

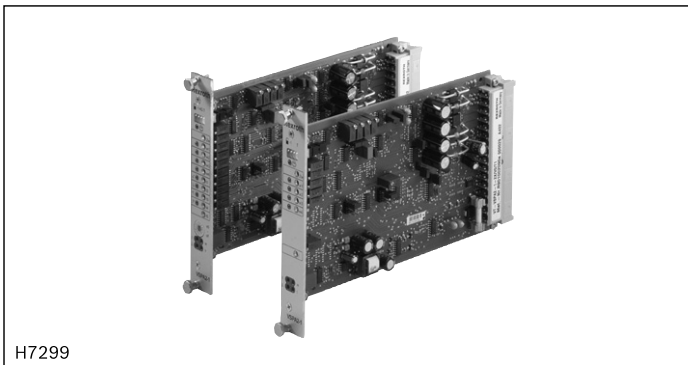
# Valve amplifier for proportional directional valves and proportional pressure valves

## Type VT-VSPA2-1

**RE 30110**

Edition: 2013-04

Replaces: 05.12



H7299

- ▶ Component series 2X
- ▶ Analog, euro-card format
- ▶ Suitable for controlling proportional directional valves:
  - 4WRA 6...-2X, 4WRA 10...-2X,
  - 4WRZ...-7X,
 and proportional pressure valves:
  - 3DREP 6..2X

### Features

- ▶ Differential input ( $\pm 10$  V)
- ▶ Four callable command value inputs ( $\pm 10$  V)
- ▶ Current input (4 ... 20 mA)
- ▶ Inversion of the internal command value signal via 24 V input or jumper
- ▶ Selection of ramp time via quadrant recognition (24 V input) or ramp time call-ups (24 V inputs) with option T5
- ▶ Selection of the ramp time range via jumper
- ▶ Characteristic curve correction by means of separately adjustable step levels and maximum values
- ▶ Enable input
- ▶ "Ramp on/off" input
- ▶ "Ready for operation" output signal
- ▶ Switchable measuring socket with option T5
- ▶ Reverse polarity protection for the voltage supply
- ▶ Power supply with DC/DC converter without raised zero point

### Contents

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### Notice:

**When using the VT-VSPA2-1-2X amplifier card as replacement for VT 3000-3X, VT 3006-3X, VT 3013-3X, VT 3014-3X, VT 3017-3X, VT 3018-3X, VT 3026-3X, VT-VSPA2-1-1X/... or VT-VSPA2-50-1X/..., make sure to observe the configuration and setting information according to the 30110-Z additional information.**

## Ordering code

01	02	03	04	05	06				
VT-VSPA2	-	1	-	2X	/	V0	/	/	*

01	Valve amplifier for proportional directional valves and proportional pressure valves, analog, Euro-card format	<b>VT-VSPA2</b>
02	For controlling proportional directional valves 4WRA 6...-2X, 4WRA 10...-2X and 4WRZ...-7X as well as proportional pressure valves 3DREP 6..2X	<b>1</b>
03	Component series 20 to 29 (20 to 29: Unchanged technical data and pin assignment)	<b>2X</b>
04	Version: Standard	<b>V0</b>
05	Option: With one ramp time	<b>T1</b>
	Option: With five ramp times	<b>T5</b>
06	Further details in the plain text	<b>*</b>

## Accessories

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

## Function

### Power supply unit [1]

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

### Command value specification

The internal command value signal is calculated from the total (summation [6]) of the external command value signal available at the differential input [2] and at the current input [3], the called-up signal [4] and the zero point offset [5] (zero point potentiometer "Zw").

### The following applies:

Standard values	Current input	Differential input	Command value measuring socket	Flow direction
-100 %	4 mA	-10 V	-10 V	P to B, A to T
0 %	12 mA	0 V	0 V	
100 %	20 mA	10 V	10 V	P to A, B to T
0 %	< 1 mA <sup>1)</sup>		0 V	

<sup>1)</sup> If the current input is not wired-up or if the cable of the current command value is broken, the resulting internal command value signal is 0 %.

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

### Command value call-ups [4]

Four command value signals "w1" to "w4" can be called up. The external command value voltages (command values 1 to 4) are either defined directly by the regulated voltage outputs +10 V and -10 V or via external potentiometers. If these command value inputs are directly connected to the regulated voltages, the command values are set at the potentiometers "w1" to "w4". When using external potentiometers, the internal potentiometers will function as attenuators or limiters.

Only one call-up can be operated at the same time. If several call-ups are operated simultaneously, call-up "1" has the lowest priority and call-up "4" has the highest priority. The respective active call-up is indicated via a yellow LED on the front plate.

### Command value inversion [7]

The command value created internally from the input signals, the command value call-ups and the zero point offset signal can be inverted by an external signal or jumper J1. The inversion is indicated by an LED ("-1") on the front plate.

**Enable function [8]**

The enable function enables the power output stages and forwards the internal command value signal to the ramp generator. The enable signal is indicated by an LED on the front plate. If enable 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 [9]**

The ramp generator limits the rise of the control output. The downstream step functions and amplitude attenuators do not extend or shorten the ramp time.

Using the "Ramp on/off" signal or the jumper J2, the ramp time is set to a minimum (< 2 ms) (ramp off).

External ramp time setting:

Using an external potentiometer, the internally set ramp time can be extended. The setting can be verified by means of the measuring socket. In case of a cable break, the internal default setting will be valid automatically.

Note for setting and measuring the ramp time:

<b>Value at measuring socket "t" (T1) / "v" (T5)</b>	<b><math>U_t / V</math></b>		5	3	2			
<b>Current ramp time (<math>\pm 20\%</math>)</b>	<b><math>t / ms</math></b>		20	33	50			
<b><math>U_t / V</math></b>	1	0.5	0.3	0.2	0.1	0.05	0.03	0.02
<b><math>t / ms</math></b>	100	200	333	500	1000	2000	3333	5000

By closing the jumper J3, the ramp times specified above can be increased tenfold.

**Characteristic curve generator [10]**

Using the adjustable characteristic curve generator, the step level and maximum values for positive and negative signals can be set separately according to the hydraulic requirements. The actual development of the characteristic curve through the zero point is not stepped but linear.

**Amplitude limiter [11]**

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

**Clock generator [13]**

The clock generator creates the clock frequency of the output stages. The clock signal can be switched in three basic frequency ranges using jumpers.

**Power output stage [16]**

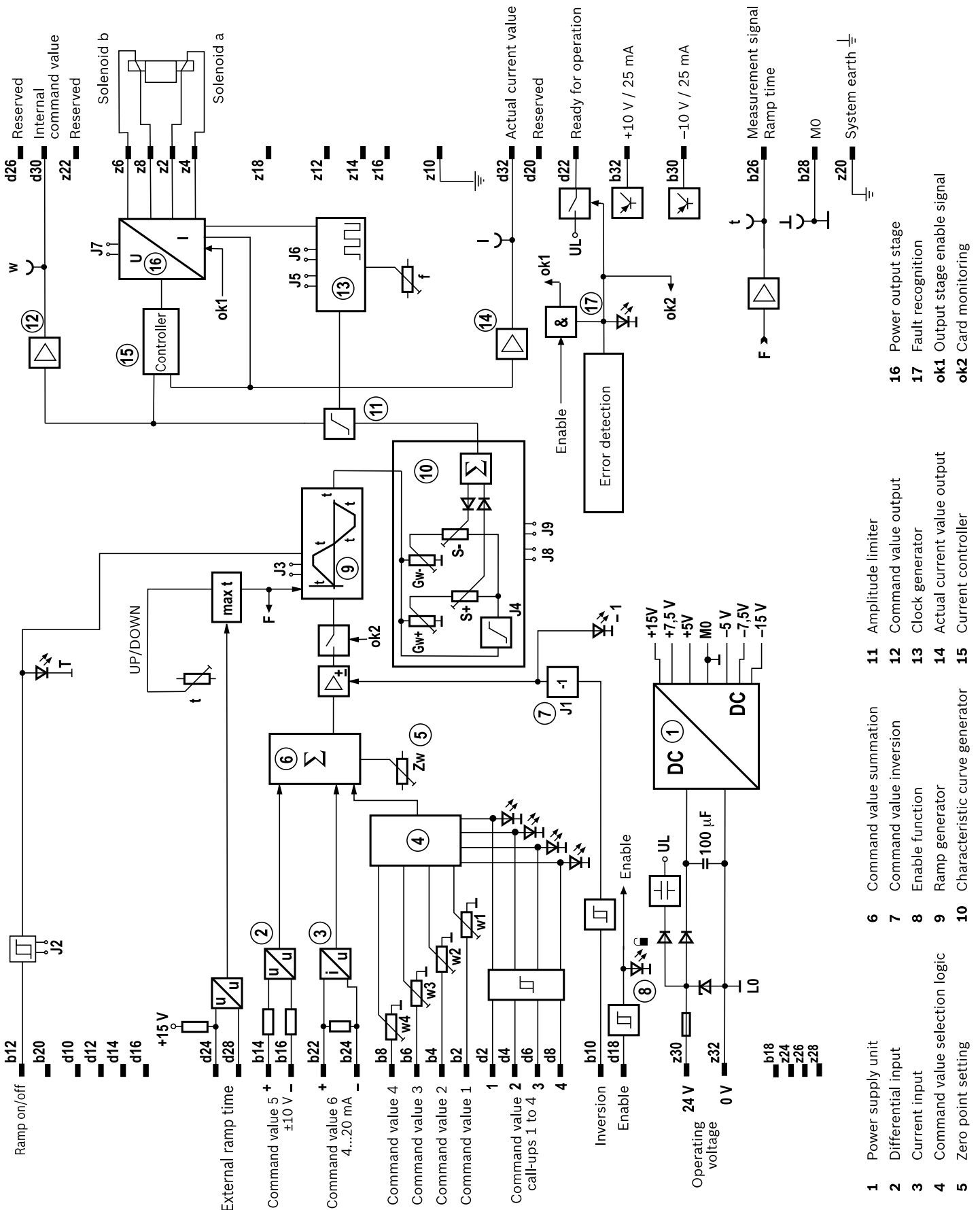
The power output stage creates the clocked solenoid current for the proportional valve. The solenoid current is limited to 2.5 A per output. The output stage outputs are short-circuit-proof. The output stages are de-energized in case of an internal fault signal or if they have not been enabled.

**Fault recognition [17]**

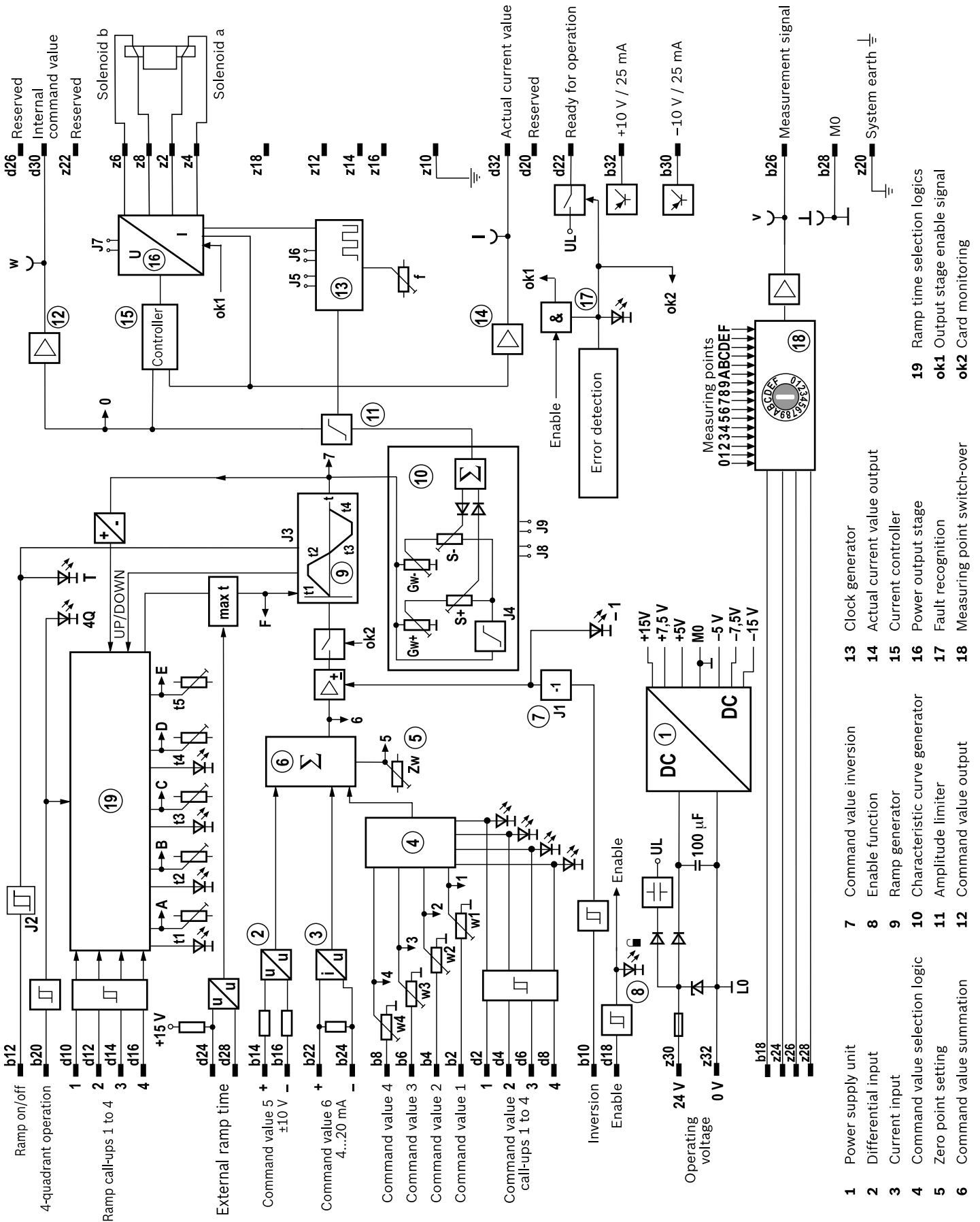
Monitors over-current of the output stage.

[ ] = Assignment to the block diagrams on pages 4 and 5

Block diagram/pin assignment, option T1



Block diagram/pin assignment, option T5



- 1 Power supply unit
- 2 Differential input
- 3 Current input
- 4 Command value selection logic
- 5 Zero point setting
- 6 Command value summation
- 7 Command value inversion
- 8 Enable function
- 9 Ramp generator
- 10 Characteristic curve generator
- 11 Amplitude limiter
- 12 Command value output
- 13 Clock generator
- 14 Actual current value output
- 15 Current controller
- 16 Power output stage
- 17 Fault recognition
- 18 Measuring point switch-over
- 19 Ramp time selection logics
- ok1 Output stage enable signal
- ok2 Card monitoring

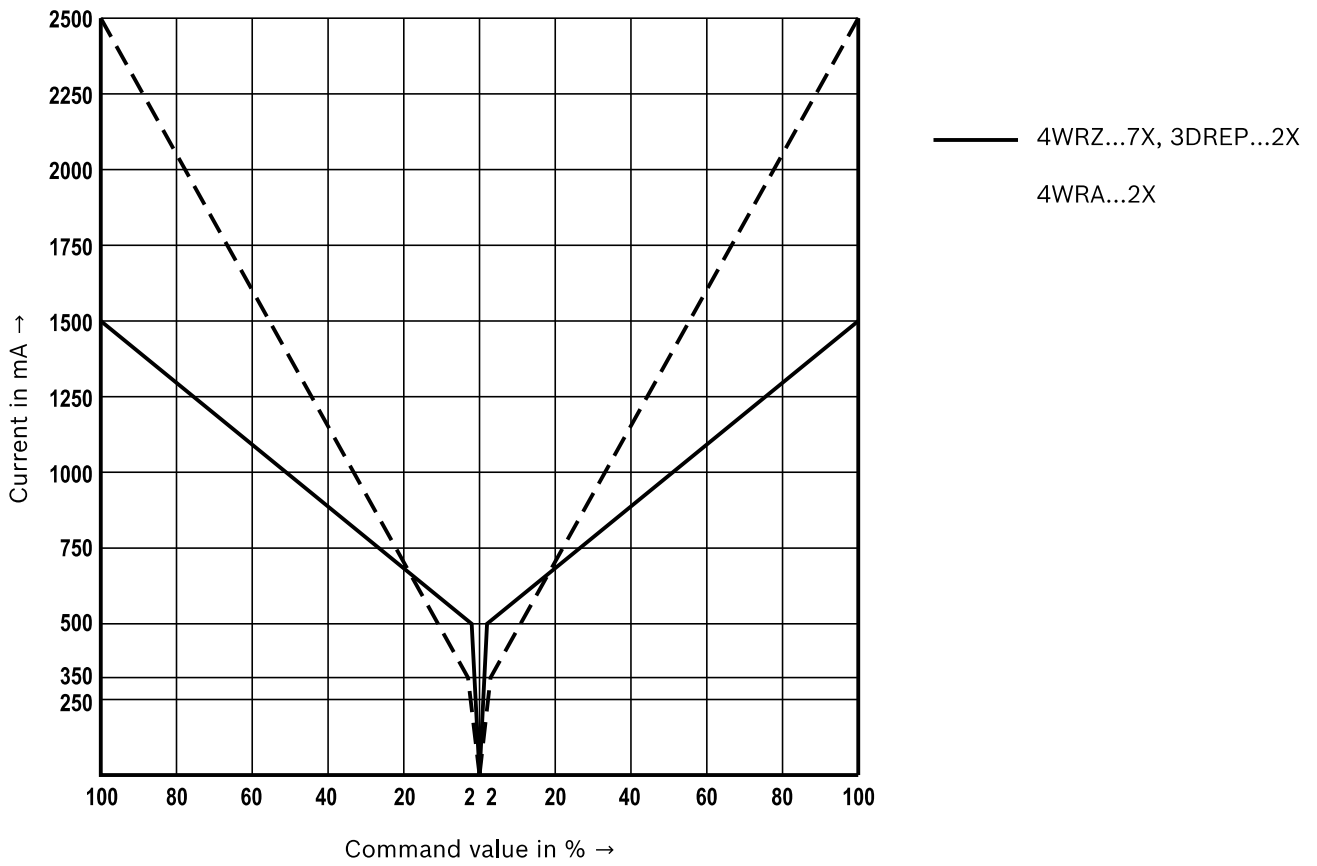
**Technical data** (for applications outside these parameters, please consult us!)

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	$P_S$	< 50 VA
Current consumption	$I$	< 2 A
Fuse	$I_S$	2 A medium time-lag, exchangeable
Inputs, analog		
Command values 1 to 4 (potentiometer inputs)	$U_e$	0 ... $\pm 10$ V, $R_e > 100$ k $\Omega$ (M0 is reference)
Command value 5 (differential input)	$U_e$	0 ... $\pm 10$ V, $R_e > 50$ k $\Omega$
Command value 6 (current input)	$I_e$	4 ... 20 mA, load $R_B = 100$ $\Omega$
External ramp time	$U_e$	0 ... +10 V, $R_e = 10$ k $\Omega$ (internally increased to +15 V, M0 is reference)
Inputs, digital		
Command value call-ups, Command value inversion, Enable, Ramp on/off, Ramp call-ups (option T5), 4-quadrant operation (option T5)	$U$ $U$	8.5 V ... $U_B \rightarrow$ ON, $R_e > 100$ k $\Omega$ 0 ... 6.5 V $\rightarrow$ OFF, $R_e > 100$ k $\Omega$
Setting ranges		
Zero adjustment (potentiometer "Zw")		$\pm 30$ %
Command values (potentiometers "w1" to "w4")		0 ... 110 %
Ramp times (potentiometer "t1" to "t5")		20 ms ... 5 s, switchable to 0.2 ... 50 s
Step level (potentiometer "S+" and "S-")		0 ... 50 %
Amplitude attenuator (potentiometer "G+" and "G-")		0 ... 110 % (applies to the step level setting of 0 %)
Outputs		
Internal command value	$U$	$\pm 10$ V $\pm 2$ %, $I_{\max} = 2$ mA
Actual current value	$U$	$\pm 2,5$ V $\pm 2$ %, $I_{\max} = 2$ mA (mV $\triangleq$ mA)
Measurement signal (option 5)	$U$	$\pm 10$ V $\pm 2$ %, $I_{\max} = 2$ mA
Ready for operation	$U$	> 16 V, 50 mA (in case of a fault: $U < 1$ V, $R_i = 10$ k $\Omega$ )
Regulated voltages	$U$	$\pm 10$ V $\pm 2$ %, 25 mA, short-circuit-proof
Power output stage	$I$	0 ... 2.5 A, short-circuit-proof
Measuring sockets		
Command value "w"		$\pm 10$ V $\pm 2$ %, $I_{\max} = 2$ mA
Actual current value signal "I"		$\pm 2,5$ V $\pm 2$ %, $I_{\max} = 2$ mA (mV $\triangleq$ mA)
Ramp time "t"		See description on page 3
Socket "v" (option T5)		See description on page 3 and table on page 10
Clock frequency		
WRA6...2X	$f$	300 ... 370 Hz (at $U_B = 24$ V and $U_{\text{command}} = 0$ V: 370 Hz)
WRA10...2X	$f$	180 ... 410 Hz (at $U_B = 24$ V and $U_{\text{command}} = 0$ V: 410 Hz)
WRZ...7X	$f$	170 Hz
3DREP 6...2X	$f$	170 Hz
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	$\theta$	0 ... 50 °C
Storage temperature range	$\theta$	-25 °C ... +85 °C
Weight	$m$	0.17 kg (net)

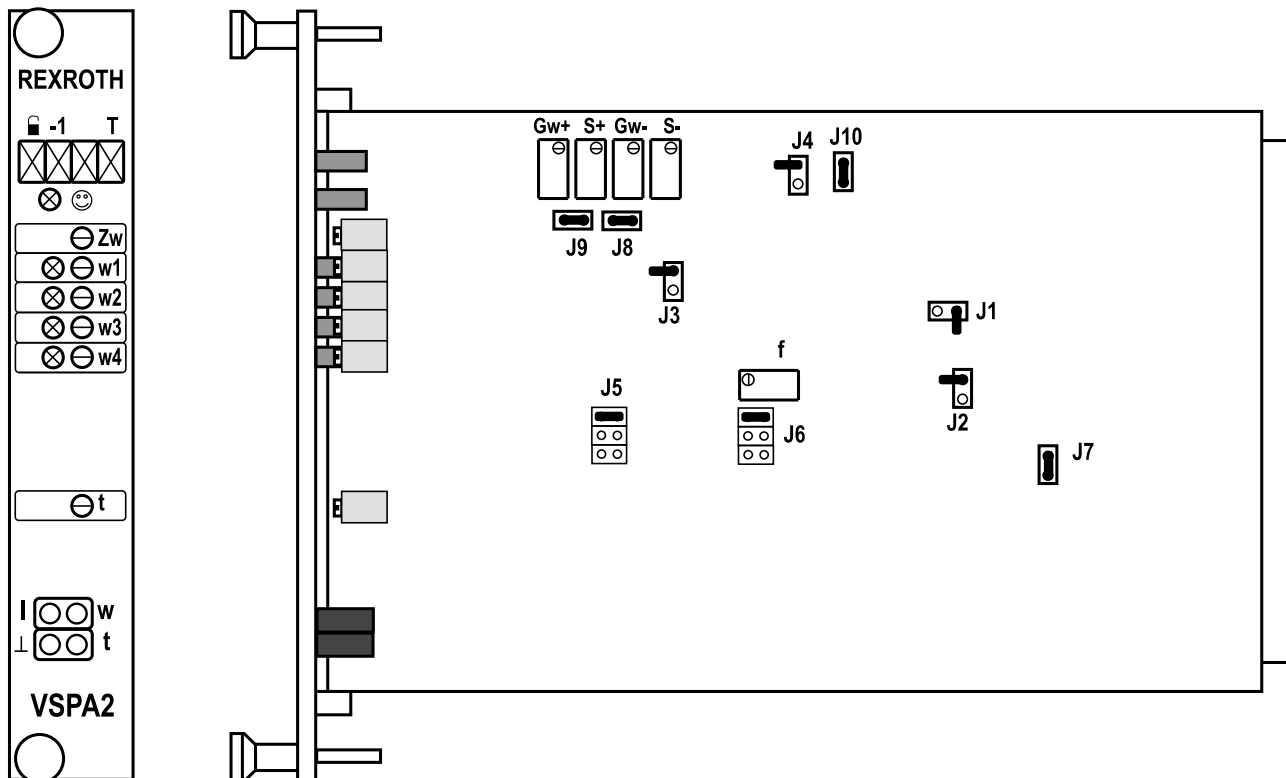
**Notice:**

For information on the environment simulation testing for the areas EMC (electromagnetic compatibility), climate and mechanical load, see data sheet 30110-U.

**Characteristic curves**



### Display/adjustment elements, option T1



Ramp time	J3
0.2 ... 50 sec.	<input type="checkbox"/>
0.02 ... 5 sec.	<input checked="" type="checkbox"/>

Step level	J8	J9
4WRA 6...2X, 4WRA 10...2X	<input type="checkbox"/>	<input type="checkbox"/>
4WRZ...7X, 3DREP 6...2X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Step function	J4
Off	<input type="checkbox"/>
On	<input checked="" type="checkbox"/>

Inversion	J1
Inverting	<input type="checkbox"/>
Not inverting	<input checked="" type="checkbox"/>

**LED displays:**

- Ready for operation (green)
- Enable (yellow)
- 1** External inverting
- T** Ramp on

Clock frequency	J5	J6
4WRA 6...2X	<input type="checkbox"/>	<input type="checkbox"/>
4WRA 10...2X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Universal, 4WRZ...7X, 3DREP 6...2X	<input type="checkbox"/>	<input type="checkbox"/>

Ramp function	J2
Off	<input type="checkbox"/>
On	<input checked="" type="checkbox"/>

Maximum current setting	J7
4WRZ...7X, 3DREP 6...2X	<input checked="" type="checkbox"/>
4WRA 6...2X, 4WRA 10...2X	<input type="checkbox"/>

**Measuring sockets:**

- I, w, t** Measurement signal (see page 6)
- ⊥** Measurement zero

<input checked="" type="checkbox"/>	= Factory setting of the jumpers
<input type="checkbox"/>	= Jumper closed
<input type="checkbox"/>	= Jumper open

**Potentiometers (some with LED display):**

- Zw Zero point calibration
- w1 Command value 1
- w2 Command value 2
- w3 Command value 3
- w4 Command value 4
- t Ramp time

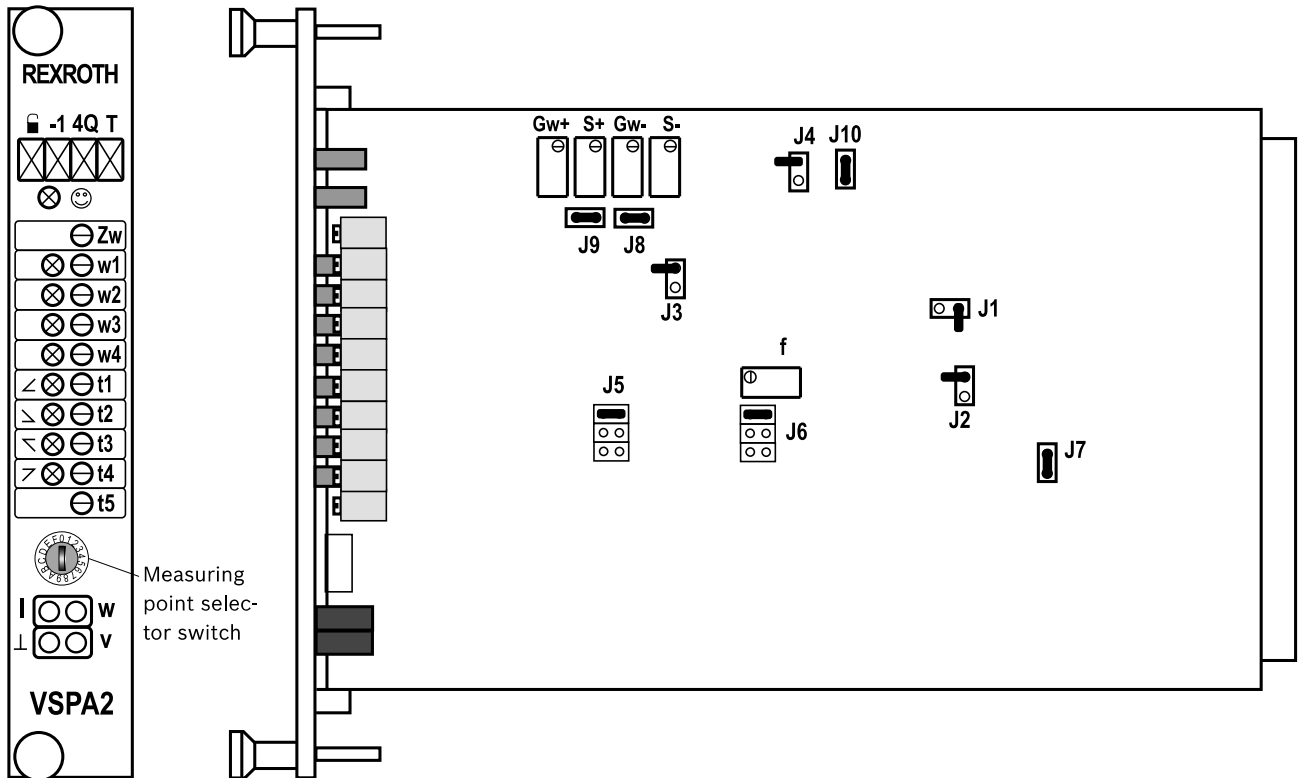
Adjustable on the board:

- Gw+ Amplitude attenuator for positive command values
- Gw- Amplitude attenuator for negative command values
- S+ Step level for positive direction
- S- Step level for negative direction
- f Clock frequency output stage

**The warranty expires if the sealed potentiometer is adjusted.**



**Display/adjustment elements, option T5**



Ramp time	J3
0.2 ... 50 sec.	<input type="checkbox"/>
20 ms ... 5 sec.	<input checked="" type="checkbox"/>

Step level	J8	J9
4WRA 6...2X, 4WRA 10...2X	<input type="checkbox"/>	<input type="checkbox"/>
4WRZ...7X, 3DREP 6...2X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Step function	J4
Off	<input type="checkbox"/>
On	<input checked="" type="checkbox"/>

Inversion	J1
Inverting	<input type="checkbox"/>
Not inverting	<input checked="" type="checkbox"/>

**LED displays:**

- Ready for operation (green)
- Enable (yellow)
- 1** External inverting
- 4Q** 4-quadrant operation
- T** Ramp on

**Measuring sockets:**

- I, w, v** Measurement signal (see page 6)
- ⊥** Measurement zero

Clock frequency	J5	J6
4WRA 6...2X	<input type="checkbox"/>	<input type="checkbox"/>
4WRA 10...2X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Universal, 4WRZ...7X, 3DREP...2X	<input type="checkbox"/>	<input type="checkbox"/>

Ramp function	J2
Off	<input type="checkbox"/>
On	<input checked="" type="checkbox"/>

Maximum current setting	J7
4WRZ...7X, 3DREP 6...2X	<input checked="" type="checkbox"/>
4WRA 6...2X, 4WRA 10...2X	<input type="checkbox"/>

<input checked="" type="checkbox"/>	= Factory setting of the jumpers
<input type="checkbox"/>	= Jumper closed
<input type="checkbox"/>	= Jumper open

**Potentiometers (some with LED display):**

- Zw Zero point calibration
- w1 Command value 1
- w2 Command value 2
- w3 Command value 3
- w4 Command value 4
- t1 Ramp time 1
- t2 Ramp time 2
- t3 Ramp time 3
- t4 Ramp time 4
- t5 Ramp time 5

Adjustable on the board:

- Gw+ Amplitude attenuator for positive command values
- Gw- Amplitude attenuator for negative command values
- S+ Step level for positive direction
- S- Step level for negative direction
- f Clock frequency output stage

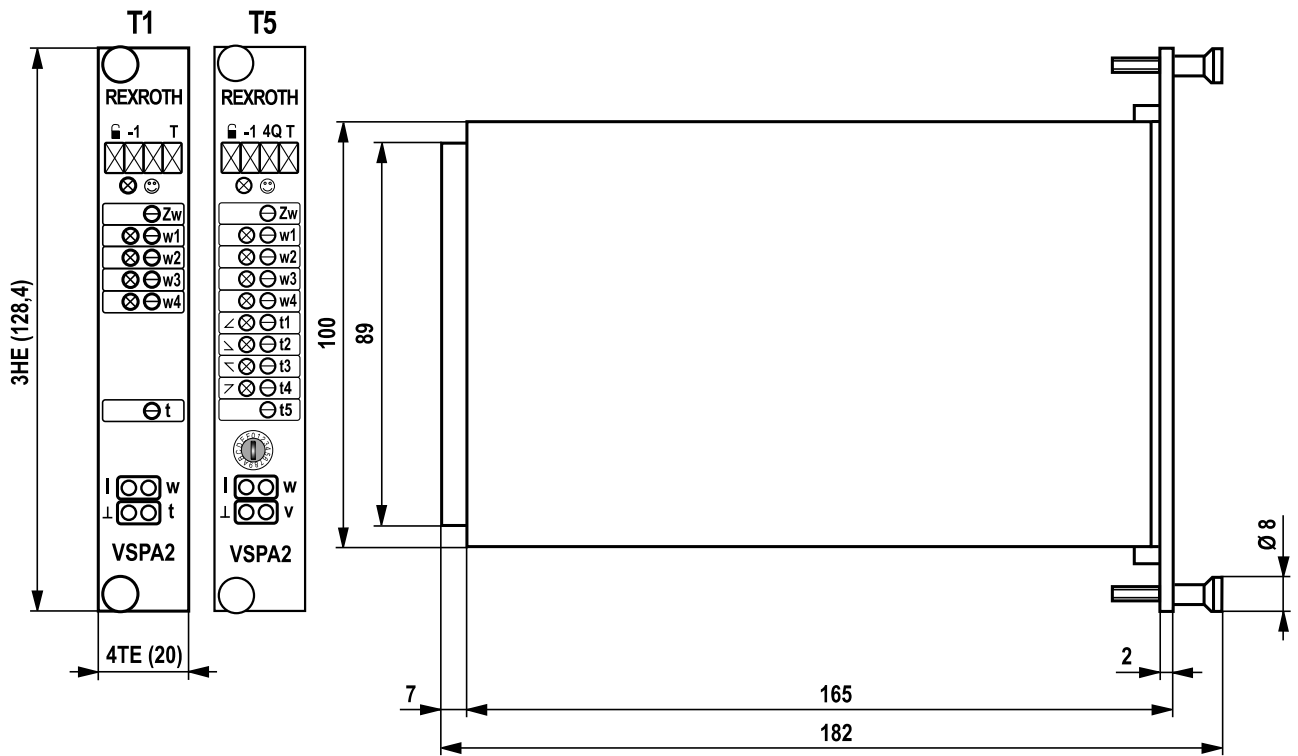
**The warranty expires if the sealed potentiometer is adjusted.**

**Display/adjustment elements, option T5 (continued)****Measuring socket "v"**

Signal designation	Measuring point selector switch	Measurement signal "v"
Internal command value	0	$\pm 100\% \triangleq \pm 10\text{ V}$
Command value call-up 1	1	$\pm 100\% \triangleq \pm 10\text{ V}$
Command value call-up 2	2	$\pm 100\% \triangleq \pm 10\text{ V}$
Command value call-up 3	3	$\pm 100\% \triangleq \pm 10\text{ V}$
Command value call-up 4	4	$\pm 100\% \triangleq \pm 10\text{ V}$
Zero point offset "Zw"	5	$\pm 30\% \triangleq \pm 3\text{ V}$
1 composite signal of the command values	6	$\pm 100\% \triangleq \pm 10\text{ V}$
Ramp output signal	7	$\pm 100\% \triangleq \pm 10\text{ V}$
Not connected	8	
Clock frequency	9	Rectangular signal $\pm 15\text{ V}$
Ramp time "t1"	A	10 mV ... 10 V <sup>1)</sup>
Ramp time "t2"	B	10 mV ... 10 V <sup>1)</sup>
Ramp time "t3"	C	10 mV ... 10 V <sup>1)</sup>
Ramp time "t4"	D	10 mV ... 10 V <sup>1)</sup>
Ramp time "t5"	E	10 mV ... 10 V <sup>1)</sup>
Current ramp time "t"	F	10 mV ... 10 V <sup>1)</sup>

<sup>1)</sup> The allocations of voltage and ramp time specified in the table on page 3 shall apply.

**Dimensions** (dimensions in mm)



**Project planning / maintenance instructions / additional information**

- For more information, refer to document 30110-B.

## Notes

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