

3UG3 monitoring relays



nsb0346h

For electrical quantities

	Page
Selection and ordering data	7/43
General technical data	7/42

Circuit diagrams	7/42
Overview	7/58
Dimension drawings	7/59



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For non-electrical quantities

	Page
Selection and ordering data	7/53
General technical data	7/42

Circuit diagrams	7/42
Overview	7/58
Dimension drawings	7/59

3RS17 interface converters



nsb0775h



3RS17 interface converter

	Page
Selection and ordering data	7/86
• Screw and Cage Clamp connection	7/86

Overview	7/85
Technical data	7/87
Configuration	7/88
Circuit diagrams	7/89
Dimension drawings	7/89

Coupling relays and interfaces



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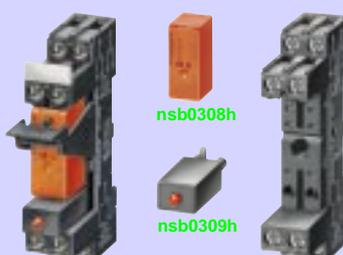
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3TX70 relay and semiconductor interfaces

	Page
Selection and ordering data	7/60, 7/64
• Double-layer, row terminal design	7/60, 7/64
• Accessories	7/61, 7/66

Application	7/60, 7/70
Technical data	7/62, 7/67
Terminal diagrams	7/71
Position of terminals	7/73
Dimension drawings	7/74



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nsb0310h

LZX: RT/PT/MT plug-in relay interfaces

	Page
Selection and ordering data	7/75
• AC and DC operation	7/75
Complete units and single modules	

Technical data	7/77
Functions	7/79
Circuit diagrams	7/79
Dimension drawings	7/80



nsb0124h

3TG10 power relay, 4 kW 4-pin

	Page
Selection and ordering data	7/81
• AC and DC operation, hum-free	7/81
With screw connection or tab connector	7/84
• Accessories	7/84

Application	7/81
Technical data	7/82
Circuit diagrams	7/84
Position of terminals	7/84
Dimension drawings	7/84

Overview

Version

The 3TG10 contactors with 4 main contacts are available with screw-type terminals or with 6.3 mm to 0.8 mm tab connectors. The designs with screw-type terminals are suitable for use in any climate and safe from touch to DIN VDE 0106 Part 100. The 3TG10 contactors have a compact design. Their overall width is 36 mm.

Application

They are suitable for use in household appliances as well as for distribution boards in offices and residential buildings, owing to their hum-free construction. They can further be used in all areas where there is only a limited amount of space available, e.g. in air conditioners, heating systems, pumps and fans - basically in all simple electrical controls.

AC and DC operation

EN 60 947-4-1 (VDE 0660 Part 102).

Surge suppression

The 3TG10 contactors are fitted with an integrated protective circuit for damping opening surges.

Overload and short-circuit protection

The 3UA7 overload relay can be used for overload protection (see NS E catalogue, available in German). This applies both for contactor mounting and for mounting as a single unit. The data for short-circuit protection of the contactors without using an overload relay are provided in the technical data.

Selection and ordering data

Ratings Utilisation category	Main contacts	Rated control supply voltage U_s	DT	Order No.	Price	Weight approx.	Pack
AC-1 Switching resistive load at 55 °C	AC-2 and AC-3						
Operat. current I_e at 400 V	Ratings of three-phase loads at 50 Hz 400 V	Operational current I_e at 400 V ¹⁾	Ratings of three-phase motors at 50 Hz 400 V	Design			
A	kW	A	kW	NO NC	PG 101	1 unit	kg Units

With screw connections, 4-pin for screwing and snapping onto 35 mm standard mounting rail · hum-free

• AC operation

	3TG10 ...0	20	13	8.4	4	4 -	230 V, 45–450 Hz ▶ 110 V, 45–450 Hz ▶ 24 V, 45–450 Hz ▶	3TG10 10-0AL2 3TG10 10-0AG2 3TG10 10-0AC2	0.15	10
						3 1	230 V, 45–450 Hz ▶ 110 V, 45–450 Hz A 24 V, 45–450 Hz ▶	3TG10 01-0AL2 3TG10 01-0AG2 3TG10 01-0AC2	0.15	10

• DC operation

	3TG10 ...0	20	13	8.4	4	4 -	DC 24 V ▶	3TG10 10-0BB4	0.15	10
						3 1	DC 24 V ▶	3TG10 01-0BB4		

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With tab connectors 6.3 x 0.8 mm, 4-pin for screwing and snapping onto 35 mm standard mounting rail · hum-free

• AC operation

	3TG10 ...1	16	10	8.4	4	4 -	230 V, 45–450 Hz ▶ 110 V, 45–450 Hz A 24 V, 45–450 Hz A	3TG10 10-1AL2 3TG10 10-1AG2 3TG10 10-1AC2	0.14	10
						3 1	230 V, 45–450 Hz ▶ 110 V, 45–450 Hz A 24 V, 45–450 Hz A	3TG10 01-1AL2 3TG10 01-1AG2 3TG10 01-1AC2	0.14	10

• DC operation

	3TG10 ...1	16	10	8.4	4	4 -	DC 24 V A	3TG10 10-1BB4	0.14	10
						3 1	DC 24 V A	3TG10 01-1BB4		

nsb0125g

1) The links for paralleling can be reduced by one pole. The rated operational currents are valid for each pole. The links for paralleling are insulated.

3TG10 power relays

Technical data

General data

Mechanical endurance	operating cycles			3 mill.	
Electrical endurance at I_e	operating cycles	AC-1 AC-3		0.1 million 0.4 million	
Rated insulation voltage U_i (pollution degree 3)		V		400	
Rated impulse withstand voltage U_{imp}		kV		4	
Safe isolation acc. to DIN VDE 0106 Part 101 and A1 (draft 2/89) between coil and contacts		V		up to 300	
Permissible ambient temperature	in operation ¹⁾ when stored	°C °C		-25 ... +55 -50 ... +80	
Degree of protection acc. to IEC 60 947-1 and IEC 60 529 (VDE 0470 Part 1)				IP 00, coil system IP 20	
Power consumption of the coils (with coil in cold state and $1.0 \times U_e$)					
	AC operation 45 – 450 Hz	VA		4.4	
	p.f.			0.9 (hum-free)	
	DC operation	W		4	
Coil voltage tolerance				0.85 to $1.1 \times U_e$	
Operating times (break-time = opening time + arcing time)				AC operation	DC operation
	Closing	closing time opening time	NO NC	ms ms	ms ms
				10 ... 50 5 ... 45	11 ... 50 5 ... 45
	Opening	opening time closing time	NO NC	ms ms	ms ms
				20 ... 30 20 ... 30	19 ... 35 21 ... 39
	Arcing time			ms	10 to 15
Shock resistance					
rectangular pulse	AC and DC operation	g/ms		5.1/5 and 3.5/10	
sine pulse	AC and DC operation	g/ms		7.9/5 and 5.2/10	
Operating frequency z in operating cycles per hour					
Rated operation	No-load op. frequency	1/h		10000	
	for AC-1	1/h		1000	
	for AC-2	1/h		500	
	for AC-3	1/h		1000	

Short-circuit protection

Fuse links	NH	Type 3NA			
Utilisation category gL/gG	DIAZED	Type 5SB			
	NEOZED	Type 5SE			
acc. to IEC 60 947-4-1 (DIN VDE 0660 Part 102)	Type of coordination "1"		A	25	
	Type of coordination "2"		A	10	
Miniature circuit-breaker	C-characteristic		A	10	

Load ratings with AC

AC-1 utilisation category, switching resistive load					
Rated operational current I_e at 55 °C to 400 V ¹⁾					
with screw connection	A			20	
with tab connector	A			16	
Ratings U_e of three-phase loads p.f. = 1					
with screw connection	V			400	230/220
with tab connector	kW			13	7.5
	kW			10	6.0
Minimum conductor cross-section with $I_{e \text{ load}}$	mm ²			2.5	

1) If the three main conducting paths are loaded with 20 A and $I > 10$ A for the fourth conducting

path: the permissible ambient temperature is 40 °C.

Technical data										
Load ratings with AC										
AC-2 and AC-3 utilisation categories										
Rated operational currents I_e up to 400 V	A	8.4								
Ratings of motors with slipring or squirrel-cage rotor at 50 Hz and 60 Hz and at 400 V	kW	4								
AC-5a utilisation category (permissible supply impedance: $\geq 0.5 \Omega$)										
Switching gas discharge lamps per main conducting path at 50 Hz 230 V										
Rating per lamp	W	18	36	58	Lead-lag					
Rated operational current per lamp	A	0.37	0.43	0.67	2 x 0.11	2 x 0.21	2 x 0.32			
Number of lamps	unit	43	37	24	2 x 81	2 x 42	2 x 28			
Switching gas discharge lamps with correction, electronic ballast per main conducting path at 50 Hz 230 V										
Rating per lamp	W	Parallel correction			Electr. ballast, 1 lamp			Electr. ballast, 2 lamps		
Capacitor	μF	4.5	4.5	7	6.8	6.8	10	10	22	
Rated operational current per lamp	A	0.11	0.21	0.32	0.10	0.18	0.27	0.18	0.35	
Number of lamps	unit	15	15	10	39	39	26	2 x 26	2 x 1	
AC-5b utilisation category, switching incandescent lamps per main conducting path at 50 Hz 230 V										
	kW	1.6								
Load ratings with DC										
DC-1 utilisation category, switching resistive load ($\frac{L}{R} \leq 1 \text{ ms}$)										
Rated operational current I_e		Conducting paths connected in series			1	2	3	4		
		up to 24 V	A	16	16	18	20			
		60 V	A	6	16	18	20			
		110 V	A	2	6	16	20			
		220 V/240 V	A	0.8	1.6	6	20			
DC-3 and DC-5 utilisation categories, shunt and series motors ($\frac{L}{R} \leq 15 \text{ ms}$)										
Rated operational current I_e		Conducting paths connected in series			1	2	3	4		
		up to 24 V	A	10	16	16	18			
		60 V	A	0.5	5	16	16			
		110 V	A	0.15	0.35	10	10			
		220 V/240 V	A	–	–	1.75	2			
Conductor cross-sections for designs										
with screw connections										
Screw connection				M3						
Finely stranded with end sleeve (DIN 46 228, style A/D/C)			mm ²	2 x (0.75 to 2.5)						
Solid			mm ²	2 x (1 to 2.5)						
			mm ²	1 x 4						
with tab connectors										
Finely stranded		6.3 to 1	mm ²	0.5 to 1						
When using push-on contact acc. to DIN 46 245/46 247		6.3 to 2.5	mm ²	1 to 2.5						
Ⓢ and Ⓣ ratings (screw connection)										
Rated insulation voltage		AC	V	600						
Conventional thermal current		Free air and enclosed	A	20						
Maximum horsepower ratings (Ⓢ and Ⓣ-approved values) Ratings of three-phase motors at 60 Hz										
		at 115 V	hp	1/2	1-phase			3-phase		
		200 V	hp	1	–	–	–	–	–	
		230 V	hp	1 1/2	3	3	3	3	3	
		460 V/575 V	hp	–	–	5	5	5	5	
		600 V	hp	–	–	–	–	–	–	

Short-circuit protection for overload, see "Overload relays and protective devices".

3TG10 power relays

Accessories

For contactor	Design	DT	Order No.	Price	Weight approx.	Pack
Type	A Max. rated operational currents $I_e/AC-1$ (at 55 °C) of contactors	mm ² Max. conductor cross-sections	PG 101	1 unit	kg	Units

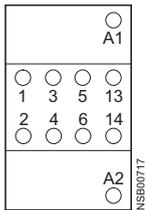
Links for paralleling (star jumpers)

<ul style="list-style-type: none"> • 3-pole without terminal ¹⁾²⁾ 						
3TG10	16 Star jumpers can be reduced by one pole	–	▶	3RT1 916-4BA31	0.004	1
<ul style="list-style-type: none"> • 3-pole with terminal ¹⁾³⁾ 						
3TG10	40	25	▶	3RT1 916-4BB31	0.013	1
<ul style="list-style-type: none"> • 4-pole with terminal ¹⁾⁴⁾ 						
3TG10	50	25	A	3RT1 916-4BB41	0.02	1

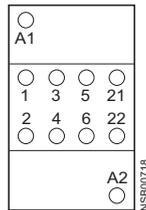
Circuit diagrams

Position of terminals

3TG10 10
1 NO

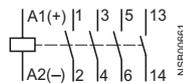


3TG10 01
1 NC

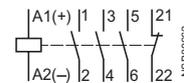


Internal circuit diagram

3TG10 10
1 NO
Ident. 10E



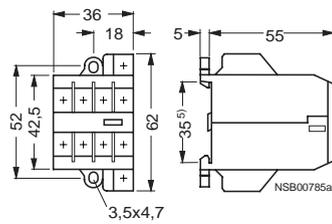
3TG10 01
1 NC
01E



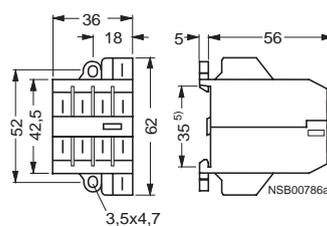
Dimension drawings

AC and DC operation

3TG10 ...-0..
with screw connections

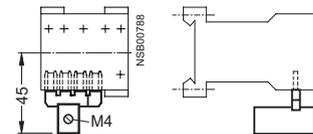


3TG10 ...-1..
with tab connectors



Accessories for 3TG10

3RT19 16-4BB41 links for paralleling, 4-pole, with terminal



The links for paralleling can be reduced by one pole.

For technical data, see page 7/82.

1) The links for paralleling can be reduced by one pole. The rated operational currents are valid for each pole. The links for paralleling are insulated.

2) Replacement type for 3TX44 90-2C.

3) Replacement type for 3TX44 90-2A.

4) Replacement type for 3TX44 90-2B.

5) Can be snapped onto 35 mm standard mounting rails.

Overview

In automation and closed-loop control, working with analog signals is unavoidable. Interfaces of 0 to 10 V and 0/4 to 20 mA have become established in this field. Interface converters load the coupling function for analog signals on the input side as well as on the output side. They are indispensable

where analog values are processed with electronic controls. In the harsh industrial environment, signals often have to be transferred over large distances. Electrical isolation is necessary due to the various different power supplies. Potential differences and losses due to cable resistance must be

prevented. Electromagnetic disturbances and overvoltages can affect the signals especially at the input end and even destroy the analog modules. With regard to the output, short-circuit protection is of particular importance. The devices are EMC-tested acc. to EN 50081 (emission)

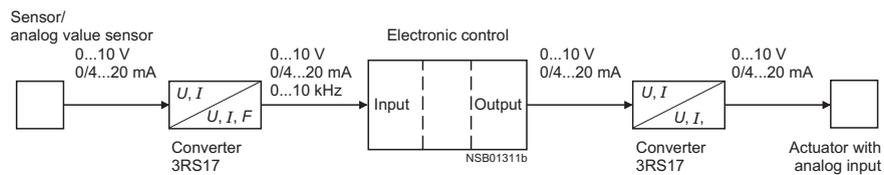
and EN 61000-6-2 (immunity). The analog signals correspond to IEC 60 381-1/2.

Application

Converters are used in analog signal processing for:

- Electrical isolation
- Conversion of normalised and non-normalised signals
- Amplification, impedance adjustment
- Conversion to frequency for processing by a digital input
- Overvoltage and EMC protection
- Short-circuit protection of the outputs

Example for application: Interface converter in analog signal evaluation



3RS17

Selection and ordering data

Screw and Cage Clamp connection

All converters with the exception of the passive individual interface converters are equipped with a yellow LED for indication of "Voltage applied".

	Input	Output	Width mm	Supply voltage V	Electrical isolation	DT	Screw terminals			Cage Clamp terminals			Weight approx. kg
							Order No. PG 101	Price 1 unit	DT	Order No. PG 101	Price 1 unit	DT	
Individual interface converters, active													
	0 ... 10 V	0 ... 10 V	6.2	AC/DC 24	2 way	A	3RS17 00-1AD00	A	3RS17 00-2AD00			0.03	
	0 ... 10 V	0 ... 20 mA	6.2	AC/DC 24	2 way	A	3RS17 00-1CD00	A	3RS17 00-2CD00			0.03	
	0 ... 10 V	4 ... 20 mA	6.2	AC/DC 24	2 way	A	3RS17 00-1DD00	A	3RS17 00-2DD00			0.03	
	0 ... 20 mA	0 ... 10 V	6.2	AC/DC 24	2 way	A	3RS17 02-1AD00	A	3RS17 02-2AD00			0.03	
	0 ... 20 mA	0 ... 20 mA	6.2	AC/DC 24	2 way	A	3RS17 02-1CD00	A	3RS17 02-2CD00			0.03	
	0 ... 20 mA	4 ... 20 mA	6.2	AC/DC 24	2 way	A	3RS17 02-1DD00	A	3RS17 02-2DD00			0.03	
	4 ... 20 mA	0 ... 10 V	6.2	AC/DC 24	2 way	A	3RS17 03-1AD00	A	3RS17 03-2AD00			0.03	
	4 ... 20 mA	0 ... 20 mA	6.2	AC/DC 24	2 way	A	3RS17 03-1CD00	A	3RS17 03-2CD00			0.03	
4 ... 20 mA	4 ... 20 mA	6.2	AC/DC 24	2 way	A	3RS17 03-1DD00	A	3RS17 03-2DD00			0.03		
Multi-range converters, switchable													
	0 ... 10 V	0 ... 10 V	6.2	AC/DC 24	2 way	A	3RS17 05-1FD00	A	3RS17 05-2FD00			0.03	
	0 ... 20 mA	0 ... 20 mA	17.5	AC/DC 24	3 way ¹⁾	A	3RS17 05-1FW00	A	3RS17 05-2FW00			0.1	
	4 ... 20 mA	4 ... 20 mA	switchable	to 240									
	0 ... 10 V	0 ... 50 Hz	6.2	AC/DC 24	2 way ²⁾	A	3RS17 05-1KD00	A	3RS17 05-2KD00			0.1	
	0 ... 20 mA	0 ... 100 Hz	17.5	AC/DC 24	3 way ¹⁾²⁾	A	3RS17 05-1KW00	A	3RS17 05-2KW00			0.1	
	4 ... 20 mA	0 ... 1 kHz	switchable	to 240									
0 ... 10 kHz	switchable												
Universal converters, switchable, start of delivery 12/01													
	0 ... 60 mV	0 ... 10 V	17.5	AC/DC 24	2 way	A	3RS17 06-1FD00	A	3RS17 06-2FD00			0.1	
	0 ... 100 mV	0 ... 20 mA			3 way	A	3RS17 06-1FE00	A	3RS17 06-2FE00			0.1	
	0 ... 300 mV	4 ... 20 mA		AC/DC 24	3 way	A	3RS17 06-1FW00	A	3RS17 06-2FW00			0.1	
	0 ... 500 mV	switchable		to 240									
	0 ... 1 V												
	0 ... 2 V												
	0 ... 5 V												
	0 ... 10 V												
	0 ... 20 V												
	2 ... 10 V												
	0 ... 5 mA												
	0 ... 10 mA												
0 ... 20 mA													
4 ... 20 mA													
± 5 mA													
± 20 mA													
switchable													
Multi-range converters, switchable, with Manual/Automatic switch and setting potentiometer as manual analog signal encoder, start of delivery 12/01													
	0 ... 10 V	0 ... 10 V	17.5	AC/DC 24	2 way	A	3RS17 25-1FD00	A	3RS17 25-2FD00			0.1	
	0 ... 20 mA	0 ... 20 mA		AC/DC 24	3 way	A	3RS17 25-1FW00	A	3RS17 25-2FW00			0.1	
	4 ... 20 mA	4 ... 20 mA		to 240									
Individual interface converters, passive													
	0/4 ... 20 mA	0/4 ... 20 mA	6.2	1-channel	2 way	A	3RS17 20-1ET00	A	3RS17 20-2ET00			0.05	
	0/4 ... 20 mA	0/4 ... 20 mA	12.5	1-channel	2 way	A	3RS17 21-1ET00	A	3RS17 21-2ET00			0.05	
	0/4 ... 20 mA	0/4 ... 20 mA	12.5	2-channel	2 way	A	3RS17 22-1ET00	A	3RS17 22-2ET00			0.05	

1) Start of delivery 12/01.

2) Technical changes are possible; see Operator's Guide.

Technical data

General data

Type		AC/DC 24 V	AC/DC 24 to 240 V
Supply voltage range		DC: 0.7 to 1.25 U_n AC: 0.8 to 1.2 U_n	DC: 0.7 to 1.1 U_n AC: 0.8 to 1.1 U_n
Rated power (own requirements)	W	Typically 0.3	Typically 0.75
Electrical isolation input/output		Active disconnecter: 1500 V, 50 Hz, 1 min Passive disconnecter: 500 V, 50 Hz, 1 min	4000 V, 50 Hz, 1 min
Rated insulation voltage			
Pollution degree 2, overvoltage category III acc. to DIN VDE 0110	V	50	300
Ambient temperature	for operation for storage	°C °C	-20 ... +60 -40 ... +85
Conductor cross-sections			
Screw connections			
solid	mm ²	1 x (0.25 ... 4)	
finely stranded with or without end sleeves	mm ²	1 x (0.5 ... 2.5)	
Terminal screws		M 3	
Cage Clamp terminals			
solid/finely stranded	mm ²	1 x (0.08 ... 2.5)	
finely stranded with end sleeve	mm ²	1 x (0.25 ... 1.5)	
Enclosure degree of protection	IEC 529	IP 30	
Terminal degree of protection	IEC 529	IP 20	
Permissible mounting position		any	
Mounting onto standard rails	EN 50 022	mm	35
Vibration performance	IEC 68-2-6		10 – 55 Hz/0.35 mm
Shock resistance	IEC 68-2-27		15 g/11 ms

Input

		Voltage inputs	Current inputs active	Current inputs passive
Input impedance		330 k Ω	100 Ω	–
Max. input voltage	AC/DC	V	30	–
Response current		μ A	–	100/250 (6.2 mm overall width)
Voltage drop		–	–	2.7 V at 20 mA

Output

		0 to 10 V	0/4 to 20 mA active	0 to 20 mA passive	Frequency ¹⁾
Output impedance	Ω	55	–	–	–
Max. output load	Ω	–	400	1000 at 20 mA 400 at 20 mA (6.2 mm overall width)	2400
Max. output current	mA	21	–	–	10
Short-circuit current	mA	40	–	Corresponds to the input current	15
Protection of the outputs		Short-circuit proof	Short-circuit proof	Short-circuit proof	Short-circuit proof
Max. overvoltage at output	AC/DC	V	30	–	30

Accuracy

		Active disconnecter (U, I)	Active disconnecter ¹⁾ (frequency)	Passive disconnecter
Total error at 23 °C	%	0.1	0.1	–
Linearity error	%	0.02	0.02	–
Deviation due to ambient temperature		0 to 10 V: 1.5 mV/K 0/4 to 20 mA: 3 μ A/K	0 to 50 Hz; 7.5 mHz/K 0 to 100 Hz; 15 mHz/K 0 to 1 KHz; 0.15 Hz/K 0 to 10 KHz; 1.5 Hz/K	Load < 600 Ω : < 50 ppm/K from measured value Load < = 600 Ω : < 175 ppm/K from measured value
Transmission error	%	–	–	0.1
Load error from measured value		–	–	0.06%/100 Ω
Limit frequency 3 dB	Hz	30	30	50
Rise time (10 to 90%)	ms	10	10 + 1 periods	–
Settling time to 1% accuracy, typically	ms	30	30 + 1 periods	–
Residual ripple	mV _{rms}	< 5	–	< 8

Unless stated otherwise, the accuracy is specified with reference to the upper range limit

1) Technical changes are possible; see Operator's Guide.

3RS17

Configuration

Active interface converters

Active interface converters offer the widest application flexibility due to the use of an external supply voltage. Project engineering with active interface converters is easy, because

input and output resistances and voltage drops are balanced by the auxiliary power. They provide pure electrical isolation as well as conversion between the different signal

types or amplification. The loading on the encoder is negligible.

Passive interface converters

Passive interface converters do not require an external supply voltage. This advantage can only be utilised in the case of current signals that are transferred 1:1. Amplification or

conversion is not possible. The converters are used for clear electrical isolation of signals and for protecting the inputs and outputs. Passive disconnectors do not operate reac-

tion free, i.e. any load on the output affects the input signal to the same degree. When the passive converter is used, an analysis of the output power of the encoder and the input

resistance of the analog input must be performed. For pure current signals being used more and more.

Calculation aid for passive converters

⚠ Important:

When passive disconnectors are used, it is important to note that:

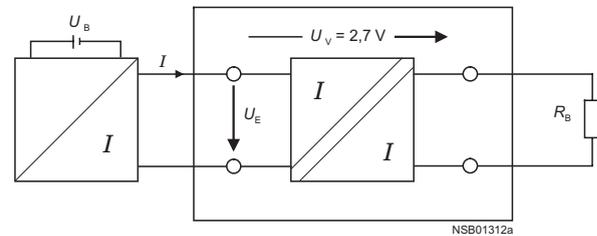
The current-driving voltage of the measuring transmitter U_E must be sufficient to drive the maximum current of 20 mA

through the passive disconnector with a voltage drop of $U_V = 2.7\text{ V}$ and the resistive load R_B .

This means that:

$$U_B \geq U_E = 2.7\text{ V} + 20\text{ mA} \times R_B$$

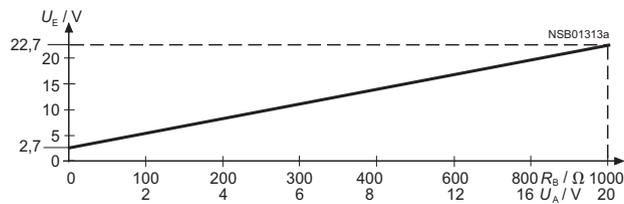
Voltage splitting with passive disconnectors



The following diagram shows the input voltage U_E as a function of the resistive load R_B taking into account the voltage drop U_V . If the resistive load is known, the minimum voltage that the current source has to produce in order to drive the maximum current of 20 mA via the passive disconnector and resistive load can be read off the Y-axis.

Input voltage

as a function of resistive load at $I_A = 20\text{ mA}$



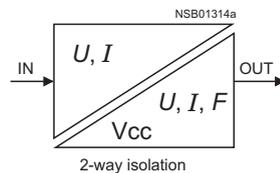
Current-carrying capacity of the outputs

A maximum output load is specified in the case of current signals. This resistance value specifies the maximum input resistance for the subsequent device for which the output of the converter is adequate.

For voltage signals, the maximum current that can be drawn from the output is the decisive factor.

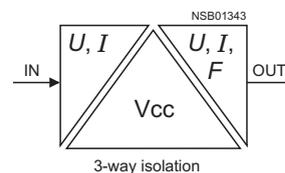
2-way isolation

In the case of 2-way isolation, the input is electrically isolated from the output. The "zero potential" for the supply voltage is the same as that on which the analog output signal is referenced.



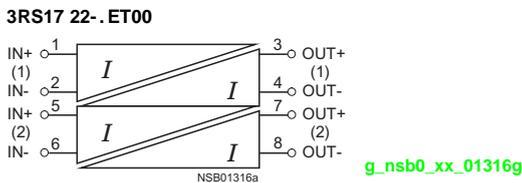
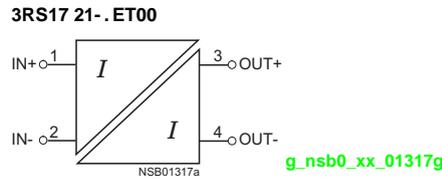
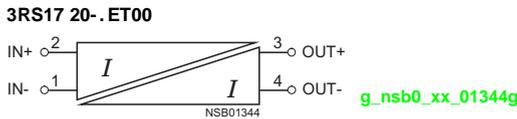
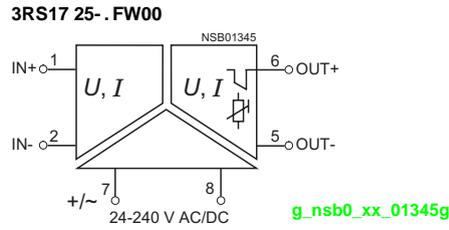
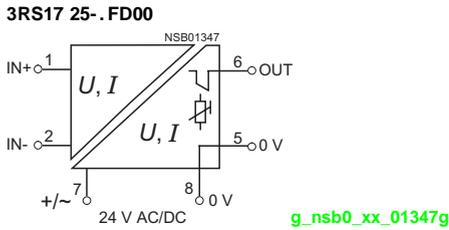
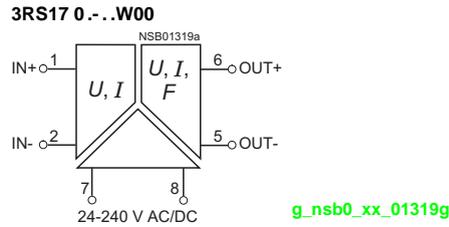
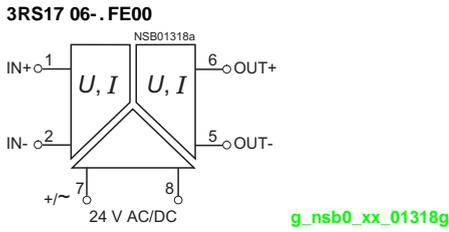
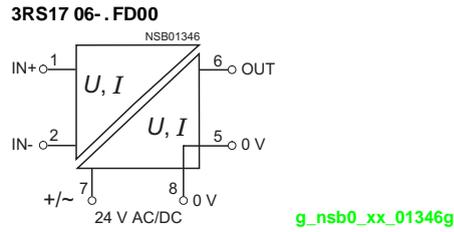
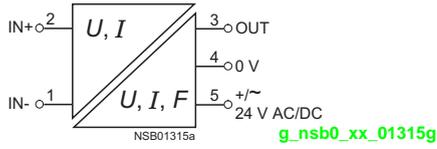
3-way isolation

In the case of 3-way isolation, each circuit is electrically isolated from the others, i.e. the input, output and supply voltage have no common potential.



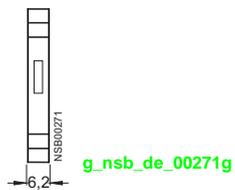
Circuit diagrams

3RS17 00-..D..
3RS17 02-..D..
3RS17 03-..D..
3RS17 05-..D..

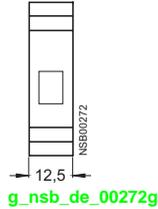


Dimension drawings

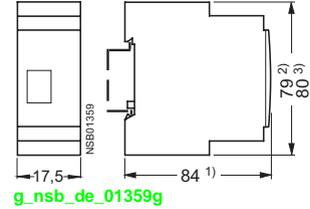
6.2 mm type:



12.5 mm type:



17.5 mm type:



1) Overall depth for 3RS17 25 is approx. 90 mm.
2) Dimension for screw connection.
3) Dimension for Cage Clamp connection.