

Valve amplifier for proportional directional control valves without electrical position feedback

Type VT-MSPA



- Component series 2X
- Suitable for control of proportional directional control valves and pump controls without electrical position feedback
- Easy valve selection of the Rexroth valves for the industrial hydraulics
- Characteristic curves of the valves stored in the device
- Valve optimization via push-buttons
- All valve parameters adjustable



Features

- Command value input 0 ... ± 10 V or 4 ... 20 mA
- Reverse polarity protection of the operating voltage
- Ramp generator up and down is separately adjustable
- Zero point setting
- Command value adjustment
- Characteristic curve generator
- Clocked power output stage
- Output short-circuit-proof
- LED status displays
- Measuring sockets for: Actual current value, internal current command/setting

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Ordering code

01	02	03	04	05						
VT-MSPA		-	2X	/		/	000	/	000	*

01	Valve amplifier for proportional directional control valves without position feedback, analog, modular design	VT-MSPA
02	For proportional valves with 1 solenoid	1
	For proportional valves with 2 solenoids	2
03	Component series 20 ... 29 (20 ... 29: unchanged technical data and connections)	2X
04	Command value voltage (1 solenoid 0 ... +10 V / 2 solenoids 0 ... ±10 V)	A5
	Command value current (4 ... 20mA)	F5
05	Further details in the plain text	*

Available variants

Type	Material no.
VT-MSPA1-2X/A5/000/000	R901439034
VT-MSPA1-2X/F5/000/000	R901439036
VT-MSPA2-2X/A5/000/000	R901439037
VT-MSPA2-2X/F5/000/000	R901439038

Function

General

The amplifier modules are intended for assembly on top hat rails. The electrical connection is established via 3 tension spring plug-in connectors. The supply voltage is 24 VDC.

Power supply unit (1)

The internal power supply unit has a making current limiter to prevent current peaks. Additionally, inverse-polarity protection is integrated.

Command value, command value summing device (3)

The "internal command value" comprises:

- ▶ "External command value", connected at the input of the differential amplifier (2)
- ▶ Zero point offset (4), "Z/B" adjustable in the standard setup

For pressure valves, a positive command value results in a pressure increase at the valve.

The following applies for "4W..." valves ¹⁾:

- ▶ Via solenoid B, a command value of 0 ... +10 V or 12 ... 20 mA results in a flow in the valve from P to A and from B to T.
- ▶ Via solenoid A, a command value of 0 ... -10 V or 12 ... 4 mA results in a flow in the valve from P→B and from A→T. In the expert setup, it is possible to invert the command value (5) (see operating instructions 30232-B).
- ▶ In normal operation, the "internal command value" can be measured at the "v" measuring socket.

Ramps

A ramp limits the incline of the command value.

You can choose between a single ramp (6) (one time for all ramps, default value) and a 4Q/2Q ramp (7) (different times for the possible ramps). The 4Q/2Q ramp times are set in the expert setup. The characteristic curve generator (9) does not influence the ramp time.

Command value attenuator "G" (8)

By means of the command value attenuator, the command value can be reduced.

Characteristic curve generator (9)

In the characteristic curve generator, the pre-set valve characteristic curve can be adjusted to the actual hydraulic and control-technical conditions.

The following can be adjusted in the expert setup:

- ▶ Pilot current "B"
- ▶ Step "S"
- ▶ Maximum current "G" (with "VT-MSPA2" separately possible for solenoid A and B)

Current controller (10)

The solenoid current is recorded, compared to the command value in the current controller and the difference is compensated.

Clock generator (11)

The clock generator creates the clock frequency "f" of the output stage. With Rexroth valves, the clock frequency sometimes changes dependent on the command value and/or the operating voltage.

Power output stage (12)

The power output stage generates the clocked solenoid current for the proportional directional valve. The solenoid current is limited to the maximum admissible current per output, depending on the set valve. The output stages are short-circuit-proof. With an internal interference signal or in case enable is missing, the output stage will be switched off.

Digital input (13)

The input DI can be set to four different functions:

- ▶ Enable (factory setting)
- ▶ "VT-MSPA1" ¹⁾ without function (permanent enable)
- ▶ "VT-MSPA2" command value inversion (permanent enable)
- ▶ Ramp ON/OFF (permanent enable)
- ▶ Single or quadrant ramp (permanent enable)

Digital output (15)

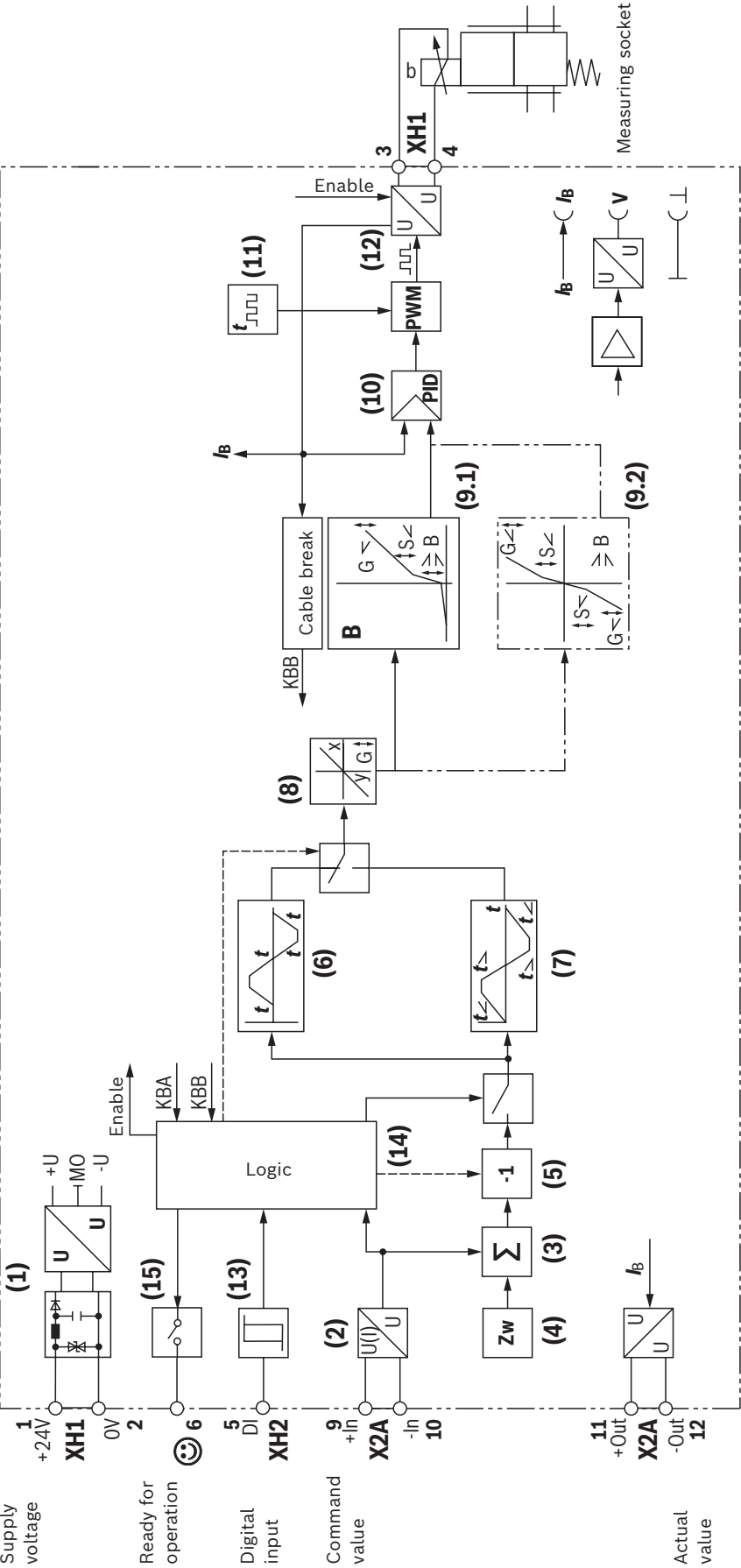
Device notifies ready for operation if there is no cable break, no internal error and $U_B \geq U_{B \min}$.

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

¹⁾ Proportional directional valve "4WRPH 6...SO855", switch position 0-5:

- ▶ Command value ± 10 V
- ▶ Command value inversion (permanent enable)

Block diagram: VT-MSPA1...



- 1

Power supply unit
- 2

Differential amplifier
- 3

Command value summing device
- 4

Zero point setting
- 5

Inverter
- 6

Single ramp
- 7

4-quadrant ramp
- 8

Command value attenuator
- 9.1

Characteristic curve generator (standard)
- 9.2

Characteristic curve generator (type "4WRPH 6...SO855")
- 10

Current controller
- 11

Clock generator
- 12

Output stage
- 13

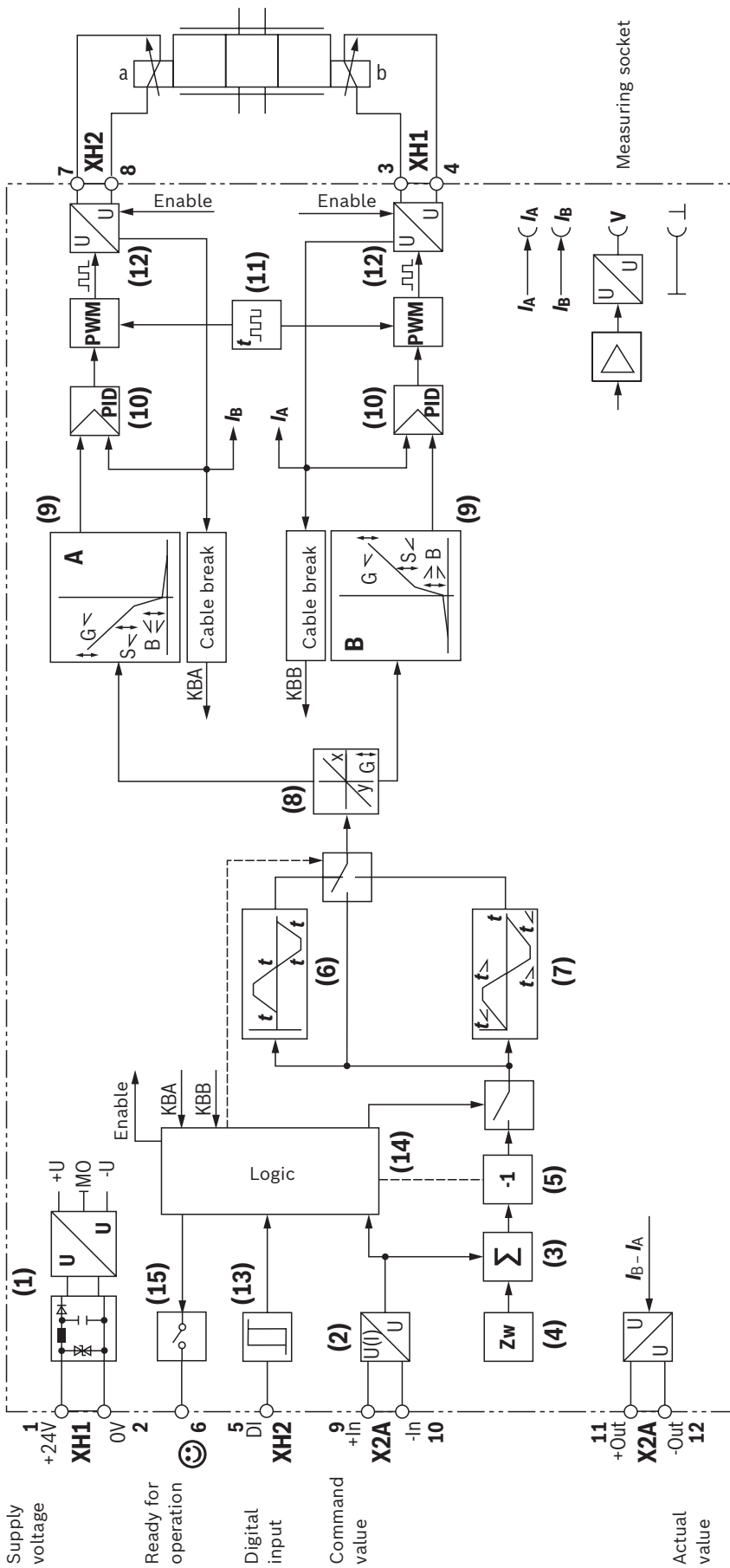
Enable or inverter or ramp off or 4Q ramp
- 14

Switching logics/fault recognition
- 15

Digital output

See also "Function" on page 3.

Block diagram: VT-MSPA2...



- | | |
|---------------------------------------|-----------------------------------------------------|
| 1 Power supply unit | 8 Command value attenuator |
| 2 Differential amplifier | 9 Characteristic curve generator |
| 3 Command value summing device | 10 Current controller |
| 4 Zero point setting | 11 Clock generator |
| 5 Inverter | 12 Output stage |
| 6 Single ramp | 13 Enable or inverter or ramp off or 4Q ramp |
| 7 4-quadrant ramp | 14 Switching logics/fault recognition |
| | 15 Digital output |

See also "Function" on page 3.

Technical data

General		
Design		Module
Type of connection		12 spring-type terminals, detachable
Weight	kg	0.14
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. With an ambient temperature of more than 50 °C, the clearance to the next assembly must be 1 cm.
Ambient temperature range	°C	0 ... +60
Storage temperature range (with UV protection)	°C	+5 ... +40
Transport temperature range	°C	−40 ... +70
Relative humidity range (no condensation)	%	10 ... 95
Protection class according to EN 60529		IP20
Sine test according to EN 60068-2-6		10 ... 500 Hz / maximum 2 g / 10 cycles / 3 axes
Noise test according to EN 60068-2-64		20 ... 500 Hz / 2.2 g _{RMS} / 6.6 g peak / 0.5 h / 3 axes
Transport shock according to EN 60068-2-27		15 g / 11 ms / 3 axes
Start-up time	s	<1
Maximum temperature change	°C/min	5
Maximum altitude for use	m	2000
UV resistance		Conditional; color changes possible with prolonged irradiation
Free fall (in original packaging)	m	1
Top hat rail assembly		TH35-7.5 or TH35-15 according to EN 60715
Housing material		Glass-fiber reinforced polyamide plastic
Resistance against aggressive media		Contact with conductive dusts is not admissible. Avoid contact with hydraulic fluids.
Conformity	► CE according to EMC Directive 2014/30/EU, tested according to	EN 61000-6-2 and EN 61000-6-3
	► RoHS Directive	2011/65/EU ¹⁾
Electro-magnetic compatibility (EMC)	► EN 61000-6-2	
	– EN 61000-4-2 ESD	kV 4 CD / 8 AD with BWK B
	– EN 61000-4-3 HF radiated	V/m 10 (80 ... 6000 MHz) with BWK A
	– EN 61000-4-4 Burst	kV 2 (5 kHz and 100 kHz) with BWK B
	– EN 61000-4-5 Surge	kV 0.5 (2 Ω/12 Ω) to operating voltage, 1 kV (42 Ω) to signal with BWK B
	– EN 61000-4-6 HF conducted	V _{eff} 10 (150 kHz ... 80 MHz) with BWK A
	– EN 61000-4-8 Magnetic field 50/60 Hz	A/m 100 with BWK A
	► EN 61000-6-3 / EN 61000-6-4	
	– EN 55016-2-1 Interference voltage	MHz 0.15 ... 30 (class A, EN 55022)
	– EN 55016-2-3 Radio interference field strength	MHz 30 ... 6000 (class B, EN 55022)

¹⁾ The product fulfills the substance requirements of the RoHS Directive 2011/65/EU.

Technical data

Electric				
Supply voltage	► Nominal value	V	24	
	► Minimum ²⁾	V	18	
	► Maximum	V	36	
	► Maximum residual ripple (40 ... 400 Hz)	V _{pp}	2.5 (observe the admissible limits)	
	► Maximum power consumption	W	< 48	
	► Fuse protection, external	A	3.15 time-lag	
Maximum current consumption		A	< 2	
Maximum switch-on current		A	< 4	
Analog inputs (command value) X2A	► 1 solenoid (0 ... 100%)			
	– Version "F5"	mA	4 ... 20	
	– Version "A5"	V	0 ... +10	
	► 2 solenoids (0 ... ±100%)			
	– Version "F5"	mA	4 ... 20	
	– Version "A5"	V	0 ... ±10	
	► Voltage inputs (differential inputs)			
	– Input resistance	kΩ	200	
Analog outputs (actual value) ³⁾ X2A	► Current inputs		Ω	100 (load resistance)
	► Voltage outputs			
	– Output range	I_A (V ≙ A)	V	0 ... -2.5
		I_B (V ≙ A)	V	0 ... 2.5
	– Minimum load impedance	kΩ	1	
Digital inputs XH2	► ON (active) ⁴⁾		V	11 ... 36
	► OFF (inactive)		V	-3 ... 5
Solenoid outputs	► Maximum solenoid current		A	2.7
	► Clock frequency setting range ⁵⁾		Hz	95 ... 505
	► Other properties			Short-circuit-proof, clocked
	► Cable length (1.5 mm ²)		m	50
Adjustment options	► Zero point calibration		%	±10
	► Command value attenuator ⁶⁾		%	70 ... 110
	► Ramp time up/down		s	0.01 ... 30
	► Step level		%	0 ... 50
Measuring sockets	► Command value/setting		"v"	V 0 ... ±10
	► Actual current value	I_A (V ≙ A)	V	0 ... ±2.5
		I_B (V ≙ A)	V	0 ... ±2.5
	► Reference potential		"⊥"	

²⁾ 21 V for valves with a maximum solenoid current of 0.8 A

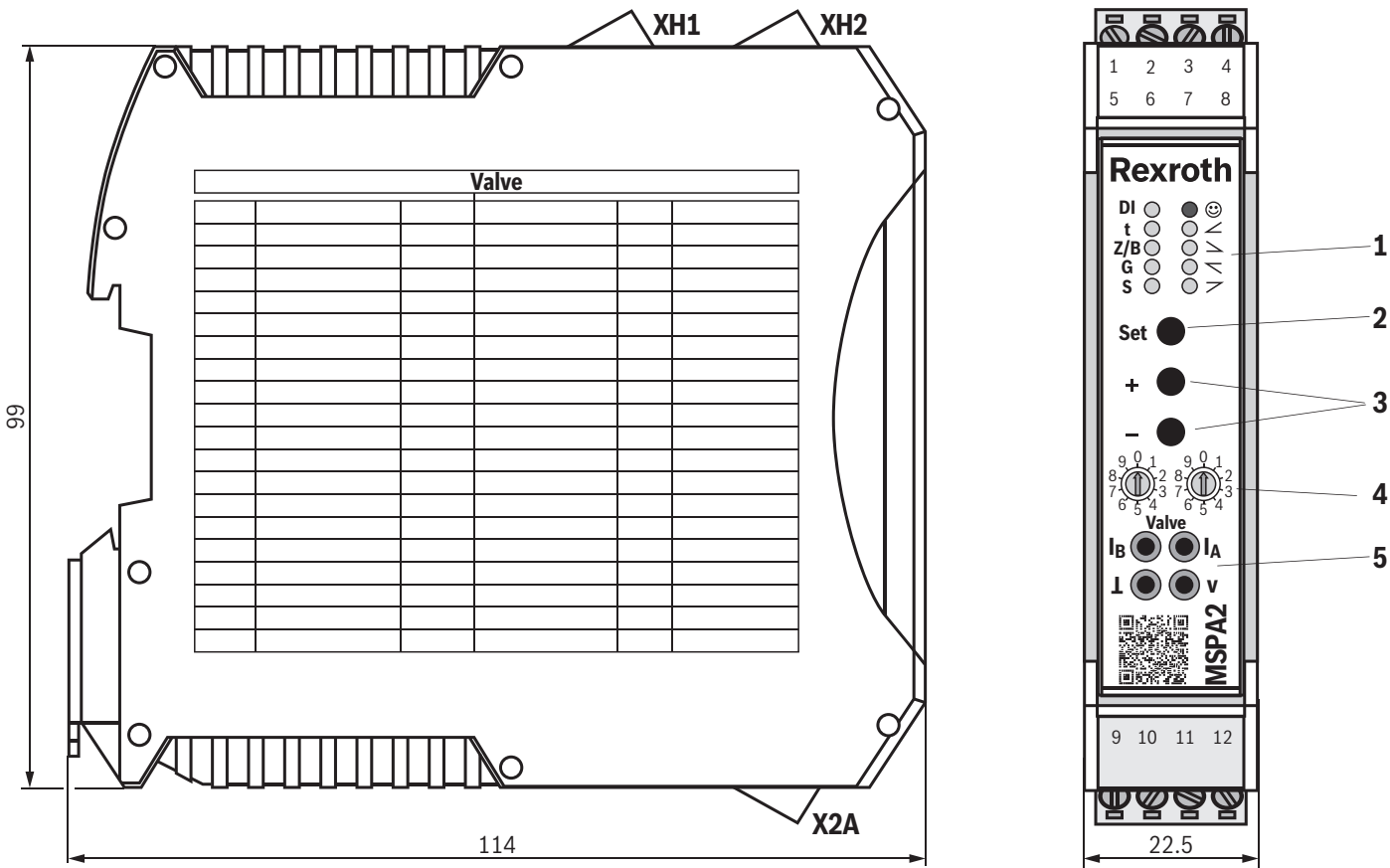
³⁾ Maximum value depending on the selected valve

⁴⁾ $R_E > 50\text{ k}$

⁵⁾ Depending on the selected valve

⁶⁾ At command value 100%

Dimensions
(dimensions in mm)



- 1
Status LEDs
Display the current operating state, menu levels and error conditions
- 2
SET key
Editing the selected parameters, selection of work operation, selection of the "expert mode"
- 3
+ / - keys
Selection of the parameters and adjustment of the parameter values
- 4
Rotary switch
Valve type selection
- 5
Measuring sockets for connecting a measuring instrument

Terminal assignment			
Assignment		Connector	Terminal
Supply voltage	+U _B	XH1	1
	0 V	XH1	2
+ Solenoid B		XH1	3
– Solenoid B		XH1	4
Digital input		XH2	5
Ready		XH2	6
+ Solenoid A ¹⁾		XH2	7
– Solenoid A ¹⁾		XH2	8
+ Command value		X2A	9
– Command value		X2A	10
+ Actual value		X2A	11
– Actual value		X2A	12

¹⁾ Only "VT-MSPA2"

Status description LEDs

Indicator light	Operating state	Display mode	Meaning
"Digital input" LED (yellow)	Normal operation	Permanent light ON/OFF	Digital input status
	Setup	Flashing	Standard setup active
	Setup	OFF	Expert setup active
	Setup	ON/flashing/flickering	Expert setup: Digital input setting
"Ready" LED (red/green)	Normal operation	Permanent light, green	Module ready for operation
	Normal operation	Permanent light, red	Error
	Normal operation and setup	Flashing light, red-green	Valve setting changed
	Normal operation and setup	Flashing light, red	Inadmissible valve number
	Normal operation	OFF	Module not ready for operation
	Setup	Flashing light, green	Expert setup active

Description of the LED display ¹⁾	
DI	Enable ²⁾
t	Ramp
Z/B	Zero point / pilot current
G	Command value attenuator
S	Step level command value
☺	Ready for operation
↙	1st quadrant (positive command value rising)
↘	2nd quadrant (positive command value falling)
↖	3rd quadrant (negative command value rising)
↗	4th quadrant (negative command value falling)

¹⁾ See operating instructions 30232-B for detailed description

²⁾ Function of the digital input can be adjusted in the setup

Accessories (separate order)

	Material no.
Shield set for the installation with shielded lines	R961011117

Assignment: Switch position/valve type

TYPE VT-MSPA1

Switch position	Valve type (1 solenoid)
0-0	No 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...G24...; DBET-7X...G24...
0-8	DBET-6X...G24-8...; DBET-7X...G24-8...
0-9	DBETX-1X...G24-25...
1-0	DBETX-1X...G24-8...
1-1	(Z)DBE6-2X...
1-2	DBEM10...-7X...G24...
1-3	DBEM10...-7X...G24-8...
1-4	DBEM20...-7X...G24...
1-5	DBEM20...-7X...G24-8...
1-6	DBEM30...-7X...G24...
1-7	DBEM30...-7X...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)

Switch position	Valve type (1 solenoid)
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 (2.7 A) ³⁾ U8 (A15VSO...) EB4 (A10VSO...)
9-6	Universal (0.8 A)
9-7	Universal (1.6 A)
9-8	Universal (2.5 A)

- 1) From component series 21
- 2) From component series 22
- 3) From component series 23

Assignment: Switch position/valve type**Type VT-MSPA2**

Switch position	Valve type (2 solenoids)
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	–
0-8	–
0-9	–
1-0	–
1-1	–
1-2	–
1-3	–
1-4	–
1-5	–
1-6	–
1-7	–
1-8	–
1-9	–
2-0	–
2-1	–
2-2	–
2-3	–
2-4	–
2-5	–
2-6	–
2-7	–
2-8	–
2-9	–
3-0	–
3-1	–
3-4	–
3-5	–
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)

Project planning information

- ▶ In especially EMC-sensitive environments, additional measures must be taken (depending on the application, e.g. shielding, filtration)
- ▶ Wiring
 - Maximum possible spatial separation between signal and load lines.
 - Do not lead signal lines through magnetic fields.
 - If possible, install signal lines without intermediate terminals.
 - Do not install signal lines in parallel to the load lines.
 - Connect cable shields (see operating instructions 30232-B)
 - For digital inputs and outputs as well as command and actual value, the max. admissible cable length for unshielded cables is 30 m. With longer cable lengths, shielded cables are to be used.
 - The distance to radios must be sufficient (> 1 m).
 - With a strongly fluctuating operating voltage, in individual cases, it may be necessary to use an external smoothing capacitor with a capacity of at least 2200 µF.
- ▶ Recommendation: Capacitor module VT 11110 (see data sheet 30750); sufficient for up to 3 amplifier modules.
- ▶ The upper and lower ventilation slots must not be concealed by adjacent devices in order to provide for sufficient cooling.
- ▶ The devices have been tested in the plant and are supplied with default settings.

Further information

- | | |
|----------------------------------------------------------------------------------------------------|--------------------------------|
| ▶ Valve amplifier for proportional directional control valves without electrical position feedback | Operating instructions 30232-B |
| ▶ Installation, commissioning and maintenance of proportional valves | Data sheet 07800 |
| ▶ Assembly, commissioning and maintenance of hydraulic systems | Data sheet 07900 |
| ▶ CE Declaration of Conformity | On request |

Bosch Rexroth AG
 Industrial Hydraulics
 Zum Eisengießer 1
 97816 Lohr am Main, Germany
 Phone +49 (0) 93 52/40 30 20
my.support@boschrexroth.com
www.boschrexroth.com

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