

Module for monitoring and limiting the solenoid currents with proportional valves

Type VT-MUXA2-2

RE 30290

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H7312

► 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 switch-off of the solenoid currents
- Additional fuse protection for the solenoid circuits by means of non-exchangeable fuses 1.25 A, fast-acting 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

Contents

Features	1
Use	2
Ordering code	2
Function	2
Block diagram VT-MUXA2-2 for one solenoid	4
Block diagram VT-MUXA2-2 for two solenoids	5
Technical data	6
Characteristic curves	7
Terminal assignment	8
Installation conditions and unit dimensions	8

Use

The module VT-MUXA2-2 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 (order separately).

The amplifier is adjusted according to the rated current data of the solenoid (rated current = 1.03 A). 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. Our capacitor module VT 11110 protects against voltage peaks and smoothes the 24 V supply voltage.

Explosion hazard in case of incorrect assembly!

Please observe the following rules in any circumstance!

1. **The Rexroth electronics listed in this data sheet must be installed and operated outside the explosive area.**
2. **The VT-MUXA2-2 module must be switched between amplifier output and solenoids and between control output (command value presetting by superior control) and amplifier input (see block diagram).**
3. **Only connect valve solenoids the maximum current of which complies with the monitoring current of the VT-MUXA2-2 monitoring module.**

Notice:

The VT-MUXA2-2 module is an electrostatically endangered component. It has to be assembled complying with ESD protection measures.

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 to 19 (10 to 19: Unchanged technical data and pin assignment)	1X
05	Standard version	V0
06	I_{\max} = 1.0 A	1A
07	Further details in the plain text	*

Included in the scope of delivery:

- Two ferrite sleeves for lines between amplifier and monitoring module conducting solenoid current

Function

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

relay switch-off 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).

Function (continued)

Both measurement results are analyzed independently of each other. Against reversed polarity, protective diodes are provided. The two 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.

Symmetry monitoring (4)

As the supply and return currents must be identical, the total currents are identical, as well. If there are deviations, e.g. in case of earth fault or faulty current measurement, the DI error signal for the relay switch-off is generated.

Correction signal generation (5)

The correction signals serve

1. as auxiliary signal for correcting (amount reduction) the command value forwarded to the amplifier as soon as the maximum admissible solenoid current is exceeded.
2. 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 is within few seconds reduced with a ramp-shaped development until the current reaches the limit value. Thus, an abrupt switch-off 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 switch-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 the solenoid currents on and off all have their own control electronics with DI, NTF inputs and the signals of the correction signal generation (5).

Shut-off

Shut-off is initiated in case the admissible maximum current is exceeded and as soon as at least one correction signal does not result in a current reduction or one of the redundant current measurements shows differences in the measurements (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 correction signal generation
- ▶ Redundant relay control circuits and relays
- ▶ Relay with positively driven contacts
- ▶ Self-test

Self-test (8)

The self-test is necessary as an occurred error has to be detected in the redundant monitoring functions. 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 actuating the "S1" reset pushbutton. The electronic reset is performed by a positive edge at the 24 V reset input.

Unintended movements of the system/machine are possible!

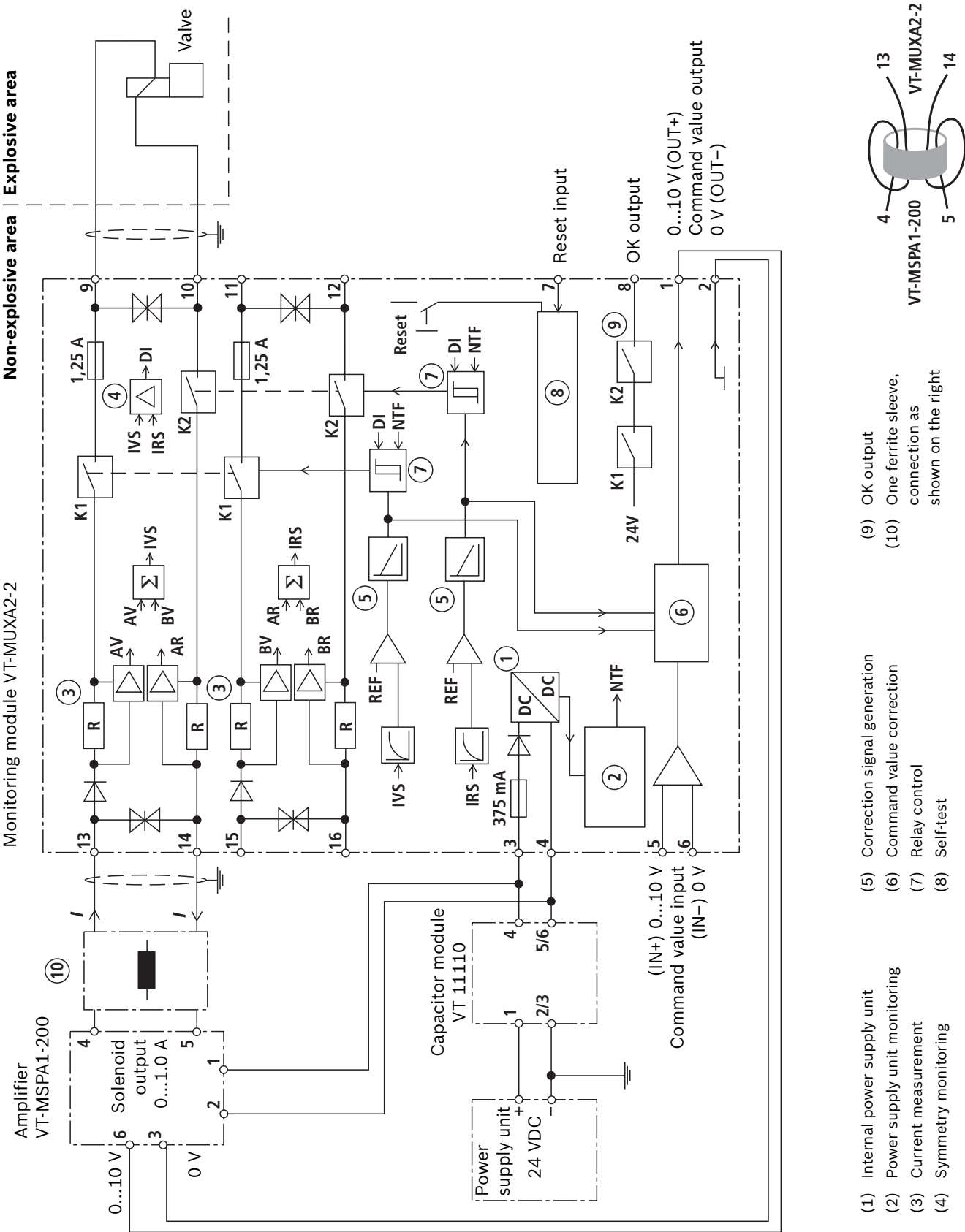
If the self-test is activated during operation, both relays are opened. Thus, the hydraulic function is considerably disturbed.

The function of the "S1" reset pushbutton can be suppressed by a 24 V 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.

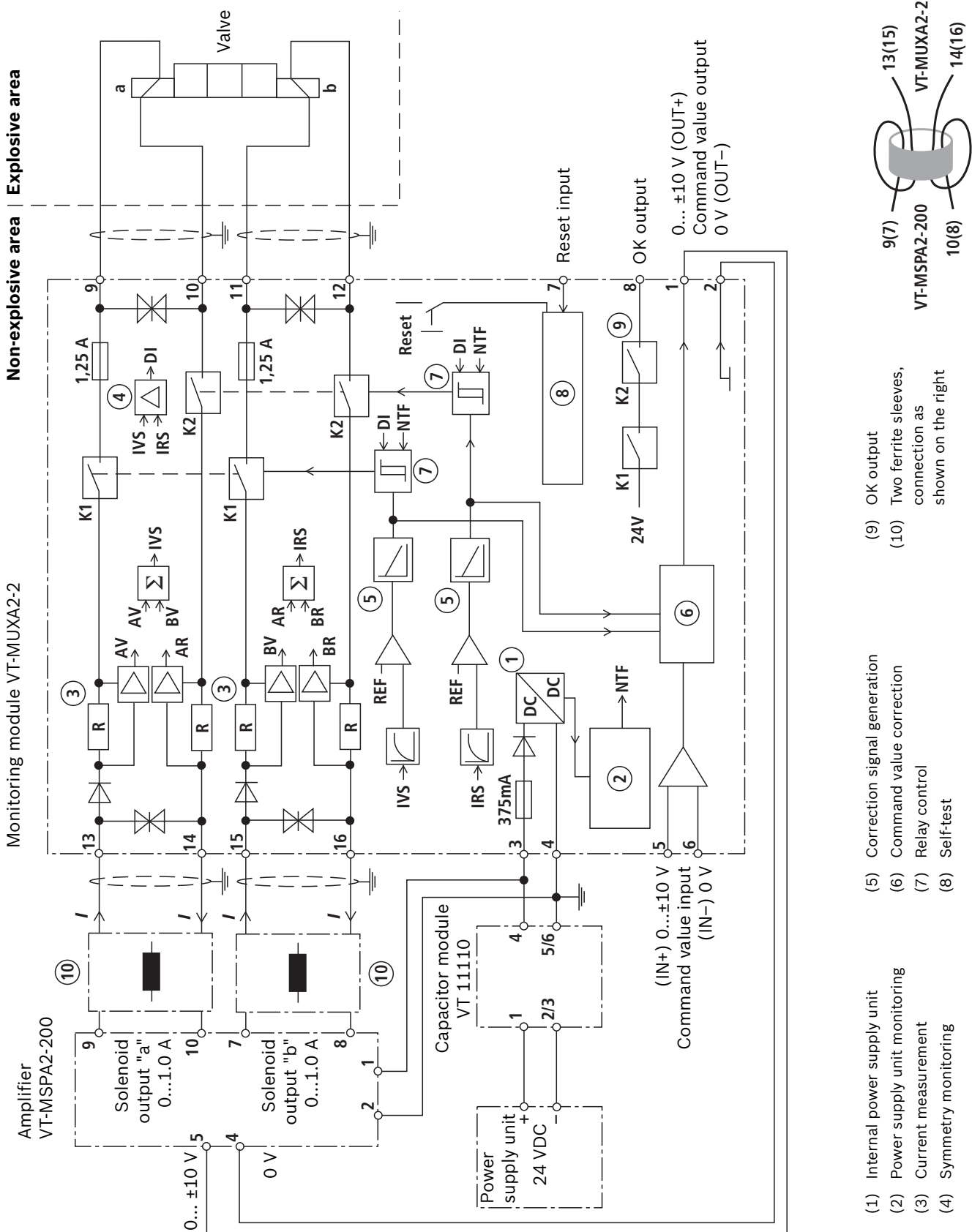
"OK" output (9)

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

Block diagram VT-MUXA2-2 for one solenoid



Block diagram VT-MUXA2-2 for two solenoids



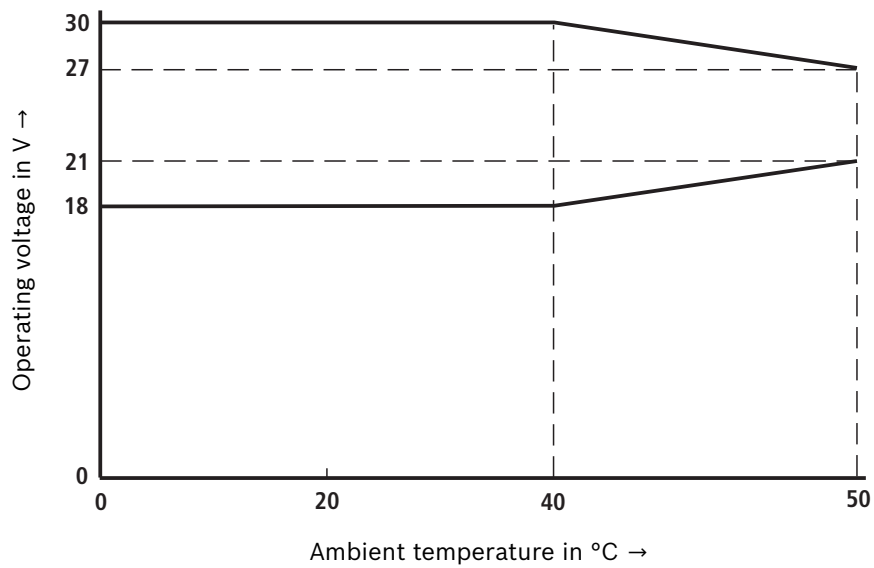
Technical data (For applications outside these parameters, please consult us!)

Operating voltage	Nominal value		U_B	24 V DC
	Maximum value		$u(t)_{\max}$	30 V at $0\text{ }^{\circ}\text{C} \leq \vartheta_U \leq 40\text{ }^{\circ}\text{C}$ ¹⁾
	Minimum value		$u(t)_{\min}$	18 V at $0\text{ }^{\circ}\text{C} \leq \vartheta_U \leq 40\text{ }^{\circ}\text{C}$ ¹⁾
	Reverse polarity protection			Yes
Power consumption			P	< 5 VA
Current consumption			I	< 0.2 A
Fuses/short-circuit protection 1 or 2 fuses for the solenoid currents, not exchangeable			I	1.25 A fast-acting (SMD)
Display LEDs	OK	Green	Is illuminated if the self-test has been completed, the relays have operated and there is no error	
	Power	Green	Is illuminated if the internal power supply unit works	
Inputs	Command value differential input		U	0 ... +10 V and/or 0 ... ± 10 V, $R_E = 100\text{ k}\Omega$
	Reset input			Edge-triggered, Low \rightarrow High
	– Low	U_R	0 ... 6.5 V	
	– High	U_R	10 V ... U_B	
	1 or 2 monitored solenoid current inputs – Admissible common-mode voltage – Reverse polarity protection – Admissible clock frequency of the solenoid currents		U Hz	$-2\text{ V} \dots U_B$ By means of diodes 0 ... 500
Outputs	Command value output		U	0 ... +10 V and/or 0 ... ± 10 V, $I = 2\text{ mA}$ (command value presetting at amplifier)
	2 solenoid current outputs		I	1.0 A (monitored to $\pm 2\text{ }\%$)
	OK output	High = OK	$U_B - 3\text{ V} / 50\text{ mA}$, short-circuit-proof	
		Low = OK	< 2 V, $R_i = 10\text{ k}\Omega$	
Clearances and creepage distances			According to EN 50178	
Admissible degree of contamination			2 according to EN 60664	
Type of connection			16-pole terminal housing with detachable terminals	
Connection cross-section			A	0.2 ... 2.5 mm ²
Type of mounting			Top hat rail TH 35-7.5 according to EN 60715	
Protection class			IP 20	
Dimensions (W x H x D)			See unit dimensions on page 8	
Operating temperature range			ϑ	0 ... +50 $^{\circ}\text{C}$ ¹⁾
Storage temperature range			ϑ	–25 ... +85 $^{\circ}\text{C}$
Weight			m	0.15 kg
Maximum admissible operating hours			h	40000

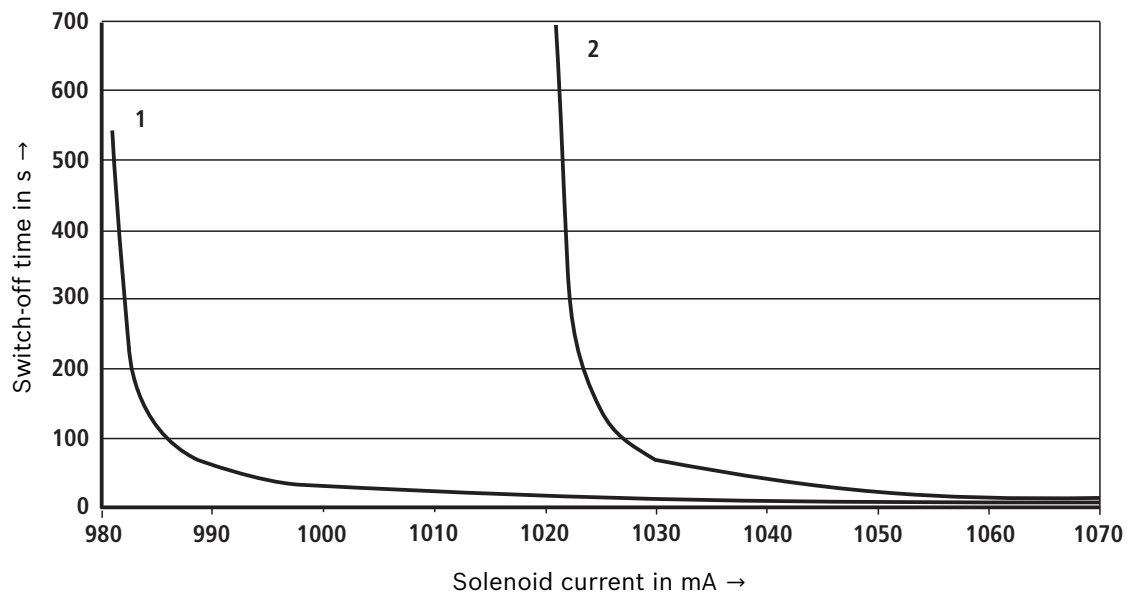
¹⁾ See also derating characteristic curves on page 7

Characteristic curves

Temperature derating for the operating voltage



Switch-off behavior



1 and 2 are limit curves

Terminal assignment

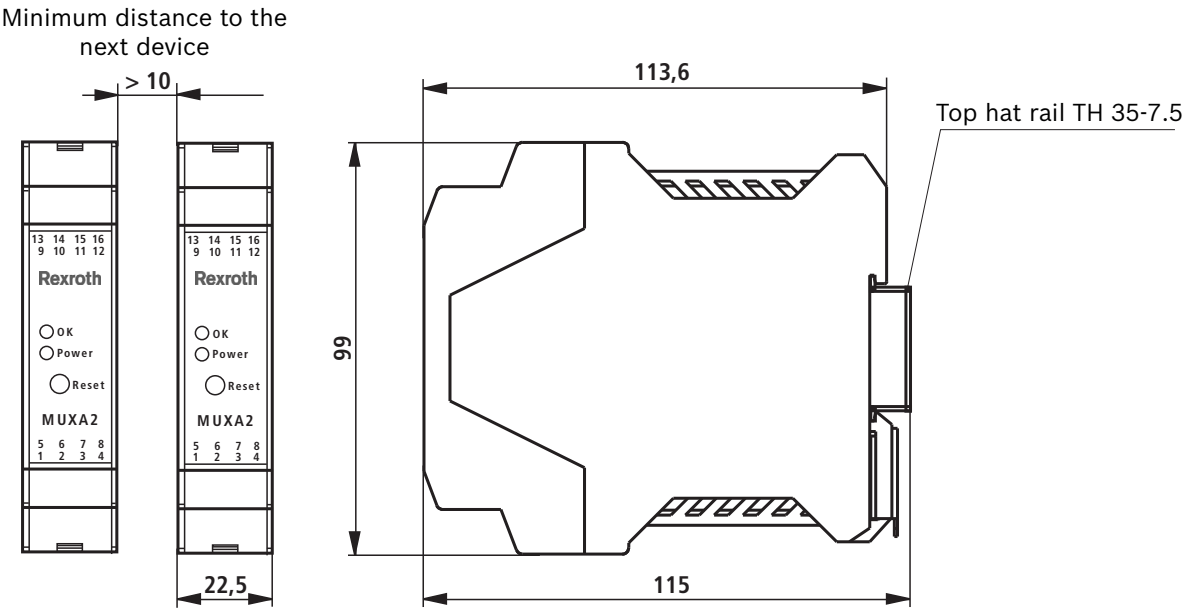
VT-MUXA2-2 for one solenoid

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

VT-MUXA2-2 for two solenoids

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

Installation conditions and unit dimensions



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