

Module for monitoring and limitation of the solenoid currents with proportional directional control valves

Type VT-MUXA2-2



► Component series 1X

Features

- Shut-off of the solenoid currents after exceedance of the admissible maximum current
- Additional, not safety-relevant command value correction prevents early switching off of the solenoid currents
- Additional fuse protection of the solenoid circuits by non-exchangeable fuses according to IEC 60127-4
- Redundant relay contacts per solenoid circuit
- Redundant solenoid current measurement per solenoid circuit
- Reverse polarity protection of the solenoid circuits
- Reverse polarity protection of the operating voltage
- Reset input – edge-triggered
- Differential input
- Command value output
- OK output
- Top hat rail mounting
- Pluggable connection terminals

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Ordering code

01	02	03	04	05	06	07
VT-MUXA	2	-	2	-	1X	/ V0 1A *

01	Analog module for monitoring solenoid coils	VT-MUXA
02	Monitoring for valves with one or two solenoids	2
03	Serial number (module type)	2
04	Component series 10 ... 19 (10 ... 19: unchanged technical data and pin assignment)	1X
05	Standard version	V0
06	$I_{\max} = 1.0\text{ A}$	1A
07	For further information, see the plain text	*

Available variant

Type	Material no.
VT-MUXA2-2-1X/V0/1A	R901254583



Note:
Two ferrite sleeves for solenoid current carrying lines between amplifier and monitoring module are included in the scope of delivery.

Function

General

The VT-MUXA2-2 module can be used to monitor 1 or 2 solenoid circuits. The solenoid currents are limited so that there is no overheating of the solenoids. The solenoid currents necessary for operating the valve are provided by an amplifier (separate order). The amplifier is adjusted according to the rated current data of the solenoid (rated current=1.03A). With a command value presetting of 10 V, it provides an output current of 1.0 A. In case of defect or incorrect operation, the amplifier may provide a current of more than 1.0 A. The interconnected VT-MUXA2-2 monitoring module recognizes the over-current, reduces the command value or switches off the solenoid current. The VT-MUXA2-2 monitoring module must be protected against voltage peaks from the 24V mains. The VT 11110 capacitor module protects against voltage peaks and smooths the supply voltage (24V).

Power supply unit (1)

The internal power supply unit provides the internally required auxiliary voltages. A green LED (power) shows that the power supply unit is working.

Power supply unit monitoring (2)

If the internal supply voltages are missing, this causes the switching off of the relay via the NTF signal. Voltages without which the relays cannot be controlled are not monitored additionally.

Current measurement (3)

The solenoid currents (I_A and I_B) are in each case measured in the supply path and in the return path (AV, AR, BV, BR). Both measurement results are analyzed independent of each other. Against reversed polarity, protective diodes are provided. The two solenoid currents (I_A and I_B) are added as neither each individual solenoid current nor the total of the currents must exceed the specific limit value.

Function

Symmetry monitoring (4)

As the supply and return currents must be identical, the total currents (I_{VS} and I_{RS}) are identical as well. If there are variations, e.g. in case of earth fault or faulty current measurement, the DI error signal for the relay switching off is generated.

Signal generation correction (5)

The signal correction serves

- ▶ as auxiliary signal for correcting (amount reduction) the command value forwarded to the amplifier as soon as the maximum admissible solenoid current is exceeded.
- ▶ as auxiliary signal for switching off the solenoid circuits if the correction is not effective.

Command value correction (6)

As long as the solenoid current is within the nominal range, the command value for the solenoid current coming from the control is forwarded to the valve amplifier without being influenced. If the maximum admissible current is exceeded, the command value amount reduced is within few seconds with a ramp-shaped development until the current reaches the limit value. Thus, an abrupt shutdown of the current is avoided. If the corrected command value reaches a value smaller than 50% of the nominal value and the solenoid current is not reduced, there is a switching off by the relay contacts. The command value correction is not structured in a redundant form. A circuit failure or an incorrect command value signal always results in the switch-off by the relay contacts if the solenoid current values are inadmissible.

Relay control (7)

The relays for switching on and off the solenoid currents all have own control electronics with DI, NTF inputs and the signals of the signal generation correction (5).

Shut-off

Shut-off is initiated in case the admissible maximum current is exceeded and as soon as at least one signal correction does not result in a current reduction or one of the redundant current measurements shows measurement differences (symmetry monitoring). Moreover, the relays remain switched off as long as after switch on or reset, the self-test is executed.

Switch on

The relays are always only switched on after passed self-test.

Safety measures

- ▶ Power supply unit monitoring
- ▶ Redundant current measurement
- ▶ Symmetry monitoring of the current measurement
- ▶ Redundant signal generation correction
- ▶ Redundant relay control circuits and relays
- ▶ Relay with positively driven contacts
- ▶ Self-test.

Self-test (8)

The self-test is necessary because an error that has occurred in the redundant monitoring functions must be detected. The command value correction circuit (6) is not checked by means of the self-test. The self-test is carried out after each operating voltage switch-on and each manual and each electronic reset of the electronics. The manually started self-test is performed after actuation the "S1" reset pushbutton. The electronic reset is performed by a positive edge at the 24V reset input.

Notice:

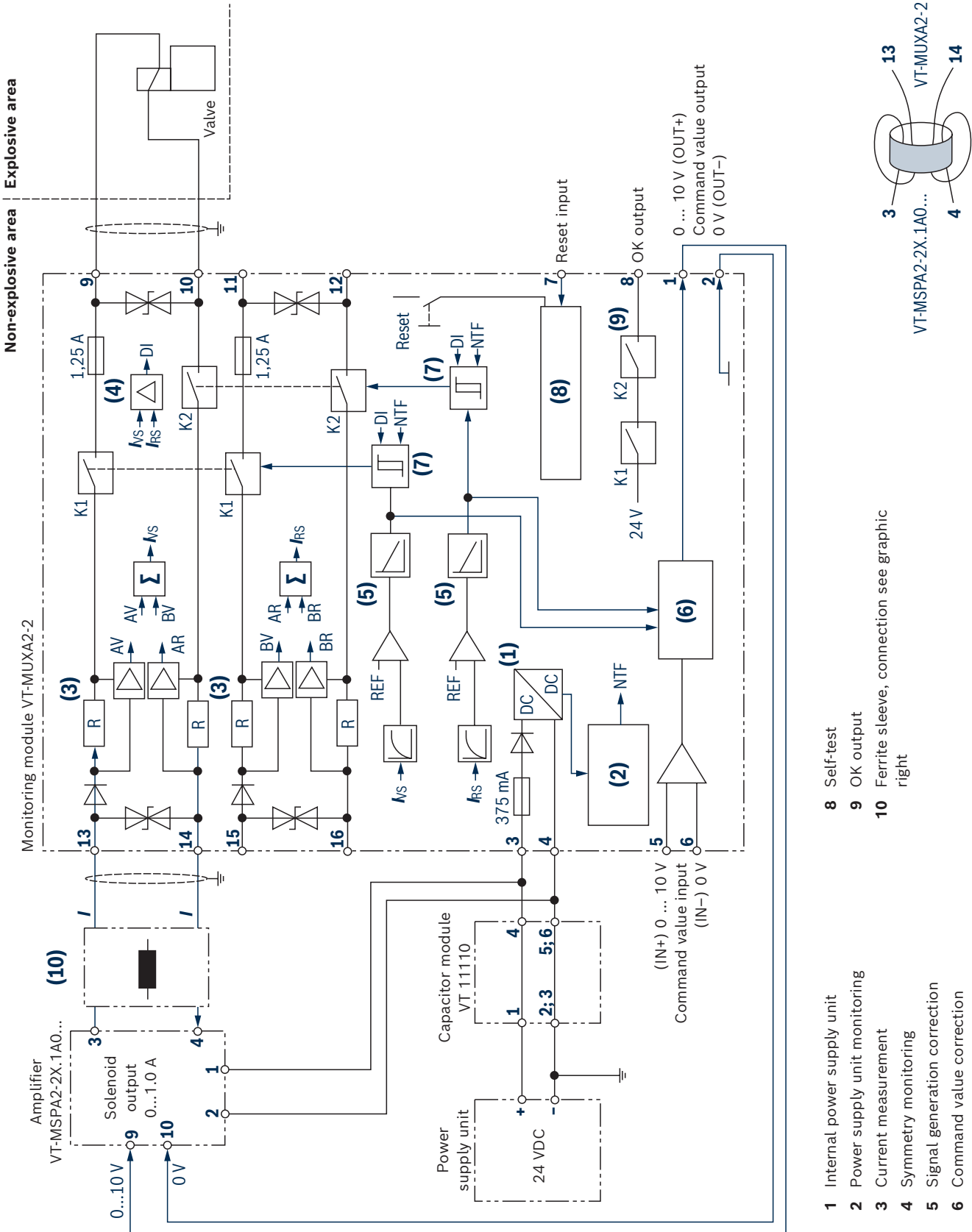
Unintended movements of the system/machine are possible.
If the self-test is activated during operation, both relays are opened. Thus, the hydraulic function is considerably disturbed.
The function of the "S1" reset pushbutton can be suppressed by a 24V signal at the reset input in order to prevent an accidental tripping. So that the self-test for checking the VT-MUXA2-2 monitoring module can be performed, the 24 V signal must be removed again.

"OK" output (9)

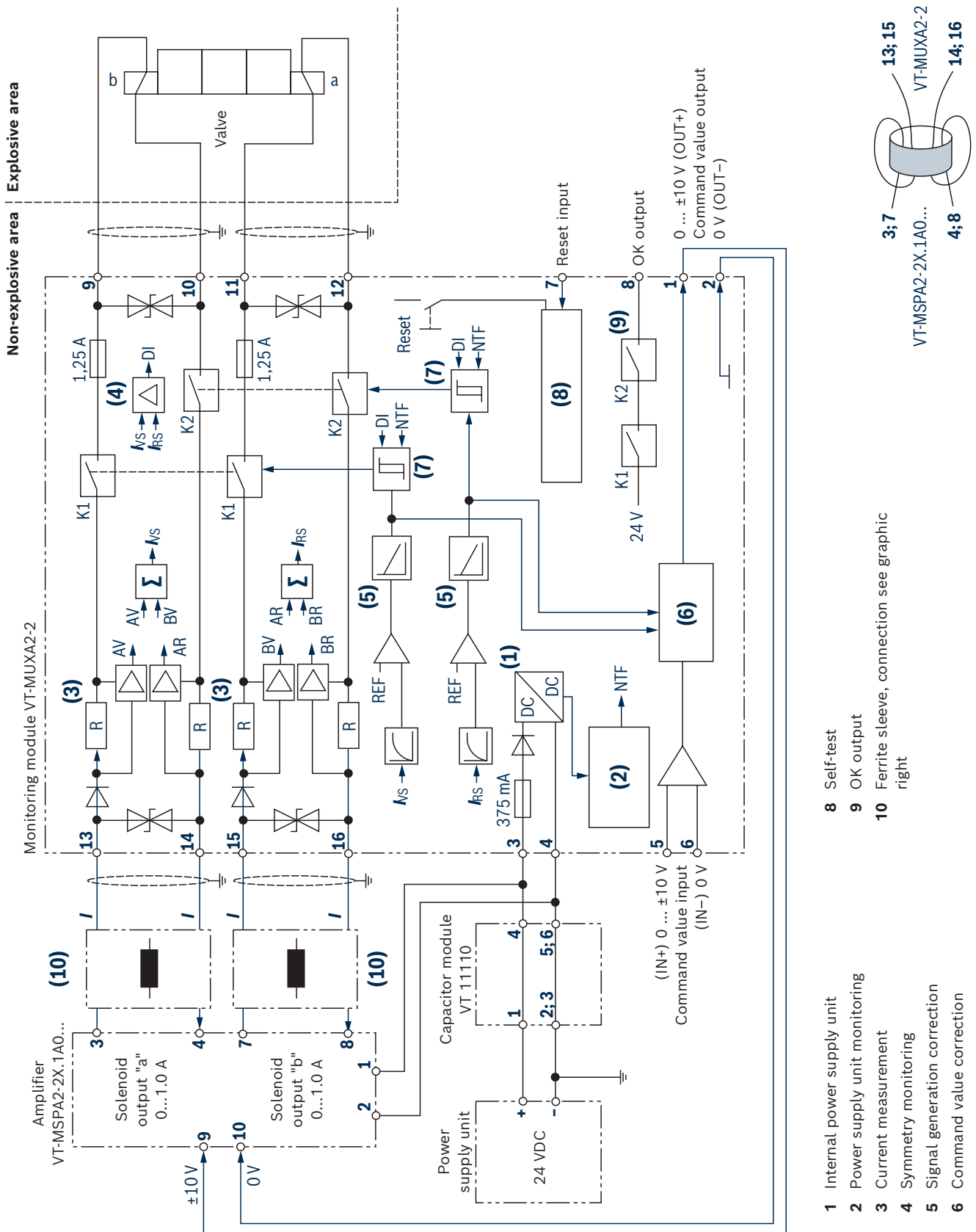
As soon as the "Test OK" signal is set and both relays have switched, as well, this is signaled by a 24V output signal and by the LED.

See also "block diagram" on page 4 and 5.

Block diagram: A solenoid



Block diagram: Two solenoids



See also "Function" on page 2 and 3.

Technical data

(For application of devices outside the specified values, please contact us!)

General			
Design		Module	
Type of connection		16-pole terminal housing with detachable terminals	
Weight	kg	0.15	
Installation position		Vertical; for the breathing of the assembly, the ventilation slots of the top and bottom side must be at least 2 cm away from covers, walls, etc. Minimum distance between assemblies 1 cm.	
Ambient temperature range	°C	0 ... +50 ¹⁾	
Storage temperature range (with UV protection)	°C	−25 ... +85	
Protection class according to EN 60529		IP20	
Type of mounting		Top hat rail TH 35-7.5 according to EN 60715	
Connection cross-section	mm ²	0.2 ... 2.5	
Maximum admissible degree of contamination according to EN 60664		2	
Clearances and creepage distances according to		EN 50178	
Maximum operating hours		40000	
Electrical			
Supply voltage (<i>U</i> _B)	▶ Nominal value	V	24
	▶ Minimum	V	18 ¹⁾
	▶ Maximum	V	30 ¹⁾
	▶ Maximum power consumption	W	<5
	▶ Fuse protection, external ²⁾	A	1.25 (fast acting; SMD)
	▶ Reverse polarity protection		Yes
Maximum current consumption		A	<0.2
Inputs	▶ Command value differential input (<i>R</i> _E = 100 kΩ)		
	– 1 solenoid	V	0 ... +10
	– 2 solenoids	V	0 ... ±10
	▶ Reset input		
	– Low	V	0 ... 6.5
	– High	V	10 ... <i>U</i> _B
	▶ Monitored solenoid current inputs		1; 2
	– Admissible common-mode voltage	V	−2 ... <i>U</i> _B
	– Reverse polarity protection		By means of diodes
Outputs	– Admissible clock frequency of the solenoid currents		Hz 0 ... 500
	▶ Command value output (<i>I</i> = 2 mA) ³⁾		
	– 1 solenoid	V	0 ... +10
	– 2 solenoids	V	0 ... ±10
	▶ 2 solenoid current outputs		A 1.0 (monitored to ±2%)
	▶ OK output		
	– Low = OK (<i>R</i> _i = 10 kΩ)	V	<2
	– High = OK	V /	<i>U</i> _B ... 3 /
		mA	50, short-circuit-proof
LED displays	▶ OK		Green is illuminated if the self-test has been completed, the relays have operated and there is no error
	▶ Power		Green is illuminated when the internal power supply unit is working

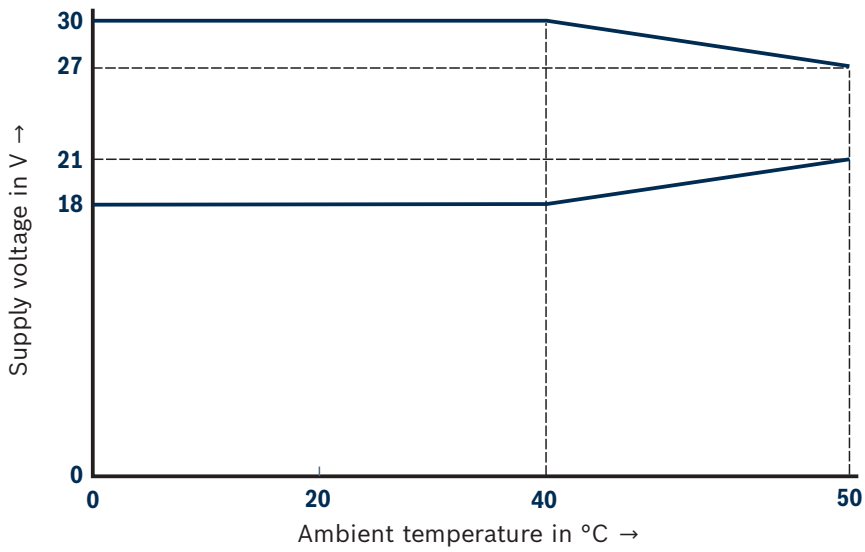
¹⁾ $0^\circ\text{C} \leq \vartheta_U \leq 40^\circ\text{C}$ (see also derating characteristic curve page 7;
 ϑ_U = dependence of the supply voltage on the ambient temperature)

²⁾ 1 or 2 fuses for the solenoid currents, not exchangeable.

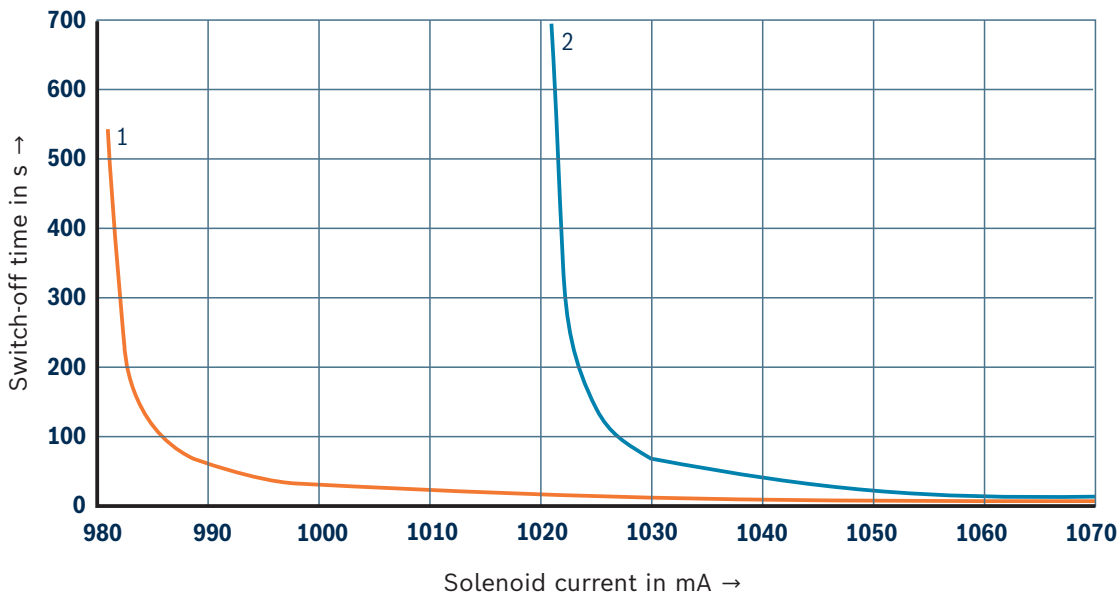
³⁾ Command value presetting at the amplifier

Characteristic curves

Temperature derating for the supply voltage



Switch-off behavior



- 1 -2% of 100% solenoid current (1.0 A)
- 2 +2% of 100% solenoid current (1.0 A)

Terminal assignment

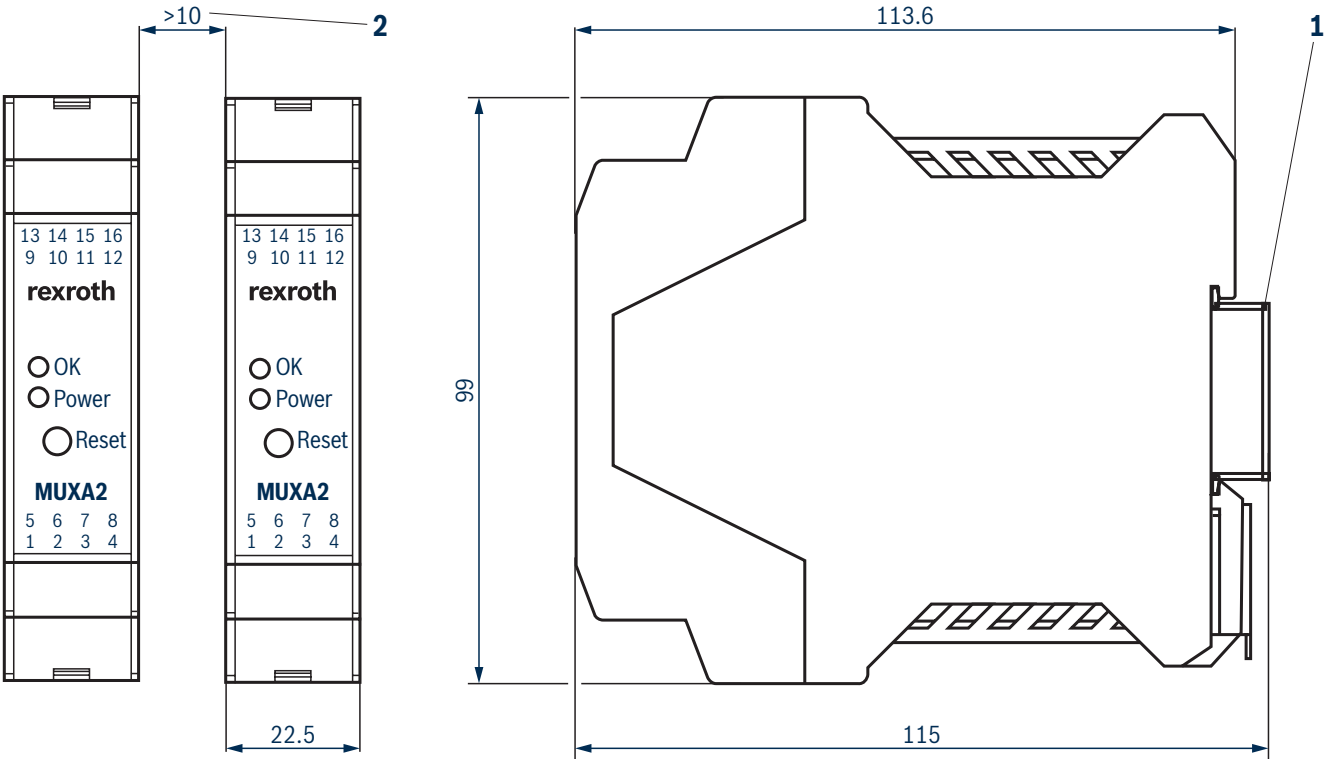
1 solenoid

Terminal	Function
1	Command value output 0 ... 10 V (OUT+)
2	Command value output 0 V (OUT−)
3	+U _B
4	Ground
5	Command value input 0 ... 10 V (IN+)
6	Command value input 0 V (IN−)
7	Reset input
8	OK output
9	Solenoid "+" output
10	Solenoid "−" output
11	Not connected
12	Not connected
13	Solenoid "+" input
14	Solenoid "−" input
15	Not connected
16	Not connected

2 solenoids

Terminal	Function
1	Command value output 0 ... ±10 V (OUT+)
2	Command value output 0 V (OUT−)
3	+U _B
4	Ground
5	Command value input 0 ... ±10 V (IN+)
6	Command value input 0 V (IN−)
7	Reset input
8	OK output
9	Solenoid a "+" output
10	Solenoid a "−" output
11	Solenoid b "+" output
12	Solenoid b "−" output
13	Solenoid a "+" input
14	Solenoid a "−" input
15	Solenoid b "+" input
16	Solenoid b "−" input

Dimensions
 (dimensions in mm)



- 1 Top hat rail TH 35-7.5
- 2 Minimum distance to the next device

Project planning information

- ▶ The Rexroth electronics listed in this data sheet must be installed and operated outside the potentially explosive area.
- ▶ The "VT-MUXA2-2" module must be switched between amplifier output and solenoids and between control output (command value presetting by higher-level control) and amplifier input (see page 4 and 5).
- ▶ Only connect valve solenoids the maximum current of which complies with the monitoring current of the "VT-MUXA2-2" monitoring module.
- ▶ The "VT-MUXA2-2" module is an electrostatically endangered component. It has to be assembled in compliance with ESD protection measures.

Further information

- | | |
|--|-----------------------------------|
| ▶ Valve amplifier for proportional valves without electrical position feedback | Operating instructions 30232-01-B |
| ▶ Installation, commissioning and maintenance of proportional valves | Data sheet 07800 |
| ▶ Assembly, commissioning and maintenance of hydraulic systems | Data sheet 07900 |

Notes

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