurs on, or close to, one of the harmonics generated by solid state control equipment, then large harmonic currents can circulate between the supply network and the capacitor equipment. These currents are limited only by the damping resistance in the circuit. Such currents will add to the

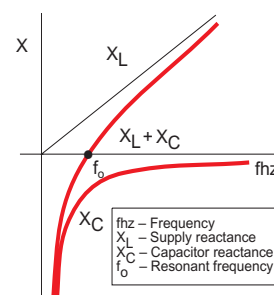


Fig. 8

harmonic voltage disturbance in the network causing an increased voltage distortion.

This results in a higher voltage across the capacitor and excessive current through all capacitor components. Resonance can occur on any frequency, but in general, the resonance we are concerned with is on, or close to, the 5th, 7th, 11th and 13th harmonics for 6 pulse systems. See Fig. 8.

Avoiding Resonance

There are a number of ways to avoid resonance when installing capacitors. In larger systems it may be possible to install them in a part of the system that will not result in a parallel resonance with the supply. Varying the kvar output rating of the capacitor bank will alter the resonant frequency. With capacitor switching there will be a different resonant frequency for each step. Changing the number of switching steps may avoid resonance at each step of switching. See Fig. 9.

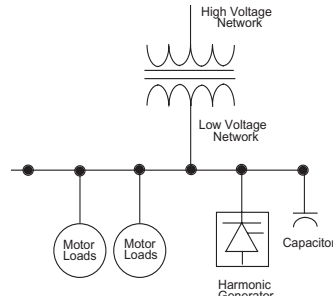


Fig. 9

Overcoming Resonance

If resonance cannot be avoided, an alternative solution is required. A reactor must be connected in series with each capacitor such that the capacitor/reactor combination is inductive at the critical frequencies but capacitive at the fundamental frequency. To achieve this, the capacitor and series connected reactor must have a tuning frequency below the lowest critical order of harmonic, which is usually the 5th. This means the tuning frequency is in the range of 175 Hz to 270 Hz, although the actual frequency will depend upon the magnitude and order of the harmonic currents present.

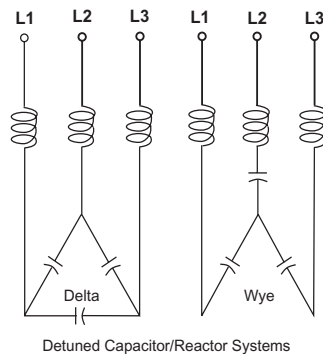


Fig. 10

The addition of a reactor in the capacitor circuit increases the fundamental voltage across the capacitor. Therefore, care should be taken when adding reactors to existing capacitors. See Fig. 10.

Reduction of Harmonic Distortion

Harmonic currents can be significantly reduced in an electrical system by using a harmonic filter.

In its basic form, a filter consists of a capacitor connected in series with a reactor tuned to a specific harmonic frequency. In theory, the impedance of the filter is zero at the tuning frequency; therefore, the harmonic current is absorbed by the filter. This, together with the natural resistance of the circuit, means that only a small level of harmonic current will flow in the network.

Types of Filters

The effectiveness of any filter design depends on the reactive output of the filter, tuning accuracy and the impedance of the network at the point of connection.

Harmonics below the filter tuning frequency will be amplified. The filter design is important to ensure that distortion is not amplified to unacceptable levels. Where there are several harmonics present, a filter may reduce some harmonics while increasing others. A filter for the 7th harmonic creates a parallel

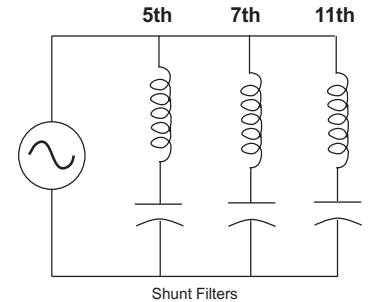


Fig. 11

resonance in the vicinity of the 5th harmonic with magnification of the existing 5th harmonic; therefore, a 7th harmonic filter requires a 5th harmonic filter. See Fig. 11. Consequently, it is often necessary to use a multiple filter design where each filter is tuned to a different frequency. Experience is extremely important in the design of such filters to ensure:

- (a) the most efficient and cost effective solution is selected;
- (b) no adverse interaction between the system and the filter.

Load Alteration

Whenever load expansion is considered, the network is likely to change and existing filter equipment should be evaluated in conjunction with the new load condition. It is not recommended to have two or more filters tuned to the same frequency connected on the same distribution system. Slight tuning differences may cause one filter to take a much larger share of the harmonic distortion. Or, it may cause amplification of the harmonic order which the equipment has been designed to reduce. When there is a need to vary the power factor correction component of a harmonic filter, careful consideration of all load parameters is necessary.

Harmonic Analysis

The first step in solving harmonic related problems is to perform an analysis to determine the specific needs of your electrical distribution system. To determine capacitor and filter requirements, it is necessary to establish the impedance of the supply network and the value of each harmonic current. Capacitor, reactor and filter bank equipment are then specified under very detailed and stringent computer analysis to meet your needs.

Your ABB Solution to Harmonics

ABB is the world's largest manufacturer of dry type low voltage capacitors! ABB Control Inc. utilizes this experience in recommending three options to solve the problems associated with applying capacitors to systems having harmonic distortion:

1. Apply the correct amount of capacitance (kvar) to the network to avoid resonance with the source. This may be difficult, especially in automatic systems as the capacitance is always changing. This solution usually means connecting less capacitance to the system than is actually needed for optimum power factor correction.
2. Install reactors in series with capacitors to lower the resonance below critical order harmonics; i.e., 5th, 7th, 11th & 13th. This design tunes the resonant frequency of the system well below the critical harmonic and is called an anti-resonance bank. This solution allows the capacitors to operate in a harmonic environment.

3. Filters are recommended if a problem exists with harmonic distortion before the application of power factor correction, or if the harmonic distortion is above the limits recommended in IEEE 519, "Guide for Harmonic Control and Reactive Compensation of Static Power Converters". (The recommended limits for voltage distortion in IEEE 519 are presently 5% for general applications.) Tuned filters sized to reduce the harmonic distortion at critical frequencies have the benefits of correcting the power factor and improving the network power quality.

With our knowledge of harmonics, ABB provides a complete range of products from individual capacitors, fixed banks and automatic banks, to power filter systems. All these products utilize dry type low voltage ABB power factor correction capacitor elements which are self-healing for internal faults.

To maintain stringent quality control standards, most control components found in automatic and anti-resonance filter bank products are also ABB products. These products include contactors, circuit breakers, control relays, disconnect switches, power factor relays and pushbutton devices.

ABB Capacitor Features & Services

Every ABB Control low voltage capacitor product incorporates our unique dry type design. Therefore, environmental and personnel concerns associated with leakage or flammability of conventional oil-filled units are eliminated. Other features include:

- Patented Sequential Protection System includes dry, self-healing design; internally protected elements; and dry, non-flammable vermiculite filler
- Individual units, fixed and automatic capacitor bank designs, 208-600V
- Automatic and fixed tuned or anti-resonance capacitor banks
- Power factor and harmonic studies
- UL and CSA

Sizing capacitors at the motor load Using formulas

Sizing Capacitors at the Motor Load

When the determination is made that power factor correction capacitors ARE a good investment for a particular electrical system, you need to know:

- How many capacitors are needed?
- What sizes are appropriate?

The capacitor provides a local source of reactive current. With respect to inductive motor load, this reactive power is the magnetizing or "no-load current" which the motor requires to operate.

A capacitor is properly sized when its full load current rating is 90% of the no-load current of the motor. This 90% rating avoids overcorrection and the accompanying problems such as overvoltages.

One Selection Method: Using Formulas

If no-load current is known . . .

The most accurate method of selecting a capacitor is to take the no-load current of the motor, and multiply by .90 (90%). Take this resulting figure, turn to the appropriate catalog page, and determine which kvar size is needed, catalog number, enclosure type, and price.

EXAMPLE: Size a capacitor for a 100hp, 460V 3-phase motor which has a full load current of 124 amps and a no-load current of 37 amps.

1. Multiply the no-load current figure of 37 amps by 90%.

$$37 \text{ no load amps} \times 90\% = 33 \text{ no load amps}$$

2. Turning to the catalog page for 480 volt, 3-phase capacitors, find the closest amp rating to, but NOT OVER 33 amps. See Table 1, sample catalog pricing chart. Per the sample chart the closest amperage is 32.5 amps. The proper capacitor unit, then is 27 kvar and the appropriate catalog number depends on the type enclosure desired.

NOTE

The formula method corrects power factor to approximately .95

If the no load current is not known . . .

If the no-load current is unknown, a reasonable estimate for 3-phase motors is to take the full load amps and multiply by 30%. Then take that figure and multiply times the 90% rating figure being used to avoid overcorrection and overvoltages.

EXAMPLE: Size a capacitor for a 75hp, 460V 3-phase motor which has a full load current of 92 amps and an unknown no-load current.

1. First, find the no-load current by multiplying the full load current times 30%.

$$92 \text{ (full load amps)} \times 30\% = 28 \text{ estimated no-load amps}$$

2. Multiply 28 no-load amps by 90%.

$$28 \text{ no-load amps} \times 90\% = 25 \text{ no-load amps}$$

3. Now examine the capacitor pricing and selection chart for 480 volt, 3-phase capacitors. Refer again to Table 1. Here it will be seen that the closest capacitor to 25 amps full load current without going over is a 20 kvar unit, rated at 24.1 amps.

4. The correct selection, then, is 20 kvar!

TABLE 1
480 VOLT, 60 Hz., 3-Phase

Enclosure Size	kvar Rating	Rated Current Per Phase	Approx. Shipping Weight (Lbs.)	Indoor - Nema 1	Outdoor - Nema 3R	Indoor - Nema 12
				Catalog Number	Catalog Number	Catalog Number
	1.5	1.8	8	C484G1.5	C484R1.5	C484D1.5
	2	2.4	8	C484G2	C484R2	C484D2
	2.5	3.0	8	C484G2.5	C484R2.5	C484D2.5
	3	3.6	8	C484G3	C484R3	C484D3
	4	4.8	8	C484G4	C484R4	C484D4
	5	6.0	8	C484G5	C484R5	C484D5
	6	7.2	8	C484G6	C484R6	C484D6
	7.5	9.0	8	C484G7.5	C484R7.5	C484D7.5
	10	12.0	13	C484G10	C484R10	C484D10
	12	14.4	13	C484G12	C484R12	C484D12
	15	18.0	13	C484G15	C484R15	C484D15
	18	21.7	13	C484G18	C484R18	C484D18
	19	22.8	13	C484G19	C484R19	C484D19
	20	24.1	13	C484G20	C484R20	C484D20
	21	25.3	13	C484G21	C484R21	C484D21
	22	26.5	13	C484G22	C484R22	C484D22
	22.5	27.1	13	C484G22.5	C484R22.5	C484D22.5
	24	28.9	13	C484G24	C484R24	C484D24
	25	30.0	13	C484G25	C484R25	C484D25

Sizing capacitors at the motor load Using charts

An Alternate Selection Method — Using Charts

TABLE 2: Suggested Maximum Capacitor Ratings for T-Frame NEMA Class B Motors

Induction motor rating (HP)	NOMINAL MOTOR SPEED											
	3600 R/Min		1800 R/Min		1200 R/Min		900 R/Min		720 R/Min		600 R/Min	
	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)	Capacitor rating (kvar)	Line current reduction (%)
3	1.5	14	1.5	23	2.5	28	3	38	3	40	4	40
5	2	14	2.5	22	3	26	4	31	4	40	5	40
7.5	2.5	14	3	20	4	21	5	28	5	38	6	45
10	4	14	4	18	5	21	6	27	7.5	36	8	38
15	5	12	5	18	6	20	7.5	24	8	32	10	34
20	6	12	6	17	7.5	19	9	23	12	25	18	30
25	7.5	12	7.5	17	8	19	10	23	12	25	18	30
30	8	11	8	16	10	19	14	22	15	24	22.5	30
40	12	12	13	15	16	19	18	21	22.5	24	25	30
50	15	12	18	15	20	19	22.5	21	24	24	30	30
60	18	12	21	14	22.5	17	26	20	30	22	35	28
75	20	12	23	14	25	15	28	17	33	14	40	19
100	22.5	11	30	14	30	12	35	16	40	15	45	17
125	25	10	36	12	35	12	42	14	45	15	50	17
150	30	10	42	12	40	12	52.5	14	52.5	14	60	17
200	35	10	50	11	50	10	65	13	68	13	90	17
250	40	11	60	10	62.5	10	82	13	87.5	13	100	17
300	45	11	68	10	75	12	100	14	100	13	120	17
350	50	12	75	8	90	12	120	13	120	13	135	15
400	75	10	80	8	100	12	130	13	140	13	150	15
450	80	8	90	8	120	10	140	12	160	14	160	15
500	100	8	120	9	150	12	160	12	180	13	180	15

Applies to three-phase, 60Hz motors when switched with capacitors as a single unit.

Another method of selecting the proper capacitor employs the use of only a selection chart shown in Table 2 or 3. These tables take other variables such as motor RPM into consideration in making recommendations for capacitor applications. They are convenient because they only require that the user know the horsepower and RPM of the motor. Both tables estimate the percentage reduction in full load current drawn by the motor as a result of the capacitor's installation.

WARNING!

NEVER OVERSIZE CAPACITORS OR EXCEED 1.0 POWER FACTOR OR RESULTING PROBLEMS WITH THE MOTOR CAN OCCUR!!

If calculations or a kvar determination chart indicate a kvar rating not found in a pricing and selection chart, always refer to the next lower kvar rating!

EXAMPLE: A manufacturer needs to determine the proper capacitors required for a 1200 RPM, 75HP T-Frame NEMA class B motor.

1. First find 75 in the horsepower column of the chart.
2. Locate the 1200 RPM capacitor rating (kvar) column. Note the figure of 25 kvar.
3. Now refer to the appropriate pricing and selection chart Table 1, page 6.11. The appropriate kvar rating is 25 kvar. Depending on the desired enclosure, the price and catalog number can then be easily determined.

NOTE

Using the above charts for selecting capacitors will correct power to approximately .95.

TABLE 3: Suggested Maximum Capacitor Ratings for U-Frame NEMA Class B Motors

H.P. Rating	NEMA Motor Design A or B Normal Starting Torque Normal Running Current											
	3600 RPM		1800 RPM		1200 RPM		900 RPM		720 RPM		600 RPM	
	kvar	%AR	kvar	%AR	kvar	%AR	kvar	%AR	kvar	%AR	kvar	%AR
3	1.5	14	1.5	15	1.5	20	2	27	2.5	35	3.5	41
5	2	12	2	13	2	17	3	25	4	32	4.5	37
7.5	2.5	11	2.5	13	2	15	4	22	5.5	30	6	34
10	3	10	3	11	3.5	14	5	21	6.5	27	7.5	31
15	4	9	4	10	5	13	6.5	18	8	23	9.5	27
20	5	9	5	10	5	11	7.5	18	10	20	10	25
25	5	6	5	8	7.5	11	7.5	13	10	20	10	21
30	5	5	5	8	7.5	11	10	15	15	22	15	25
40	7.5	8	10	8	10	10	15	16	15	18	15	20
50	10	7	10	8	10	9	15	12	20	15	25	22
60	10	6	10	8	15	10	15	11	20	15	25	20
75	15	7	15	8	15	9	20	11	30	15	40	20
100	20	8	20	8	25	9	30	11	40	14	45	18
125	20	6	25	7	30	9	30	10	45	14	50	17
150	30	6	30	7	35	9	40	10	50	17	60	17
200	40	6	40	7	45	8	55	11	60	12	75	17
250	45	5	45	6	60	9	70	10	75	12	100	17
300	50	5	50	6	75	9	75	9	80	12	105	17

Applies to three-phase, 60Hz motors when switched with capacitors as a single unit.

Sizing capacitors at the motor load

Using charts

Power factor correction chart

Original power factor in percent	DESIRED CORRECTED POWER FACTOR IN PER CENT																				
	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
50	0.982	1.008	1.034	1.060	1.086	1.112	1.139	1.165	1.192	1.220	1.248	1.276	1.306	1.337	1.369	1.403	1.442	1.481	1.529	1.590	1.732
51	.937	.962	.989	1.015	1.041	1.067	1.094	1.120	1.147	1.175	1.203	1.231	1.261	1.292	1.324	1.358	1.395	1.436	1.484	1.544	1.687
52	.893	.919	.945	.971	.997	1.023	1.050	1.076	1.103	1.131	1.159	1.187	1.217	1.248	1.280	1.314	1.351	1.392	1.440	1.500	1.643
53	.850	.876	.902	.928	.954	.980	1.007	1.033	1.060	1.088	1.116	1.144	1.174	1.205	1.237	1.271	1.308	1.349	1.397	1.457	1.600
54	.809	.835	.861	.887	.913	.939	.966	.992	1.019	1.047	1.075	1.103	1.133	1.164	1.196	1.230	1.267	1.308	1.356	1.416	1.669
55	.769	.795	.821	.847	.873	.899	.926	.952	.979	1.007	1.035	1.063	1.090	1.124	1.156	1.190	1.228	1.268	1.316	1.377	1.519
56	.730	.756	.782	.808	.834	.860	.887	.913	.940	.968	.996	1.024	1.051	1.085	1.117	1.151	1.189	1.229	1.277	1.338	1.480
57	.692	.718	.744	.770	.796	.822	.849	.875	.902	.930	.958	.986	1.013	1.047	1.079	1.113	1.151	1.191	1.239	1.300	1.442
58	.655	.681	.707	.733	.759	.785	.812	.838	.865	.893	.921	.949	.976	1.010	1.042	1.076	1.114	1.154	1.202	1.263	1.405
59	.618	.644	.670	.696	.722	.748	.775	.801	.828	.856	.884	.912	.939	.973	1.005	1.039	1.077	1.117	1.165	1.226	1.368
60	.584	.610	.636	.662	.688	.714	.741	.767	.794	.822	.850	.878	.907	.939	.971	1.005	1.043	1.083	1.131	1.192	1.334
61	.549	.575	.601	.627	.653	.679	.706	.732	.759	.787	.815	.843	.870	.907	.936	.970	1.008	1.048	1.096	1.157	1.299
62	.515	.541	.567	.593	.619	.645	.672	.698	.725	.753	.781	.809	.836	.870	.902	.936	.974	1.014	1.062	1.123	1.265
63	.483	.509	.535	.561	.587	.613	.640	.666	.693	.721	.749	.777	.804	.838	.870	.904	.942	.982	1.030	1.091	1.233
64	.450	.476	.502	.528	.554	.580	.607	.633	.660	.688	.716	.744	.771	.805	.837	.871	.909	.949	.997	1.058	1.200
65	.419	.445	.471	.497	.523	.549	.576	.602	.629	.657	.685	.713	.740	.774	.806	.840	.878	.918	.966	1.027	1.169
66	.368	.414	.440	.466	.492	.518	.545	.571	.598	.626	.654	.682	.709	.743	.775	.809	.847	.887	.935	.996	1.138
67	.358	.384	.410	.436	.462	.488	.515	.541	.568	.596	.624	.652	.679	.713	.745	.779	.817	.857	.905	.966	1.108
68	.329	.355	.381	.407	.433	.459	.486	.512	.539	.567	.595	.623	.650	.684	.716	.750	.788	.828	.876	.937	1.079
69	.299	.325	.351	.377	.403	.429	.456	.482	.509	.537	.565	.593	.620	.654	.686	.720	.758	.798	.840	.901	1.049
70	.270	.296	.322	.348	.374	.400	.427	.453	.480	.508	.536	.564	.591	.625	.657	.691	.729	.769	.811	.878	1.020
71	.242	.268	.294	.320	.346	.372	.399	.425	.452	.480	.508	.536	.563	.597	.629	.663	.701	.741	.783	.850	.992
72	.213	.239	.265	.291	.317	.343	.370	.396	.423	.451	.479	.507	.538	.568	.600	.634	.672	.712	.754	.821	.963
73	.186	.212	.238	.264	.290	.316	.343	.369	.396	.424	.452	.480	.507	.541	.573	.607	.645	.685	.727	.794	.936
74	.159	.185	.211	.237	.263	.289	.316	.342	.369	.397	.425	.453	.480	.514	.546	.580	.616	.658	.700	.767	.909
75	.132	.158	.184	.210	.236	.262	.289	.315	.342	.370	.398	.426	.453	.487	.519	.553	.591	.631	.673	.740	.882
76	.105	.131	.157	.183	.209	.235	.262	.288	.315	.343	.371	.399	.426	.460	.492	.526	.564	.604	.652	.713	.855
77	.079	.105	.131	.157	.183	.209	.236	.262	.289	.317	.345	.373	.400	.434	.466	.500	.538	.578	.620	.687	.829
78	.053	.079	.105	.131	.157	.183	.210	.236	.263	.291	.319	.347	.374	.408	.440	.474	.512	.552	.594	.661	.803
79	.026	.052	.078	.104	.130	.156	.183	.209	.236	.264	.292	.320	.347	.381	.413	.447	.485	.525	.567	.634	.776
80	.000	.026	.052	.078	.104	.130	.157	.183	.210	.238	.266	.294	.321	.355	.387	.421	.459	.499	.541	.608	.750
81	-	.000	.026	.052	.078	.104	.131	.157	.184	.212	.240	.268	.295	.329	.361	.395	.433	.473	.515	.582	.724
82	-	-	.000	.026	.052	.078	.105	.131	.158	.186	.214	.242	.269	.303	.335	.369	.407	.447	.489	.556	.698
83	-	-	-	.000	.026	.052	.079	.105	.132	.160	.188	.216	.243	.277	.309	.343	.381	.421	.463	.530	.672
84	-	-	-	-	.000	.026	.053	.079	.106	.134	.162	.190	.217	.251	.283	.317	.355	.395	.437	.504	.646
85	-	-	-	-	-	.000	.027	.053	.080	.108	.136	.164	.191	.225	.257	.291	.329	.369	.417	.478	.620
86	-	-	-	-	-	-	.000	.026	.053	.081	.109	.137	.167	.198	.230	.265	.301	.343	.390	.451	.593
87	-	-	-	-	-	-	-	.000	.027	.055	.082	.111	.141	.172	.204	.238	.275	.317	.364	.425	.567
88	-	-	-	-	-	-	-	-	.000	.028	.056	.084	.114	.145	.177	.211	.248	.290	.337	.398	.540
89	-	-	-	-	-	-	-	-	-	.000	.028	.056	.086	.117	.149	.183	.220	.262	.309	.370	.512
90	-	-	-	-	-	-	-	-	-	-	.000	.028	.058	.089	.121	.155	.192	.234	.281	.342	.484
91	-	-	-	-	-	-	-	-	-	-	-	.000	.030	.061	.093	.127	.164	.206	.253	.314	.456
92	-	-	-	-	-	-	-	-	-	-	-	-	.000	.031	.063	.097	.134	.176	.223	.284	.426
93	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.032	.066	.103	.145	.192	.253	.395
94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.034	.071	.113	.160	.221	.363
95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.037	.079	.126	.187	.328
96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.042	.089	.150	.292
97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.047	.108	.251
98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.061	.203
99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.142

Sizing Capacitors for Improving System Power Factor

Sizing and selecting capacitors for system power factor correction is calculated using a Power Factor Correction Chart. Before this chart can be used, however, the total kW requirement needs to be known for the ENTIRE system in addition to the PRESENT and DESIRED power factors.

EXAMPLE: A plant has a present power factor level of .75; a load draws 806 amps at 480V; average power consumption of 500kW; and a desired power factor level of .90. Compute the necessary capacitance required and select the proper automatic and fixed bank unit.

1. First, look at the left hand column of the Power Factor Correction chart entitled "Original Power Factor". Find your current power factor level of .75.
2. Second, follow the column of figures to the right of the .75 figure until you come to the column entitled ".90" (your desired power factor level).

3. The number in that row is .398. Now multiply this figure by the total plant kW of 500:

$$.398 \times 500\text{kW} = 199 \text{ kvar}$$

4. The resulting total of 199 represents the amount of capacitive power (kvar) required to bring the power factor to the desired level of .90.

5. Referring to the sample selection charts (See Table 4 or Table 5, next page), select the appropriate kvar rating.

NOTE: When selecting automatic bank units, select the closest kvar rating to the amount of kvar desired based on present and future applications. If the desired rating is not listed, the next higher kvar rating should be selected. When selecting fixed bank units, however, select the kvar rating WITHOUT GOING OVER (See Warning, page 6.12) the desired capacitance level.

In this example for the automatic capacitor bank, 200 kvar is the closest to the desired 199 kvar. For the fixed capacitor bank, 180 kvar should be selected without going over the desired kvar of 199.

Sizing capacitors at the motor load Using charts

What if Present Power Factor Cannot Be Determined Because kVA is Unknown?

1. First, find the apparent power (kVA). kVA demand on a 3-phase system is equal to:

$$\text{kVA} = \text{VOLTS} \times \text{AMPS} \times \sqrt{3} \div 1000$$

2. The voltage and amperage of the distribution system will be known. Again, using the above example, we know that the distribution system is 480 volts and draws 806 amps. Therefore:

$$480 \text{ VOLTS} \times 806 \text{ AMPS} \times \sqrt{3} \div 1000 = 670 \text{ kVA}$$

3. Now power factor can be solved for:

$$500 \text{ kW} / 670 \text{ kVA} = .746 \text{ pf}$$

4. With the power factor now known, the Power Factor Improvement chart can be used as before.

How is the Power Factor Correction Chart Used if Existing Power Factor Level is Unknown?

1. First, power factor has to be calculated. Power factor is equal to active power (kW) divided by apparent power (kVA). kW will be known because it is the total amount of power consumed over a given period of time and is the amount shown on a utility bill. Therefore:

$$\text{pf} = \text{kW} / \text{kVA}$$

2. Using the above example, 500kW divided by 670kVA equals a present power factor (pf) of .746.

$$500 \text{ kW} / 670 \text{ kVA} = .746 \text{ pf}$$

3. When DETERMINING power factor, always round off to the next higher rating. Therefore, the .746 power factor figure is rounded off to .75.

NOTE: Don't confuse rounding UP a power factor figure that is manually calculated with the warning on page 46 that tells you to round DOWN when using a catalog selection chart!

4. Now that present power factor is known, the above problem can be solved as before.

FINAL EXAMPLE: A manufacturer has a 480 volt, 3-phase metered demand of 460kW. An ammeter on the system shows total current draw of 770 amps. Existing power factor and apparent power (kVA) are unknown. What is the existing system power factor and how much capacitance is required to correct to .92?

1. First, solve for kVA.

$$480 \text{ VOLTS} \times 770 \text{ AMPS} \times \sqrt{3} \div 1000 = 640 \text{ kVA}$$

2. Next, solve for Power Factor.

$$460 \text{ kW} / 640 \text{ kVA} = .72 \text{ POWER FACTOR}$$

3. To correct the power factor from .72 to .92 refer to the Power Factor

TABLE 4 - Fixed Capacitor Banks

110	2/55	F246G110
120	2/60	F246G120
130	1/40, 2/45	F246G130
150	3/50	F246G150
160	2/80	F246G160
180	3/60	F246G180
200	4/50	F246G200
240	4/50	F246G240

TABLE 5 - Automatic Capacitor Banks

125	AA4G150B6A	AA4D125B
150	AA4G150B6A	AA4D150B6A
175	AA4G175B7A	AA4D175B7A
200	AA4G200B8A	AA4D200B8A
225	AA4G225B9A	AA4D225B9A
250	AA4G250B10A	AA4D250B10A
300	AA4G300B12A	AA4D300B12A

Correction Chart on page 47. A factor of .534 will be determined.

4. The final step is to multiply the 460kW figure by the correction factor of .534.

$$460 \text{ kW} \times .534 = 245 \text{ kvar}$$

This system would require the installation of 245 kvar of capacitance to improve the power factor to .92. Refer to the appropriate automatic or fixed bank catalog pages, select the proper voltage and phase, then identify the proper catalog number.

Typical recommended ratings of cables & protected devices

Typical recommended ratings of cables and protected devices

3- Phase Capacitor kVar	Rated Current Per Phase (amps)	Minimum Copper Cable Size for 75oC Insulation	Recommended fuse amps Type Class RK5 (Time Delay)	Recommended Disconnect Switch Amps	Recommended MCCB Trip Amps
240 Volt					
2.5	6	#14	10	30	15
3.5	8.4	#14	15	30	15
5	12	#14	20	30	20
7.5	18	#12	30	30	30
10	24	#10	40	60	40
15	36	#6	60	60	60
20	48	#4	80	100	80
25	60	#4	100	100	90
30	72	#2	125	200	110
40	96	#1	175	200	150
50	120	1/0	200	200	200
60	144	2/0	250	400	225
75	180	250 kcmil	300	400	300
100	241	400 kcmil	400	400	400
125	301	(2) - 4/0	500	600	500
150	361	(2) - 250 kcmil	600	600	600
200	481	(2) - 400 kcmil	800	800	750
250	601	(3) - 300 kcmil	1000	1000	900
300	722	(3) - 400 kcmil	1200	1200	1100
480 Volt					
1.5	1.8	#14	3	30	15
2	1.8	#14	3	30	15
2.5	3	#14	6	30	15
3	3.6	#14	6	30	15
3.5	4.2	#14	10	30	15
4	4.8	#14	10	30	15
5	6	#14	10	30	15
6	7.2	#14	15	30	15
6.5	7.8	#14	15	30	15
7.5	9	#14	15	30	15
10	12	#14	20	30	20
15	18	#12	30	30	30
20	24	#10	40	60	40
25	30	#8	50	60	50
30	36	#6	60	60	60
35	42	#6	70	100	70
40	48	#4	80	100	80
45	54	#4	90	100	90
50	60	#4	100	100	90
60	72	#2	125	200	110
70	84	#1	150	200	150
75	90	#1	150	200	150
80	96	#1	175	200	150
90	108	1/0	200	200	175
100	120	2/0	200	200	200
150	180	250 kcmil	300	400	300
200	241	400 kcmil	400	400	400
250	301	(2) - 4/0	500	600	500
300	361	(2) - 250 kcmil	600	600	600
350	421	(2) - 300 kcmil	700	800	650
400	481	(2) - 400 kcmil	800	800	750
500	601	(3) - 300 kcmil	1000	1000	902

Typical recommended ratings of cables & protected devices

Typical recommended ratings of cables and protected devices

3-Phase Capacitor kvar	Rated Current Per Phase (amps)	Minimum Copper Cable Size for 75°C Insulation	Recommended fuse amps Type RK5 (Time Delay)	Recommended Disc Switch Amps	Recommended MCCB Trip Amps
600 Volt					
2	2	#14	3	30	15
3	3	#14	6	30	15
4	4	#14	6	30	15
5	5	#14	10	30	15
7.5	7	#14	15	30	15
10	10	#14	20	30	15
15	14	#14	25	30	25
20	19	#10	35	60	30
25	24	#10	40	60	40
30	29	#8	50	60	50
35	34	#8	60	60	60
40	38	#6	70	100	60
45	43	#6	80	100	70
50	48	#4	80	100	80
60	58	#4	100	100	90
70	67	#2	125	200	110
80	77	#2	150	200	125
90	87	#1	150	200	150
100	96	#0	175	200	150
150	144	3/0	250	400	225
200	192	300 kcmil	350	400	300
250	241	400 kcmil	400	400	400
300	289	(2) - 3/0	500	600	450
350	337	(2) - 4/0	600	600	550
400	385	(2) - 300 kcmil	650	800	600
500	481	(2) - 400 kcmil	800	800	750

NOTE: Cable sizes are derived from Article 310, Table 310-16 of 2002 **NEC**®

The above table gives recommended ratings of cables, disconnect switches, and/or molded case circuit breakers for use with capacitor loads. For requirements not covered in the table, the following application guidelines may be used for capacitor switching duty:

- Power Cable Sizing 135% of Capacitor Current
- Disconnect Switch 165% of Capacitor Current
- Molded Case Circuit Breaker 135% of Capacitor Current

Note: For specific applications, refer to the NEC®.

Extract from NEC® Separate overcurrent protection

Extract from 2002 NEC® Code Requirements

460-8. Conductors.

(A) Ampacity. The ampacity of capacitor circuit conductors shall not be less than 135 percent of the rated current of the capacitor. The ampacity of conductors that connect a capacitor to the terminals of a motor or to motor circuit conductors shall not be less than one third the ampacity of the motor circuit conductors and in no case less than 135 percent of the rated current of the capacitor.

(B) Overcurrent Protection. An overcurrent device shall be provided in each ungrounded conductor for each capacitor bank. The rating or setting of the overcurrent device shall be as low as practicable.

Exception: A separate overcurrent device shall not be required for a capacitor connected on the load side of a motor overload protective device.

(C) Disconnecting Means. A disconnecting means shall be provided in each ungrounded conductor for each capacitor bank and shall meet the following requirements.

(1) The disconnecting means shall open all ungrounded conductors simultaneously.

(2) The disconnecting means shall be permitted to disconnect the capacitor from the line as a regular operating procedure.

(3) The rating of the disconnecting means shall not be less than 135 percent of the rated current of the capacitor.

Exception: A separate disconnecting means shall not be required where a capacitor is connected on the load side of a motor controller.

460-9. Rating or Setting of Motor Overload Device. Where a motor installation includes a capacitor connected on the load side of the motor overload device, the rating or setting of the motor overload device shall be based on the improved power factor of the motor circuit.

The effect of the capacitor shall be disregarded in determining the motor circuit conductor rating in accordance with Section 430-22.

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Separate overcurrent protection

A separate overcurrent device is not necessary when an ABB capacitor is electrically connected on the load side of the motor starter fused safety switch or breaker. Personnel and facility short circuit protection is provided within the capacitor by ABB's patented Sequential Protection System. Short circuit protection between the main feed and the capacitor is provided by the motor starter fused safety switch or breaker. A disconnect switch can be provided when the capacitor is connected as illustrated in Option C (See Fig. 12). When the capacitor is connected as shown in Option C, the capacitor remains energized when the motor is off. The optional disconnect switch provides a means to disconnect the capacitor when the motor is not in operation.

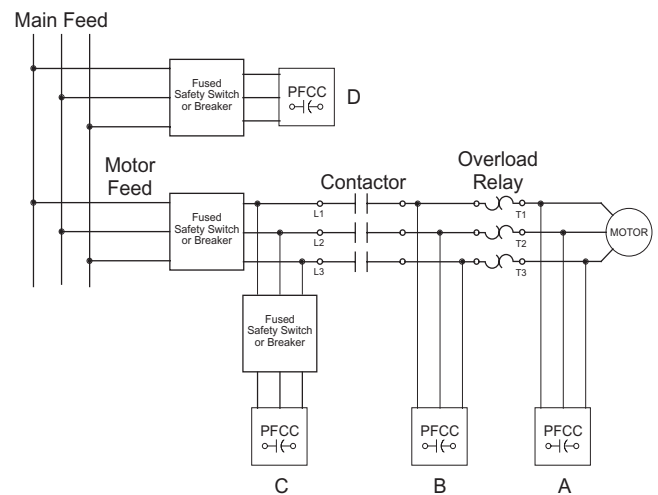


Fig. 12

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Notes

Panels • MCCs • Distribution Systems



Systems
Panels
Motor control centers
Distribution systems



Description

The Modular New System (MNS) offers the user many alternative solutions and notable advantages in comparison with conventional-type installations:

- Compact, space saving design
- Back-to-back arrangement
- Economic energy distribution in the cubicles
- Easy project and detail engineering through standardized components
- Comprehensive range of standardized types
- Various design levels depending on operating and environmental conditions
- Easy combination of the different equipment systems, such as fixed and withdrawable modules in a single cubicle
- Arc-proof design possible (standard design with fixed module design)
- Earthquake, vibration and shock proof design is possible
- Easy assembly without special tools
- Easy conversion and retrofit
- Largely maintenance-free
- High operational reliability and availability

- Optimum personal protection

Applications

MNS systems are suitable for applications in all fields concerning distribution and use of electrical energy:

- Main and sub-distribution boards for energy
- Motor current supply of motor control centers
- Electronic cabinets for open and closed-loop control purposes
- For use in:
 - Utility companies
 - Power plants
 - Oil refineries
 - Off-shore drilling platforms
 - Ships
 - Production facilities
 - Sewage management
 - Buildings for other than dwelling purposes

Standards

Type tested switchgear assemblies (TTA)
IEC 439-1; EN 60-439; DIN VDE 0660, part 500;
BS 5486, UTE 63-412

Test certificates

- Germanischer Lloyd, Hamburg (shipping)
- ASTA; Great-Britain (resist. to accidental arcs according to IEC 1641, VDE 0660 part 508)
- Federal Ministry for Regional Planning
- Building and Urban Development, Bonn (shelters)
- DRL German Research Institute for Aerospace e.V., Jülich, Earthquake Test for Security Areas in Nuclear Power Stations

Contact factory for more information.



Notes

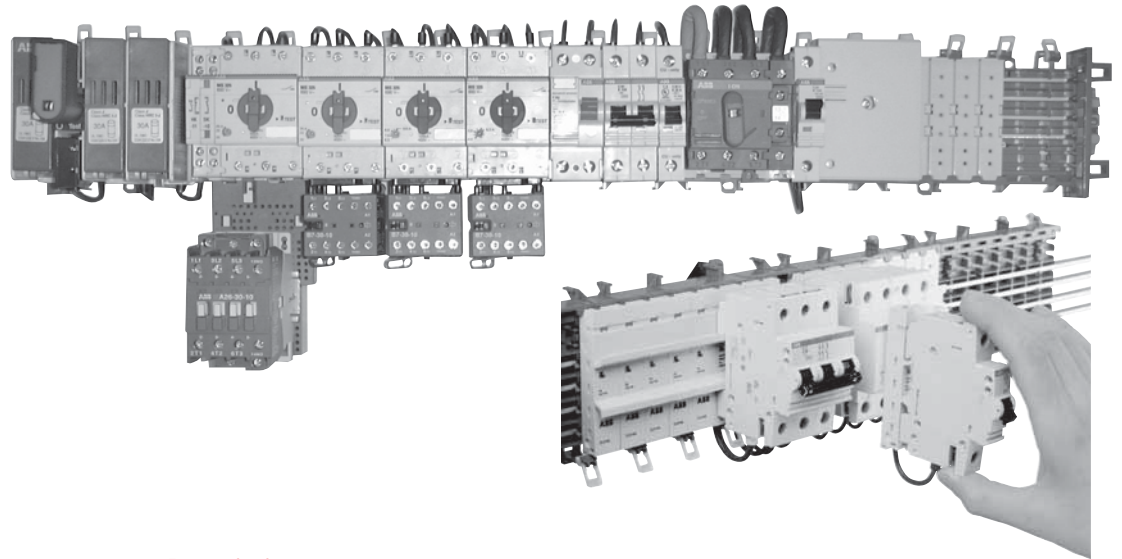
Modular power distribution bus system

smissline



smissline

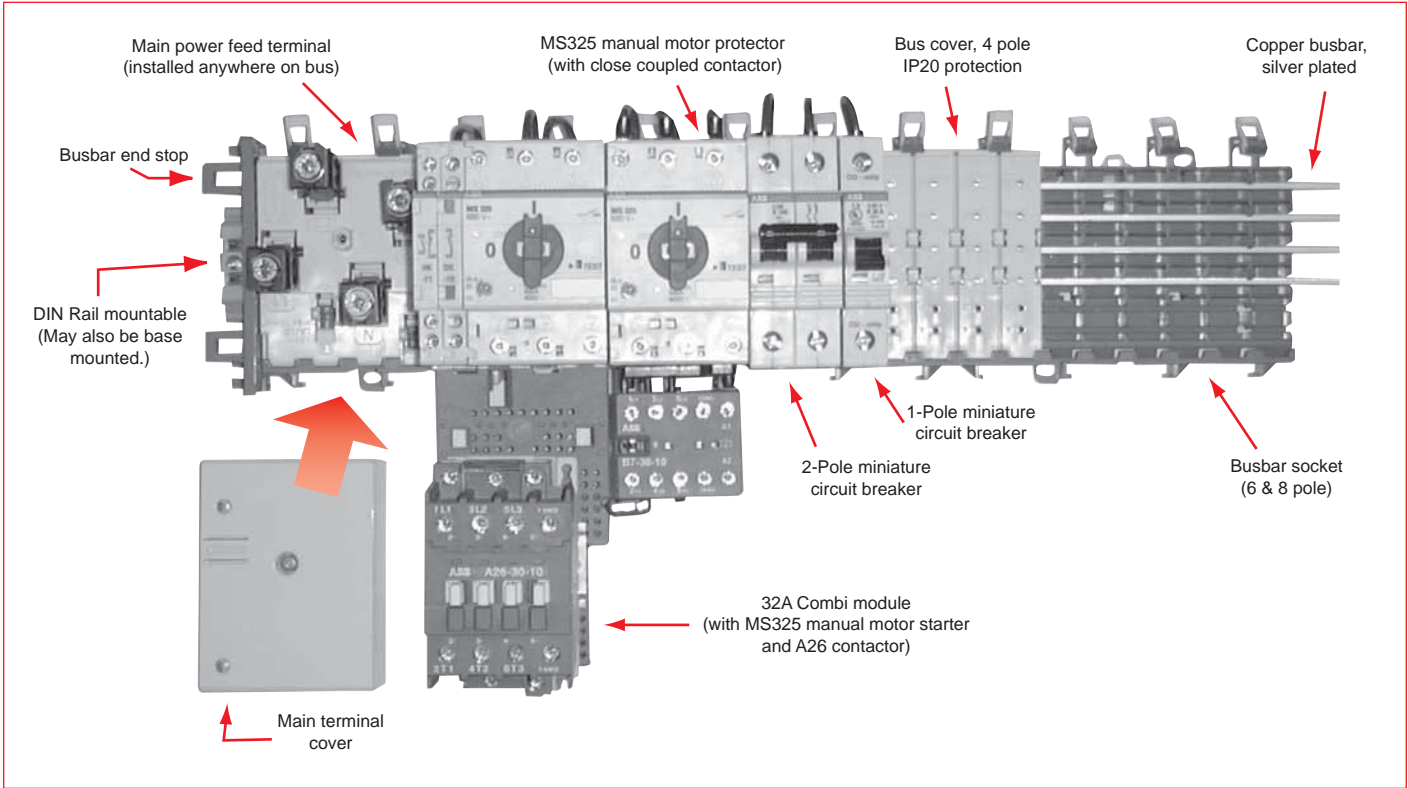
Modular power distribution bus system

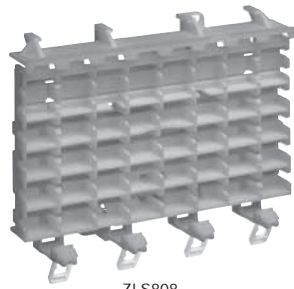


Description

- The smissline power distribution bus system provides a versatile and flexible means of distributing power to a wide variety of electrical devices. Ideal for group motor installations and ABB modular DIN rail products
- Hot swappable socket mounted components.
- Individual devices may be turned off and safely removed without turning off power to the whole bus.
- Bus system "Starter kits" available in various lengths, can also be easily cut down for custom installations.
- Busbar rated 100A when end fed and up to 200A when center fed. Main power feed terminals may be installed anywhere along the bus system.
- Individual bus stab adapters are available in L1, L2, L3 and N phase connections; they can be connected together to form multi-pole units. Unwired modules are available where bus connection is not required. 18mm width.
- Snap-on installation. No tools required to install or remove bus mounted components.
- System can be DIN rail or base mounted.
- Bus covers protect unused portions of the bus from accidental contact providing total bus isolation and IP20 finger safe protection.
- Reputable history of performance and reliability.
- UL508 Recognized, UL File No. E222110.

Components

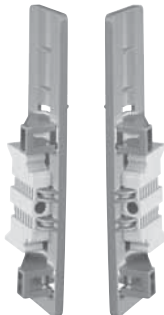




ZLS808



ZLS200



ZLS730



ZLS224



ZLS251



ZLS240

Sockets

Number of Modules	Length (inches)	Catalog number	List price
8	5.7	ZLS808	\$ 30
6	4.3	ZLS806	28

Bus bar — 100A for L1, L2 L3, neutral and ground

	Length (inches)	Catalog number	List price
Cut to desired length	78.7	ZLS200	\$ 95

End stops

	Catalog number	List price
Left and right included	ZLS730	\$ 30

Main power feed terminals

Width in modules	End feed (A)	Center feed (A)	Phases	Wire range AWG	Catalog number	List price
4	100	150	3P 3P+N	10-1/0	ZLS225 ZLS224	\$ 110 120
2	100	200	N L1 L2 L3	8-4/0	ZLS250 ZLS251 ZLS252 ZLS253	60

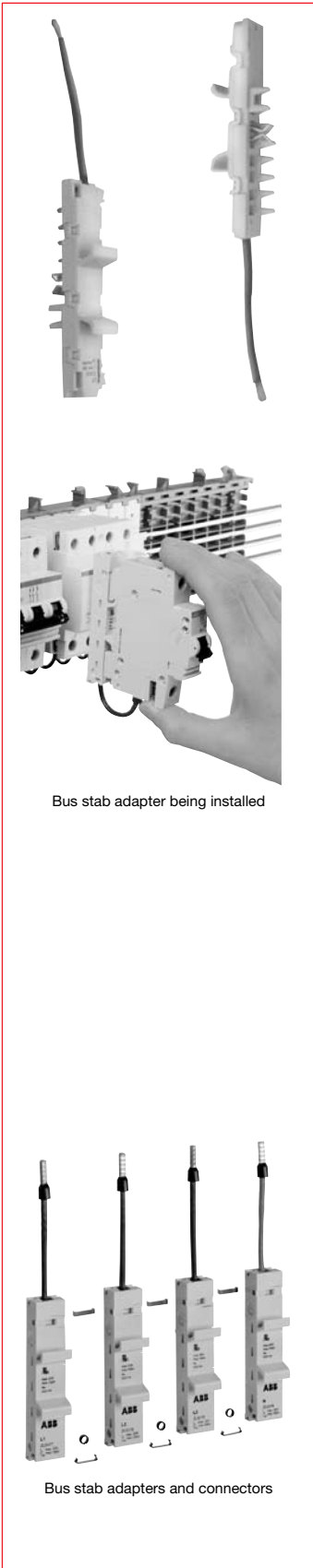
Main power feed bus stab adaptor

Width in modules	End feed (A)	Center feed (A)	Phases	Catalog number	List price
4	100	100	3P	ZLS240	\$ 110
4	100	100	3P+N	ZLS241	120

Combi module

Description	Width Mods	Qty	Catalog number	List price
Bottom clip Bottom fed	3	1	ZLS8403LWB-S	\$ 110
Bottom clip Top fed	3	1	ZLS8403LWT-S	

For connecting MMP, contactor, and breaker combinations to busbar.



Bus stab adapter being installed

Bus stab adapters and connectors

Bus stab adapters

	Current Rating (A)	Phase	Catalog number	List price
Top Clip Top Fed	32	N	ZLS160	\$ 20
		L1	ZLS161	20
		L2	ZLS162	20
		L3	ZLS163	20
		L1 300mm	ZLS161L300	23
		L2 300mm	ZLS162L300	23
		L3 300mm	ZLS163L300	23
	L1, L2, L3	ZLS183TT	60	
	63	N	ZLS170	30
		L1	ZLS171	30
		L2	ZLS172	30
		L3	ZLS173	30
		L1 300mm	ZLS171L300	33
L2 300mm		ZLS172L300	33	
L3 300mm	ZLS173L300	33		
L1, L2, L3	ZLS189TT	60		
*	*	ZLSS164	13	
Top Clip Bottom Fed	32	N	ZLS176	20
		L1	ZLS177	20
		L2	ZLS178	20
		L3	ZLS179	20
		L1 300mm	ZLS177L300	23
		L2 300mm	ZLS178L300	23
		L3 300mm	ZLS179L300	23
	L1, L2, L3	ZLS183TB	60	
	63	N	ZLS166	30
		L1	ZLS167	30
		L2	ZLS168	30
		L3	ZLS169	30
		L1 300mm	ZLS167L300	33
L2 300mm		ZLS168L300	33	
L3 300mm	ZLS169L300	33		
L1, L2, L3	ZLS189TB	60		
*	*	ZLS164	13	
Bottom Clip Top Fed	32	N	ZLS176	20
		L1	ZLS177	20
		L2	ZLS178	20
		L3	ZLS179	20
		L1 300mm	ZLS177L300	23
		L2 300mm	ZLS178L300	23
		L3 300mm	ZLS179L300	23
	L1, L2, L3	ZLS183BT	60	
	63	N	ZLS166	30
		L1	ZLS167	30
		L2	ZLS168	30
		L3	ZLS169	30
		L1 300mm	ZLS167L300	23
L2 300mm		ZLS168L300	23	
L3 300mm	ZLS169L300	23		
L1, L2, L3	ZLS189BT	60		
*	*	ZLS164	13	
Bottom Clip, Bottom Fed	32	N	ZLS160	30
		L1	ZLS161	30
		L2	ZLS162	30
		L3	ZLS163	30
		L1 300mm	ZLS161L300	23
		L2 300mm	ZLS162L300	23
		L3 300mm	ZLS163L300	23
	L1, L2, L3	ZLS183BB	60	
	63	N	ZLS170	30
		L1	ZLS171	30
		L2	ZLS172	30
		L3	ZLS173	30
		L1 300mm	ZLS171L300	33
L2 300mm		ZLS172L300	33	
L3 300mm	ZLS173L300	33		
L1, L2, L3	ZLS189BB	60		
*	*	ZLS164	13	

Multi-pole bus stab adapter connectors

Quantity	Catalog number	List price
1 bag	ZLS174	\$ 10

Connection pieces are used to join individual bus stab adapters into any multi-pole configuration desired (L1-L2, L1-N, L1-L2-L3, etc.). Each bag contains enough pieces to make 25 connections. For example, 25 2-pole bus stab adapters or 12 3-pole bus stab adapters.



ZLS100



ZLS101



ZLS722



ZLS239

Bus covers

	Quantity	Catalog number	List price
	5 pack	ZLS100	\$ 25

Covers unused portions of the busbar to protect from physical contact. Supplied as a 4-module unit, separable into 1-module units by snapping it apart.

Bus cover DIN rail extensions

	Quantity	Catalog number	List price
	10 pack	ZLS101	\$ 20

Snaps on to ZLS100 and provides 18mm wide mounting position for any DIN rail mounted device.

Bus covers — High profile

Width in modules	Quantity	Catalog number	List price
1/2 module	5 pack	ZLS721	\$ 23
1 module	5 pack	ZLS722	30

Bus divider

Width in modules	Quantity	Catalog number	List price
1 module	1	ZLS239	\$ 10

Allows a single smisline assembly to be divided into two isolated busbar systems.

Components

Neutral and ground



Neutral and ground sockets

Number of modules	Length (inches)	Catalog number	List price
8	5.7	ZLS811	\$ 17
6	4.3	ZLS810	15

Use ZLS200, 100A busbar from page 20.5.

Neutral terminals

Width in modules	Wire range		Catalog number	List price
	AWG	mm ²		
1/2	14 - 8	10	ZLS812	\$ 22
1	10 - 1	50	ZLS813	40
2	8 - 3/0	95	ZLS254	60

Ground terminals

Width in modules	Wire range		Catalog number	List price
	AWG	mm ²		
1/2	14 - 8	10	ZLS815	\$ 22
1	10 - 1	50	ZLS816	40
2	8 - 3/0	95	ZLS255	60

Neutral and ground bus covers

Description	Width in modules	Quantity	Catalog number	List price
With DIN rail top	1	Package of 10	ZLS832	\$ 25
Flat top	8	Package of 1	ZLS833	5

Labels

Description	Quantity	Catalog number	List price
Self-adhesive, 6 x 17mm	Sheet of 420	ZLS825	\$ 90
Paper (protective cover required)	Sheet of 160	ZLS821	12
Cover	Bag of 100	ZLS820	100

Applications with other ABB products

Manual motor protectors



MS325-1.0

For more information on manual motor protectors, see Section 5.



MS116

Manual motor protectors — Type MS325

Thermal setting range (Amps)	Single-phase horsepower ratings ①		3-phase horsepower ratings			Catalog number	List price
	120V	240V	240V	480V	600V		
0.10 – 0.16	—	—	—	—	—	MS325-0.16	\$ 144
0.16 – 0.25	—	—	—	—	—	MS325-0.25	
0.25 – 0.40	—	—	—	—	—	MS325-0.40	
0.40 – 0.63	—	—	—	—	—	MS325-0.63	
0.63 – 1.0	—	—	—	1/2	1/2	MS325-1.0	165
1.0 – 1.6	—	1/10	—	3/4	3/4	MS325-1.6	
1.6 – 2.5	—	1/6	1/2	1	1.5	MS325-2.5	
2.5 – 4.0	1/8	1/3	1	2	3	MS325-4.0	
4.0 – 6.3	1/4	1/2	1.5	3	5	MS325-6.3	
6.3 – 9.0	1/3	1	2.5	5	7.5	MS325-9.0	
9.0 – 12.5	1/2	2	3	7.5	10	MS325-12.5	192
12.5 – 16	1	2.5	5	10	10	MS325-16	
16 – 20	1.5	3	5	10	15	MS325-20	211.50
20 – 25	2	3	7.5	15	20	MS325-25	223.50

NOTE: Use Discount schedule MA

Manual motor protectors — Type MS116

Thermal setting range (Amps)	Single-phase horsepower ratings ①		3-phase horsepower ratings			Catalog number	List price
	120V	240V	240V	480V	600V		
0.10 – 0.16	—	—	—	—	—	MS116-0.16	\$ 129
0.16 – 0.25	—	—	—	—	—	MS116-0.25	
0.25 – 0.40	—	—	—	—	—	MS116-0.40	
0.40 – 0.63	—	—	—	—	—	MS116-0.63	
0.63 – 1.0	—	—	—	1/2	1/2	MS116-1.0	148.50
1.0 – 1.6	—	1/10	—	3/4	3/4	MS116-1.6	
1.6 – 2.5	—	1/6	1/2	1	1.5	MS116-2.5	
2.5 – 4.0	1/8	1/3	1	2	3	MS116-4.0	
4.0 – 6.3	1/4	1/2	1.5	3	5	MS116-6.3	
6.3 – 10	1/2	1.5	3	5	7.5	MS116-10	
8.0 – 12	1/2	2	3	7.5	10	MS116-12	172.50
10 – 16	1	2	5	10	10	MS116-16	

NOTE: Use Discount schedule MA

Manual motor protector/contactor close coupling adapters

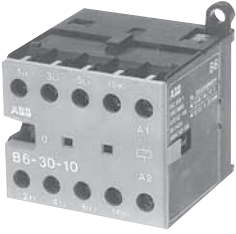
Device	Catalog number	List price
MS116 + B6/B7 contactor MS116 + A9, A12, A16 contactor	BEA7/116 BEA16/116	\$ 9
MS325 + B6/B7 contactor MS325 + A9, A12, A16 contactor MS325 + A26 contactor	BEA7/325 BEA16/325 BEA26/325	12 13.50 15

NOTE: Use Discount schedule MA

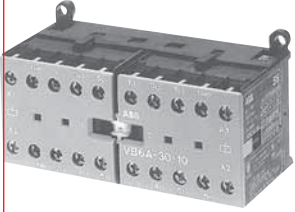


Applications with other ABB products

Miniature contactors



B6C-1



VB6M-1

For more information on miniature controls, see Section 4

Miniature contactors — Non-reversing with screw connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C. —	B6C-★ B6C-★01 B6C4P-★	\$ 51
								3			
								4			
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C. —	B7C-★ B7C-★01 B7C4P-★	72
								3			
								4			
DC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	BC6C-★ BC6C-★01	57
								3			
								3			
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	BC7C-★ BC7C-★01	78
								3			
								3			

NOTE: Use Discount schedule AA

Miniature mechanically interlocked contactors with screw connections

General purpose AC1	Maximum motor FLA AC3	3 Phase motor horsepower				Single phase		Number of power poles	Auxiliary contacts	Catalog number	List price
		208V	230V	460V	600V	120V	230V				
AC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VB6M-★ VB6M-★01	\$ 104
								3			
								3			
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VB7M-★ VB7M-★01	143
								3			
								3			
DC operated											
12	6.8	1	2	3	1	1/2	1	3	1 N.O. 1 N.C.	VBC6M-★ VBC6M-★01	105
								3			
								3			
16	9.6	2	3	5	5	1	2	3	1 N.O. 1 N.C.	VBC7M-★ VBC7M-★01	156
								3			
								3			

NOTE: Use Discount schedule AA

Coil voltage selection

★ Coil voltage suffix. Refer to Coil Voltage Selection Chart and substitute the desired coil voltage suffix for the ★.

Coil voltage selection chart

	Volts								
	12	24	42	48	110/125	110/120	220	220/240	380/415
AC 40-450 Hz		F	L	G		1		2	M
DC	U	Y	V	W	P		R		

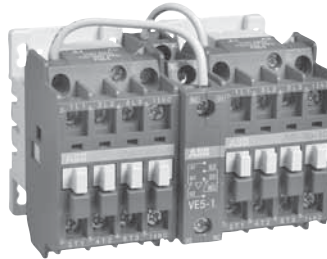
Applications with other ABB products

A-Line contactors

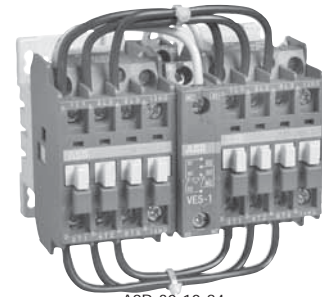
A9 - A26, AC operated



A26-30-10-84



A9M-30-10-84



A9R-30-10-84

General purpose current	UL motor switching current	Maximum motor horsepower ratings				Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
UL rated													
AC1													
21	9	2	2	5	7.5	1 0	0 1	A9-30-10-84 A9-30-01-84	\$ 78	A9M-30-10-84 A9M-30-01-84	\$ 255	A9R-30-10-84 A9R-30-01-84	\$ 315
25	11	3	3	7.5	10	1 0	0 1	A12-30-10-84 A12-30-01-84	84	A12M-30-10-84 A12M-30-01-84	315	A12R-30-10-84 A12R-30-01-84	375
30	17	5	5	10	15	1 0	0 1	A16-30-10-84 A16-30-01-84	102	A16M-30-10-84 A16M-30-01-84	345	A16R-30-10-84 A16R-30-01-84	413
40	28	7.5	10	20	25	1 0	0 1	A26-30-10-84 A26-30-01-84	183	A26M-30-10-84 A26M-30-01-84	405	A26R-30-10-84 A26R-30-01-8	480

Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A75-30-11-80

Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.18 for available combinations. Only side-mounted blocks are allowed to be factory installed. If auxiliary contacts are not required for A50 - A300, subtract \$ 40 from list price and change catalog number to "00" instead of "11."

Mechanical interlock

Mechanically interlocked contactors are designed for reversing, 2 speed, reduced voltage, etc. type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A300 — mounted on common baseplate

Power wiring is not included. The NC electrical interlock is provided with the mechanical interlock for A9 - A110 contactors.

Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80				85	86			55

For other voltages, see page 1.26.

Reversing

Reversing contactors are designed for reversing type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A300 — mounted on common baseplate

The NC electrical interlock is provided with the mechanical interlock for A9 - A110 contactors.

For more information on
across the line contactors
see Section 1.

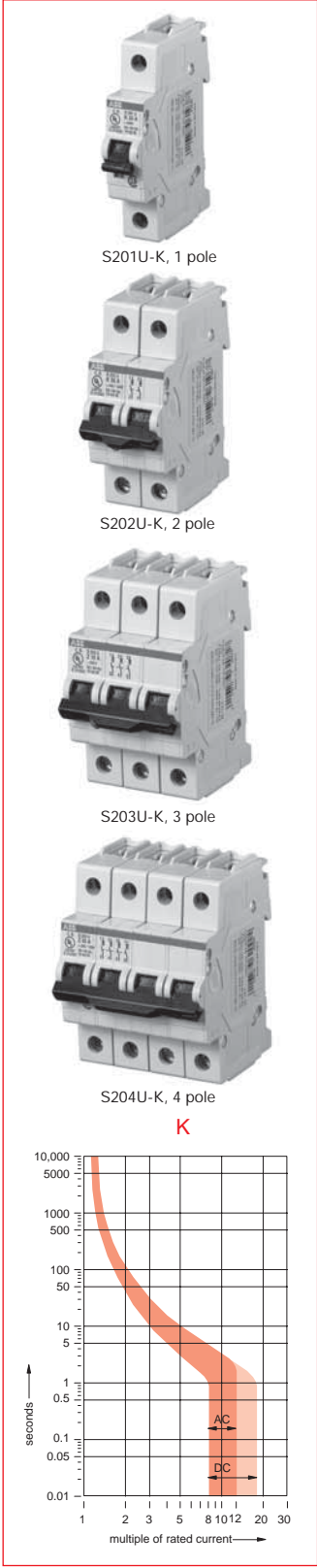


Applications with other ABB products

Miniature MCCBs

S200U, 240 VAC

K UL 489 CSA C22.2 - NO. 5
VDE 0660
Cable & equipment protection



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.2	S201U-K0.2	\$ 54			
0.3	S201U-K0.3	54			
0.5	S201U-K0.5	54			
0.75	S201U-K0.75	54			
1	S201U-K1	54			
1.6	S201U-K1.6	54			
2	S201U-K2	54			
3	S201U-K3	54			
4	S201U-K4	54			
5	S201U-K5	54			
6	S201U-K6	54			
8	S201U-K8	54			
10	S201U-K10	54	A	10	4.6
13	S201U-K13	54			
15	S201U-K15	54			
16	S201U-K16	54			
20	S201U-K20	54			
25	S201U-K25	56			
30	S201U-K30	58			
32	S201U-K32	58			
40	S201U-K40	64			
50	S201U-K50	70			
60	S201U-K60	80			
63	S201U-K63	80			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.2	S202U-K0.2	128			
0.3	S202U-K0.3	128			
0.5	S202U-K0.5	128			
0.75	S202U-K0.75	128			
1	S202U-K1	128			
1.6	S202U-K1.6	128			
2	S202U-K2	128			
3	S202U-K3	128			
4	S202U-K4	128			
5	S202U-K5	128			
6	S202U-K6	128			
8	S202U-K8	128			
10	S202U-K10	128	A	5	9.2
13	S202U-K13	128			
15	S202U-K15	128			
16	S202U-K16	128			
20	S202U-K20	128			
25	S202U-K25	130			
30	S202U-K30	134			
32	S202U-K32	134			
40	S202U-K40	134			
50	S202U-K50	162			
60	S202U-K60	182			
63	S202U-K63	182			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.2	S203U-K0.2	\$ 194			
0.3	S203U-K0.3	194			
0.5	S203U-K0.5	194			
0.75	S203U-K0.75	194			
1	S203U-K1	194			
1.6	S203U-K1.6	194			
2	S203U-K2	194			
3	S203U-K3	194			
4	S203U-K4	194			
5	S203U-K5	194			
6	S203U-K6	194			
8	S203U-K8	194			
10	S203U-K10	194	A	1	13.9
13	S203U-K13	194			
15	S203U-K15	194			
16	S203U-K16	194			
20	S203U-K20	194			
25	S203U-K25	196			
30	S203U-K30	200			
32	S203U-K32	200			
40	S203U-K40	214			
50	S203U-K50	246			
60	S203U-K60	280			
63	S203U-K63	280			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.2	S204U-K0.2	265			
0.3	S204U-K0.3	265			
0.5	S204U-K0.5	265			
0.75	S204U-K0.75	265			
1	S204U-K1	265			
1.6	S204U-K1.6	265			
2	S204U-K2	265			
3	S204U-K3	265			
4	S204U-K4	265			
5	S204U-K5	265			
6	S204U-K6	265			
8	S204U-K8	265			
10	S204U-K10	265	B	1	18.0
13	S204U-K13	265			
15	S204U-K15	265			
16	S204U-K16	265			
20	S204U-K20	265			
25	S204U-K25	275			
30	S204U-K30	285			
32	S204U-K32	285			
40	S204U-K40	314			
50	S204U-K50	343			
60	S204U-K60	392			
63	S204U-K63	392			

Delivery Class
A - Standard item, stock to 2 weeks lead time
B - Stock to 4 weeks lead time
C - 6 to 8 week lead time

UL489 listed as branch circuit protective device

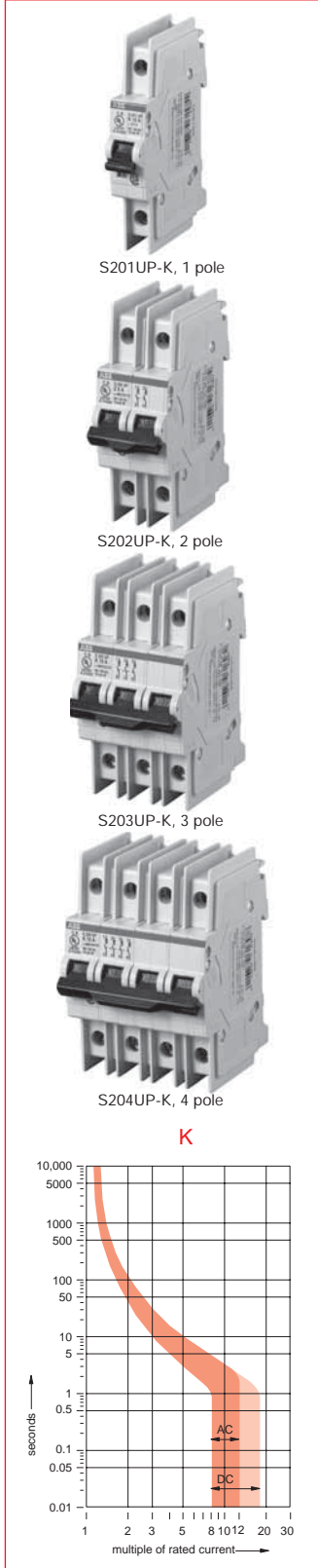
Applications with other ABB products

Miniature MCCBs

S200UP, 480Y/277 VAC



K UL 489 CSA C22.2 - NO. 5
VDE 0660
Cable & equipment protection



Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
1 pole					
0.2	S201UP-K0.2	\$ 90			
0.3	S201UP-K0.3	90			
0.5	S201UP-K0.5	90			
0.75	S201UP-K0.75	90			
1	S201UP-K1	90			
1.6	S201UP-K1.6	90			
2	S201UP-K2	90			
3	S201UP-K3	90			
4	S201UP-K4	90			
5	S201UP-K5	90			
6	S201UP-K6	90			
8	S201UP-K8	90	A	10	4.6
10	S201UP-K10	90			
13	S201UP-K13	90			
15	S201UP-K15	90			
16	S201UP-K16	90			
20	S201UP-K20	90			
25	S201UP-K25	90			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
2 pole					
0.2	S202UP-K0.2	210			
0.3	S202UP-K0.3	210			
0.5	S202UP-K0.5	210			
0.75	S202UP-K0.75	210			
1	S202UP-K1	210			
1.6	S202UP-K1.6	210			
2	S202UP-K2	210			
3	S202UP-K3	210			
4	S202UP-K4	210			
5	S202UP-K5	210			
6	S202UP-K6	210	A	5	9.2
8	S202UP-K8	210			
10	S202UP-K10	210			
13	S202UP-K13	210			
15	S202UP-K15	210			
16	S202UP-K16	210			
20	S202UP-K20	210			
25	S202UP-K25	210			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
3 pole					
0.2	S203UP-K0.2	\$ 320			
0.3	S203UP-K0.3	320			
0.5	S203UP-K0.5	320			
0.75	S203UP-K0.75	320			
1	S203UP-K1	320			
1.6	S203UP-K1.6	320			
2	S203UP-K2	320			
3	S203UP-K3	320			
4	S203UP-K4	320			
5	S203UP-K5	320			
6	S203UP-K6	320	A	1	13.9
8	S203UP-K8	320			
10	S203UP-K10	320			
13	S203UP-K13	320			
15	S203UP-K15	320			
16	S203UP-K16	320			
20	S203UP-K20	320			
25	S203UP-K25	320			

Rated current	Catalog number	List price	Delivery class	Sugg. order qty	Wgt. oz. (1 pc.)
4 pole					
0.2	S204UP-K0.2	440			
0.3	S204UP-K0.3	440			
0.5	S204UP-K0.5	440			
0.75	S204UP-K0.75	440			
1	S204UP-K1	440			
1.6	S204UP-K1.6	440			
2	S204UP-K2	440			
3	S204UP-K3	440			
4	S204UP-K4	440			
5	S204UP-K5	440			
6	S204UP-K6	440	B	1	18.0
8	S204UP-K8	440			
10	S204UP-K10	440			
13	S204UP-K13	440			
15	S204UP-K15	440			
16	S204UP-K16	440			
20	S204UP-K20	440			
25	S204UP-K25	440			

Delivery Class

- A - Standard item, stock to 2 weeks lead time
- B - Stock to 4 weeks lead time
- C - 6 to 8 week lead time

UL489 listed as branch circuit protective device



Technical data

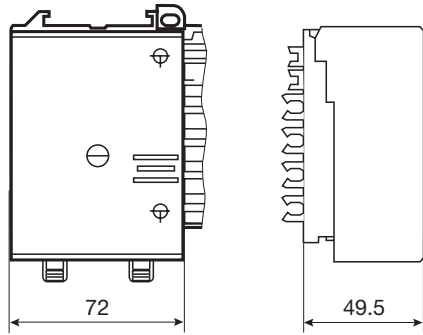
Approximate dimensions

Technical data

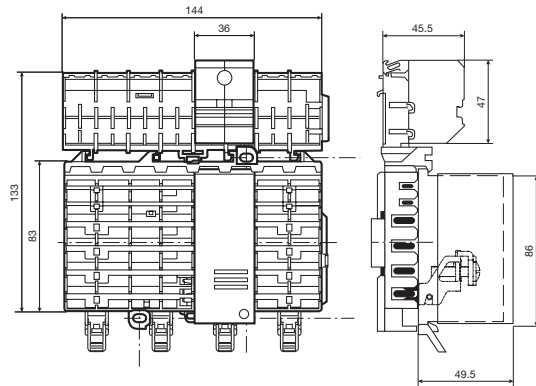
Item		Description
Rated voltage	VAC	600
Rated current	A	100 (end feed); up to 200A (center feed)
Short circuit rating	KAIC	50 when protected by 150A fuse
Approval		UL508 Recognized component
Power feed terminals wire range	AWG	10-1/0 & 8-3/0

Approximate dimensions

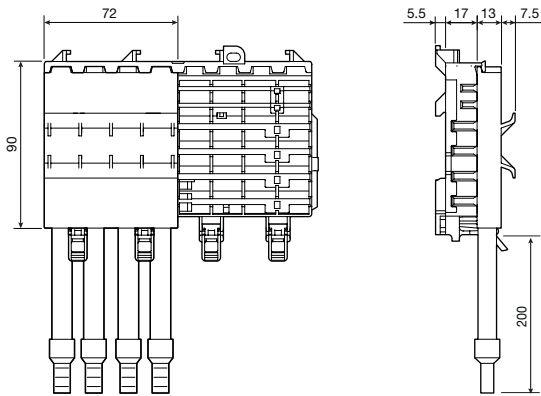
ZLS224 – Main power feed terminal



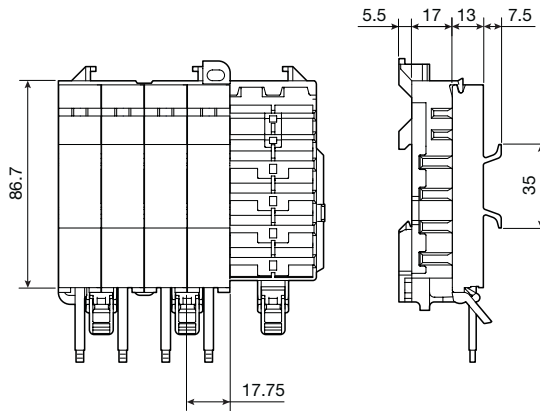
Incoming terminal components



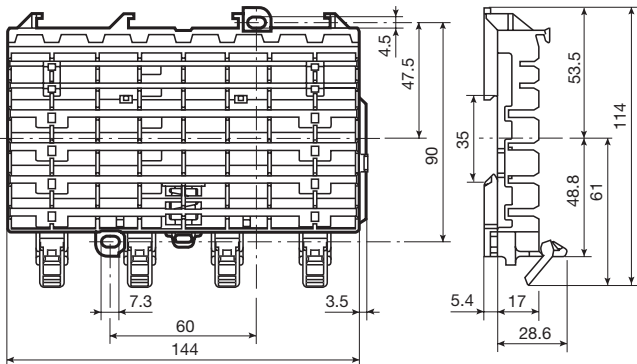
Adapter for non-smisline devices, 100A



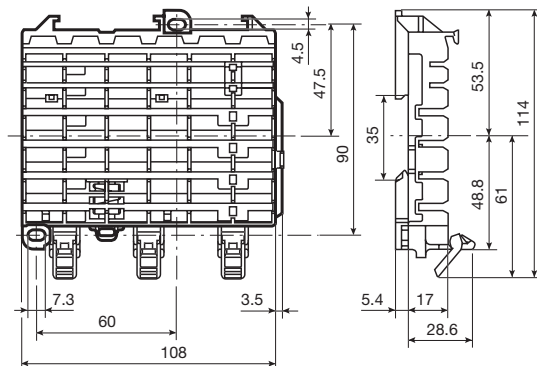
Adapter for foreign devices, 30A, 60A



ZLS808 – Socket base



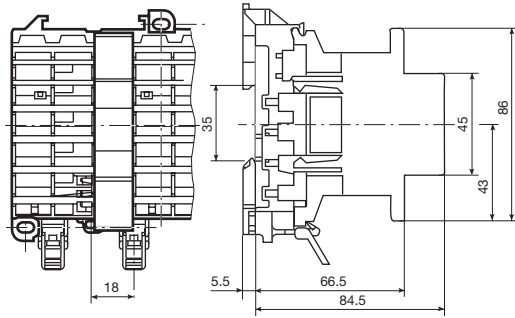
ZLS806 – Socket base



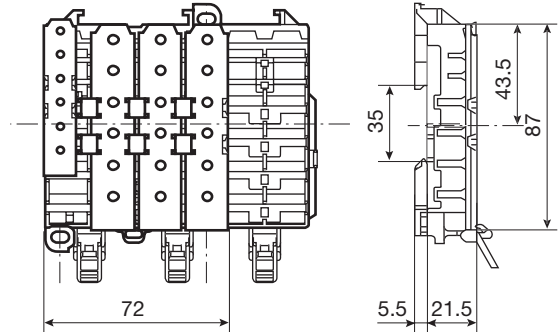
Approximate dimensions



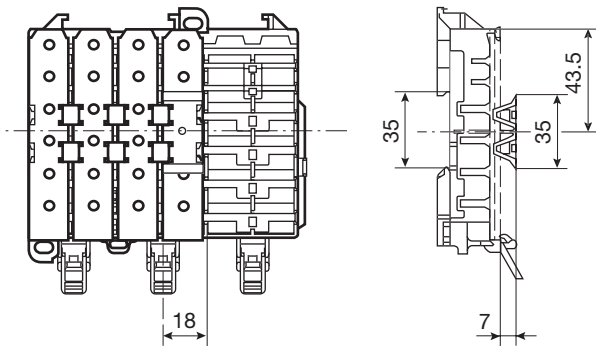
ZLS239 – Busbar isolator



ZLS100 – Bus bar cover



ZLS101 – Extension adapter





Notes

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 - Softstarters
 - Pushbuttons
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 - Motor Protectors (Voltage Monitors)
 - ProgramaCube® (Timers & Counters)

ABB Absolute Rail Design

Terminal Block Configuration

Terminal Block Selection

Terminal Block Properties

Part No. 1000000000 Type: ABS-00
Color: ABS-00 Price: \$ 0.00
Material: ABS-00 Qty: 1 \$ 0.00

ABB Absolute Rail Design



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