

Electric Drives  
and Controls

Hydraulics

Linear Motion and  
Assembly Technologies

Pneumatics

Service

**Rexroth**  
Bosch Group

Amplifier module for controlling <sup>1)</sup>  
the explosion-proof  
proportional directional valves  
4WRA...XE, 3DREP 6...XE and 4WRZ...XE

**RE 30228-200/03.11** 1/8  
Replaces: 07.05

Type VT-MSPA2-200

Component series 1X



H 7282

## Table of contents

Content	
Features	1
Ordering code	2
Functional description	2
Block diagram	3
Technical Data	4
Characteristic curves	5
Terminal assignment	6
Device view / unit dimensions	6
Important notes / setting information	7

## Features

Page	– Amplifier module is not subject to the directive 94/9/EC (ATEX directive)
1	
2	– In connection with the Rexroth monitoring module <sup>1)</sup> VT-MUXA2-2 suitable for controlling proportional directional valves without electric position feedback, types 4WRA...XE, 3DREP 6...XE and 4WRZ...XE
2	
3	– Command value input $\pm 10$ V (differential input)
4	
5	– Ramp generation with separately adjustable ramp time "up/down"
6	
6	– Characteristic curve correction by means of separately adjustable step heights
7	
	– Release input
	– Reverse polarity protection for the voltage supply
	– Power supply with DC/DC converter without raised zero point for the internal supply
	– LED displays: <ul style="list-style-type: none"> <li>• Ready for operation (green)</li> <li>• Release (yellow)</li> </ul>

<sup>1)</sup> For the operation of the valve in the explosive area, additional safety measures are required. Here, we recommend using the Rexroth monitoring module VT-MUXA2-2. In this connection, observe data sheet 30290.

## Ordering code

	<b>VT-MSPA2</b>	<b>200</b>	<b>1X</b>	<b>V0</b>	<b>0</b>	<b>*</b>
Analog amplifier in modular design For controlling the explosion-protected valves 4WRA...XE (component series 2X), 3DREP 6...XE (component series 2X) and 4WRZ...XE (component series 7X) = <b>200</b> Component series 10 to 19 (10 to 19: Identical technical data and ports)			<b>= 1X</b>			Further details in the plain text 0 = Basic version V0 = Basic version

## Functional description

### General

The amplifier modules are snapped onto top hat rails according to EN 60715. The electrical connection is established via screw terminals. The modules are operated with 24 V direct voltage.

( ) = Assignment to the block diagram on page 3

### Power supply unit (1)

The amplifier modules have a power supply unit with switch-on current limitation. This unit supplies all internally required positive and negative supply voltages. The switch-on current limitation prevents high switch-on current peaks.

### Command value provision

The internal command value signal is generated from the external command value signal available at the differential input (2).

A positive command value results in a current increase in the "b" solenoid and thus a flow in the valve from P → A and from B → T.

A negative command value results in a current increase in the "a" solenoid and thus a flow in the valve from P → B and from A → T.

### Release function (10)

The release function enables the power output stage and forwards the internal command value signal to the ramp generator. The release signal is displayed by an LED on the front plate. If the release is connected, the internal command value is changed (with any kind of command value specification) by the set ramp time. Thus, a controlled valve does not open abruptly.

### Ramp generator (3)

The ramp generator limits the rise of the actuating variable. The downstream step functions do not extend or shorten the ramp time.

Notes for setting and measuring the ramp time:

Value at measuring socket "t <" or "t >"	$U_t$ in V	5	3	2
current ramp time ( $\pm 20\%$ )	$t$ in ms	20	33	50

$U_t$ in V	1	0.5	0.3	0.2	0.1	0.05	0.03	0.02
$t$ in ms	100	200	333	500	1000	2000	3333	5000

The following applies:  $t = \frac{100 \text{ Vms}}{U_t}$

Example: Measured  $U_t = 5 \text{ V}$

Results in  $t = \frac{100 \text{ Vms}}{5 \text{ V}} = 20 \text{ ms}$

### Characteristic curve generator (4)

Using the adjustable characteristic curve generator, the step height for positive and negative signals can be set separately, adjusted to the hydraulic requirements. The actual development of the characteristic curve through the zero point is not stepped but linear. (Characteristic curve see page 5)

### Amplitude limiter (5)

The command value is limited to ca.  $\pm 110\%$  of the nominal range.

### Current controller (6)

The current is controlled according to the command value.

### Power output stage (7)

The power output stage creates the clocked solenoid current for the proportional valve. The rated solenoid current is 1000 mA per output. The output stage outputs are short-circuit-proof. The output stages are de-energized in case of an internal fault signal or if the release is missing.

### Clock generator (8)

The clock generator creates the clock frequency  $f$  of the output stages.

$f = 150 \text{ Hz} \dots 400 \text{ Hz}$ , adjustable by means of the potentiometer "f" (preset to 240 Hz)

### Fault detection (10)

The solenoid line is monitored for cable break as well as over-current of the output stage.

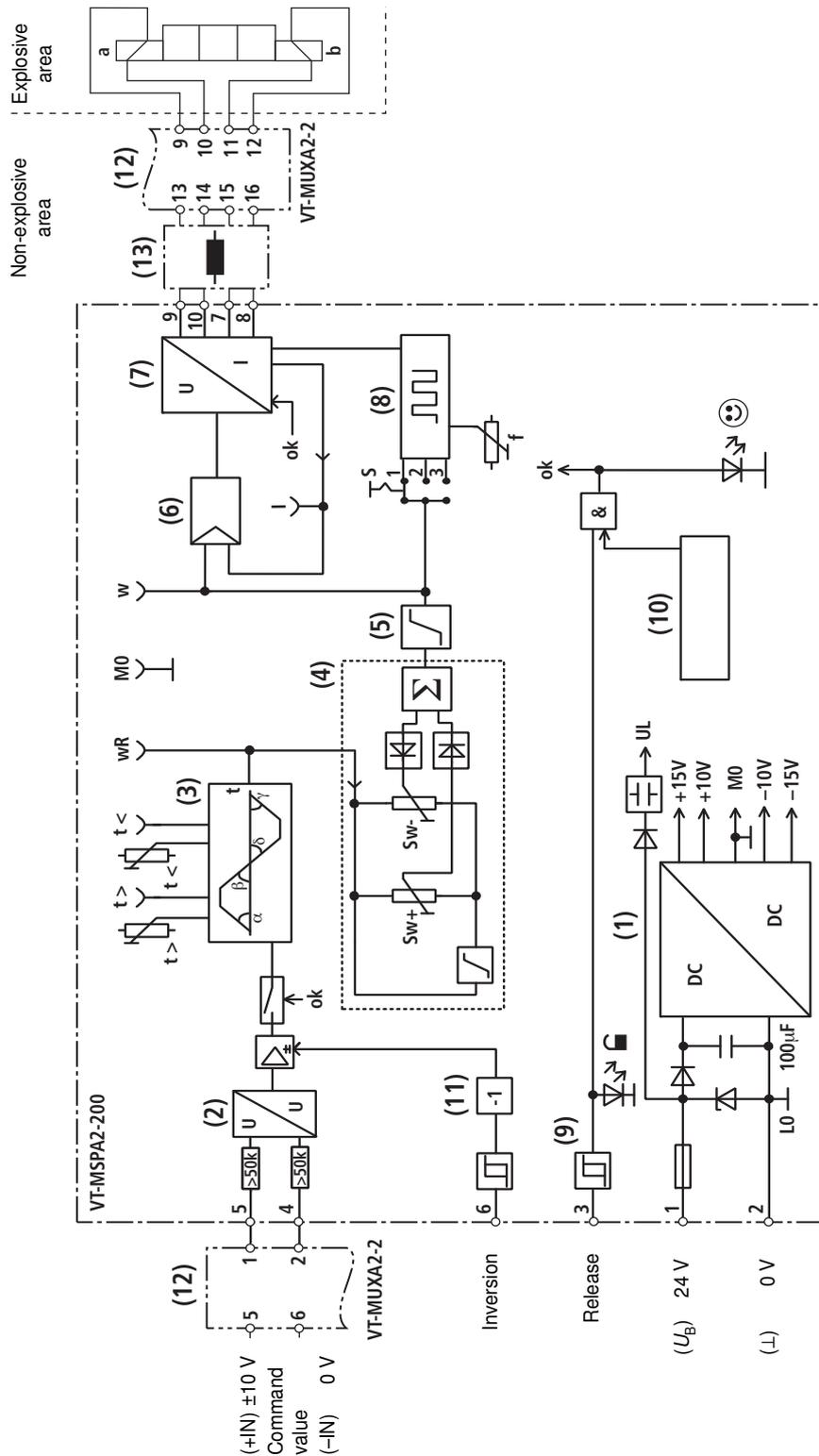
### Command value inversion (11)

The command value created internally from the input signal and the zero point offset signal can be inverted by an external signal.

### Monitoring and limitation of the solenoid current (12)

The VT MUXA2-2 module provides for the monitoring and limitation of the solenoid current. The functioning is described in data sheet 30290.

## Block diagram



- |     |                          |   |                     |      |  |
|-----|--------------------------|---|---------------------|------|--|
| t > | Ramp time "down"         | ☺ | Ready for operation | (9)  | Release function   |
| t < | Ramp time "up"           | ☹ | Release             | (10) | Fault recognition  |
| Sw  | Step height              | ☹ |                     | (11) | Inversion  |
| w   | Command value            |   | (1)                 | (12) | Monitoring module<br>VT-MUXA2-2<br>(order separately)                              |
| wR  | Command value after ramp |   | (2)                 | (13) | Two ferrite sleeves (only<br>included in the delivery of the<br>monitoring module) |
|     |                          |   | (3)                 |      |  |
|     |                          |   | (4)                 |      |  |
|     |                          |   | (5)                 |      |  |
|     |                          |   | (6)                 |      |  |
|     |                          |   | (7)                 |      |  |
|     |                          |   | (8)                 |      |  |
|     |                          |   | (10)                |      |  |
|     |                          |   | (11)                |      |  |
|     |                          |   | (12)                |      |  |
|     |                          |   | (13)                |      |  |

## Technical Data (for applications outside these parameters, please consult us!)

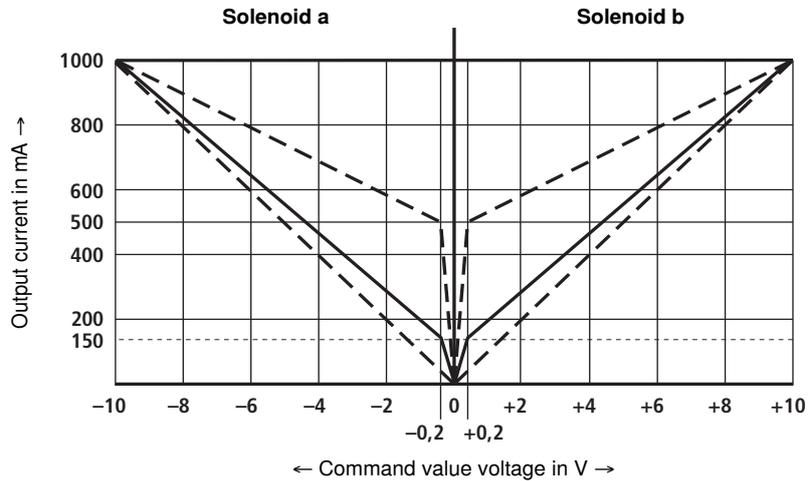
Operating voltage	Nominal value	$U_B$	24 VDC
	Maximum value	$u_B(t)_{\max}$	35 V
	Minimum value	$u_B(t)_{\min}$	18 V
Power consumption		$P$	< 24 VA
Current consumption		$I$	< 1 A
Fuse	Thermal overload protection (with restart if the value falls below the temperature threshold)		
Inputs			
Analog	Command value (differential input)	$U_e$	0 ... ±10 V; $R_e > 50 \text{ k}\Omega$
Digital	Release	ON	$U$ 8.5 V ... $U_B$ ; $R_e > 100 \text{ k}\Omega$
		OFF	$U$ 0 ... 6.5 V; $R_e > 100 \text{ k}\Omega$
	Inversion	ON	$U$ 8.5 V ... $U_B$ ; $R_e > 100 \text{ k}\Omega$
		OFF	$U$ 0 ... 6.5 V; $R_e > 100 \text{ k}\Omega$
Setting ranges			
	Clock frequency	$f$	150 Hz ... 400 Hz, adjustable, preset to 240 Hz
	Ramp times (potentiometer "t <" and "t >")	$t <, t >$	20 ms...5 s
	Step heights (potentiometer "Sw+" and "Sw-")		0 % ... 50 %
Outputs			
	Power output stages	$I$	0 ... 1000 mA, short-circuit-proof; clocked
Measuring sockets	Ramp time "t <"	$U$	20 mV...5 V
	Ramp time "t >"	$U$	20 mV...5 V
	Actual value "I"	$U$	0 ... ±1000 mV (measured value in mV $\triangleq$ solenoid current in mA)
	Command value "w"	$U$	0 ... ±10 V
	Command value after ramp "wR"	$U$	0 ... ±10 V
Type of connection	Screw terminals		
Connection cross-section	$A$	0.5 ... 2.5 mm <sup>2</sup>	
Mounting type	Top hat rail TH 35-7.5 according to EN 60715		
Protection class	IP 20 according to EN 60529		
Dimensions (W x H x D)	See unit dimensions		
Admissible operating temperature range	$\vartheta$	0 ... +50 °C	
Storage temperature range	$\vartheta$	-25 °C ... +70 °C	
Weight	$m$	0.14 kg	

### Note!

For information on the environment simulation testing for the areas EMC (electromagnetic compatibility), climate and mechanical load, see data sheet 30228-U.

## Characteristic curves

Dependency of the output current from the command value voltage

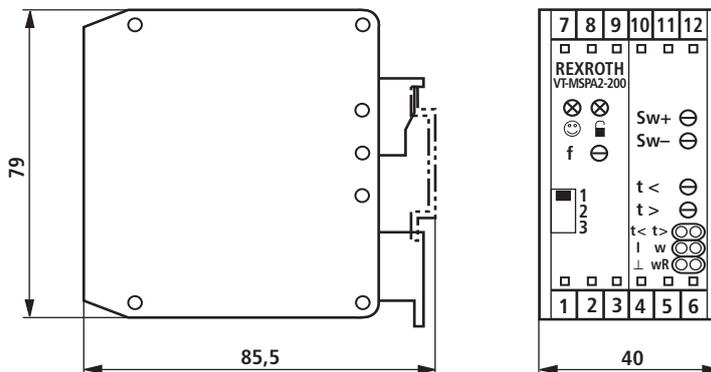


Setting range of the step height of the output current: 0 ... 500 mA  
Pre-setting ex works: 150 mA

## Terminal assignment

Operating voltage	$+U_B$	1	7	Solenoid "b"
	0 V	2	8	
Release	$U_F$	3	9	Solenoid "a"
	0 V (-IN)	4	10	
Command value input	$\pm 10$ V (+IN)	5	11	n.c.
	Inversion	6	12	n.c.

## Device view / unit dimensions (dimensions in mm)



### LED displays:

-  Ready for operation (green)
-  Release (yellow)

### Potentiometer:

- Sw+** Step height for positive direction
- Sw-** Step height for negative direction
- t <** Ramp time for increasing command values
- t >** Ramp time for decreasing command values
- f** Frequency setting, 240 Hz pre-set, 150 Hz ...400 Hz adjustable

### Mode selector switch: without function

### Measuring sockets:

- t <** Ramp time "up"
- t >** Ramp time "down"
- I** Actual current value
- w** Command value
- wR** Command value after ramp
- ⊥** Measurement null

## Important notes / setting information

### Explosion hazard caused by incorrect assembly!

For achieving the prescribed safety when operating the one of the specified valves in the explosive area, it has to be ensured that the solenoid current does not exceed 1 A. For monitoring and limiting the valve current, we recommend using the Rexroth monitoring module VT-MUXA2-2. In this connection, observe data sheet 30290.

The VT-MSPA2-200 amplifier module and the VT-MUXA2-2 monitoring module may only be installed outside the explosive area!

The VT-MSPA2-200 amplifier module and the VT-MUXA2-2 monitoring module are not subject to the directive 94/9/EC (ATEX directive)!

More information:

- The amplifier module may only be wired when de-energized!
- Do not lay signal lines close to power cables and lines!
- Do not use free-wheeling diodes in the solenoid lines!
- The distance to aerial lines, radios, and radar systems has to be 1 m at least!
- Always shield command value lines, connect shielding to protective earthing (PE) on the module side!
  - Also shield the solenoid lines!
  - For solenoid lines up to 50 m in length, use the line type LiYCY 1.5 mm<sup>2</sup>!
  - With greater lengths please consult us!
  - In applications in connection with the VT-MUXA2-2 monitoring module, please observe the wiring specified in the block diagram of data sheet 30290.
- For switching command values, relays with gold-plated contacts have to be used (small voltages, low currents)!
- Only carry out measurements at the module using instruments with  $R_i > 100 \text{ k}\Omega$ .
- For setting the potentiometers, use a screwdriver with a blade width of 4 mm!
- With a strongly fluctuating operating voltage, it may in the individual case be necessary to use an external smoothing capacitor with a capacity of at least 2200  $\mu\text{F}$ .  
 Recommendation: Capacitor module VT 11110 (see data sheet 30750), sufficient for up to 3 amplifier modules
- In connection with the VT-MUXA2-2 monitoring module, the operating voltage has to be fed in via a capacitor module. The solenoid current connections to the VT-MUXA2-2 monitoring module must be led via ferrite sleeves. The ferrite sleeves are included in the scope of delivery of the VT-MUXA2-2 monitoring module.
- In the condition as supplied, the clock frequency is set to 240 Hz. Rotating the "f" potentiometer changes the valve hysteresis and may lead to disturbing noise developments.

### Setting information

Prerequisite: The system-specific wiring must have been completed.

Signal	Setting
Ramp times:	- Set ramp time according to formula or table (see functional description "Ramp generator") and check it at the measuring sockets "t >" or "t <"
Step height:	- Apply the release signal - with an external command value provision of +0.3 V, set the measuring signal at "wR" to +0.3 V - using the "Sw+" potentiometer, set the necessary positive step height - with an external command value provision of -0.3 V, set the measuring signal at "wR" to -0.3 V - using the "Sw-" potentiometer, set the necessary negative step height Note: With an external command value provision, it must at least result in +0.3 V / -0.3 V at the "wR" measuring socket.
Clock frequency:	Condition as supplied: $f = 240 \text{ Hz}$ <b>Note:</b> The new setting of the frequency can be carried out with a digital multimeter that is able to measure frequencies. Measure at connection terminals 7 or 9 against 2 (ground).