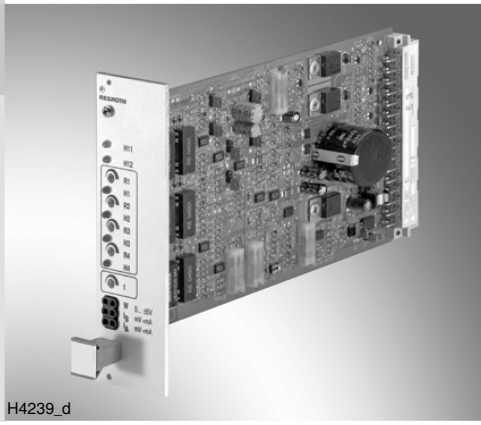
Electrical amplifier

RE 30113/12.12 1/10
Replaces: 09.05

Type VT-VSPA2-50

Series 1X



H4239_d

similar figure

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Features

- Suitable for controlling proportional pressure control valves (type 3DREP 6, from series 2X) and pilot operated directional valves (type .WRZ, from series 7X) without electrical position feedback
- Four command values that can be adjusted by means of potentiometers
- For command value call-ups with LED indicator lamp
- Differential input, can be switched over to current input
- Enable input with LED indicator lamp
- Indication “ready for operation” by LED
- Step function generator
- Ramp generator with one or five ramp times
- Two clocked current output stages
- Reverse polarity protection for voltage supply

Ordering code

VT-VSPA2 – 50 –1X/ | *

Amplifier for controlled proportional valves, analogue, with 2 output stages

Amplifier for proportional valves type 3DREP 6 (from series 2X) and type .WRZ (from series 7X) **= 50**

Production code and further details in clear text

T1 = 1 ramp time
T5 = 5 ramp times

1X = Series 10 to 19 (10 to 19: unchanged technical data and pin assignment)

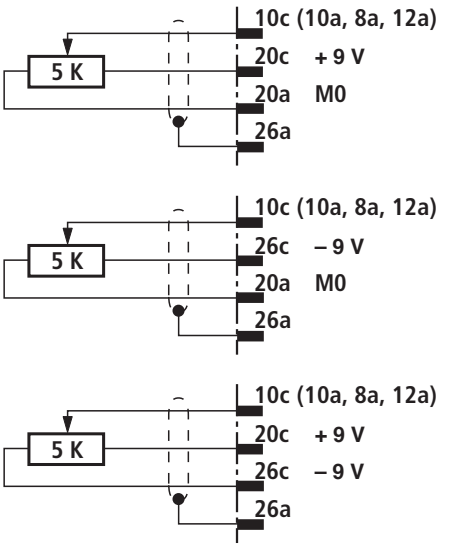
Card holder:

– Type VT 3002-1-2X/32D, see data sheet 29928
Single card holder without power pack

Functional description

Command value inputs 1 to 4 can be used to call up command values [1] by controlling associated relays (K1 to K4). The command value voltage is applied either directly via the regulated ±9 V voltages of the power supply unit [9] or via an external command value potentiometer. The following is valid for these inputs: ±9 V ≙ ±100 % [1)]. If these four command values are connected directly to the regulated voltages of ±9 V, then four different command values can be set using potentiometers w1 to w4. When external command value potentiometers are used at these inputs, the internal potentiometers act as attenuators or limiters, unless they are set to maximum.

External command value potentiometers



LEDs “H1” to “H4” indicate, which command value is currently being called up. If more than one command value is called up at a time, the input with the highest number has priority.

Example: If command value 1 and command value 3 are activated at the same time, command value 3 becomes effective.

A further output of the card provides a supply voltage for the command value call-ups, which can be switched from +9 V to –9 V using relay K6 [1)].

For the amplifier variant with 5 ramp times (ordering code **T5**) an adjustable tamp time (“t1” to “t4”) is assigned to each of the four call-up command values. If no command value is called up, time “t5” is effective with this component.

All relays on the card are operated at 24 VDC (smoothed).

Additionally, the direct command value input 5 is available for the input voltage 0 to ±6 V. The following is valid here: ±6 V ≙ ±100 % [1)].

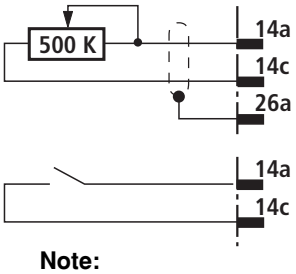
Command value input 6 is a differential input (0 to ±10 V). It can be configured as current input (4 to 20 mA or 0 to ±20 mA) by setting jumpers [2] (see “adjustment elements”, page 6). If the command value is provided by external electronics with a different reference potential, this input must be used. When the command value voltage is applied or removed, care must be taken to ensure that both signal cables are disconnected from or connected to the input.

Before being passed on, all command values are summated with the correct amount and sign [3].

The downstream ramp generator [4] generates a ramp-shaped output signal from a stepped input signal. The time constant of the output signal can be adjusted using potentiometers “t” or “t1” to “t5”. The given ramp time refers to a command value step-change of 100 % and can be ca. 1 s or 5 s, depending on the jumper setting (J5, J6). If a command value step-change of less than 100 % is fed to the input of the ramp generator, the ramp time shortens accordingly.

Functional description (continued)

External time potentiometer and ramp „off“



Ramp“regulatable“
Time: min. = 0 Ω
Time: max. = 500 kΩ

Ramp „on/off“

Note:
When an external time potentiometer is used, the internal ramp time potentiometer must be set to maximum. The maximum ramp time shortens, because the resistance of the external potentiometer is connected in parallel to that of the internal potentiometer (ca. 500 kΩ).

By operating relay K5 or by plugging an external jumper, the ramp time is set to its minimum value (ca. 30 ms).

The output signal of the ramp generator [4] is fed in parallel to the summator [6] and the step function generator [5]. At command value voltages > ±1 % the step function generator generates a polarity-dependent step-change signal that is added to the output signal of the ramp generator. This step function results in the fact that the overlap section of the valve spool is passed quickly. At higher command value voltages, the step function generator outputs a constant output signal.

The output signal of the summator [6] is the current command value and is fed to the two current regulators [7] and measuring socket “W” on the front panel of the card. A command value of 100 % corresponds to a voltage of 6 V at the command value measuring socket. A positive command value signal at the input of the amplifier controls the output stage for solenoid “b”, a negative signal the output stage for solenoid “a”. When the command value signal is less than ±1 % (step function still ineffective), a biasing current of 50 mA flows through both solenoids. The actual values of the currents through the two solenoids can be measured separately at sockets “I_A” (solenoid “a”) and “I_B” (solenoid “b”). Here, a current of 1.5 A corresponds to a voltage of 1.5 V. [2)]

The output stages are enabled with a signal of > 8.5 V at the enable input (indicated by yellow LED “H11” on the front panel). The output stages can be permanently enabled independently of the state of the enable input by setting jumper J7. In this case, the switching input is ineffective. The signal „ready for operation“ is output [10] and the green LED „H12“ on the front panel lights up, if:

– The enable signal is applied
– The internal ±9 V voltage supply is operable (amplitude and symmetry)
– There is no short-circuit of the solenoid cables
– The current input (with circuitry of the input amplifier [2] for 4 to 20 mA) does not signal any faults [10]

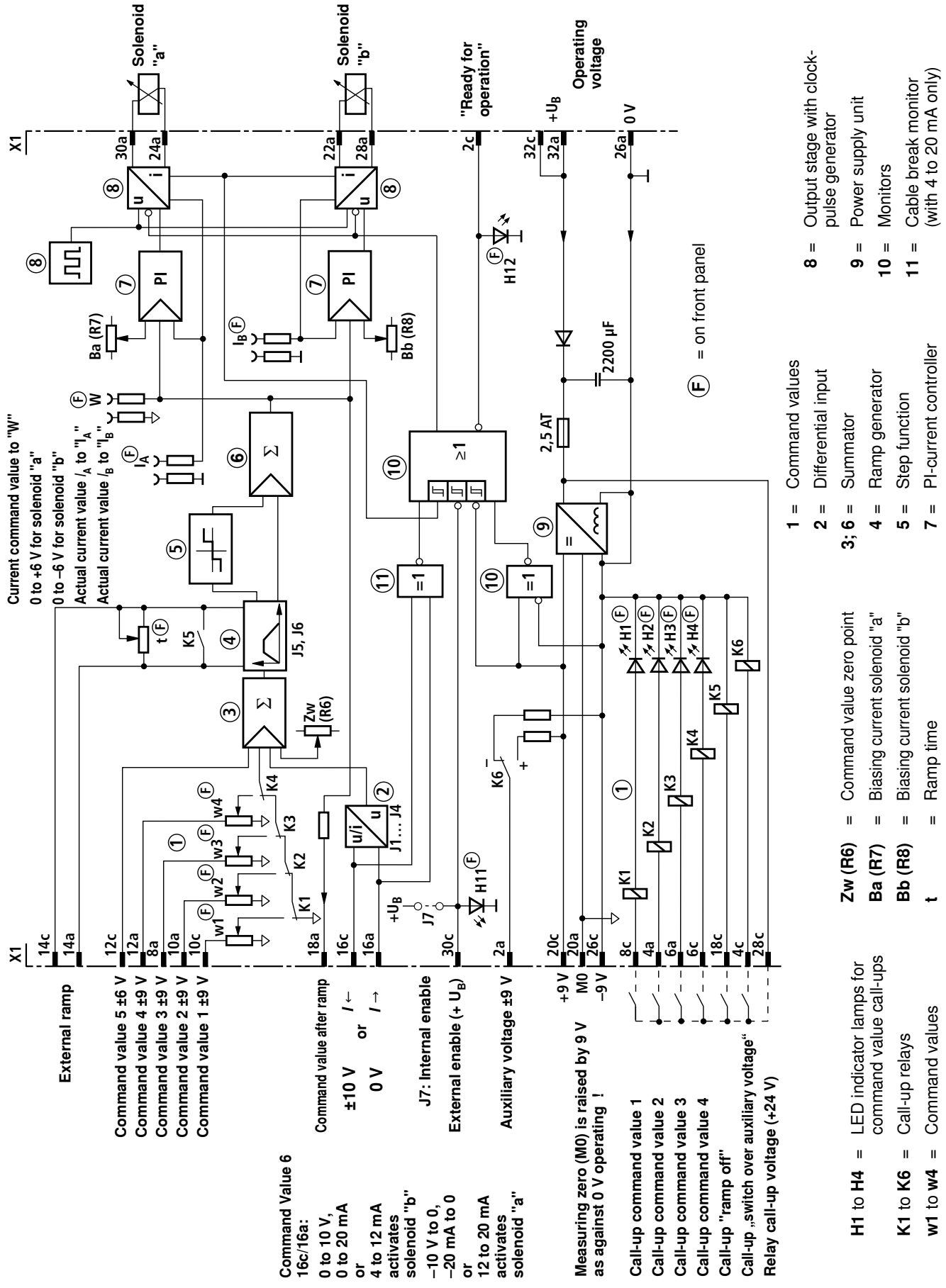
In the event of a fault, both output stages are immediately deenergised and the message “ready for operation” is reset. After elimination of the fault, the card is immediately operable; however, “ready for operation” is signalled only after a delay of 75 ms (±30 %) so that even short-time malfunction can be acquired by a PLC.

[1)] = Reference potential for command values 1 to 5 is M0 (measuring zero).

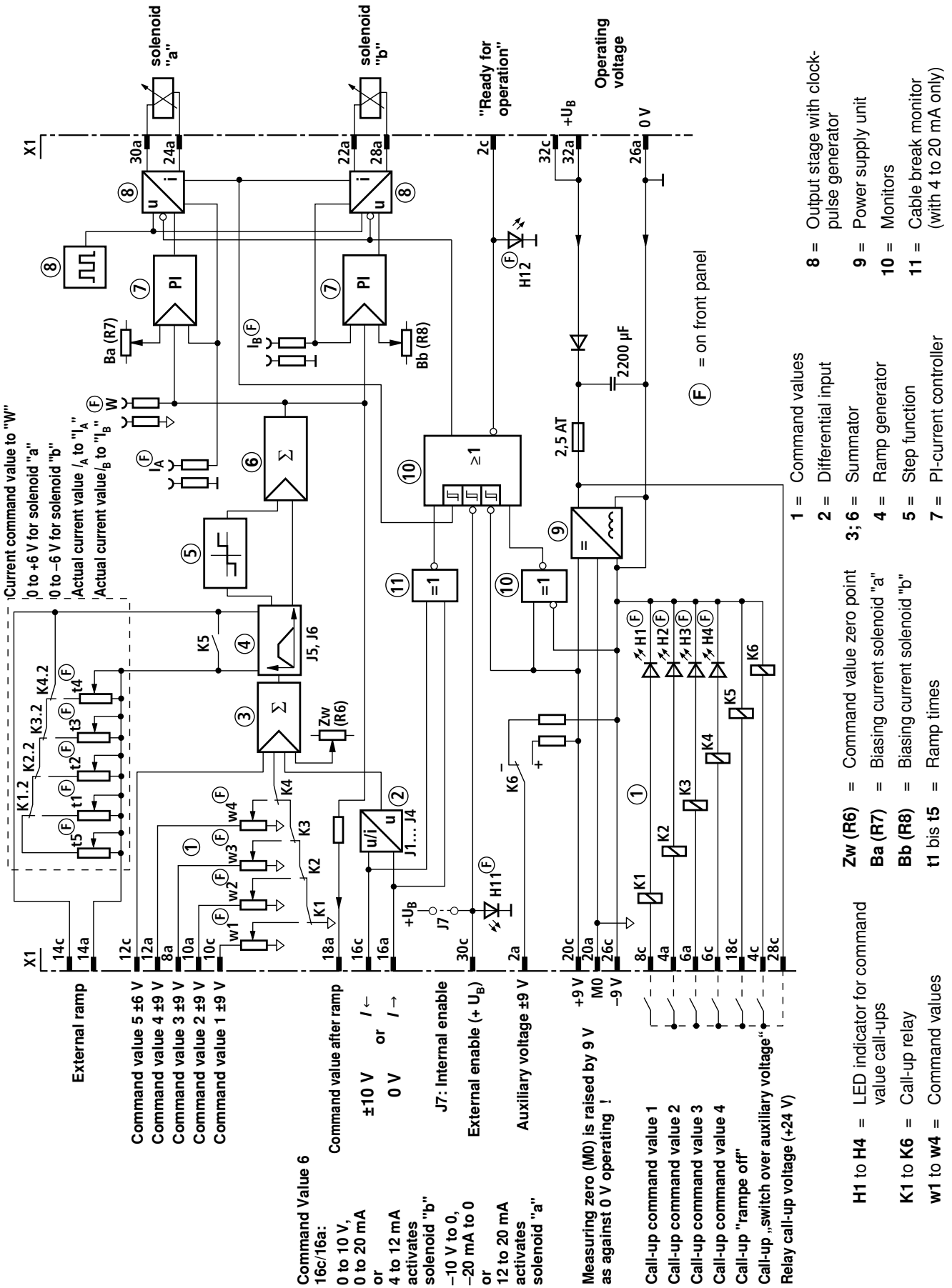
[2)] = Reference potential for the actual values is 0V operating voltage.

[ ] = Cross-reference to block circuit diagram on pages 3 and 4

Block circuit diagram / pin assignment VT-VSPA2-50-1X/T1



Block circuit diagram / pin assignment VT-VSPA2-50-1X/T5



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

Operating voltage	U_0	24 VDC +40 % –5 %
Operating range:		
– Upper limit value	$u_0(t)_{max}$	35 V
– Lower limit value	$u_0(t)_{min}$	22 V
Current consumption	I	< 1.2 A
Power consumption	P_s	< 30 VA
Fuse	I_S	2.5 AT
Inputs:		
– Command values 1 to 4	U_i	±9 V (reference potential is M0)
– Command value 5	U_i	±6 V (reference potential is M0)
– Command value input 6 (differential input)	U_i	0 to ±10 V; R_i = 100 kΩ
or	I_i	4 to 20 mA; load R_i = 100 Ω
		(4 mA ≙ –100 %; 12 mA ≙ 0 %; 20 mA ≙ +100 %)
or	I_i	0 to ±20 mA
– Enable		
• active	U_i	> 8.5 V
• inactive	U_i	< 6.5 V
Relay data to 20 °C		
– Nominal voltage	U	Operating voltage U_0
– Response voltage	U	16.8 V
– Release voltage	U	2.4 V
– Coil resistance	R	2150 Ω
Ramp time (adjustment range)	t	30 ms to ca. 1 s or 5 s
Outputs:		
– Output stange		
• solenoid current	I_{max}	1.5 A; R_{20} = 5 Ω
• biasing current	I	50 mA ±25 %
• clock-pulse frequency	f	220 Hz ±10 %
– Signal ready for operation"		
• when ready for operation	U	> 16 V, 50 mA
• in the event of a fault	U	< 1 V, R_i = 10 kΩ
– Regulated voltage	U	±9 V ±1 %; ±25 mA. externally loadable
– Measuring sockets		
• command value "W"	U	0 to ±6 V; R_i = 1 kΩ (reference potential is M0)
• actual current value "I_A" and "I_B"	U_A; U_B	0 to 1.5 V ≙ 0 to 1.5 A (reference potential is 0 V operating voltage)

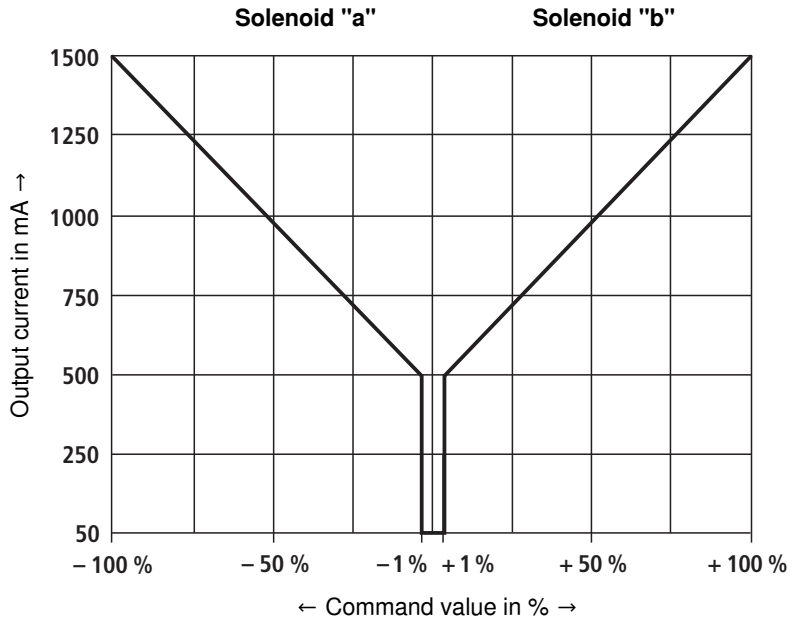
Technical Data

Type of connection		32-pin male connector, DIN 41612, form D
Card dimensions		Euro-card 100 x 160 mm, DIN 41494
Front panel dimensions:		
– Height		3 HE (128.4 mm)
– Width soldering side		1 TE (5.08 mm)
– Width component side		7 TE
Permissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	–25 to +85 °C
Weight	m	0.13 kg

Note:

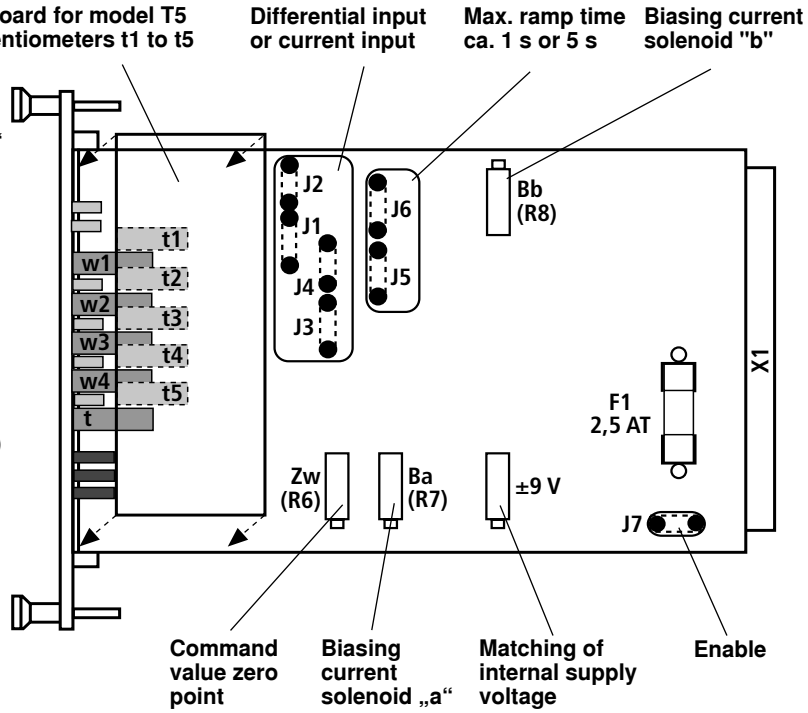
For details regarding **environment simulation tests** covering EMC (electro-magnetic compatibility), climate and mechanical loading, see data sheet 30113-U.

Output characteristic curve



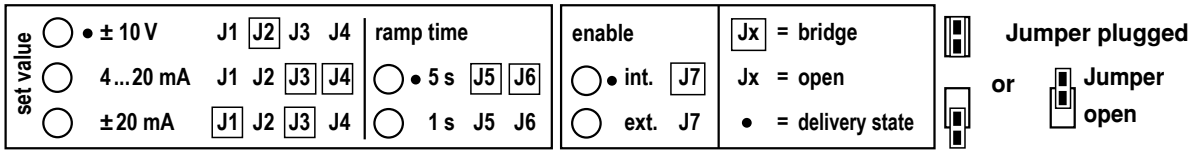
Indicator / adjustment elements

H11 - Yellow LED indicator lamp „enable“
H12 - Green LED indicator „ready for operation“
w1/H1 - Com. value 1 with LED
w2/H2 - Com. value 2 with LED
w3/H3 - Com. value 3 with LED
w4/H4 - Com. value 4 with LED
t - Ramp time (with VT-VSPA2…/**T1**)
t1 to **t5** - Ramp times (with VT-VSPA2…/**T5**)
W - Solenoid current command value
I_B - Actual current value solenoid "b"
I_A - Actual current value solenoid "a"



Meaning of the jumpers on the card for the settings

(labels on the back of the front panel)



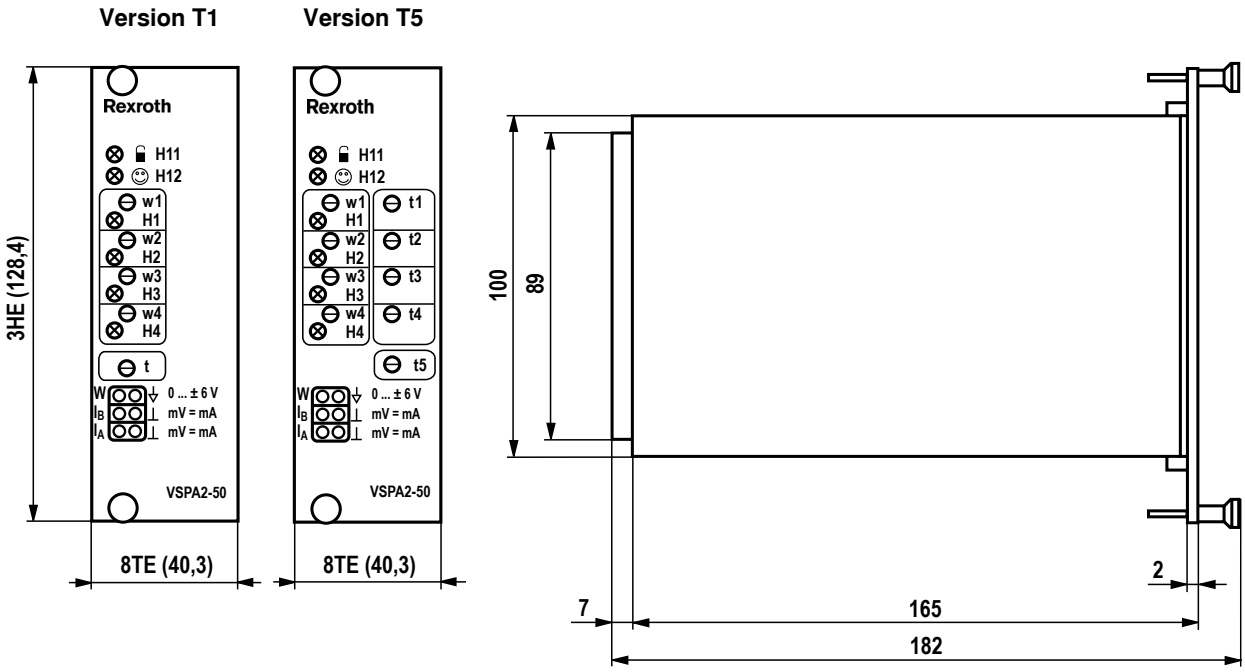
Command value **Ramp time** **Enable**

Note:

The circles (◯) are used for identifying settings carried out by the customer.

Factory setting is identified by "•".

Unit dimensions (dimensions in mm)



Engineering / maintenance notes / supplementary information

- The amplifier card may only be unplugged or plugged when disconnected from the power supply.
- For the solenoid connection, plugs fitted with free wheeling diodes or LED lamps must not be used.
- Measurements on the card may only be taken using instruments $R_i > 100$ kΩ.
- Measuring zero (M0) is increased by +9 V as against 0 V operating voltage and is not electrically isolated, i.e. – 9 V regulated voltage ≙ 0 V operating voltage. Therefore do not connect measuring zero (M0) to 0 V operating voltage.
- For switching command values use relays with gold-plated contacts (small voltages, small currents).
- For operating the card relay only use contacts with a load carrying capacity of approx. 40 V, 50 mA. When using an external control, the control voltage may have a maximum residual ripple content of 10 %.
- Always shield command value cables; connect shield to 0 V operating voltage on the card side, leave the other end open (risk of earth loops).
  Recommendation: Also shield solenoid cables.
  For solenoid cables of up to 50 m length, use cable type LiYCY 1.5 mm^2.
  For greater lengths, please consult us.
- The distance to aerial lines, radio sources and radar equipment must be at least 1 m.
- Do not lay solenoid and signal cables near power cables.
- Because of the charging current of the smoothing capacitor on the card, back-up fuses must have slow-blowing characteristics.
- The potentiometer can be adjusted using a screw driver with a 2 mm blade.
- **Notes:** When using the **differential input, both inputs** must always be activated or deactivated simultaneously.
  When the 4-20 mA current input is used, the command value zero point may have to be slightly re-adjusted using the “Zw“ potentiometer (see indicator / adjustment elements).
  Electrical signals generated via control electronics (e.g. signal “ready for operation”) must not be used for switching safety-relevant machine functions! (See also the European standard “Safety requirement for fluid power systems and components – Hydraulics”, EN ISO 4413)

Notes

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Notes

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