3RS17 interface converters

Overview

Interface converters perform the coupling function for analog signals on both the input side and the output side. They are indispensable when processing analog values with electronic controls. Under harsh industrial conditions in particular, it is often necessary to transmit analog signals over long distances. This means that electrical isolation is essential due to the different supply systems. The resistance of the wiring causes potential differences and losses which must be prevented.

Electromagnetic faults and overvoltages can affect the signals on the input side in particular or even destroy the analog modules. All terminals of the 3RS17 interface converters are safe up to a voltage of 30 V DC and protected against switching poles. Short-circuit protection is an especially important function for the outputs.

The devices are EMC-tested according to

- EN 50081 (basic specification for emitted interference)
- EN 61000-6-2 (basic specification for interference immunity)

The analog signals comply with

- IEC 60381-1/2

Function

Active interface converters

Active interface converters provide maximum flexibility for the application by the use of an external supply voltage. Configuration with active interface converters is extremely easy because input and output resistances and voltage drops are compensated by the auxiliary supply. They support complete voltage isolation as well as conversion from one signal type to another or reinforcement. The load of the measured value transmitter is negligible.

Passive interface converters

Passive interface converters do not require an external supply voltage. This advantage can only be used by current signals that are converted 1:1. Reinforcement or conversion is not possible. The converters are used for complete electrical isolation of current signals and to protect the inputs and outputs. Passive isolators do not operate reaction-free, any load on the output produces an equal load on the input. When the passive converter is to be used, the output performance of the sensor and the input resistance of the analog input must be analyzed. This technique is being increasingly implemented in the case of pure current signals.

Calculation guide for passive converters

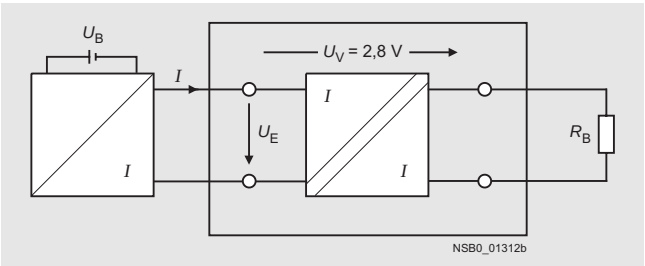
Note: Please note the following when using passive isolators:

The current-driving voltage of the measuring transducer U_E must be sufficient to drive the maximum current of 20 mA over the passive isolator with a voltage loss of U_V = 2.8 V and the load R_B.

This means that:

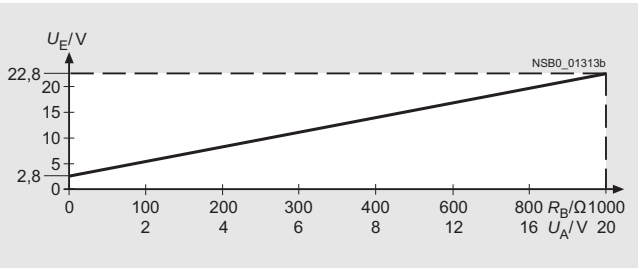
$U_B \geq U_E = 2.8\ V + 20\ mA \times R_B$

Distribution of the voltages in the case of passive isolators



Input voltage depending on the load at I_a = 20 mA

The following graphic shows the input voltage U_E as a function of the load R_B taking into account the voltage loss U_V. If the load is known, the y-axis shows the minimum voltage that has to be supplied by the current source in order to drive the maximum current of 20 mA over the passive isolator and load.



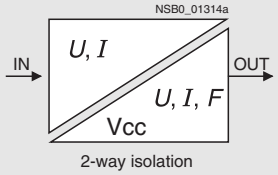
Current carrying capacity of the outputs

A maximum output resistance is specified for current signals. This resistance value specifies how large the input resistance of the next device connected in series can be as a result of the power of the converter.

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

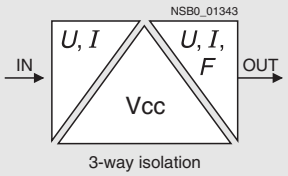
2-way isolation

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



3-way isolation

For the 3-path isolation, each circuit is electrically isolated from the other circuits i.e. input, output, and supply voltage do not have a potential link.



3RS17 interface converters

Technical specifications

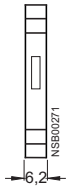
Type 3RS17			24 V AC/DC	24 ... 240 V AC/DC
General data				
Supply voltage operating range	DC AC		0.7 ... 1.25 x U_n 0.8 ... 1.2 x U_n	0.7 ... 1.1 x U_n 0.8 ... 1.1 x U_n
Rated power		W	Typically 0.3	Typically 0.75
Electrical isolation of input/output			Active disconnector: 1500 V, 50 Hz, 1 min; Passive disconnector: 500 V, 50 Hz, 1 min	4000 V, 50 Hz, 1 min
Rated insulation voltage U_i Degree of pollution 2 Overvoltage category III acc. to DIN VDE 0100		V	50	300
Ambient temperature	During operation During storage	°C °C	-25 ... +60 -40 ... +85	
Connection type			**Screw terminals**	
• Terminal screw			M3 (for standard screw driver size 2 and Pozidriv 2)	
• Solid		mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)	
• Finely stranded with end sleeve		mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)	
• AWG cables, solid or stranded		AWG	2 x (20 ... 14)	
• Tightening torque		Nm	0.8 ... 1.2	
Connection type			**Spring-loaded terminals**	
• Solid	Enclosures IEC 529	mm^2	2 x (0.25 ... 1.5)	
• Finely stranded, with end sleeves acc. to DIN 46228	Terminals IEC 529	mm^2	2 x (0.25 ... 1.5)	
• Finely stranded		mm^2	2 x (0.25 ... 1.5)	
• AWG cables, solid or stranded		AWG	2 x (24 ... 16)	
Vibration resistance acc. to IEC 68-2-6			10 ... 55 Hz: 0.35 mm	
Shock resistance acc. to IEC 68-2-27		g/ms	15/11	
Input				
Impedance	Voltage inputs Current inputs, active	kΩ Ω	330 100	
Input voltage max.	Voltage inputs Current inputs, active	V V	30 AC/DC 30 AC/DC	
Operating current	Current inputs, passive	µA	100/250 (6.2 mm width)	
Voltage drop	Current inputs, passive	V	2.7 at 20 mA	
Output				
Internal resistance	Voltage output, 0 ... 10 V	Ω	55	
Output load	Current 0/4 ... 20 mA active, max. Current 0 ... 20 mA passive, max. Frequency, min.	Ω Ω Ω	400 1000 at 20 mA 2400	
Output voltage	Frequency	V	20.9	
Output current	Voltage output, 0 ... 10 V, max. Frequency, max.	mA mA	21; note the terminating resistance (> 500 Ω)! 10	
Short-circuit current	Voltage output, 0 ... 10 V Current output, 0 ... 20 mA, passive Frequency	mA mA mA	40 Corresponds to the input current 15	
Protection of the outputs			Short-circuit resistant	
Max. overvoltage at output		V	30	
Accuracy				
Total error at 23 °C	Active disconnector (frequency) Active disconnector (U, I)	% %	0.1 0.1[1)]	
Linearity error	Active disconnector (U, I) Active disconnector (frequency)	% %	0.02 0.02	
Deviation due to ambient temperature	Active disconnector (frequency) Active disconnector (U, I) Passive disconnector		0 ... 50 Hz: 7.5 mHz/K; 0 ... 100 Hz: 15 mHz/K; 0 ... 1 kHz: 0.15 Hz/K; 0 ... 10 kHz: 1.5 Hz/K 0 ... 10 V: 1.5 mV/K; 0/4 ... 20 mA: 3 µA/K With load < 600 Ω: <100 ppm/K of measured value with load ≥ 600 Ω: < 175 ppm/K of measured value	
Transmission error	Passive disconnector	%	0.1	
Measured value load error		%/Ω	0.06/100	
Limit frequency at 3 dB	Active disconnector (frequency) Active disconnector (U, I) Passive disconnector	Hz Hz Hz	30 30 50	
Rise time (10 ... 90 %)	Active disconnector (frequency) Active disconnector (U, I)	 ms	10 + 1 period 10	
Settling time at 1 % accuracy	Active disconnector (frequency) Active disconnector (U, I)	 ms	30 + 1 period 30	
Residual ripple	Active disconnector (U, I) Passive disconnector	mV_{eff} mV_{eff}	< 5 < 8	

The accuracy refers to the upper limit of effective range if not otherwise stated.

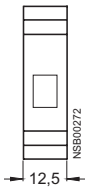
[1)] For 3RS17 06: 0.1 % for selected output 4... 20 mA; 0.3 % for selected output 0 ... 20 mA; 0.3 % for selected output 0 ... 10 V and from an input voltage > 50 mV. For an input voltage < 50 mV an offset of max. 20 ms is effective at the output.

Dimensional drawings

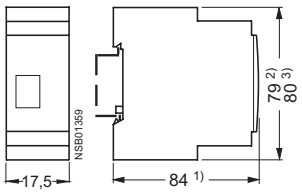
6.2 mm design



12.5 mm design



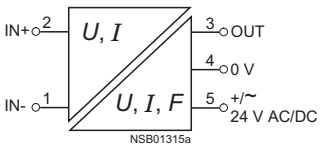
17.5 mm design



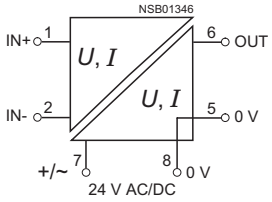
1) Depth for 3RS17 25 is approx. 90 mm.
2) Dimensions for screw terminal.
3) Dimensions for spring-loaded terminal.

Schematics

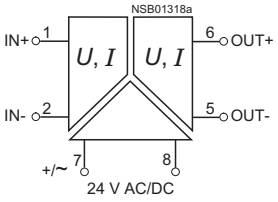
3RS17 00-..D..
3RS17 02-..D..
3RS17 03-..D. .
3RS17 05-..D..



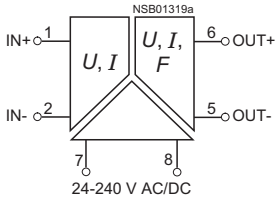
3RS17 06- . FD00



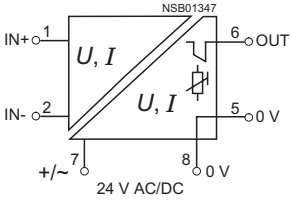
3RS17 06-.FE00



3RS17 0.-..W00



3RS17 25-.FD00



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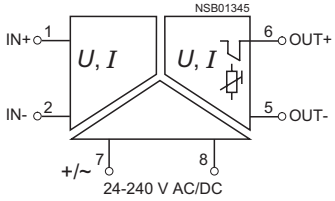

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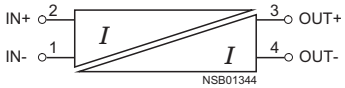
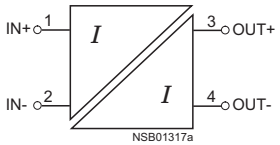


3RS17 21-.ET00



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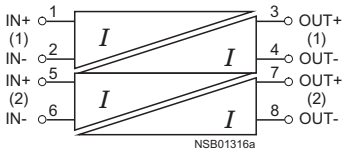

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