

Special features

- for operating voltage up to 690 V AC
- disconnecter abilities according to DIN VDE 0660 Part 107, IEC 60947-3
surge withstand capability U_{imp} (1.2/50): 4 kV
- can be used as main circuit breaker according to DIN VDE 0660 Part 101, IEC 60947-2 through individual position indication for each pole, red = ON, green = OFF
- comprehensive protection against electric shock
- locking device available as accessory

General

1. Description

The S 220 industrial miniature circuit-breaker has a current-limiting effect. Each pole contains two different trip releases acting on the joint contact mechanism:

1. the delayed, thermal trip release for overcurrent protection,
2. the electro-magnetic instantaneous release for short-circuit protection.

2. Task

Protection against excessive temperature rises of electric items in the case of overcurrents, caused by overload, short circuit or earth-fault current.

Resistance against electric shock in the case of excessive touch voltage caused by insulation fault if assigned and installed according to DIN VDE 0100, IEC 60364.

3. Application

In installation, switch, controlling and measuring units for commercial and industrial apparatus up to 690 V AC (UL/CSA approval up to 600 V AC as supplementary protector).

4. K-type characteristic for line and device protection

Operating current 0.2 to 63 A, in 19 grades. Motor protection is reached selecting the operating current appropriate for the individual motor data. The electromagnetic trip releases are calibrated to avoid nuisance tripping caused by starting currents.

In circuits with groups of filament lamps, mains shunt compensated fluorescent lamps or other discharge lamps, the conductor cross section to be protected can be used more efficiently as compared to miniature circuit-breakers with the same operating current, trip characteristics type B and C, considering the starting current.

By reason of the smaller thermal threshold current value, the operating current can be assigned directly to the admissible current-carrying capacity according to DIN VDE 0298 Part 4, IEC 60364-5-52. As a result, it is usually possible to select a higher current-intensity grade than in the case of miniature circuit-breakers with B-type characteristics.

5. Additional devices

Auxiliary switch 1 NO + 1 NC (= H 11) for retrofitting, convertible to 2 NO or 2 NC.

For switching auxiliary current circuits, depending on the switching position of the miniature circuit-breaker;

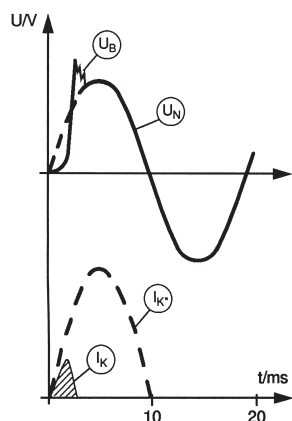
with 2 galvanically separated devices. Through coupling the device with the contact mechanism, the auxiliary switch remains trip-free.

The ABB miniature circuit-breaker has a current-limiting effect.

Compared to zero-point self-extinguishing miniature circuit-breakers, S 220 offers three main advantages:

- higher short-circuit capacity
- improved back-up selectivity
- lines and defective sectors are subject to a significantly smaller let-through value $\int i^2 dt$.

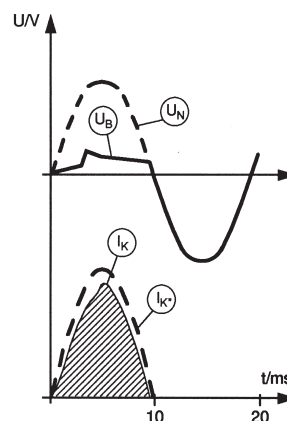
Current-limiting circuit-breaker by ABB



SK 0175 Z 96

U_N = mains voltage
 U_B = arc voltage
 I_k = let-through short-circuit current
 $I_{k'}$ = prospective short-circuit current

Zero-point extinguishing miniature circuit-breaker



SK 0537 Z 93

Technical data

No. of poles:	1-, 2- and 3-pole
specifications:	IEC 60947-2,
rated current I_n :	0.2 to 63 A

internal resistance:	nominal current I_n /A	internal resistance per pole mΩ	power loss per pole W
	0.2	32000	1.3
	0.3	13500	1.2
	0.5	6400	1.6
	0.75	2900	1.6
	1	1400	1.4
	1.6	630	1.6
	2	420	1.7
	3	160	1.4
	4	120	1.9
	6	47	1.7
	8	34	2.2
	10	9.6	1
	16	7.6	2.0
	20	5.1	2.1
	25	4.4	2.8
	32	3.3	3.4
	40	2.6	4.2
	50	1.7	4.3
	63	1.6	6.4

connection:	individual or busbar
terminals:	combined box terminal with M5 screw
connection capacity (Cu):	1 x 25 mm ² or 2 x 10 mm ² for finely stranded to massive conductors min. cross section 1 mm ²
protection according to IEC 60529, EN 60529, VDE 0470:	IP 20
size:	DIN 43 880, frame size 1
depth of device:	83 mm
dimensions:	see illustrations on page 15
mounting position:	optional
fixing:	snap-on onto DIN rails- EN 60 715, 35 mm width, screw fixing by means of mounting plate(see Accessories)
climatic resistance: according to DIN 40 046 or, as applicable, IEC 60068:	constant climate 23/83, 40/93, 55/20 (°C/Rh) alternating climate (24 h cycle) 25/95 – 40/93 (°C/Rh)
ambient temperature:	T _{max} + 55 °C, T _{min} – 25 °C
shock resistance:	10 g at least 20 impacts shock duration 13 ms
vibration resistance:	5 g, at least 30 minutes
mechanical service life:	20,000 operations
service life at rated load and operating voltage:	20,000 operations, I_n 0,2 ... 32 A 4,000 operations, I_n 40 ... 63 A
specifications:	VDE 0660, IEC 60 947-2

operating voltage U_n : 1-pole 400/690 V ~ 60 V ~
multi-pole 690 V ~ 110 V ~
The tripping values for electromagnetic trip releases are valid for AC values from 16 ⅔ to 60 Hz. Deviating frequencies or DC current will cause the tripping characteristics to change as is indicated in the table on page 6.

min. rated voltage U_{Bmin} :	12 V ~, 12 V ~ (with respect to contact stability)
insulation group acc. to former VDE 0110: pollution degree 2	C at 500 V ~ } compareable to overvol- B at 750 V ~ } tage category III
trip-free mechanism:	miniature circuit-breaker and auxiliary switch
housing:	plastic, gray RAL 7035
operating lever:	black, in ON and OFF position sealable; lockable with lock adapter (see Accessories)

Auxiliary switch S 220-H 11

terminal:	M 3.5 screw with captive clamping washer
connection capacity (Cu):	2 x 0.75 ... 2.5 mm ² ... 1.5 mm ² with connector sleeve
permanent current I_{th2} :	5 A
rated current I_n at:	220 V ~ : 5 A 400 V ~ : 2 A 60 V ~ : 2 A 110 V ~ : 1.5 A 250 V ~ : 1 A
min. switching capacity:	5 VA

Tripping characteristics

standard	tripping characteristic and rated current range (ref. reference range)	thermal trip tripping currents: conv.non-trip. current I_1 conventional trip. current I_2		tripping time	electromagnetic trip ② hold impacts from trips at the latest at		tripping time
IEC/EN60947-2	K 0.2 to 63 A	$1.05 \cdot I_n$ $6.0 \cdot I_n$	$1.2 \cdot I_n$ $1.5 \cdot I_n$ $> 2 \text{ s } (T_V)$	$> 2 \text{ h}$ $< 2 \text{ h } ①$ $< 2 \text{ min } ①$	$8 \cdot I_n$ $14 \cdot I_n$	$< 0.2 \text{ s}$	$> 0.2 \text{ s}$

① as from operating temperature(after $I_1 > 2 \text{ h}$).

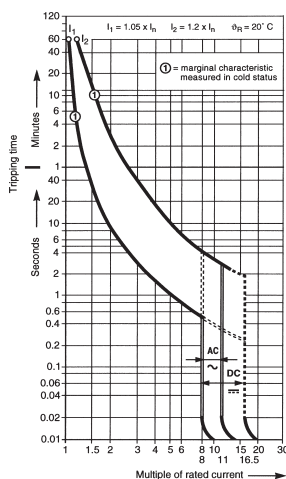
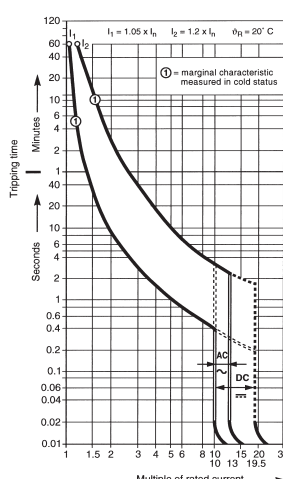
② Frequency influence of electromagnetic trips

The tripping values indicated for electromagnetic trips apply to a frequency of $16^{2/3} \dots 60 \text{ Hz}$. Deviating frequencies or DC current will cause the tripping characteristics to change by the factor indicated in the following table.

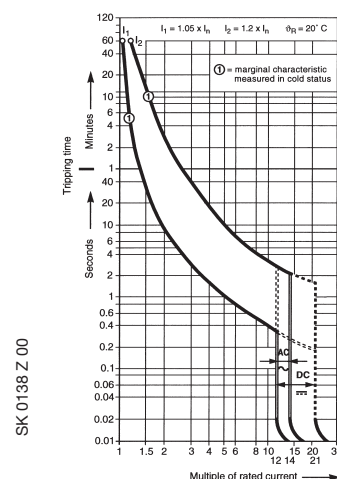
	AC 100 Hz	200 Hz	400 Hz	DC
factor ca.	1.1	1.2	1.5	1.5

tripping values of thermal trips are frequency-independent.

Characteristics

S 220-K 0,2 ... 8 A
K 40 ... 63 A

S 220-K 10 ... 16 A



S 220-K 20 ... 32 A

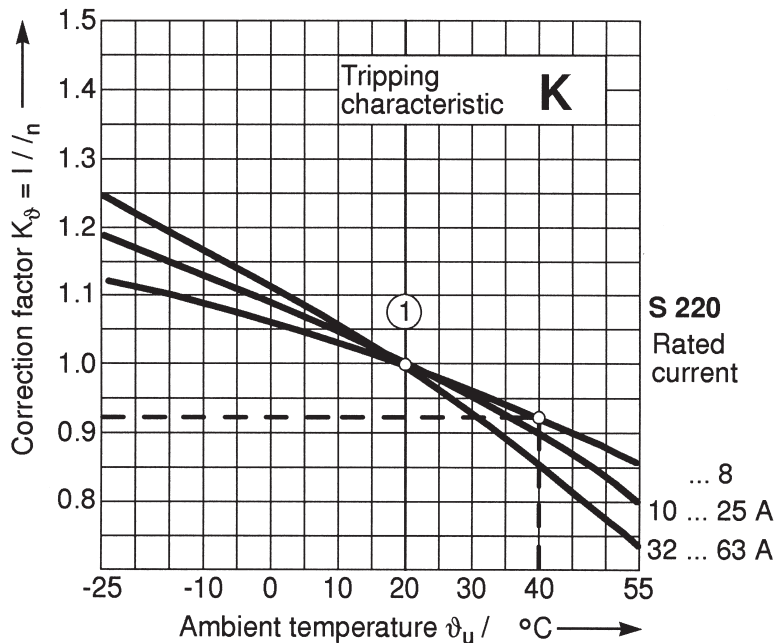
Short circuit capacity according to IEC/EN60947-2

nominal current-range	AC							DC
	1-phase			2/3-phase				1-pole
	up to 133 V ~	230 V ~	400 V ~	133/230 V ~	230/400 V ~	290/500 V ~	400/690 V ~	up to 60 V – ⑤
0.2 up to 1 A	unlimited	unlimited	unlimited	unlimited	unlimited	unlimited	unlimited	unlimited
1.6 and 2 A	unlimited	unlimited	1.5 kA $\cos \varphi = 0.95$	unlimited	unlimited	6 kA $\cos \varphi = 0.7$	1.5 kA $\cos \varphi = 0.95$	unlimited
3 and 4 A	15 kA $\cos \varphi = 0.3$	4.5 kA $\cos \varphi = 0.8$	1.5 kA $\cos \varphi = 0.95$	15 kA $\cos \varphi = 0.3$	4.5 kA $\cos \varphi = 0.8$	3 kA $\cos \varphi = 0.9$	1.5 kA $\cos \varphi = 0.95$	8 kA $T \leq 13 \text{ ms}$
6 and 8 A	15 kA $\cos \varphi = 0.3$	6 kA $\cos \varphi = 0.7$	1.5 kA $\cos \varphi = 0.95$	15 kA $\cos \varphi = 0.3$	6 kA $\cos \varphi = 0.7$	4.5 kA $\cos \varphi = 0.8$	1.5 kA $\cos \varphi = 0.95$	8 kA $T \leq 13 \text{ ms}$
10 up to 32 A	30 kA $\cos \varphi = 0.25$	10 kA $\cos \varphi = 0.5$	6 kA $\cos \varphi = 0.7$	30 kA $\cos \varphi = 0.25$	10 kA $\cos \varphi = 0.5$	10 kA $\cos \varphi = 0.5$	6 kA $\cos \varphi = 0.7$	8 kA $T \leq 13 \text{ ms}$
40 up to 63 A	6 kA $\cos \varphi = 0.7$	4.5 kA $\cos \varphi = 0.8$	3 kA $\cos \varphi = 0.9$	6 kA $\cos \varphi = 0.7$	4.5 kA $\cos \varphi = 0.8$	4.5 kA $\cos \varphi = 0.9$	3 kA $\cos \varphi = 0.9$	6 kA $T \leq 13 \text{ ms}$

⑤ In symmetrically earthed DC circuits, S 222 two-pole devices (two poles connected in series) can be used up to 110 V DC. In this case, the short-circuit capacity is one

grade above the 1-pole version (10 kA instead of 8 kA).
Any connection is possible, polarity does not need to be taken into account.

Current-carrying capacity I/I_n depending on ambient temperature ϑ_R



① possible load with a given ambient temperature of + 20 °C.

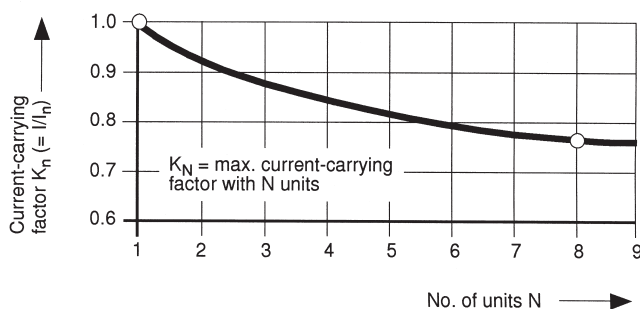
Example:

A K6 miniature circuit-breaker is used in an ambient temperature of + 40 °C. What maximum current is possible? From the chart, you can see:
 $I/I_n = 0.93$
 $I = 0.93 \cdot 6 = 5.58 \text{ A}$

Mutual thermal influence

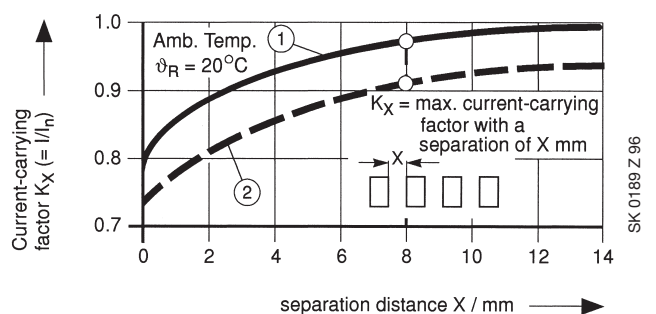
of miniature circuit-breakers connected in series
device spacing = 0.

trip characteristic K

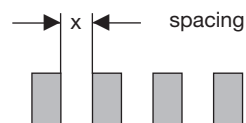


of miniature circuit-breakers depending on device spacing
(at least 7 devices in a row)

trip characteristic K



- ① measured in open air
- ② measured in flush-mounted consumer unit



Example: If 8 devices are connected in series, the max. possible permanent current is reduced to $0.77 \times I_n$.

Example: When connecting several devices in series with a spacing of 6 mm, the max. possible permanent current is reduced to
 $0.95 = I_n$ (installed in open air)
 $0.9 = I_n$ (installed in consumer unit)

Maximum back-up protection

Maximum back-up protection is necessary only if the solid short-circuit current to be expected at the place of installation may exceed the short-circuit capacity.

nominal current circuit- breaker S 220 I_n A	maximum back-up protection		
	MCBs S 220-K		
	230/400 V ~ to main c.b.s S 700 E and K ¹⁾ A	230/400 V ~ max. back-up prot. gL A	400/690 V ~ max. back-up prot. gL A
0.5	63	optional	optional
0.75	63	optional	optional
1.0	63	optional	optional
1.6	63	optional	20
2	63	optional	25
3	63	35	25
4	63	35	35
6	100	63	50
8	100	63	63
10	100	100	80
16	100	100	100
20	100	100	100
25 ... 32	100	100	100
40 ... 63	100	125	125

1) Back-up protection up to at least 25 kA

Short-circuit discrimination

If the short circuit current does not exceed the nominal switching capacity of the miniature circuit-breaker, selectivity exists up to the values indicated. At $U_n \geq 133/230$ V, selectivity exists up to the short circuit current indicated. See also page 4.

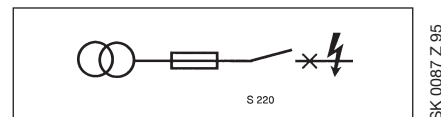
For cases where the max. back-up protection exceeds the nominal switching capacity, see above

Short circuit discrimination in kA



to main miniature circuit-breakers S 700 E_{sel} and K

Short circuit discrimination in kA



to fuse gL/gG
(DIN VDE 0636, IEC 269/3)

		to main miniature circuit-breaker S 700-E/-K									to fuse charact. gL/gG								
		230/400 V ~																	
S 220 K	In/A	16	20	25	35	40	50	63	80	100	16	20	25	35	50	63	80	100	125
	≤ 2	> 15	> 15	> 15	> 15	> 15	> 15	> 15	> 15	> 15	1	1.2	4	> 15	> 15	> 15	> 15	> 15	> 15
	3	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	0.3	0.8	1.5	4.5	4.5	4.5	4.5	4.5	4.5
	4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		0.6	1	3.3	4.5	4.5	4.5	4.5	4.5
	6	10	10	10	10	10	10	10	8	8		0.6	1.3	3	5.5	6	6	6	6
	8	10	10	10	10	10	10	10	8	8		1.1	2.5	3.5	6	6	6	6	6
	10	15	15	15	15	15	15	15	12.5	12.5		1	1.7	2.5	4	7	10		
	16	15	15	15	15	15	15	15	12.5	12.5		1.5	2	3	5	6			
	20		15	15	15	15	15	15	12.5	12.5		1.6	2.6	3.6	5.5				
	25		**	15	15	15	15	15	12.5	12.5		2.4	3.3	5					
	32			15	15	15	15	12.5	12.5					3.1	3				
	40				4.5	4.5	4.5	4.5	4.5						3				
	50/63					4.5	4.5	4.5	4.5						2.5				

** limited or no selectivity possible in overload range (therm. tripping)

K

according to IEC/EN60947-2
for power circuits, motors,
transformers, lamps
and for line protection

10000



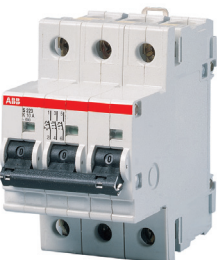
S 221

SK 0191 B 91



S 222

SK 0192 B 91



S 223

SK 0193 B 91



S 220-H 11

SK 0194 B 91

Selection table

No. of poles	rated current In A	order details	bbn 40 16779 EAN	price 1 piece €	price group	weight 1 pc. kg	pack. units pc.
		type code	order code				
1	0.2	S 221-K 0.2	GHS 221 0001 R0087	31610 6		0.18	10
	0.3	S 221-K 0.3	GHS 221 0001 R0117	31620 5			
	0.5	S 221-K 0.5	GHS 221 0001 R0157	31630 4			
	0.75	S 221-K 0.75	GHS 221 0001 R0187	31640 3			
	1	S 221-K 1	GHS 221 0001 R0217	31650 2			
	1.6	S 221-K 1.6	GHS 221 0001 R0257	31660 1			
	2	S 221-K 2	GHS 221 0001 R0277	31670 0			
	3	S 221-K 3	GHS 221 0001 R0317	31680 9			
	4	S 221-K 4	GHS 221 0001 R0337	31690 8			
	6	S 221-K 6	GHS 221 0001 R0377	31700 4			
	8	S 221-K 8	GHS 221 0001 R0407	31710 3			
	10	S 221-K 10	GHS 221 0001 R0427	31720 2			
	16	S 221-K 16	GHS 221 0001 R0467	31730 1			
	20	S 221-K 20	GHS 221 0001 R0487	31740 0			
	25	S 221-K 25	GHS 221 0001 R0517	31750 9			
	32	S 221-K 32	GHS 221 0001 R0537	31760 8			
	40	S 221-K 40	GHS 221 0001 R0557	31770 7			
	50	S 221-K 50	GHS 221 0001 R0577	31780 6			
	63	S 221-K 63	GHS 221 0001 R0607	31790 5			
U _n 690 V ~ 60 V ∴							
2	0.2	S 222-K 0.2	GHS 222 0001 R0087	31800 1		0.36	5
	0.3	S 222-K 0.3	GHS 222 0001 R0117	31810 0			
	0.5	S 222-K 0.5	GHS 222 0001 R0157	31820 9			
	0.75	S 222-K 0.75	GHS 222 0001 R0187	31830 8			
	1	S 222-K 1	GHS 222 0001 R0217	31840 7			
	1.6	S 222-K 1.6	GHS 222 0001 R0257	31850 6			
	2	S 222-K 2	GHS 222 0001 R0277	31860 5			
	3	S 222-K 3	GHS 222 0001 R0317	31870 4			
	4	S 222-K 4	GHS 222 0001 R0337	31880 3			
	6	S 222-K 6	GHS 222 0001 R0377	31890 2			
	8	S 222-K 8	GHS 222 0001 R0407	31900 8			
	10	S 222-K 10	GHS 222 0001 R0427	31910 7			
	16	S 222-K 16	GHS 222 0001 R0467	31920 6			
	20	S 222-K 20	GHS 222 0001 R0487	31930 5			
	25	S 222-K 25	GHS 222 0001 R0517	31940 4			
	32	S 222-K 32	GHS 222 0001 R0537	31950 3			
	40	S 222-K 40	GHS 222 0001 R0557	31960 2			
	50	S 222-K 50	GHS 222 0001 R0577	31970 1			
	63	S 222-K 63	GHS 222 0001 R0607	31980 0			
U _n 690 V ~ 125 V ∴ ①							
3	0.2	S 223-K 0.2	GHS 223 0001 R0087	31990 9		0.54	3
	0.3	S 223-K 0.3	GHS 223 0001 R0117	32000 4			
	0.5	S 223-K 0.5	GHS 223 0001 R0157	32010 3			
	0.75	S 223-K 0.75	GHS 223 0001 R0187	32020 2			
	1	S 223-K 1	GHS 223 0001 R0217	32030 1			
	1.6	S 223-K 1.6	GHS 223 0001 R0257	32040 0			
	2	S 223-K 2	GHS 223 0001 R0277	32050 9			
	3	S 223-K 3	GHS 223 0001 R0317	32060 8			
	4	S 223-K 4	GHS 223 0001 R0337	32070 7			
	6	S 223-K 6	GHS 223 0001 R0377	32080 6			
	8	S 223-K 8	GHS 223 0001 R0407	32090 5			
	10	S 223-K 10	GHS 223 0001 R0427	32100 1			
	16	S 223-K 16	GHS 223 0001 R0467	32110 0			
	20	S 223-K 20	GHS 223 0001 R0487	32120 9			
	25	S 223-K 25	GHS 223 0001 R0517	32130 8			
	32	S 223-K 32	GHS 223 0001 R0537	32140 7			
	40	S 223-K 40	GHS 223 0001 R0557	32150 6			
	50	S 223-K 50	GHS 223 0001 R0577	32160 5			
	63	S 223-K 63	GHS 223 0001 R0607	32170 4			
U _n 690 V ~							

① 125 V ∴ with 2 contact decks connected in series

Auxiliary switch 1 NO + 1 NC, to be fitted by user (convertable in 2 NO or 2 NC)

Auxiliary switch	S 220-H 11	GHS 220 1904 R0003	31600 7			0.05	10
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