rexroth
A Bosch Company

Operating instructions

Valve amplifier for proportional valves without electrical position feedback

Type VT-MSPA, component series 2X

RE 30232-B, Edition 2025-03, Replaces: 2024-04

The data specified only serve to describe the product. As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

The cover shows an example configuration. The product delivered may differ from the image on the cover.

Translation of the original operating instructions. The original operating instructions were prepared in German language.

Contents

1 About this documentation

1.1 Validity of the documentation

This documentation is valid for valve amplifiers VT-MSPA1-2X and VT-MSPA2-2X from Bosch Rexroth.
This documentation is intended for fitters, operators, service technicians, system operators and machine manufacturers.
This documentation contains important information on the safe and proper mounting, transport, commissioning, operation, use, maintenance, demounting and simple troubleshooting of the product.

- Read this documentation thoroughly, especially Chapter 2 “Safety instructions“ and Chapter 3 “General notes on damage to material and the product“, before working with the product.

1.2 Required and supplementary documentations

- The product must not be commissioned until you have been provided with the documentation marked with the book symbol 🕮 and you have understood and observed it.

Tabelle 1: Required and supplementary documentation

	Title	Document number	Document type
🕮	Order confirmation		
🕮	Valve amplifier for proportional valves without electrical position feedback, VT-MSPA	30232	Data sheet

1.3 Representation of information

Uniform safety instructions, symbols, terms and abbreviations are used so that you can quickly and safely work with your product using this documentation. For a better understanding, they are explained in the following sections.

1.3.1 Safety instructions

In this documentation, safety instructions precede a sequence of activities whenever there is a risk of personal injury or damage to equipment. The measures described for hazard avoidance must be observed.
Safety instructions are structured as follows:

⚠ SIGNAL WORD

Type and source of danger
Consequences in case of non-compliance
- Hazard avoidance measures
- <Enumeration>

- **Warning symbol:** draws attention to a hazard
- **Signal word:** identifies the degree of hazard
- **Type and source of danger:** Specifies the type and source of hazard

- **Consequences**: describes the consequences in case of non-compliance
- **Precautions**: states, how the hazard can be avoided

Tabelle 2: Hazard classifications according to ANSI Z535.6-2011

Warning sign, signal word	Meaning
⚠ DANGER	Indicates a hazardous situation which, if not avoided, will certainly result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Damage to property: The product or the environment could be damaged.

1.3.2 Symbols

The following symbols indicate notices which are not safety-relevant but increase the comprehensibility of the documentation.

Tabelle 3: Meaning of the symbols

Symbol	Meaning
	If this information is disregarded, the product cannot be used or operated in an optimum manner.
▶	Individual, independent action
1. **2.** **3.**	Numbered instruction: The numbers indicate that the actions must be carried out one after the other.

1.3.3 Designations

The following designations are used in this documentation:

Tabelle 4: Designations

Designation	Meaning
Electronics	Command value cards, amplifiers, and controls manufactured by Bosch Rexroth
RE xxxxx	Rexroth document in English language
VT-MSPA...-2X	Valve amplifier

1.3.4 Abbreviations

The following abbreviations are used in this documentation:

Tabelle 5: Abbreviations

Abbreviation	Meaning
ANSI	American National Standards Institute
EMC	**E**lectro**m**agnetic **c**ompatibility
FC	Frequency converter
PELV	Protective Extra Low Voltage

2 Safety instructions

2.1 About this chapter

The product has been manufactured according to the generally accepted codes of practice. However, there is still the danger of personal injury and damage to property if you do not observe this chapter and the safety instructions in this documentation.

- ▶ Read this documentation completely and thoroughly before working with the product.
- ▶ Keep this documentation in a location where it is accessible to all users at all times.
- ▶ Always include the required documentation when passing the product on to third parties.

2.2 Intended use

The products are electrical and electronic components.
You may use the product as follows:

- For operating proportional valves and pump controls without electrical position feedback
- While adhering to the operating and ambient conditions according to data sheet RE 30232
- While adhering to the given performance limits
- In the original condition, without damage
- Repairs by customers are not permitted

The product is intended only for professional use and not for private use.
Operation according to the intended use also implies that you have read and understood this documentation completely, especially chapter 2 “Safety instructions“.

2.3 Improper use

Any use other than described in the section “Intended use” is considered as improper and is therefore not permitted.
The installation or use of inappropriate products in safety-relevant applications could result in unintended operating states in the application which in turn could cause personal injuries and/or damage to property. Therefore, please only use a product for safety-relevant applications if this use is expressly specified and permitted in the documentation of the product. For example, in explosion-protected areas or in safety-related parts of control systems (functional safety).
Bosch Rexroth AG does not assume any liability for damage caused by improper use. The user assumes all risks involved with improper use.
Improper use includes, but is not limited to:

- operating the electronics outside the specified performance limits and operating conditions, especially the prescribed ambient conditions
- the use as safety-related part of controls in the sense of DIN EN ISO 13849. Functional safety must be realized by means of appropriate, additional components.
- the use in potentially explosive atmospheres

- improper transport
- incorrect storage
- lack of cleanliness during storage and assembly
- incorrect installation

2.4 Qualification of personnel

The activities described in this documentation require basic knowledge of electrics and hydraulics as well as knowledge of the associated technical terms. In order to ensure safe use, these activities may only be carried out by an expert in the respective field or an instructed person under the direction and supervision of an expert.

Experts are those who are able to recognize potential hazards and apply the appropriate safety measures due to their professional training, knowledge and experience, as well as their understanding of the relevant conditions pertaining to the work to be undertaken. An expert must observe the relevant specific professional rules.

With regard to electronic products, expertise means, for example:

- the ability to read and completely understand circuit diagrams,
- in particular, completely understanding the relationships regarding the safety equipment and
- knowledge of the function and structure of electrical and electronic components.

Bosch Rexroth offers training courses that support your qualification in specific fields. An overview over the training contents can be found online at: `https://www.boschrexroth.com`

2.5 General safety instructions

- Observe the valid regulations on accident prevention and environmental protection.
- Observe the safety regulations and provisions of the country in which the product is used/applied.
- Only use Rexroth products in technically perfect condition.
- Observe all information on the product.
- Persons assembling, operating, disassembling or maintaining Rexroth products may not be under the influence of alcohol, other drugs or medication influencing the ability to react.
- Only use accessory and spare parts approved by the manufacturer in order to rule out personnel hazards arising from unsuitable spare parts.
- Comply with the technical data and environmental conditions specified in the product documentation.
- If unsuitable products are installed or used in safety-relevant applications, unintended operational states can occur in these applications, which can cause personal injury and damage to property. Therefore, use the product only in safety-relevant applications, if this use is expressly specified and permitted in the documentation of the product.
- You may only commission the product when it has been established that the final product (for example, a machine or system), in which the Rexroth products

have been installed, complies with national regulations, safety regulations and standards relevant to the application.

2.6 Product- and technology-related safety instructions

⚠ WARNING

Hazardous movement!

Risk of injury due to incorrect connection or incorrect activation of electrical and electronic devices and resulting unforeseeable machine movements.

- Adhere to safety according to EN ISO 13849 or IEC 62061.
- If persons have to enter the hazard zone while the control is active, provide superordinate monitoring functions or measures for personal safety. These measures must be provided according to the specific data of the system and on the basis of the risk and failure analysis of the system manufacturer/user. In this connection, the safety provisions applied for the system must be taken into account.
- Failures and defects in the control current or the energy supply can result in uncontrolled machine movements.
- Electronics emit interference to other electronics within the permitted limit values and also react to interference. This can cause malfunction in the control process. Only use electronics below EMC limit values or provide appropriate shielding.
- Electrostatic processes, an inadequate grounding concept or missing equipotential bonding can lead to damage to the electronics and hence cause malfunction or uncontrolled movements of the machine. Ensure proper grounding and provide equipotential bonding.
- Using the product outside the specified IP protection class can result in short-circuit and malfunction and hence in uncontrolled machine movements. Therefore, use the product only within the IP protection class and in environments as specified in the data sheet.
- Provide safety functions for personal safety separately. Amplifiers, command value preprocessing cards and control electronics themselves do not include safety functions for personal safety and are no safety-related components.
- Avoid contact with salt-laden environments and adhere to the ambient temperature given in the data sheet.
- In the event of an emergency, fault or other abnormalities, switch the system off and secure it against being switched on again.

⚠ WARNING

High electrical voltage due to incorrect connection!

Danger to life, risk of injury due to electric shock.

- When carrying out any work, disconnect the relevant machine section from the power supply and protect it against being switched on again.
- Only connect devices, electrical components and cables which feature protective extra low voltage (PELV) to connections or terminals having voltages from 0 to 50 Volt.
- Only connect voltages and power circuits that feature safe isolation from dangerous voltages. Safe isolation can be achieved with isolation transformers, safe optocouplers or mains-free battery operation.
- Always connect all cables to the provided connections. Avoid open cables or contacts.

Lightning!

Risk of uncontrolled machine movements.

- An inadequate grounding concept or missing equipotential bonding can lead to damage to the electronics. Provide for equipotential bonding of the device.

⚠ CAUTION

Fault currents and short-circuits!

Impairment of safety and malfunction.

- Keep the surroundings free from electrically conductive contamination (acids, bases, corrosive agents, salts, metal vapors, etc.) and do not expose the device to these substances. Generally rule out any deposits according to protection class IP.

2.7 Personal protective equipment

Check determined personal protective equipment for completeness and protective effect and wear it (observe customer regulations and list of personal protective equipment).

2.8 Obligations of the machine end-user

The operation of installations, systems and machines basically requires the implementation of a holistic IT security concept which is state-of-the-art in terms of technology. Accordingly, Bosch Rexroth products and their properties have to be considered as components of installations, systems and machines for their holistic IT security concept.

Unless otherwise documented, Bosch Rexroth products are designed for operation in local, physically and logically secured networks with access restrictions for authorized persons, and they are not classified according to IEC 62443-4-2.

3 General notes on damage to material and the product

NOTICE

High voltage!
The electronics may be damaged.
- Wire electronics from Bosch Rexroth only when these are disconnected from the power supply.

Wrong cables! Power loss, scorching of cable!
Risk of damage to the product!
- Only use the cables specified in the data sheet with the respective cable cross-sections for electronic devices from Bosch Rexroth!

External electromagnetic interference!
Risk of malfunction.
- The distance to radio sources has to be sufficiently large (>> 1 m).
- In the case of strongly fluctuating operating voltage, it may be necessary to use an external smoothing capacitor in individual cases.

Emitted interference!
Risk of affecting other devices.
- Use shielded signal and solenoids cables in order that EMC requirements are fulfilled.

Overload!
Risk of overloading and damage to the supply cable in the case of insufficient dimensioning and/or operation with several electrical devices.
- Provide current limitation by overload protection.
- Select an appropriate rating of power supply units and cables.

Short-circuit!
Risk of overloading and damage of the supply cable in the case of defects of the electrical device.
- Provide current limitation by overload protection.

Impermissible temperature range!
Risk of overheating. The devices can be thermally destroyed.
- Adhere to the specification in the data sheet.

Cables lying around!
Risk of stumbling!
- Lay cables and lines so that they cannot be damaged and no one can trip over them.

4 Scope of delivery

Information on the scope of delivery can be found in the shipping documents and data sheet RE 30232 of your Bosch Rexroth product.

- Check the scope of delivery for completeness and possible transport damage.

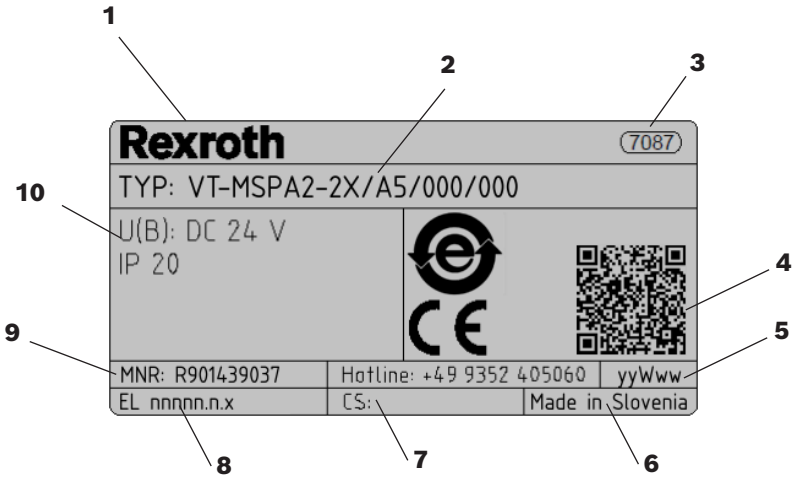
In case of complaints, please contact Bosch Rexroth AG, see chapter 16.1 “List of addresses“ on page 35.

5 About this product

You can find information on the product and its performance in the data sheet of your electronics. The data sheet and further information can be found at: `https://www.boschrexroth.com/VT-MSPAx`.

5.1 Identification of the product

The most important data of the product are given on a label or are printed directly at the side of the product.



1 Word mark
2 Material short text
3 Factory
4 QR code
5 Date of production
6 Country of origin
7 Customer-specific data
8 Serial number
9 Material number
10 Electrical data and protection class

6 Transport and storage

There are no special instructions for transporting electronic products. You must, however, observe the notes in Chapter 2 “Safety instructions” and comply with the ambient conditions for storage and transport which are detailed in the technical data sheet RE 30232.

6.1 Storing electronic products

Proceed as follows in order to prepare electronics from Bosch Rexroth for storage and further use:

- Whenever possible, use the original packaging for storage.
- Observe the permissible storage temperature range specified in the data sheet.
- Protect the electronics from dust and humidity.

7 Installation

NOTICE

Risk of short-circuit!

In the case of electronics with housing, water may condense within the housing!

- Let the electronics acclimate itself for several hours, as otherwise water may condense in the housing.

The electronics are provided with cooling slots According to the specified protection class, dirt and fluids may easily enter and cause malfunction and short-circuit! Reliable operation is thus no longer ensured.

- When working on electronics, observe strictest cleanliness and make sure that no fluids will enter the housing.

Major potential differences!

Risk of destruction of electronics by plugging or unplugging connectors under voltage.

- Switch off power supply to the relevant system part before installing the products or plugging or unplugging connectors.

External electromagnetic interference!

Risk of malfunction.

- The distance to radio sources has to be sufficiently large (>> 1 m).
- Do not lay solenoid or signal cables near power cables.
- Shield command and actual value cables. Connect the shield to system ground on both ends.

7.1 Required tools

A screwdriver (blade width 2.0 mm, blade thickness 0.4 mm) is required for connecting flexible cables to the terminals of the VT-MSPA...-2X. For commissioning we recommend that you use a multimeter (measuring lead with 2-mm connectors). Further tools are not required.

7.2 Recommended accessories

For the connection of the VT-MSPA...-2X we recommend the following accessories (Table 6). These accessories are not included in the scope of the supply, but have to be ordered separately:

Tabelle 6: Accessories

Denomination	Material no.
Shield kit for installation with shielded cables (SERVICE PACKAGE VT-HMC...-1X/M...SCHIR&*ET)	R961011117

7.3 Installation conditions

- When installing the amplifier, strictly adhere to the ambient conditions specified in data sheet RE 30232.
- The housing of the VT-MSPA...-2X features protection class IP20. Requirements that exceed protection class IP20 have to be ruled out. Avoid contact of the VT-MSPA...-2X with hydraulic fluids, acids, bases, corrosive agents, salts, metal vapors, solvents, etc.

7.3.1 Place of installation

Electronics from Bosch Rexroth are intended for installation in control cabinets. Outdoor installation is not permitted.

7.4 Installing und connecting the VT-MSPA...-2X

The dimensions of valve amplifier VT-MSPA...-2X are given in data sheet RE 30232.
The mounting orientation is vertical. Observe the required mounting distances:
• The distance to covers and walls must be at least 2 cm.
At ambient temperatures above 50 °C, provide a minimum distance of 1 cm to the next assembly.
By snapping the housing of the VT-MSPA...-2X on a conductive and earthed mounting rail, the earth connection is established with the rear wall of the control cabinet. This constitutes HF grounding of the VT-MSPA...-2X.
Do not use any silicone-containing sealants, adhesives or insulating agents.
Ensure maintenance-friendly installation, i.e. simple access to the connection lines. Free access to the connection side must be ensured.
• Lay cables and lines so that they cannot be damaged and no one can trip over them.

Install the VT-MSPA...-2X as follows on a DIN mounting rail in the control cabinet:

1. Disconnect the relevant system part from the power supply.
2. Snap the back panel of the VT-MSPA...-2X carefully into position on the DIN mounting rail. Mechanical contact points on the rear panel of the VT-MSPA...-2X ensure firm seating on the DIN mounting rail and the connection of the housing to the grounding system of the control cabinet.

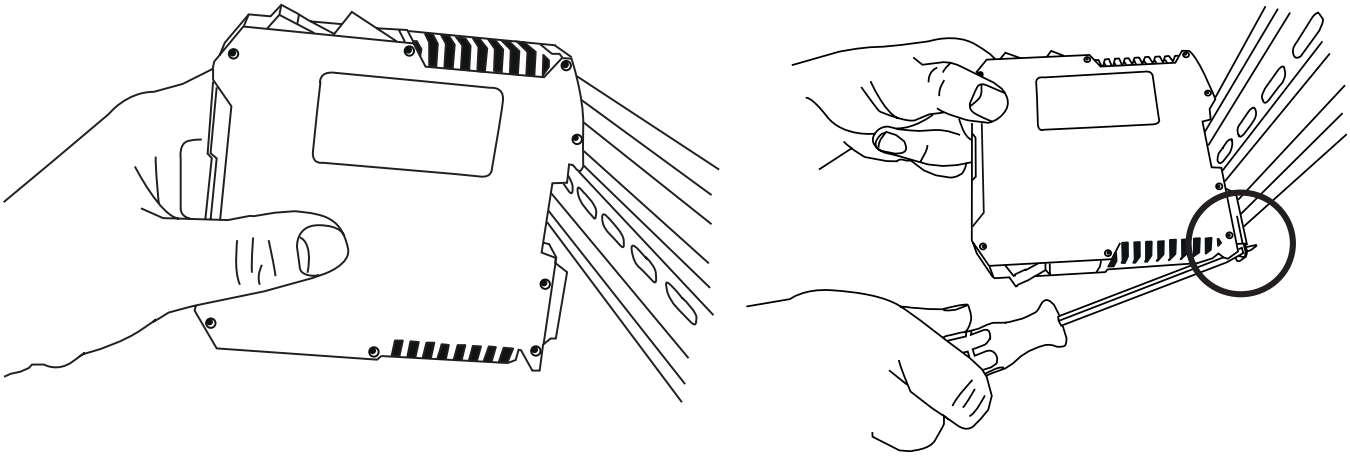


Fig. 1: Mounting the VT-MSPA...-2X on a DIN mounting rail

Should the spring-loaded latch not snap open automatically, it can be released using a screwdriver (see Fig. 1 on the right). After having positioned the latch, let it spring back to the snapped-in position.

Observe the following when connecting the VT-MSPA...-2X:

- For mounting, observe the notes on applicable standards and operating conditions in data sheet RE 30232.
- Do not use connectors with free-wheeling diodes or LED lamps for connecting solenoid cables to the valve!
- Use low-capacitance cables.
- Whenever possible, execute cable connections without intermediate terminals.
- Install sensor cables separately.
- When sources of electromagnetic interference are used (e.g. frequency converter), malfunction may occur. Avoid the installation of the VT-MSPA...-2X in the direct vicinity to sources of disturbance.
- The distance to aerial lines, radio sources and radar equipment must be at least 1 m.
- Do not lay signal cables near power cables.
- The system ground is an essential, integral part of EMC protection of the VT-MSPA...-2X. Here, interference, which is transported to the VT-MSPA...-2X via data and voltage supply cables, is dissipated. This function can only be ensured, if the system ground itself does not inject interference into the control electronics.

7.5 Connecting the supply voltage

1. Disconnect the relevant system part from the power supply.
2. Inspect all cables for intactness.
3. Connect the signal and solenoid cables according to your circuit diagram to the relevant terminals of the VT-MSPA...-2X.
4. Connect the supply voltage and check the presence of voltage by switching on.

7.5.1 Shielding

For digital inputs and outputs as well as for the command value and the actual value the permissible cable length of unshielded cables is 30 m. In the case of greater lengths use shielded cables with a copper braid shield. Connect the cable shield on both ends and on a large area to the system ground. For connection of the cable shield to the VT-MSPA..-2X we recommend the use of our shield kit, see Fig. 2 (accessories, see chapter 7.2, page 14). As solenoid cables you may use unshielded cables.

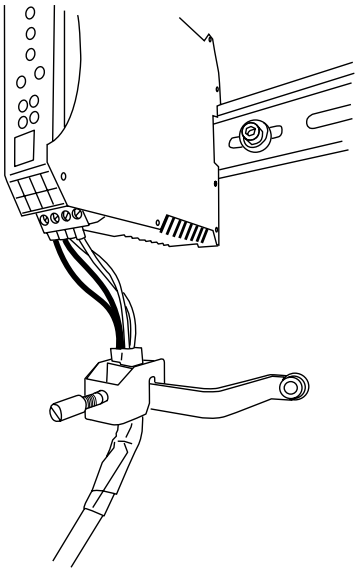


Fig. 2: Shielding of the VT-MSPA...2X

7.5.2 General notes on wiring

- Install signal and power cables as far away from each other as possible and do not install them in parallel.
- Do not route signal cables through strong magnetic fields.
- Lay signal lines as continuously as possible. If intermediate terminals are required, the shield must be dealt with separately.
  Install power cables consisting of two individual wires (e.g. voltage supply) as twisted cables.
- Cables should only have the number of wires actually required. If this is impossible, connect the wires with each other and connect them to ground on one side in the control cabinet.

Tabelle 7: Recommended cable variants

Interface	Maximum length [m]	Cable type	Minimum cross-section [mm²]	Remarks
Digital in/out	30	Unshielded	0.25 to 2.5	For 30 m or more, shielded cable required
	50	Shielded	0.25 to 2.5	
Command value	30	Twisted pair	0.25 to 2.5	For 30 m or more, shielded cable required
	50	Twisted pair, shielded	0.25 to 2.5	
Actual value	30	Twisted pair	0.25 to 2.5	For 30 m or more, shielded cable required
	50	Twisted pair, shielded	0.25 to 2.5	
Solenoid cable	20	Unshielded	1.0 to 1.5	
	50	Unshielded	1.5 to 2.5	
Operating voltage	20	Unshielded	1.0 to 1.5	
	50	Unshielded	1.5 to 2.5	

Tabelle 8: Clamping range, rated connection

	Min.	Max.
Rigid	0.2 mm²	2.5 mm²
Flexible	0.2 mm²	2.5 mm²
Flexible with wire end ferrule	0.25 mm²	2.5 mm²

The stripped length is 10 mm each.

7.5.3 Connecting the individual contacts

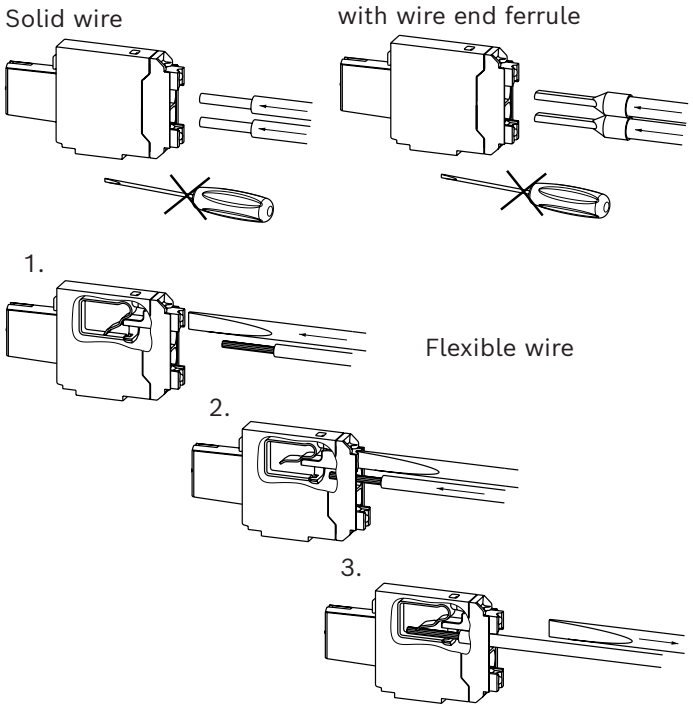


Fig. 3: XG20/XG21: “PUSH-IN“ contact

7.5.4 Suppressing interference of the system

Should interference occur in conjunction with signals of the electronics, inspect the interference suppression of other electrical components, e.g. as follows:

Possible causes of interference	
Switched inductance	DC: antiparallel free-wheeling diode over actuator winding
	AC: type-related R/C combination over actuator winding
Electric motors	R-C combinations from each motor winding to earth
Frequency converter	Inlet filter in the voltage supply of the frequency converter
	Motor control lines shielded and installed separately from other cables and/or output filter for motor cables.
	Large-area contact of the frequency converter housing to the rear wall of the control cabinet

8 Commissioning

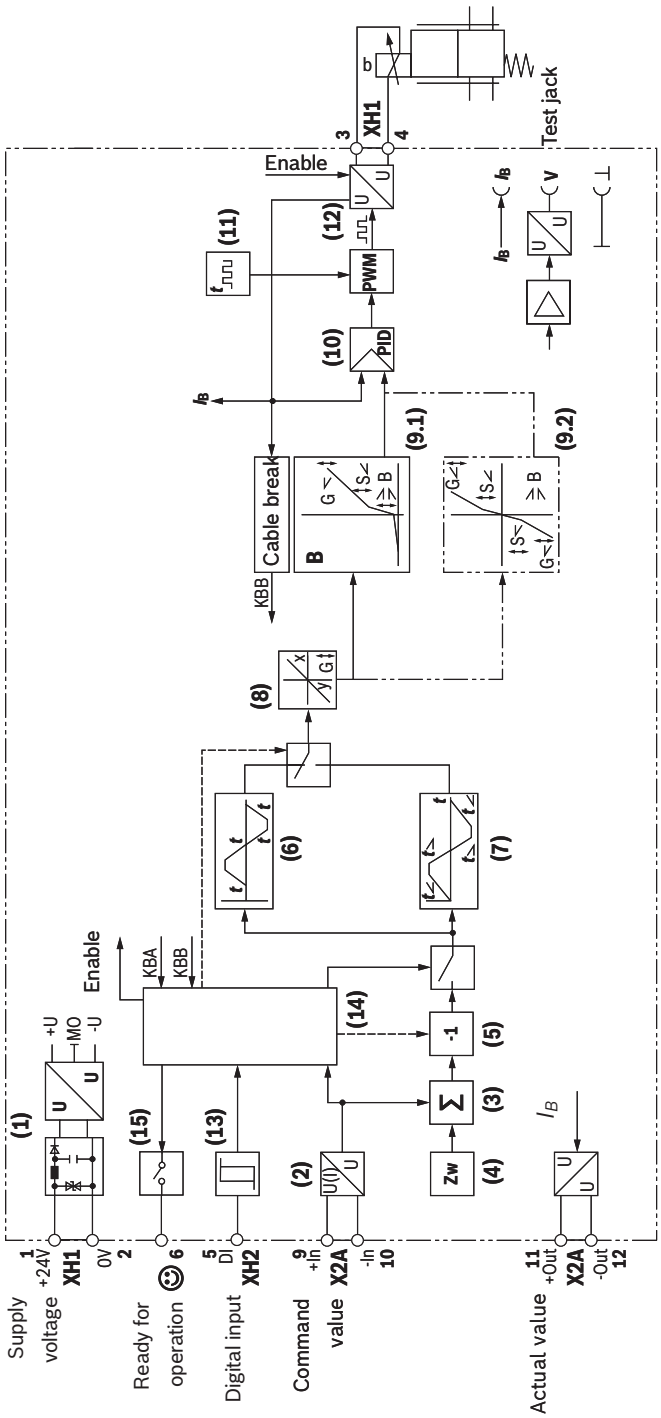
NOTICE

Uncontrolled plugging and unplugging of connectors!

The device might be destroyed.

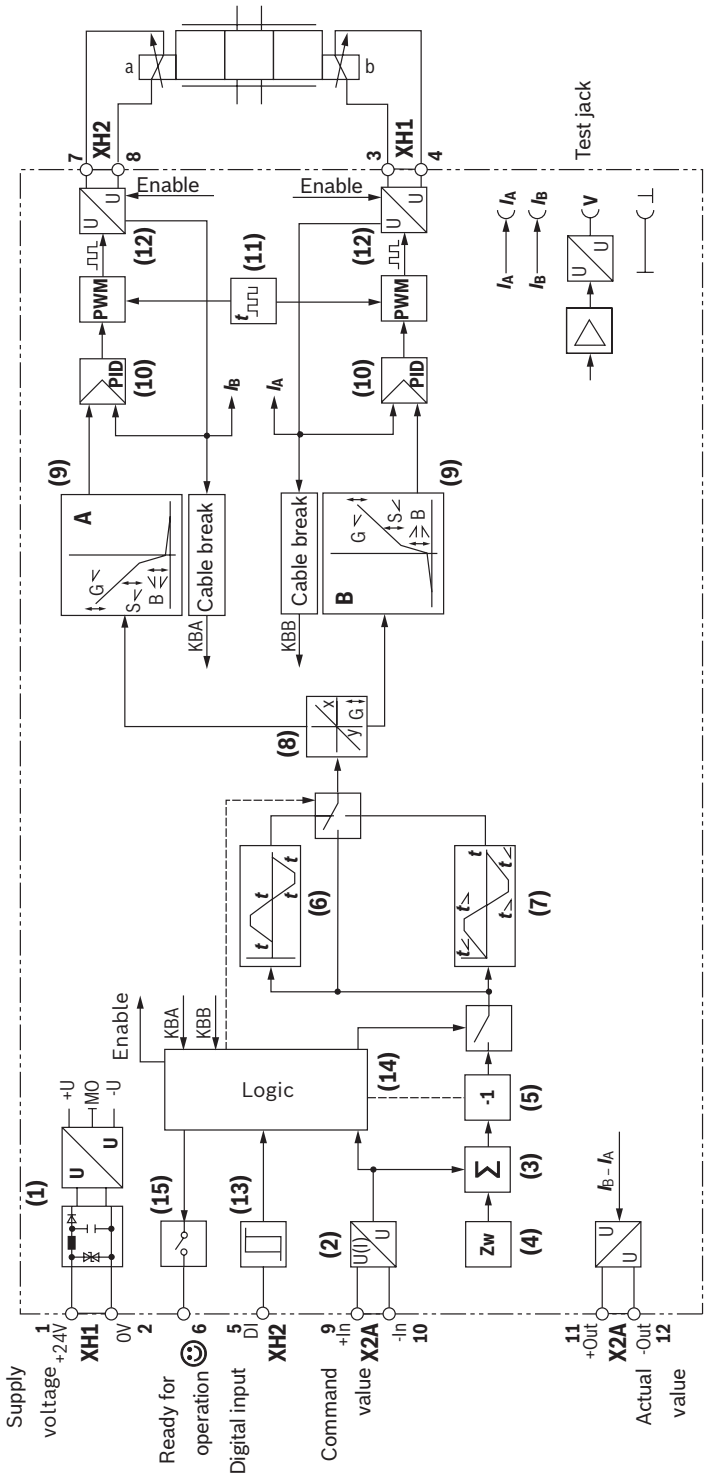
- Before plugging or unplugging connectors into or from the device, disconnect the device from the power supply or de-energize it reliably!
  Damage to the device caused by incorrect handling is not covered by the warranty!
- Observe the protection class, the voltage supply and the environmental conditions according to data sheet RE 30232.

8.1 Block diagram VT-MSPA1-2X



1 Mains adapter
2 Differential amplifier
3 Command value summator
4 Zero point adjustment
5 Inversion
6 Simple ramp
7 4-quadrant ramp
8 Command value attenuator
9 Characteristic curve generator 9.1 standard or 9.2 special variant 4WRPH 6...SO855.
10 Current regulator
11 Clock pulse generator
12 Output stage
13 Enable or inversion or ramp off or 4Q ramp
14 Switching logic/error detection
15 Digital output

8.2 Block circuit diagram of VT-MSPA2-2X



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15 Digital output

8.3 Operating and display elements

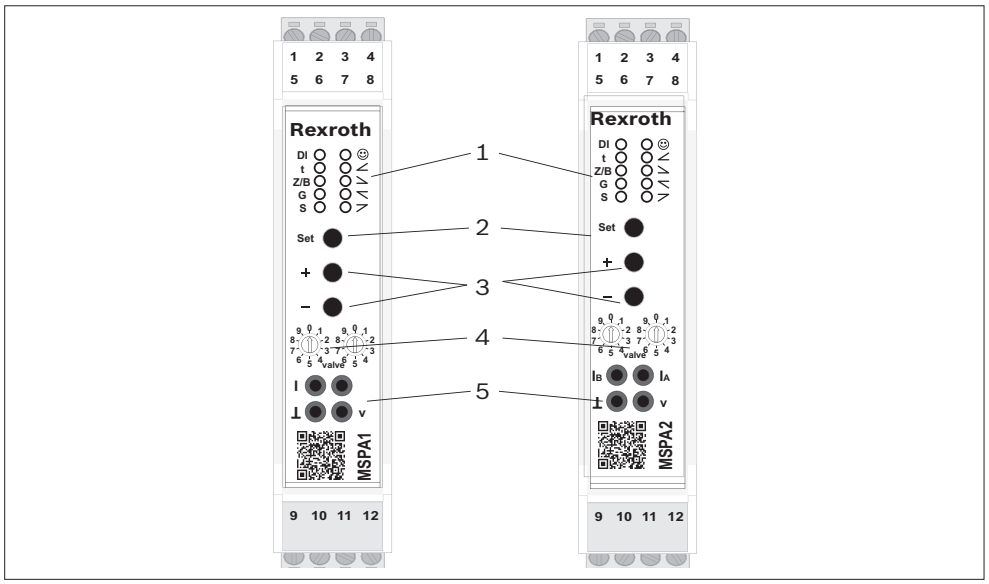


Fig. 4: Operating and display elements

No.	Meaning
1	**Status LEDs** Indicate the current operational state, menu levels and error states
2	**SET key** Editing of selected parameters, selection of operating mode, selection of “Expert Mode“
3	**Keys + / -** Selection of parameters and setting of parameter values
4	**Rotary switch** Selection of the valve type
5	**Test jacks**

8.3.1 Status LEDs

Blinking code

●	Solid on
◍	Blinking
⊗	Flickering
○	**OFF**

Description of LED indicator lamps

DI	Digital (enable) input
t	Ramp
Z/B	Command value zero point / biasing current
G	Command value attenuator
S	**Command value step height**
☺	**Ready for operation**
◿	**1st quadrant (positive command value, increasing)**
◺	**2nd quadrant (positive command value, falling)**
◸	**3rd quadrant (negative command value, increasing)**
◹	**4th quadrant (negative command value, falling)**

Indicator lamps	Operating state	Display mode	Meaning
LED DI “digital input“ (yellow)	Normal operation	Permanently ON/OFF	Status of digital input
	Setup	Blinking	Standard setup active
	Setup	OFF	Expert setup active
	Setup	ON/blinking/flickering	Expert setup: Setting of enable input
LED ☺ “ready“ (red/green)	Normal operation	Solid on green	Module ready for operation
	Normal operation	Solid on red	Error
	Normal operation and setup	Blinking red/green	Valve number changed (but not confirmed)
	Normal operation and setup	Blinking red	Invalid valve number
	Normal operation	OFF	Module not ready for operation
	Setup	Blinking green	Expert setup active

8.3.2 Test jacks

I_B	Actual current in solenoid B (VT-MSPA2-2X), I with VT-MSPA1-2X
I_A	Actual current in solenoid A (VT-MSPA2-2X)
⊥	Reference potential
v	Internal command value or set value

8.4 Selecting the valve types

When setting a valve, the operator generally must ensure that no command value and no enable is applied to the VT-MSPA...-2X!

The desired valve type has to be selected by means of the two rotary switches, see item 4. The left-hand rotary switch sets the tens place, the right-hand rotary switch the units place of the item. While you make the settings, test jack “v“ outputs the selected rotary switch position as a voltage value in 100-mV increments.

Tabelle 9: List of available valve types

VT-MSPA1-2X																	
		Standard			Expert												
Rotary switch position	Valve type (one solenoid)	t	Z	G	4Q	t1	t2	t3	t4	GB	GA	SB	SA	B	f	Inv	DIn
0-0	No valid valve	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	-
0-1	4WRA6...-2X	●	●	●	●	●	●	–	–	●	–	●	–	–	●	–	●
0-2	4WRA10...-2X	●	●	●	●	●	●	–	–	●	–	●	–	–	●	–	●
0-3	4WRZ...-7X	●	●	●	●	●	●	–	–	●	–	●	–	–	●	–	●
0-4	3DREP6...-2X	●	●	●	●	●	●	–	–	●	–	●	–	–	●	–	●
0-5	4WRPH6...-2X (SO855)	●	●	●	●	●	●	●	●	●	●	●	●	–	●	●	●
0-6	DBEP6...-1X	●	●	●	●	●	●	–	–	●	–	●	–	–	●	–	●
0-7	DBET-6X/7X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
0-8	DBET-6X/7X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
0-9	DBETX-1X...G24-25...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-0	DBETX-1X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-1	(Z)DBE6-2X...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-2	DBEM10...-7X/8X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-3	DBEM10...-7X/8X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-4	DBEM20...-7X/8X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-5	DBEM20...-7X/8X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●

VT-MSPA1-2X																		
		Standard			Expert													
Rotary switch position	**Valve type (one solenoid)**	**t**	**Z**	**G**	**4Q**	**t1**	**t2**	**t3**	**t4**	**GB**	**GA**	**SB**	**SA**	**B**	**f**	**Inv**	**DIn**
1-6	DBEM30...-7X/8X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-7	DBEM30...-7X/8X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-8	(Z)DRE6...-1X...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
1-9	ZDRE10...-2X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-0	ZDRE10...-2X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-1	DRE...10...-6X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-2	DRE...10...-6X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-3	DRE...20...-6X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-4	DRE...20...-6X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-5	DRE...30...-6X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-6	DRE.30...-6X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-7	3DRE...-7X...G24...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-8	3DRE...-7X...G24-8...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
2-9	3FREX6...-1X...G24-25...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
3-0	3FREX10...-1X...G24-25...	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
3-1	3DREP6...-2X... (SO674)	●	●	●	●	●	●	–	–	●	–	●	–	●	●	–	●
3-2	Z3DRE10..-1X...G24... [1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
3-3	DBE6X-1X...G24-25... [1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
3-4	DBE6X-1X...G24-8... [1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
3-5	DRE6X-1X---G24-8... [1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
3-6	DBET-1X..HG24-8... [1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
3-7	Pump control 1 (0.7 A) EP2 (A7VO)	●	●	●	●	●	●	–	–	●	–	●	–	●	●	–	●
3-8	Pump control 2 (0.6 A) ED72 (A10VSO/31) ER72 (A10VSO/31)	●	●	●	●	●	●	–	–	●	–	●	–	●	●	–	●
3-9	Pump control 3 (0.6 A) EP2 (A10VSO/52, 53) EK2 (A10VSO/52, 53) L4 (A15VSO...) E2 (A15VSO...) EP2,6 (A6VM)	●	●	●	●	●	●	–	–	●	–	●	–	●	●	–	●
4-0	DBE10Z-1X..G24-8.. [1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
4-1	DRE10Z-1X...G24-8... [1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
4-2	(Z)3DRE6...-2X/...G24... [2]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
4-3	(Z)3DRE6...-2X/...G24-8... [2]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
4-4	Pump control 4 (1.9 A) [3] U7 (A15VSO...) EC4 (A10VSO...)	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
4-5	Pump control 5 (2.7A) [3] U8, A15VSO: EB4 (A10VSO...)[1]	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	●
9-6	Universal (0.8 A)	●	●	●	●	●	●	–	–	●	–	●	–	●	●	–	●
9-7	Universal (1.6 A)	●	●	●	●	●	●	–	–	●	–	●	–	●	●	–	●
9-8	Universal (2.5 A)	●	●	●	●	●	●	–	–	●	–	●	–	●	●	–	●
Rest	No valve selected	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

1) Available as of series 21 (VT-MSPA1-21...)
2) Available as of series 22
3) Available as of series 23

VT-MSPA2-2X																	
		Standard			Expert												
Rotary switch position	**Valve type (two solenoids)**	**t**	**Z**	**G**	**4Q**	**t1**	**t2**	**t3**	**t4**	**GB**	**GA**	**SB**	**SA**	**B**	**f**	**Inv**	**DIn**
0-0	No valve	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
0-1	4WRA6...-2X	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
0-2	4WRA10...-2X	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
0-3	4WRZ...-7X	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
0-4	3DREP6...-2X	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
0-5	3DREP6...-2X (SO674)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
0-6	DBEP6...-1X	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
0-7 ... 3-6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-7	Pump control 1 (0.74 A) EP (A4CSG)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3-8 --- 3-9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
9-6	Universal (0.8 A)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
9-7	Universal (1.6 A)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
9-8	Universal (2.5 A)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

If no valve type is selected, the LEDs signal the status shown on the left. The yellow LEDs rotate clockwise in pairs.

The ready LED ☺ blinks red/green, if the valve number saved last and the current rotary switch position do not match!
The amplifier is active and utilizes the parameters of the valve type saved last.
Remedy:
If you wish to change the valve, remove the command value and the enable, press key **[Set]** > 1 sec and accept the new valve type.
If the rotary switch position was changed accidentally, reset it to the original valve number.
→ The ready LED ☺ is lit green.
Check in any case additionally the actually connected valve!
Upon every valve change all editable parameters are reset to factory settings!

8.5 Menu

1.1.1 Menu structure

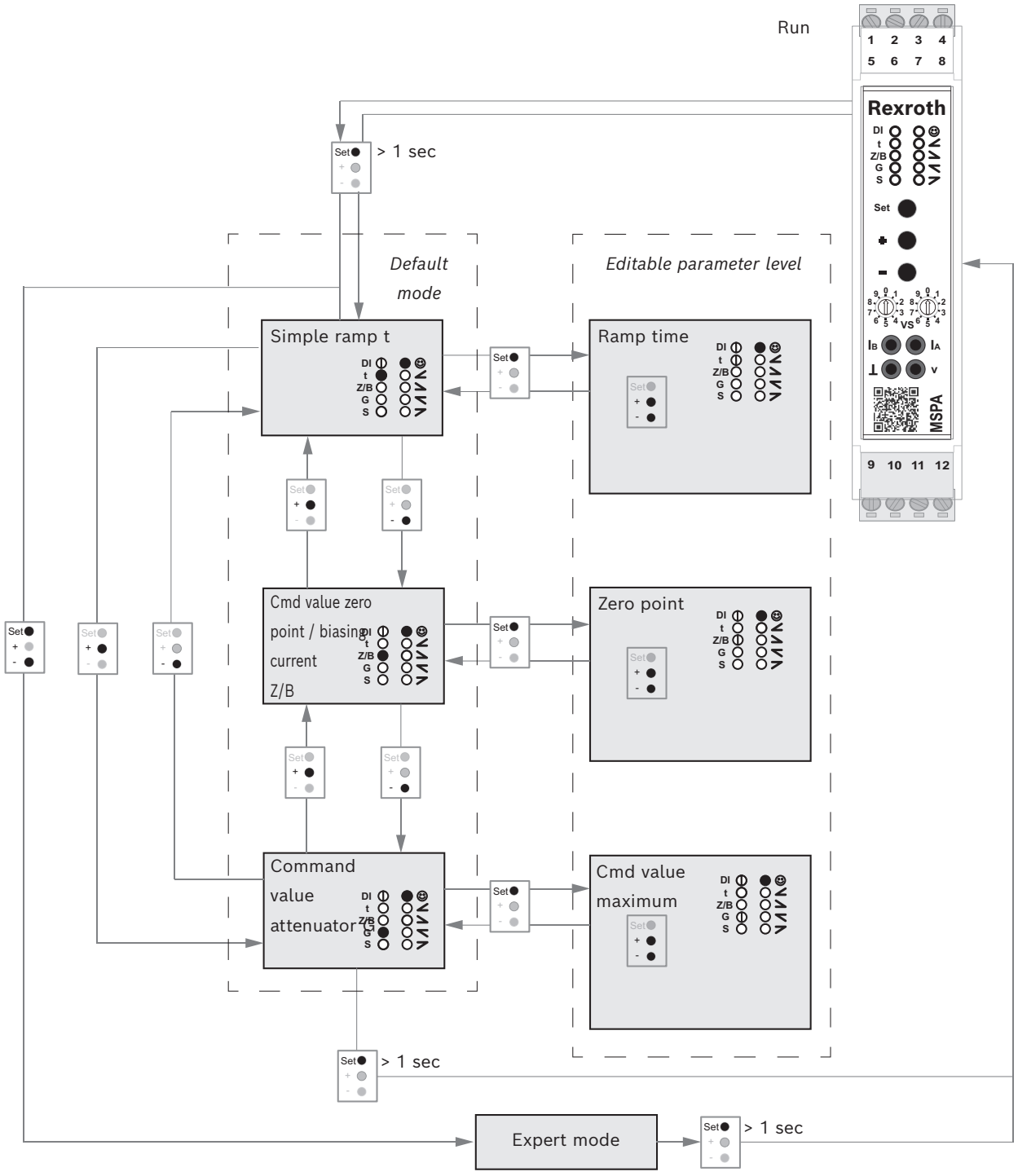


Fig. 5: Menu structure

The menu structure and operation of the “Expert Mode” corresponds to that of the “Standard Mode“. The parameters in the “Expert Mode“ can be found in chapter 8.6.2 „Explanation of menu level “Expert Mode““.

8.6 Parameter setting

During parameter setting the device remains in operation.
It continues to monitor with the existing parameters until the parameter setting is completed.
The following has to be taken into account for parameterizing:
First, select the correct valve by means of the rotary coding switch. As soon as the position of the rotary coding switch is changed, test jack “v“ outputs the valve number in the form of the corresponding voltage in volt [0.1 V/valve number].
Valve no. 13, for example, has a voltage of 1.3 V.
As soon as a valve was correctly accepted (by pressing Set > 1 s), the internal command value is again signaled at test jack “v“.
To have the valve number shown again at test jack “v” for 5 s, press “-“ once.

Select parameter

- **Press [Set]** > 1 sec. to witch to the first settable parameter (simple ramp, see Fig. 5).

Set parameter value

- Press **[Set]** to edit the selected parameter.
- **Press [+]** or **[-]** to change the set value.

Set values can be checked with the help of a multimeter. Every set value stands for a voltage output or a percentage value at the connected multimeter. The assignments are listed in the tables in chapters 8.6.1 and 8.6.2 (output at test jack).

If, while a parameter is set, no key is pressed for 10 minutes , the amplifier returns to normal operation without saving the newly set value.

Exiting editable parameter

- Press **[Set]** to exit the editable parameter. This saves the set parameters.

Setting other parameters

- Press **[+]** or **[-]** until the relevant parameter is displayed.

To switch to the “Expert Mode“ you have to be in the “Standard Mode“: Press **[-]** and **[Set]** simultaneously. In the “Expert Mode”, the general parameter setting procedure corresponds to the menu level “Standard Mode“.
To exit the “Expert Mode“, press **[Set]** (> 1 s).

The device is again in the operation mode.

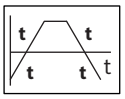
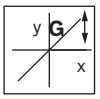
Finish parameter setting

- Press **[Set]** (> 1 s).

The device is again in the operation mode.

8.6.1 Explanation of menu level “Standard Mode“

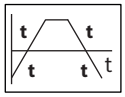
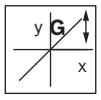
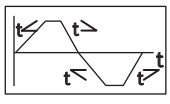
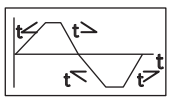
The order in which the parameters below are listed corresponds to the order on the device.
LED ☺ “ready“ solid green, LED “DI“ blinks yellow.

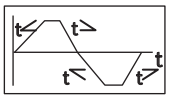
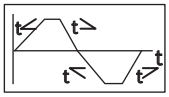
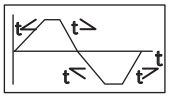
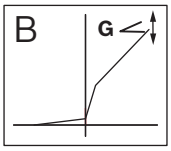
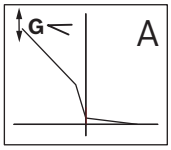
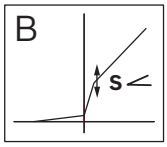
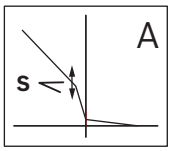
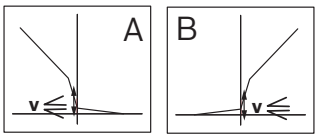
Parameter	LED indicator lamps	Description	Editable parameter	Output at test jack v
Simple ramp t			Ramp time	0/10 ms...1000 ms: 0/10 mV...1.00 V (1 s/V) 1 s...5 s: 1.0 V...5.0 V (1 s/V) 5 s ... 30 s U = 0.2 V/s * t + 4 V
Command value zero point Z/B			Zero point	0...±10 %: 0...±1 V (0.1 V/%)
Command value attenuator G			Command value maximum	70...110 %: 0.70 V...1.10 V

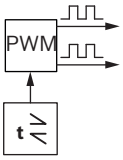
8.6.2 Explanation of menu level “Expert Mode“

The order in which the parameters below are listed corresponds to the parameter order on the device.

Depending on the selected valve type, individual functions may not be available and are skipped in the selection of functions. See chapter 8.4“Selecting the valve types” on page 22. LED ☺ “ready“ blinks green

Parameter	LED indicator lamps	Description	Editable parameter	Output at test jack v
Simple ramp t			Ramp time	0/10 ms...1000 ms: 0/10 mV...1.00 V (1 s/V) 1 s...5 s: 1.0 V...5.0 V (1 s/V) 5 s ... 30 s U = 0.2 V/s * t + 4 V
Command value zero point/biasing current Z/B			Zero point	0...±10 %: 0...±1 V (0.1 V/%)
Command value attenuator G			Command value maximum	70...110 %: 0.70 V...1.10 V
Ramp function t			On/off	Simple ramp ON: +1 V Ramp OFF: 0 V 4Q ramp ON: +4 V
4Q ramp t1, 1st quadrant (positive command value, increasing)			Ramp time 1st quadrant [1)]	0/10 ms...1000 ms: 0/10 mV...1.00 V (1 s/V) 1 s...5 s: 1.0 V...5.0 V (1 s/V) 5 s... 30 s 5.0 V ... 10 V U = 0.2 V/s * t + 4 V

Parameter	LED indicator lamps	Description	Editable parameter	Output at test jack v
4Q ramp t2, 2nd quadrant (positive command value, falling)			Ramp time 2nd quadrant [1]	0/10 ms...1000 ms: 0/10 mV...1.00 V (1 s/V) 1 s...5 s: 1.0 V...5.0 V (1 s/V) 5 s... 30 s 5.0 V ... 10 V U = 0.2 V/s * t + 4 V
4Q ramp t3, 3rd quadrant (negative command value, increasing)			Ramp time 3rd quadrant [1]	0/10 ms...1000 ms: 0/10 mV...1.00 V (1 s/V) 1 s...5 s: 1.0 V...5.0 V (1 s/V) 5 s... 30 s 5.0 V ... 10 V U = 0.2 V/s * t + 4 V
4Q ramp t4, 4th quadrant (negative command value, falling)			Ramp time 4th quadrant [1]	0/10 ms...1000 ms: 0/10 mV...1.00 V (1 s/V) 1 s...5 s: 1.0 V...5.0 V (1 s/V) 5 s... 30 s 5.0 V ... 10 V U = 0.2 V/s * t + 4 V
Command value attenuator GB for solenoid B (positive command value)			Command value attenuator Solenoid B	70...110 %: 0.70 V...1.10 V
Command value attenuator GA for solenoid A (positive command value)			Command value attenuator Solenoid A	70...110 %: 0.70 V...1.10 V
Step height SB, positive command value (solenoid B)			Step height, solenoid B	Biasing current...50 %: 0...5.0 V
Step height SA, negative command value (solenoid A)			Step height, solenoid A	Biasing current...50 %: 0...5.0 V
Biasing current B (solenoid A + B)			Biasing current of solenoid A and solenoid B	0...step height %: 0...5.0 V

Parameter	LED indicator lamps	Description	Editable parameter	Output at test jack v
PWM frequency, relative, f Universal valves: absolute			PWM frequency, relative Universal valves, absolute	80 % to 120 % of the nominal frequency 0.8 V...1.2 V 0.95 V...5.05 V (100 Hz/V) 95 Hz ... 505 Hz
Command value inversion Inv		Command value inversion	ON/OFF	ON: +1 V OFF: 0 V
Function: **Digital (enable) input DI**		Digital (enable) input	1: Enable input (default) 2: Inversion [2) 3)] 3: Ramp ON/OFF [3)] 4: Changeover simple ramp/4Q ramp [3)]	1: 1 V 2: 2 V 3: 3 V 4: 4 V

1) Ramp times effective only when 4Q operating mode is activated
2) Function available only on VT-MSPA2-2X/..
3) The function of the digital input is XOR-linked to the internally selected state

8.7 Restoring the VT-MSPA...-2X to factory settings

This function is available exclusively directly upon switching on the operating voltage. It resets all customer-specific parameters of the set valve to the factory settings.

The module has to be de-energized.

- **Press and hold [Set]** and switch on the supply voltage.

The LEDs signal the status shown on the left.

After some time, the LEDs switch to the status shown on the left.
The module is restored to factory settings.

- **Release [Set]**.

Restoring to factory settings is completed.

9 Operation

Should a fault occur during operation, e.g. a power failure, the VT-MSPA...-2X can simply be switched on again without further measures and it is then ready for operation again.
If the VT-MSPA...-2X detects an error, a reaction takes place according to the table below.

Tabelle 10: Fault evaluation

Error	Comment	LED (red/ green) ready	LED (yellow) "digital input"	LEDs (yellow) "functions"	Solenoid output stages	Output "ready"	Output test jack "v"
No error		Solid on green	Normal indication	Normal indication	Normal operation	Normal operation	Normal operation
Operating voltage UB too low	UB < UBmin	Solid on red	Normal indication	Normal indication	Switched off	Switched off	7 V
Operating voltage UB too high	UB > UBmax	Blinking green	Normal indication	Normal indication	Normal operation	Normal operation	Normal operation
Cable break, command value 0..±10 V	(Ucomm = 0 V) error cannot be recognized; behavior of the output stages as with command value = 0 V (corresponds to 0 %)	Solid on green	Normal indication	Normal indication	Normal operation	Normal operation	Normal operation
Cable break, command value +4..20 mA [1]	Icomm < 2 mA	Solid on red	Normal indication	Normal indication	Switched off	Switched off	4 V
Overcurrent, command value +4..20 mA [1]	Icomm > ca. 35 mA	Solid on red	Normal indication	Normal indication	Switched off	Switched off	4 V
Solenoid cable break	Error is only certain recognized when > 3.5 %	Solid on red	Normal indication	Normal indication	Normal operation	Switched off	6 V (solenoid B) 5 V (solenoid A)
Overcurrent solenoid/output stages	E.g. short-circuited solenoid	Solid on red	Normal indication	Normal indication	Switched off	Switched off	8 V
Serious error	Internal parameter memory (EEPROM) defective	Solid on red	Normal indication	Permanently on (all 8)	Switched off	Switched off	9 V
Serious error	Main controller does not work	Fast blinking red & green	Fast blinking	Fast blinking (all 8)	Switched off	Switched off	-14 V

The "error" voltage at test jack "v" is automatically output as long as the erroneous state persists (= LED "ready" is solid red).
When the above causes of error are eliminated the amplifier module automatically resumes operation according to its intended use.
[1] For resetting the command value has to be briefly withdrawn from the module. In the case of a serious error the module has to be replaced.

10 Maintenance and repair

Bosch Rexroth electronics are usually maintenance-free.

10.1 Cleaning and care

NOTICE
Ingress of contaminants and humidity! Malfunction and loss of function. ▶ When working on electronics observe strictest cleanliness. ▶ Only use a dry and dust-free cloth for cleaning. **Solvents and aggressive cleaning agents!** Damage and accelerated aging of electronics. ▶ Do not use aggressive cleaning agents for cleaning, but only a dry and dust-free cloth.

Proceed as follow for cleaning and care:

- ▶ Carry out a visual inspection and check that all screws are tightened and lines fit properly.
- ▶ Check all plug-in and clamped connections at least once a year for correct fit and damage.
- ▶ Inspect cables for rupture and crushes. Have damaged or defective cables replaced immediately!
- ▶ Clean housing parts with a dry and dust-free cloth.

10.2 Inspection and maintenance

Maintenance of Bosch Rexroth electronics is restricted to the points described under chapter 8.6.1“Cleaning and care” above.

10.3 Repair

Bosch Rexroth electronics may only be replaced as a complete unit. Unauthorized modifications to devices are not permitted for safety reasons! Repairs may only be carried out by Bosch Rexroth AG. For repairs send the device to the service address given in chapter 16.1.
Please return the devices to us in their original packaging.
Repaired devices are returned with factory settings.
In the case of parameterized devices, user-specific settings are not maintained. The operator has to transmit the relevant user parameters again.

11 Demounting and replacement

11.1 Required tools

For replacement, a screwdriver is necessary.

11.2 Preparing for disassembly

⚠ WARNING

Risk of injury by demounting parts under pressure and electric voltage!
If you do not de-pressurize and de-energize the system before starting demounting, you may get injured and the product or system parts may be damaged!

- ▶ Decommission the entire system as described in the general instructions for the system.
- ▶ The system and all connected components must be brought to a safe state. In addition, the components must be switched off, de-pressurized, de-energized and secured against restarting.

NOTICE

Electric arc and short-circuit!
Risk of destruction of system components.

- ▶ Put plug-in connectors down in a way that no short-circuit fault can occur.

Decommission the entire system as described in the general instructions for the system. In any case, bring the system to a safe state, shut it down, depressurize and disconnect it from the power supply and secure it against being switched on again.

11.3 Disassembly process

Proceed as follows to demount the VT-MSPA...-2X:

1. Disconnect connection cables and unplug connectors.
2. Loosen the latch from its snapped-in position using a screwdriver.
3. Carefully remove the VT-MSPA...-2X from the DIN rail while the latch is pulled out.

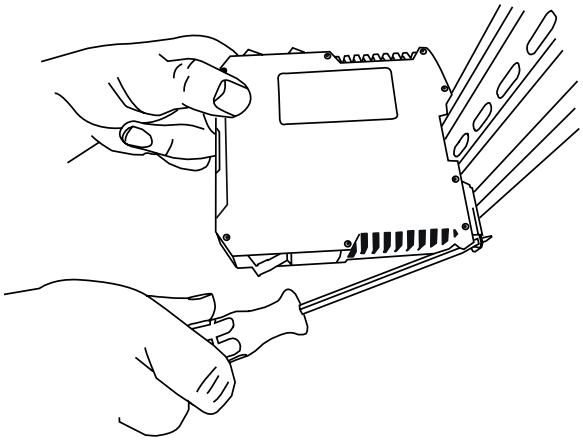


Fig. 6: Demounting des VT-MSPA...-2X from the DIN rail

11.4 Preparations for storage and further use

Proceed as follows in order to prepare electronics from Bosch Rexroth for storage and further use:

- Whenever possible, use the original packaging for storage.
- Observe the permissible storage temperature range given in data sheet RE 30232 .
- Protect against dust and humidity.

12 Disposal

12.1 Environmental protection

Careless disposal of the devices can lead to pollution of the environment.

- Therefore, dispose of the products according to the national regulations in your country.
- Observe the following notes for an environmentally friendly disposal of the devices.

12.2 Return to Bosch Rexroth AG

Products manufactured by us can be returned to us free of charge for disposal. When returned, the products must not contain any inappropriate foreign substances or third-party components. The components have to be sent free domicile to the following address:
Bosch Rexroth AG
Industrial Hydraulics Service
Bürgermeister-Dr.-Nebel-Straße 8
97816 Lohr am Main
Germany

12.3 Packaging

Upon request, reusable systems can be used for regular deliveries.
The materials for disposable packaging are mostly cardboard, wood, and expanded polystyrene. They can be recycled without any problems. For ecological reasons, disposable packaging should not be used for returning products to Bosch Rexroth.

12.4 Materials used

Electronic components from Bosch Rexroth do not contain any hazardous substances that could be released during intended use. Normally, no negative effects on human beings and on the environment are to be expected.
Electronics from Bosch Rexroth mainly consist of:
• Plastics
• Electronics components and assemblies
• Copper

12.5 Recycling

Due to the high share of metals the material of the products can mostly be recycled. In order to achieve an ideal metal recovery, disassembly into individual assemblies is required. The metals contained in electrical and electronic assemblies can also be recovered by means of special separation procedures. If the products contain batteries or accumulators, they have to be removed before recycling and furnished to the battery recycling, if possible.

13 Extension and modification

The VT-MSPA...-2X must be neither extended nor converted.

14 Troubleshooting

The devices are usually not susceptible to faults, as far as prescribed operating and ambient conditions are complied with.

14.1 How to proceed for troubleshooting

- Always work systematically and purposefully, even when under time pressure. Random and imprudent disassembly and readjustment of settings can, in the worst-case scenario, result in the inability to determine the original cause of error.
- First obtain a general overview of how your device works in conjunction with the entire system.
- Try to determine whether the device worked properly in conjunction with the entire system before the troubles occurred.
- Try to determine any changes of the entire system in which the device is integrated:
  - Were there any changes to the product's operating conditions or operating range?
  - Were there any changes (e.g. retrofit) or repairs carried out on the complete system (machine/system, electrics, control) or on the device? If yes, which?
  - Was the device or machine used as intended?
  - How did the fault become apparent?

- Try to get a clear idea of the cause of error. If necessary, ask the actual (machine) operator.

15 Technical data

You can find the technical data of your device in data sheet RE 30232.

16 Appendix

16.1 List of addresses

Contacts for service and spare parts

Bosch Rexroth AG
Industrial Hydraulics Service
Bürgermeister-Dr.-Nebel-Straße 8
97816 Lohr am Main
Germany

Telephone +49 (0) 9352/40 50 60
E-mail service@boschrexroth.de

Outside Germany you will find service subsidiaries in your vicinity on the Internet at `www.boschrexroth.com`

Contacts for service and spare parts

Bosch Rexroth AG
Zum Eisengießer 1
97816 Lohr am Main
Germany

Telephone +49 (0) 9352/18-0
Email my.support@boschrexroth.com

The addresses of our sales and service network and sales organizations can be found at `www.boschrexroth.com/adressen`

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