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The Drive & Control Company
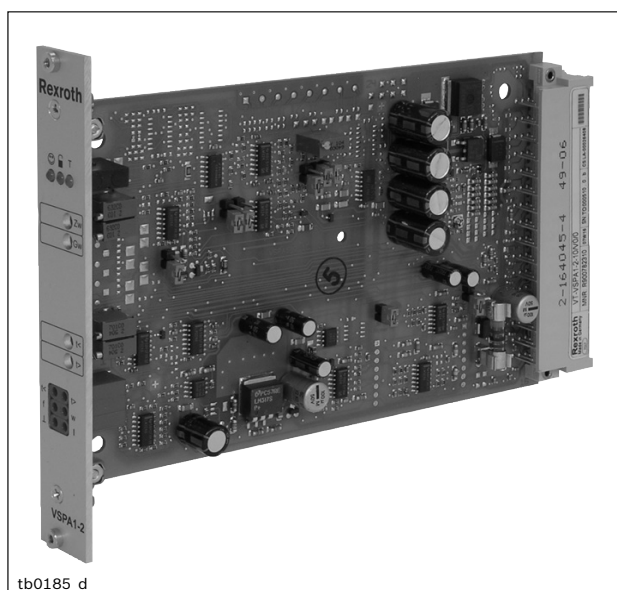
Rexroth
Bosch Group

Valve amplifiers for proportional pressure valves

Type VT-VSPA1-10, VT-VSPA1-11

RE 30100
Edition: 2013-09
Replaces: 2013-04

tb0185_d

▶ Component series 1X
▶ Analog, euro-card format
▶ Suitable for controlling proportional pressure valves:
 – (Z)DRE 6...-1X,
 – ZDRE 10...-2X,
 – 3DRE(M) 10...-7X,
 – 3DRE(M) 16...-7X,
 – DRE(M) 10...-6X,
 – DRE(M) 25...-6X,
 – DRE(M) 32...-6X,
 – Z)DBE6...-2X

Features

▶ Differential input (0 to +10 V)
▶ Current input (4 to 20 mA)
▶ Ramp generator with separately adjustable ramp times "up/down"
▶ External ramp time setting
▶ Enable input
▶ Clocked power output stage
▶ "Ready for operation" message
▶ Reverse polarity protection of the supply voltage
▶ Short-circuit protection and cable break detection of the solenoid conductor

Contents

Ordering code

01	02	03	04	05	06

| VT-VSPA1 | – | | – | 1X | / | V0 | / | 0 | * |

01	Valve amplifier for proportional pressure valves, analog, euro-card format	**VT-VSPA1**
02	For controlling the valve (Z)DRE 6...-1X	**10**
	For controlling the valves: ZDRE 10...-2X, 3DRE(M) 10...-7X, 3DRE(M) 16...-7X, DRE(M) 10...-6X, DRE(M) 25...-6X, DRE(M) 32...-6X, (Z)DBE6...-2X,	**11**
03	Component series 10 to 19 (10 to 19: Unchanged technical data and pin assignment)	**1X**
04	Version: Standard	**V0**
05	Standard option	**0**
06	Further details in the plain text	*****

Accessories

▶ Open card holder VT 3002-1-2X/48F (see data
   sheet 29928)

Function

Power supply unit (1)

The amplifier has a power supply unit with making current limiter. This unit supplies all internally required positive and negative supply voltages.

Command value specification (2), (3), (4), (5)

The internal command value signal is calculated from the total (5) of the external command value signal available at the differential input (2) or at the current input (3) and the zero point offset (4) (zero point potentiometer "Zw").
The following applies:

Standard values		Differential input	Command value socket
0 %	Current input 4 mA	0 V	0 V
+100 %	20 mA	+10 V	+10 V

There is no switch-over between current and voltage input. The inputs are permanently available (see block diagram).

Enable function (6)

The enable function (6) enables the power output stage and forwards the internal command value signal to the ramp generator (7). The enable signal is indicated by an LED. If enable is connected (via 24 V input or jumper J1), 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 (7)

The ramp generator (7) limits the rise of the control output. The downstream amplitude limiter (11) does not extend or shorten the ramp time. Using the jumper J3, the ramp time is changed by the factor 10.
The following applies:

J3	U_{socket} /V	1	0.2	0.1	0.02
Open*	t/ms	100	500	1000	5000
Closed	t/s	1	5	10	50

*   Basic setting (condition as supplied)

Formula:

$$t = \frac{100 \text{ ms}}{U_{socket} / V}$$

Ramp on/off (8)

Using jumper J2 or the "Ramp on/off" input (8) (see terminal assignment), the ramp time is set to a minimum (< 50 ms).

An activated ramp is indicated by an LED.

"Ramp on/off" input	J2	LED "T"	Ramp
0 V	Open	**On**	**On**
+24 V	Open	**Off**	**Off**
0 V	Closed	**Off**	**Off**
+24 V	Closed	**On**	**On**

External ramp time setting (9)

Using an external potentiometer or external voltage specification (according to the formula specified in section "Ramp generator"), the internally set ramp time can be extended. The setting can be verified by means of the measuring sockets. In case of a cable break, the internal default setting will be valid automatically.

The following applies to the external potentiometer:

	Setting range*	
R	**Min. ramp time (potentiometer at left turn)**	**Max. ramp time (rotary angle of the potentiometer at approx. 95 %)**
1 kΩ	100 ms	1 s
100 Ω	1 s	10 s

*   The minimum ramp time can only be reached if the internally set ramp time is lower, i.e. the corresponding potentiometer is at the left turn. The specified ramp times are true for J3 = open.

Characteristic curve generator (10)

Using the "Gw" potentiometer (11), the maximum current for the solenoid is set. In the characteristic curve generator (10), the command value signal is changed so that a linear command value pressure characteristic curve is created. For this purpose, the characteristic curve generator (10) has to be activated using jumper J4 and jumper J5 has to be opened.
In order to deactivate the characteristic curve, jumper J4 has to be opened and jumper J5 has to be closed.

Amplitude limiter (11)

The internal command value is limited to approx. +120 % of the nominal range.

Command value output (12)

0 % ≙ 0 V   +100 % ≙ +10 V

Clock generator (13)

In the clock generator (13), a frequency for the output stage is generated. The frequency is influenced by the supply voltage.
Via the jumper J6, a frequency depending on the command value signal is generated. For a universal use, jumper J6 is to be opened.
A frequency adjustment via the "frequency" potentiometer can be realized by means of jumper J7.
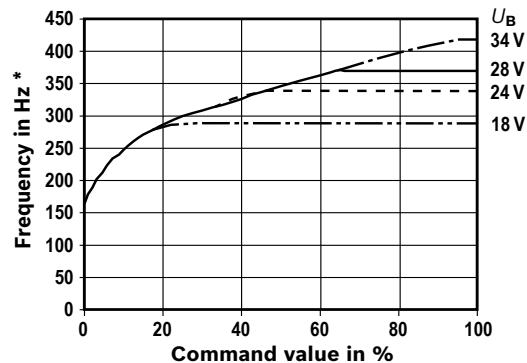
Example 1:
(Frequency adjustment via "frequency" potentiometer – without command value dependancy; J6 = open, J7 = closed)
Setting range for VT-VSPA1-10: 180 Hz ... 400 Hz ± 15 %
Setting range for VT-VSPA1-11: 210 Hz ... 310 Hz ± 15 %

Example 2:
(command value-dependent frequency – J6 = closed)

* Tolerance: ±15 %

Via the "frequency" potentiometer, the frequency can be corrected by > ±10 % (J6 and J7 closed).

Power output stage (14)

The power output stage creates a clocked solenoid current for the proportional valve.
The output stage output is de-energized in case of an internal fault signal or iif it has not been enabled. The output stage output is short-circuit-proof.

Actual value output (15)

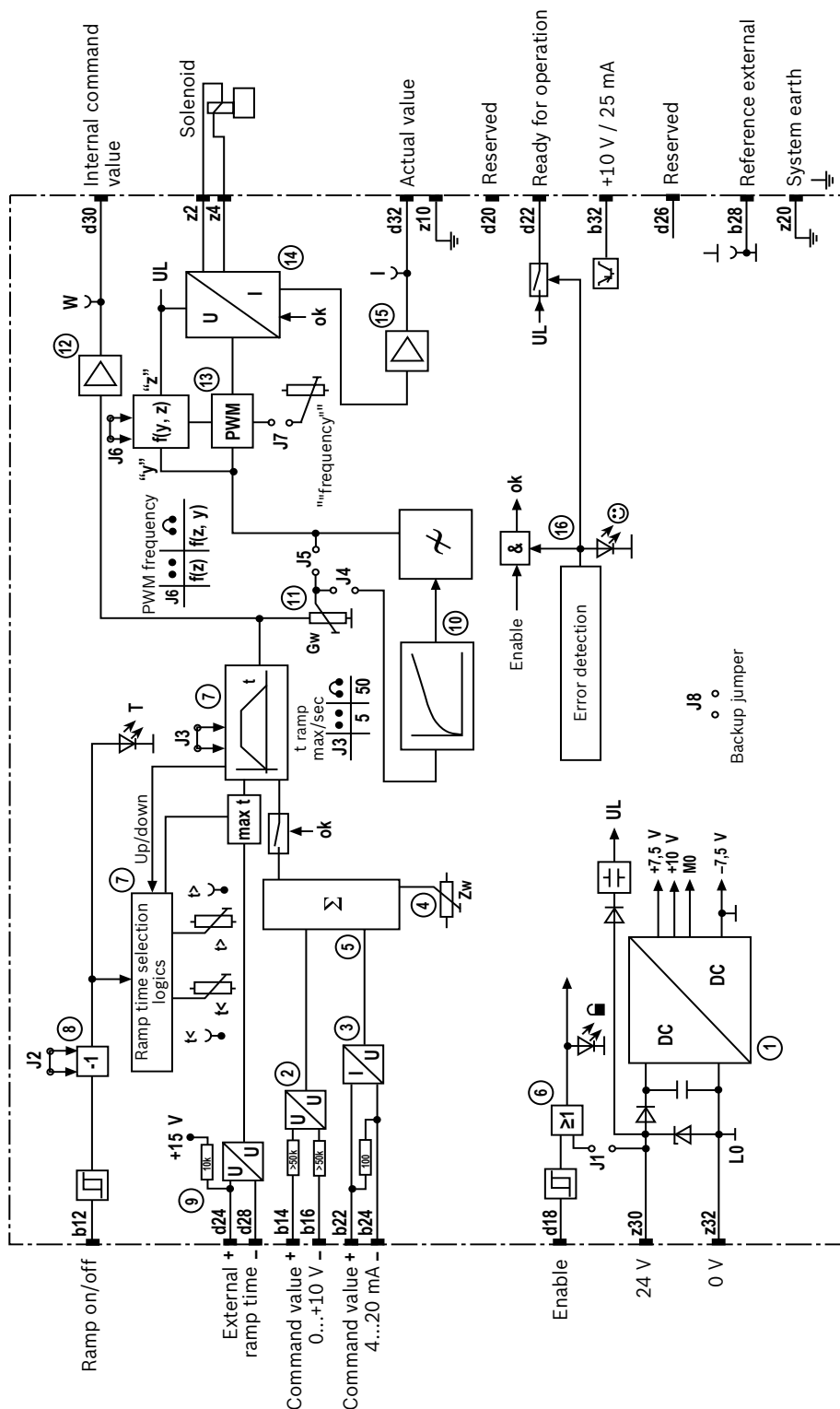1 mA ($I_{solenoid}$) ≙ 1 mV (actual value output)

Fault recognition (16)

The solenoid conductor is monitored for cable break and short-circuits. If there is no fault, a voltage > 16 V is output at the "ready-for-operation" output and the "ready-for-operation" LED is illuminated.
In case of a fault, the following applies:

	Output	LED
Short-circuit	Low	Off
Cable break	Clocking	Flashing

Block diagram

1 Power supply unit
2 Differential input
3 Current input
4 Zero point setting
5 Command value summation
6 Enable

7 Ramp generator
8 Ramp on/off
9 External ramp time
10 Characteristic curve generator
11 Amplitude limiter
12 Command value output

13 Clock generator
14 Power output stage
15 Actual value output
16 Fault recognition

Bosch Rexroth AG, RE 30100, edition: 2013-09

Setting and operating controls
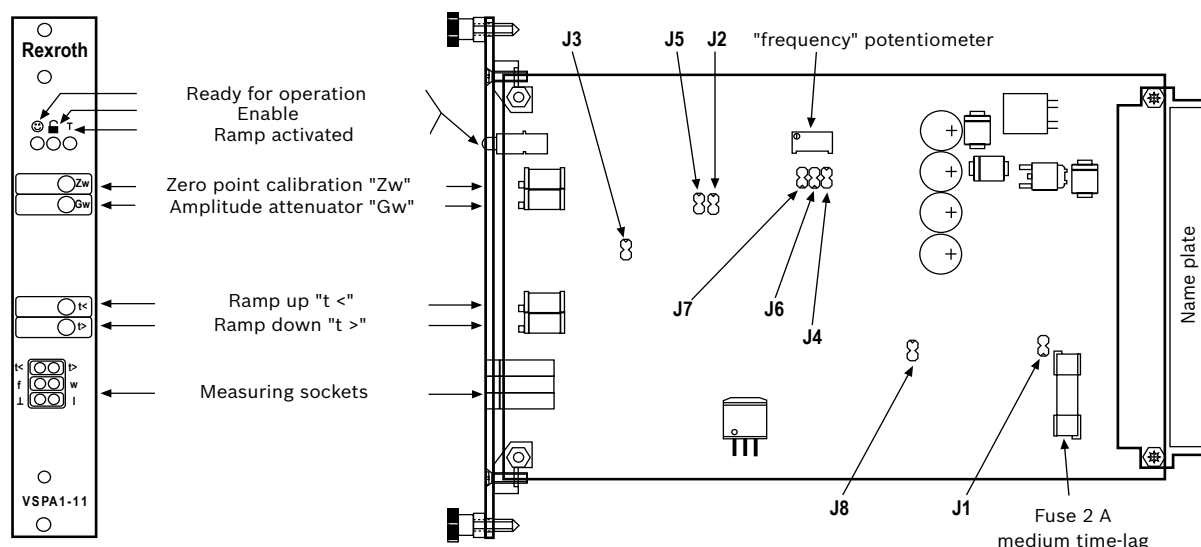
Measuring sockets

t <	Ramp time "Ramp up"
t >	Ramp time "Ramp down"
w	Command value output (0...10 V)
I	Actual value (1 mV ≙ 1 mA)
f	Clock frequency of the output stage
⊥	Reference for outputs

Additional potentiometer

"frequency"	Frequency setting (to be activated using J7)

LED

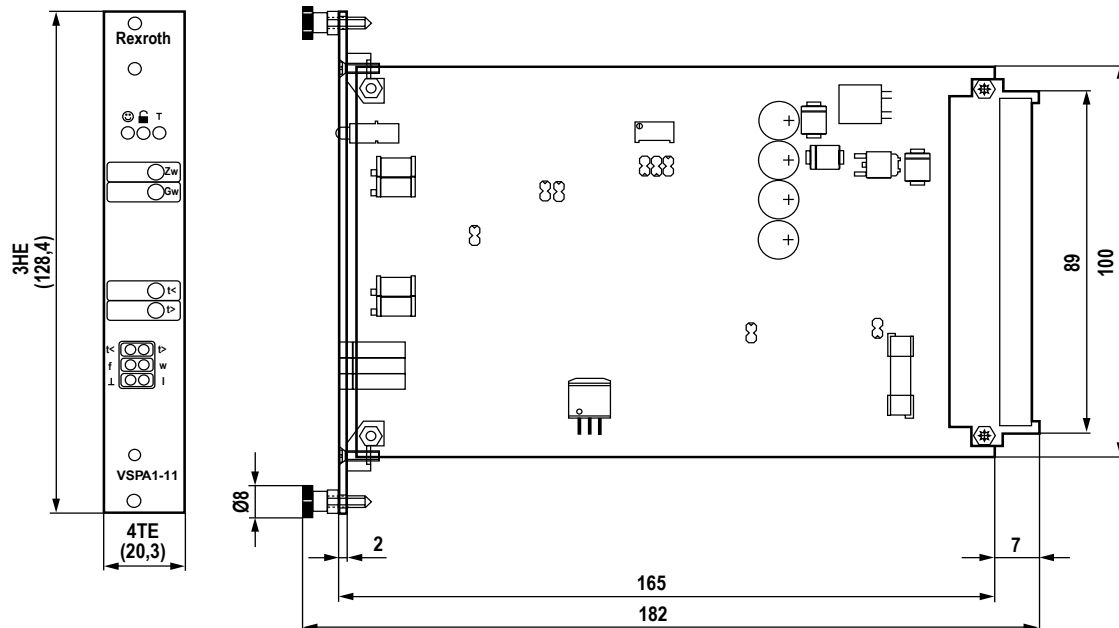|	
☺	Ready-for-operation LED
🔓	Enable LED ("enable")
T	"Ramp on active" LED
w1-w4	"Command value call-up active" LEDs (only with A4 variant)

Jumpers

			VT-VSPA1-10	VT-VSPA1-11
J1	Open	Not enabled	•	•
	Closed	Enabled		
J2		Ramp function on/off (• = open) (see table under "Ramp on/off" on page 3)		
J3	Open	Ramp time 20 ms ... 5 s	•	•
	Closed	Ramp time 200 ms ... 50 s		
J4	Open	Command value pressure characteristic curve correction inactive		
	Closed	Command value pressure characteristic curve correction active	•	•
J5	Open	Command value pressure characteristic curve correction active	•	•
	Closed	Command value pressure characteristic curve correction inactive		
J6	Open	Command value-dependent frequency deactivated	•	
	Closed	command value-dependent frequency activated (ZDRE 10, 3DRE(M) size 10 and size 16)		•
J7	Open	Frequency adjustment via "frequency" potentiometer deactivated		•
	Closed	Frequency adjustment via "frequency" potentiometer activated	•	
J8	Closed	Reserve jumper	•	•

• = Jumper condition as supplied

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

			VT-VSPA1-10	VT-VSPA1-11
Operating voltage		U_B	24 VDC + 40 % − 20 %	
Operating range	Upper limit value	$u_B(t)_{max}$	35 V	
	Lower limit value	$u_B(t)_{min}$	18 V	
Power consumption		P_S	< 24 VA	
Current consumption		I	< 2 A	
Fuse		I_S	2 A medium time-lag, exchangeable	
Inputs				
Analog	Differential input	U_e	0 ... +10 V, R_e > 50 kΩ	
	Current input	I_e	4 ... 20 mA, load R_B = 100 kΩ	
	Ramp time external	U_e	0 V ... +5 V, R_e > 10 kΩ	
Digital	Ramp call-ups	U	8.5 V ... U_B → call-up operated, R_e > 100 kΩ	
			0 ... 6.5 V → no call-up, R_e > 100 kΩ	
	Ramp on/off	U	8.5 V ... U_B → ramp on, R_e > 100 kΩ	
			0 ... 6.5 V → ramp off , R_e > 100 kΩ	
	Enable	U	8.5 V ... U_B → ON, R_e > 100 kΩ	
			0 ... 6.5 V → OFF, R_e > 100 kΩ	
Clock frequency		f	330 Hz ± 10 %, with J6 = open and J7 = closed	250 Hz ± 10 % with J6 and J7 = open
Setting ranges				
Zero adjustment (potentiometer "Zw")			+30 %	
Ramp times (potentiometer "t <" and "t >")		t	20 ms ... 5 s, switchable to 0.2 s ... 50 s	
Amplitude attenuator (potentiometer "Gw")			0 ... +120 %	
Frequency adjustment with potentiometer "frequency" (J7 operated)		f	See explanation: Clock generator, page 3	
Outputs				
Command value signal		U	0 ... +10 V ± 2 %, I_{max} = 2 mA	
Actual value signal		U	0 ... +10 V ± 2 %, I_{max} = 2 mA	
Ready for operation		U	high: >16 V, I_{max} = 50 mA	
			low: <1 V	
Regulated voltage		U	+10 V ± 2 %, I_{max} = 25 mA, short-circuit-proof	
Ramp signals measuring socket		U	+100 mV ... +5 V ± 10 %,	
			+10 mV ... +100 mV ± 50 %	
Power output stage		I	0 ... 1.9 A, short-circuit-proof, clocked	
Type of connection			48 pin male multipoint connector, DIN 41612, design F	
Card dimensions			Euro-card 100 x 160 mm, DIN 41494	
Admissible operating temperature range		ϑ	0 ... 50 °C	
Storage temperature range		ϑ	−25 ... +85 °C	
Weight		m	0.15 kg (net)	

Dimensions (dimensions in mm)

Project planning / maintenance instructions / additional information

▸ The amplifier card may only be assembled when de-energized.

▸ No connectors with free-wheeling diodes or LED displays must be used for the solenoid connection.

▸ Only carry out measurements at the card using instruments R_i > 100 kΩ.

▸ For switching command values, relays with gold-plated contacts have to be used (small voltages, low currents).

▸ Always shield command value lines, connect shielding to earth on the card-side, other side open. If no system earth exists, connect 0 V operating voltage.

▸ Recommendation:
Also shield the solenoid conductors. For solenoid conductors up to 50 m in length, use the line type LiYCY 1.5 mm^2. With greater lengths, please contact us.

▸ The distance to aerial lines, radios, and radar systems must at least be 1 m.

▸ Do not lay solenoid conductors and signal lines near power lines.

▸ If the differential input is used, both inputs must always be connected or disconnected at the same time.