

# Bosch Rexroth VT-VSPA1-2-1X/V0/0 proportional valve amplifier

Manufacturer: Bosch Rexroth  
Manufacturer part number / published order designation: R900782310  
Published model: VT-VSPA1-2-1X/V0/0

## About this compilation

Prepared by Hydmaster from selected manufacturer documentation. Original technical pages follow without cropped drawings, rewritten data or altered units. This cover and index are Hydmaster editorial material, not a manufacturer-issued exact-execution datasheet.

Coverage: applicable family/component reference. Exact execution documentation remains incomplete. Do not treat standard component or stage drawings as approval of the complete custom assembly.

## Execution notes and conditions

Exact connector/pin count and binding terminal assignment: current maker card 32 versus RE30115/2006 48-pin conflict.

Current factory card 32-pin versus RE30115/2006 48-pin connector conflict: exact connector and pin assignment require manufacturer confirmation. Reference circuit/dimension pages are not a binding connector drawing.

Option 0 excludes A4 four-command call-ups. Configure output current and characteristic for the actual DBET 6X or universal valve application.

## Source-page index

Source page numbers below are physical pages of each complete original PDF. The original printed page labels and technical content remain unchanged. Compiled page numbers count this cover/index.

### Source A: Bosch Rexroth Vt Vspa1 2 Re30115 2006 Original

| Original pages | Compiled pages | Relevant content                                                                                                                                                                                                                                                                                      |
|----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-4            | 2-5            | Original VT-VSPA1-2 series overview and manufacturer photograph; Existing option 0 key, DBET 6X application and command/enable/ramp function; Clock-frequency, output-current and fault-monitoring functions; VT-VSPA1-2 reference block diagram; unresolved connector revision requires confirmation |
| 6              | 6              | Actual Eurocard adjustment panel; A4-specific controls do not apply to option 0                                                                                                                                                                                                                       |
| 8-10           | 7-9            | Supply/current/input/ramp/thermal conditions; connector revision conflict disclosed; Eurocard dimensions and operating temperature; not a binding connector installation drawing; Valve-specific commissioning, wiring and maintenance requirements                                                   |

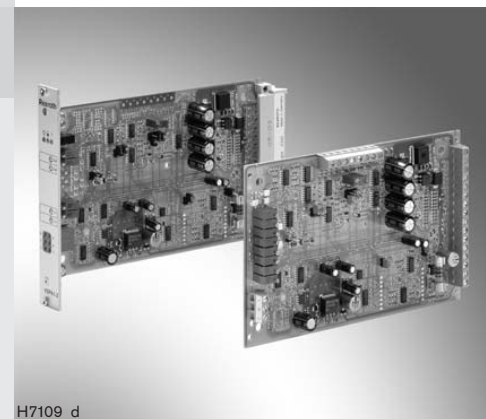
# Electrical amplifiers

**RE 30115/02.06**  
Replaces: 06.05

1/10

## Types VT-VSPA1-2 and VT-VSPA1K-2

Component series 1X



H7109\_d

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### Features

- Suitable for controlling pressure valves of type DBET, component series 6x or as universal amplifier (see technical data)
- Differential input (0 to +10 V)
- Current input (4 to 20 mA)
- 4 command value call-ups (only in conjunction with option A4)
- Ramp generator with separately adjustable ramp time for “up/down”
- External ramp time selection
- Enable input
- Clocked current output stage
- Signal “ready for operation”
- Reverse polarity protection of supply voltage
- Short-circuit protection of solenoid cable
- Solenoid cable break detection

## Ordering code

| VT-VSPA1                                                                            |           | - 2 -1X/V0/ / * |                                                                 |
|-------------------------------------------------------------------------------------|-----------|-----------------|-----------------------------------------------------------------|
| Amplifier for controlled proportional pressure valves, analogue, with one solenoid  |           |                 | Further details in clear text (additional functions on enquiry) |
| With 48-pin male connector and front panel                                          | = No code |                 | 0 = Standard option                                             |
| With 16- or 24-pin terminal strip without front panel                               | = K       |                 | A4 = Variant with 4 command value call-ups                      |
| Component series 10 to 19<br>(10 to 19 unchanged technical data and pin assignment) |           | = 1X            | V0 = Basic version                                              |

### Available accessories

#### Suitable card holders:

- 19" rack types VT 19101, VT 19102, VT 19103 and VT 19110 (see RE 29768)
- Enclosed card holder type VT 12302 (see RE 30103), in conjunction with blind plate 4TE/3HE, material no. R900021004

- Open card holder type VT 3002-2X/48F (see RE 29928), only for installation in control cabinets!

#### Suitable power supply unit:

- Type VT-NE30-2X, see RE 29929  
Compact power supply unit 115/230 VAC → 24 VDC, 108 W

#### Test unit:

- Type VT-PPV-1X, see RE 29687

## Function

### Power supply unit (1)

The amplifier card is fitted with a power supply unit with switch-on current limitation. This power supply unit provides all internally required positive and negative supply voltages. The switch-on current limitation prevents high switch-on current peaks caused by the smoothing capacitors in the current output stage.

### Command value selection (2), (3), (4)<sup>1)</sup>, (5), (6)

The internal command value signal is the sum (6) of the external command value signal applied to differential input (2) or current input (3) or the called up signal (4)<sup>1)</sup> and the zero point offset (5) (zero point potentiometer "Zw").

The following is valid:

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

There is no changeover between current and voltage input. The inputs are permanently available (see block circuit diagram).

### Command value call-ups (4)<sup>1)</sup>

It is possible to call up four command value call-ups "w1" to "w4". The external voltages (command values 1 to 4) are fed forward either directly via the voltage output +10V or via external potentiometers. If the command value inputs are connected directly to the regulated voltage, the command values can be adjusted by means of potentiometers "w1" to "w4". If external potentiometers are used, the internal potentiometers act as attenuators or limiters.

<sup>1)</sup> Provided only in conjunction with option A4

Only one call-up is possible at a time. If several call-ups are activated simultaneously, call-up "w1" has the lowest and call-up "w4" the highest priority.

The currently active call-up is signalled by a yellow LED.

### Enable function (7)

The enable function (7) is used to enable the current output stage and to pass the internal command value signal on to the ramp generator (8). The enable signal is signalled by an LED. When the enable is given (via 24 V input or jumper J1), the internal command value (with any command value selection) changes over the set ramp time. The valve will therefore not open suddenly when activated.

### Ramp generator (8)

Ramp generator (8) limits the gradient of the control output. The downstream amplitude limiter (12) does not shorten or extend the ramp time. The ramp time can be changed by a factor of 10 by means of jumper J3.

The following is valid:

| J3    | $U_{\text{socket}} / V$ | 2   | 1   | 0.2 | 0.1  | 0.02 |
|-------|-------------------------|-----|-----|-----|------|------|
| open* | t/msec                  | 50  | 100 | 500 | 1000 | 5000 |
|       | t/sec                   | 0.5 | 1   | 5   | 10   | 50   |

\* Basic setting (factory setting)

Formula:

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

## Function (continued)

### Ramp ON/OFF (9)

Jumper J2 or the "ramp ON/OFF" input (9) (see terminal assignment) can be used to set the ramp time to a minimum (<50 ms).

The activation of a ramp is signalled by an LED.

| "Ramp ON/OFF" input | J2      | LED "T" | Ramp |
|---------------------|---------|---------|------|
| 0 V                 | open    | ON      | ON   |
| +24 V               | open    | OFF     | OFF  |
| 0 V                 | plugged | OFF     | OFF  |
| +24 V               | plugged | ON      | ON   |

### External ramp time adjustment (10)

The internally set ramp time can be extended by means of an external potentiometer or an external voltage selection (according to the formula given in the section "Ramp generator"). The setting can be checked at the measuring socket. In the case of a cable break, the internal setting is automatically valid.

The adjustment range depends on "R". The following is valid:

|         | Adjustment range *                                                                 |                                                                           |
|---------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| R       | Min. ramp time<br>Rotary angle of the<br>potentiometer at left-<br>hand limit stop | Max. ramp time<br>at rotary angle of the<br>potentiometer of approx. 95 % |
| 1 kOhm  | 100 ms                                                                             | 1 s                                                                       |
| 100 Ohm | 1 s                                                                                | 10 s                                                                      |

\* The minimum ramp time can only be achieved, if the internally set ramp time is smaller, i.e. the corresponding potentiometer is at its left-hand limit stop. The specified ramp times are valid when J3 = open.

### Characteristic curve generator (11)

Potentiometer "Gw" (12) is used to adjust the maximum current for the solenoid. Characteristic curve generator (11) changes the command value signal so that a linear command value/pressure characteristic curve is obtained (corrected characteristic curve adapted for DBET-6X). To this end, characteristic curve generator (11) must be activated via jumper J4, and jumper J5 must be opened!

For deactivating the characteristic curve, jumper J4 must be opened and jumper 5 plugged. This activates linear curve characteristics.

### Amplitude limiter (12)

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

### Command value output (13)

0 % → 0 V      +100 % → +10 V

### Clock-pulse generator (14)

The clock-pulse generator (14) generates a frequency for the output stage. The supply voltage has an influence on the frequency.

A frequency that depends on the command value signal can be generated via jumper J6 (adapted for DBET-6X). For universal

use, jumper J6 must be opened.

Frequency balancing by means of the "frequency" potentiometer is possible with the help of jumper J7.

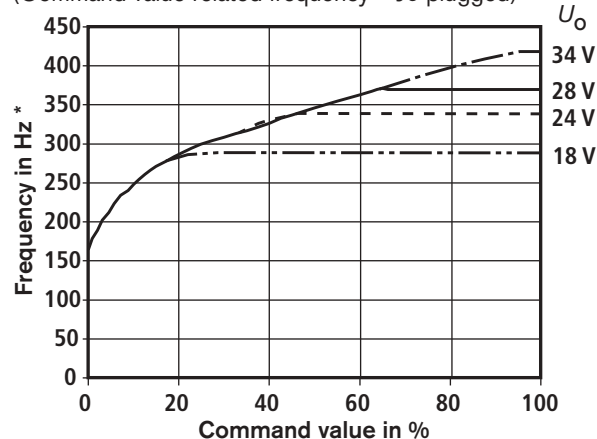
Example 1:

(Frequency balancing by means of "frequency" potentiometer - independently of the command value; J6 = open, J7 = plugged)

Adjustment range: 210 Hz – 310 Hz ±15 %

Example 2:

(Command value-related frequency – J6 plugged)



\* Tolerance: ±15 %

The "frequency" potentiometer can be used to correct the frequency by >±10 % (J6 and J7 plugged).

### Current output stage (15)

The current output stage generates a clocked solenoid current for the proportional valve.

The output stage output is de-energised in the case of an internal fault signal or missing enable. The output of the output stage is short-circuit-proof.

### Actual value output (16)

1 mA ( $I_{\text{solenoid}}$ ) = 1 mV (actual value output)

### Fault detection (17)

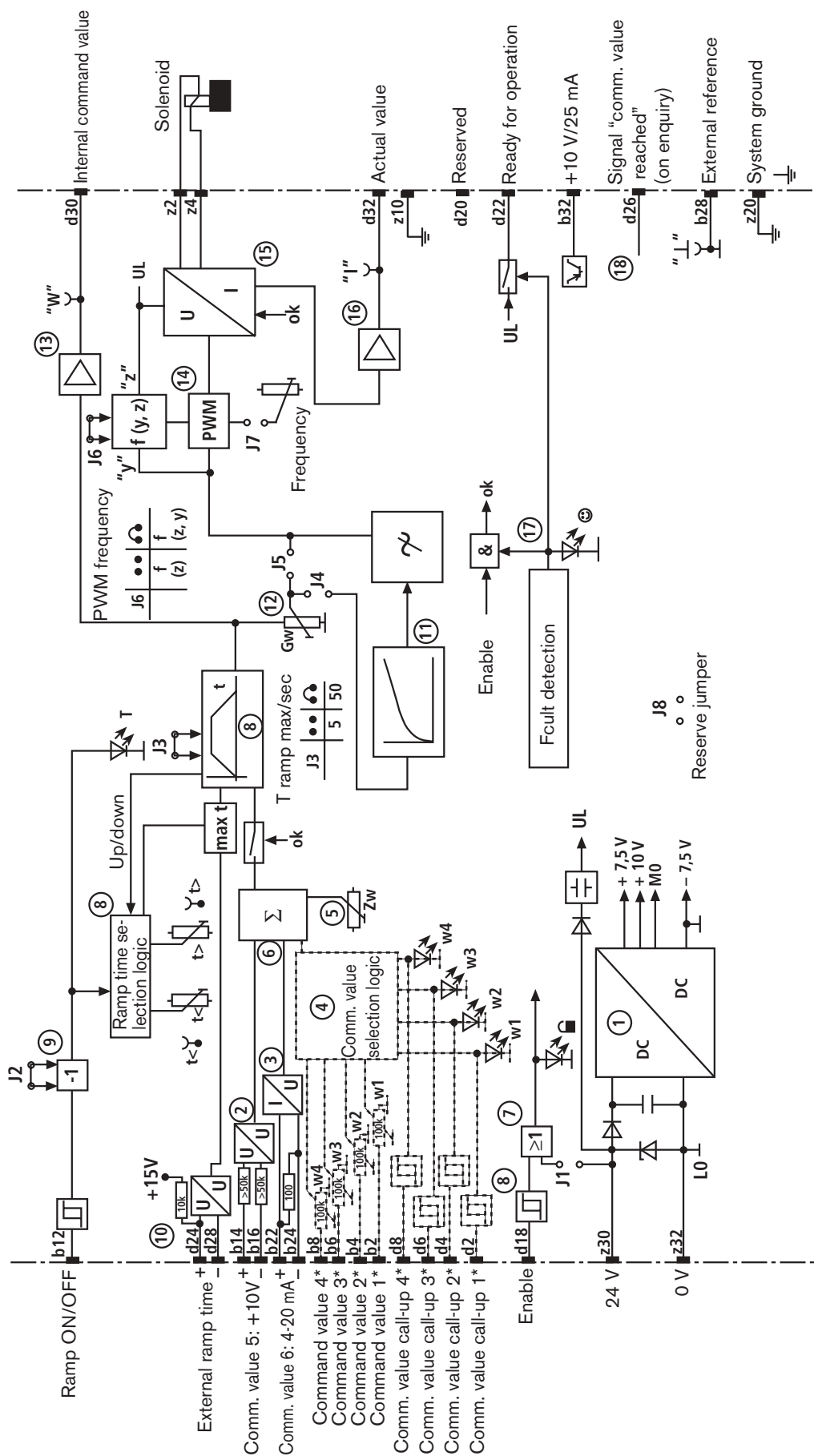
The solenoid cable is monitored for cable break and short-circuit. When no fault is present, a voltage >16 V is output at the ready-for-operation output, and the ready-for-operation LED is lit. In the event of a fault, the voltage drops to <1 V and the LED flashes.

### Command-value-reached output (18) – function on enquiry!

When the internal command value corresponds to the command value selection after the ramp and no fault is present, a signal of >16 V is output at the "command-value-reached" output.

When the enable is missing, a signal >16 V is output as soon as the internal command value reaches 0 %.

## Block circuit diagram VT-VSPA1-2

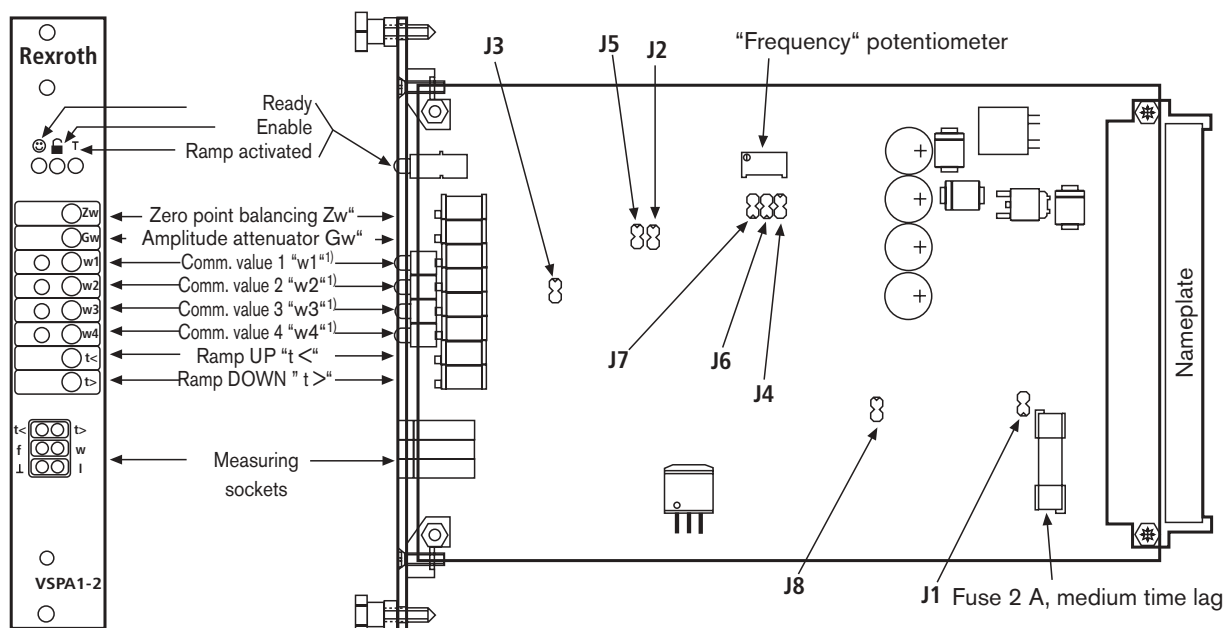


- |                             |                            |                                                |
|-----------------------------|----------------------------|------------------------------------------------|
| (1) Power supply unit       | (7) Enable                 | (13) Comm. value output                        |
| (2) Differential input      | (8) Ramp generator         | (14) Clock-pulse generator                     |
| (3) Current input           | (9) Ramp ON/OFF            | (15) Current output stage                      |
| (4) Command value call-ups* | (10) External ramp time    | (16) Actual value output                       |
| (5) Zero point adjustment   | (11) Char. curve generator | (17) Fault detection                           |
| (6) Comm. value summation   | (12) Amplitude limiter     | (18) Output "comm. value-reached" (on enquiry) |

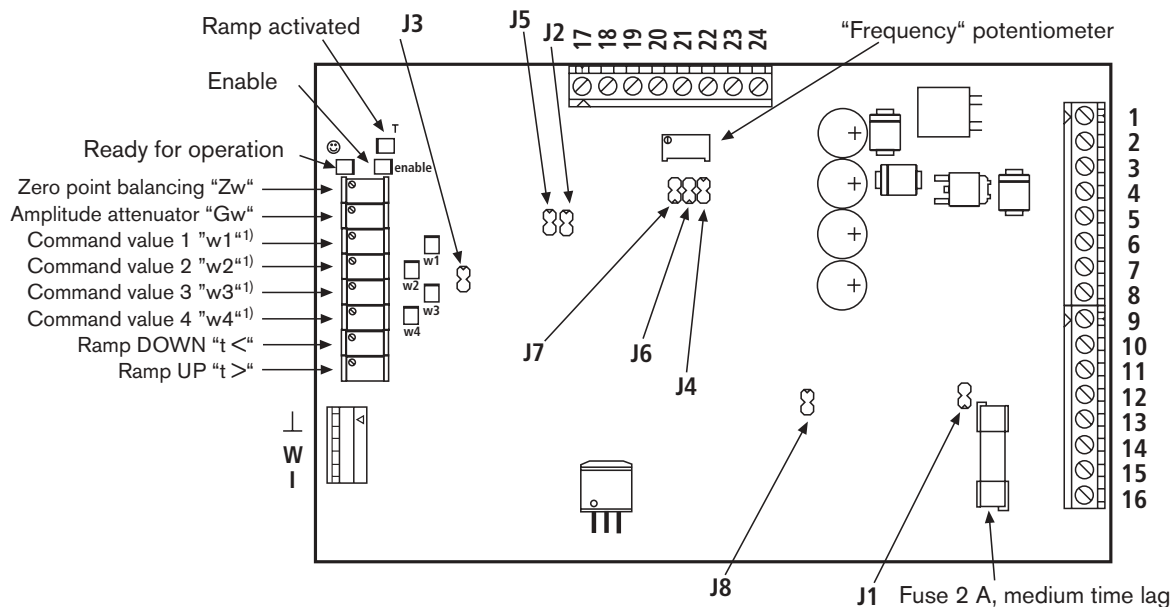
\*Only provided for option A4

## Adjustment and control elements

### VT-VSPA1-2:



### VT-VSPA1K-2:



<sup>1)</sup> Only provided for option A4

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

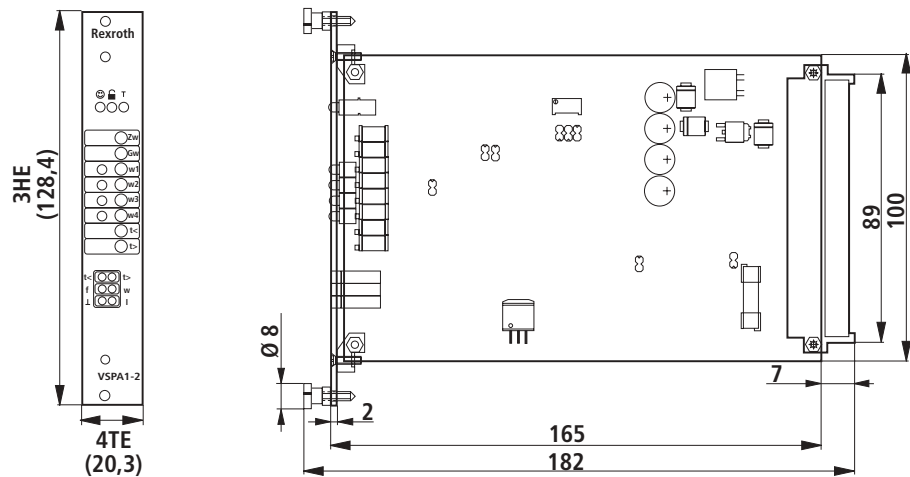
|                                                     |                 |                                                                                                                                                      |
|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating voltage                                   | $U_O$           | 24 VDC + 40 % – 20 %                                                                                                                                 |
| Operating range:                                    |                 |                                                                                                                                                      |
| Upper limit value                                   | $u_O(t)_{\max}$ | 35 V                                                                                                                                                 |
| Lower limit value                                   | $u_O(t)_{\min}$ | 18 V                                                                                                                                                 |
| Power consumption                                   | $P_S$           | < 24 VA                                                                                                                                              |
| Current consumption                                 | $I$             | < 2 A                                                                                                                                                |
| Fuse                                                | $I_F$           | 2 A medium time lag, replaceable                                                                                                                     |
| Inputs:                                             |                 |                                                                                                                                                      |
| – Analogue                                          |                 |                                                                                                                                                      |
| – Command values 1 to 4 (potentiometer inputs) *    | $U_e$           | 0 to +10 V, $R_e > 100 \text{ k}\Omega$                                                                                                              |
| – Differential input                                | $U_e$           | 0 to +10 V, $R_e > 50 \text{ k}\Omega$                                                                                                               |
| – Current input                                     | $I_e$           | 4 to 20 mA, load $R_L = 100 \text{ }\Omega$                                                                                                          |
| Ramp time external                                  | $U_e$           | 0 to +5 V, $R_i > 10 \text{ k}\Omega$                                                                                                                |
| – Digital                                           |                 |                                                                                                                                                      |
| – Command value call-ups*                           | $U$             | 8.5 V to $U_O$ → call-up active, $R_i > 100 \text{ k}\Omega$<br>$U$ 0 V to 6.5 V → no call-up, $R_i > 100 \text{ k}\Omega$                           |
| – Ramp call-ups                                     | $U$             | 8.5 V to $U_O$ → call-up active, $R_i > 100 \text{ k}\Omega$<br>$U$ 0 V to 6.5 V → no call-up, $R_i > 100 \text{ k}\Omega$                           |
| – Ramp ON/OFF                                       | $U$             | 8.5 V to $U_O$ → ramp ON, $R_i > 100 \text{ k}\Omega$<br>$U$ 0 V to 6.5 V → ramp OFF, $R_i > 100 \text{ k}\Omega$                                    |
| – Enable                                            | $U$             | 8.5 V to $U_O$ → ON, $R_i > 100 \text{ k}\Omega$<br>$U$ 0 V to 6.5 V → OFF, $R_i > 100 \text{ k}\Omega$                                              |
| *Provided only for option A4                        | $U$             | 0 V to 6.5 V → OFF, $R_i > 100 \text{ k}\Omega$                                                                                                      |
| Clock-pulse frequency:                              | $f$             | 250 Hz $\pm$ 10 %<br>when J6 and J7 = open                                                                                                           |
| Adjustment ranges:                                  |                 |                                                                                                                                                      |
| – Zero balancing (potentiometer “Zw”)               |                 | +30 %                                                                                                                                                |
| – Command values (potentiometers “w1” to “w4”)      |                 | 0 to 100 %                                                                                                                                           |
| – Ramp times (potentiometers “t <” and “t >”)       | $t$             | 20 ms to 5 s, can be changed over to 0.2 s to 50 s                                                                                                   |
| – Amplitude attenuator (potentiometer “Gw”)         |                 | 0 to +120 %                                                                                                                                          |
| – Frequency matching with potentiometer (J7 active) | $f$             | see explanation: Clock-pulse generator, page 3                                                                                                       |
| Output signals                                      |                 |                                                                                                                                                      |
| – Command value signal                              | $U$             | 0 to +10 V $\pm$ 2 %, $I_{\max} = 2 \text{ mA}$                                                                                                      |
| – Actual value signal                               | $U$             | 0 to +10 V $\pm$ 2 %, $I_{\max} = 2 \text{ mA}$                                                                                                      |
| – Ready for operation                               | $U$             | > 16 V, $I_{\max} = 50 \text{ mA}$<br>(in the event of a fault: $U < 1 \text{ V}$ , $R_i = 10 \text{ k}\Omega$ )                                     |
| – Output “command value reached” — on enquiry       | $U$             | > 16 V, $I_{\max} = 50 \text{ mA}$ (when command value reached)<br>(when command value not reached: $U < 1 \text{ V}$ , $R_i = 10 \text{ k}\Omega$ ) |
| – Regulated voltage                                 | $U$             | +10 V $\pm$ 2%, $I_{\max} = 25 \text{ mA}$ , short-circuit-proof                                                                                     |
| – Ramp signal measuring sockets                     | $U$             | +100 mV to +5 V $\pm$ 10 %,<br>+10 mV to +100 mV $\pm$ 50 %                                                                                          |
| – Current output stage                              | $I$             | 0 to 1.9 A, short-circuit-proof, clocked                                                                                                             |
| Type of connection:                                 |                 |                                                                                                                                                      |
| – VT-VSPA1-2                                        |                 | 48-pin male connector, DIN 41612, form F                                                                                                             |
| – VT-VSPA1K-2                                       |                 | 16 or 24-pin terminal strip                                                                                                                          |

**Technical data (continued)**

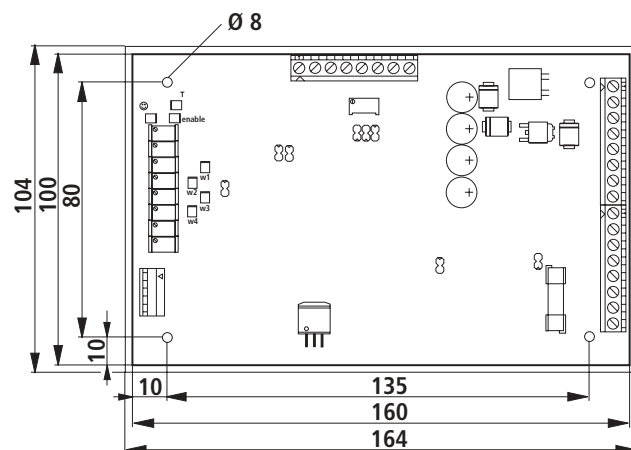
|                                               |                                   |                |
|-----------------------------------------------|-----------------------------------|----------------|
| Card dimensions:                              | Euro-card 100 x 160 mm, DIN 41494 |                |
| Front panel dimensions (refers to VT-VSPA1-2) |                                   |                |
| – Height                                      | 3HE (128.4 mm)                    |                |
| – Width soldering side                        | 1TE (5.08 mm)                     |                |
| – Width component side                        | 3TE (15.24 mm)                    |                |
| Permissible operating temperature range       | †                                 | 0 to 50 °C     |
| Storage temperature range                     | †                                 | -25 to + 85 °C |
| Weight                                        | m                                 | 0.15 kg (net)  |

**Unit dimensions (nominal dimensions in mm)****VT-VSPA1-2:**

Example: VT-VSPA1-2-1X/V0/A4

**VT-VSPA1K-2:**

Example: VT-VSPA1K-2-1X/V0/A4



## Engineering/maintenance notes/supplementary information

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- The factory settings of parameters are as follows: Corrective characteristic curves and command value-dependent frequency = active (matched to DBET-6X): max. ramp time = 5 s, biasing current = 100 mA, max. output current = 1.6 A
- The amplifier card may only be installed when disconnected from the power supply!
- Do not use plug-in connectors with free-wheeling diodes or LED indicator lamps for connecting the solenoid!
- Measurements on the card may only be taken using instruments  $R_i > 100 \text{ k}\Omega$ !
- Use relays with gold-plated contacts for passing on command values (small voltages, small currents)!
- Always shield command value cables; connect the shield to ground on the card side and leave the other end open. If no system ground is provided, connect 0 V operating voltage.  
Recommendation: Shield also solenoid cables! For solenoid cables up to 50m length, use cable type LiYCY 1.5mm<sup>2</sup>.  
In the case of 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!
- **Caution:** When the differential input is used, both inputs must always be activated or deactivated simultaneously.
- **Note:** Electrical signals brought out via control electronics (e.g. signal “ready for operation”) must not be used for switching safety-relevant machine functions!  
(See also European standard “safety requirements for fluid power systems and components - hydraulics”, EN 982.)