The Drive & Control Company

Rexroth Bosch Group

Digital valve amplifier for proportional valves without electrical position feedback

Type VT-VSPD-1

RE 30523
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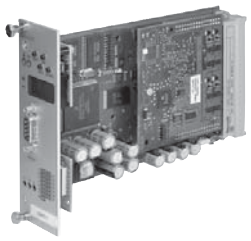

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- Component series 2X

Features

Suitable for controlling proportional valves without electrical position feedback of types:

- 4WRA 6 and 10, component series 2X
- 4WRZ 10 to 52, component series 5X to 7X
- (Z)DBE 6, component series 1X
- DBE(M)T, component series 5X
- DBE(M) 10 and 25, component series 5X
- DBE(M) 32, component series 3X
- DBEP 6, component series 1X
- DRE 4 K, component series 3X
- DRE(M) 10 and 25, component series 5X
- (Z)DRE 6, component series 1X
- ZDRE 10, component series 1X, 2X
- 3DRE(M) 10 P and 16 P, component series 6X, 7X
- DRE(M) 32, component series 4X
- 3DREP 6, component series 1X and 2X
- DBET 6, component series 6X

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Contents

Features (continued)

- The user-specific data can be exactly reproduced and is protected against unintended or unauthorized adjustment
- Valve selection using the BODAC operating software
- Command value input, optionally as voltage or current interface
- Voltage input as differential input
- For any application freely programmable output stage frequency, pilot, step and end current or characteristic curve correction with a maximum of 8 nodes
- Command value input with variable input adjustment
- Ramp generator
- Digital inputs for calling up pre-set command value parameters
- Enable input and fault output
- Freely configurable measuring socket X2
- Display (optional) for diagnosis, as well as complete configuration and parameterization
- Configuration and parameterization via serial interface with BODAC PC software (CD:SYS-HACD-BODAC-01)
- Up to 32 amplifiers can be interconnected for parameterization and diagnosis via the local bus

Ordering code

01	02	03	04	05	06	07
VT-VSPD	– 1	– 2X	/ V0	/	– 0	– 1

01	Digital amplifier for proportional valves without electrical position feedback	**VT-VSPD**
02	Amplifier for valve types (see page 1, features)	**1**
03	Component series 20 ... 29 (20 to 29: Unchanged technical data and pin assignment)	**2X**
04	Basic device	**V0**
05	Without display	**0**
	With display	**1**
06	Basic device	**0**
07	With valve output stage	**1**

Required accessories:

- PC program BODAC: CD ordering information: SYS-HACD-BODAC-01 (R900777335) or free download on the Internet at www.boschrexroth.com/hacd
- Interface cable: Cable set VT-HACD-1X/03.0/HACD-PC (R900776897) or standard 1:1 cable

Suitable card holders:

- Open card holder VT 3002-1-2X/48F, mat. no. R900020154) or VT 3002-1-2X/64G, mat. no. R900991843), see data sheet 29928
  Only with control cabinet installation.
- Connection adapter VT 10812-2X/64G, mat. no. R900713826, see data sheet 30105

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Functional description

The valve amplifier is set-up as printed circuit board in Europe format 100 x 160 mm with daughter board, fitted on both sides.
The central unit of the amplifier is a microcontroller controlling the entire process. Data for configuration, command values and parameters are stored in a FLASH in a non-volatile form.
Four binarily coded digital inputs are used to call up parameter sets (command values) from the memory in which you can store a maximum of 16 sets. A call-up activates the command value for the valve spool position with the related ramp times.
More control inputs have the following functions:

"Command value valid":	Enabling of the parameter set addressed by the current call-up (H active)
"Enable":	Activation of the outputs (acknowledgment of the fault message with low→high edge)

The command value can be preset via digital command value call-ups [5] and/or via analog inputs [1]. The analog input AI4 (b14/b16) is to be used for the command value presetting of ±10 V, the analog input AI6 (b22/b24) for any command value presetting from 4 to 20 mA.
Command values from 0 to +10 V (12...20 mA) control solenoid B.
Command values from 0 to –10 V (4...12 mA) control solenoid A.
The digital command value is added to the analog command value with the correct sign, according to the set call-up.
The command value inputs can be varied by means of software in the signal level.
Apart from the internal ramp generation option, you can also influence the ramp for "up" and "down" from external signals with correct total and correct sign by means of the AI2 (b6/b8) and AI5 (b18/b20) analog inputs.
For the valves, the software configures a step function generator [8] for the realization of the overlap jump if an overlapped control spool is selected.

Enable and error messages
The control is activated by the H level at the enable input. If no command value call-up is active, the digital call-up 0 is set.
Error logics [13] identify any cable break of the command value input for 4 to 20 mA as well as an inactive enable input. If there is an error, a fault message is output to (d22) by means of a low signal and displayed visually by the "OK" LED (OK goes out) on the front plate. It is possible to configure the enable so that an inactive enable input is not displayed as error.

Parameterization and diagnosis
Selection of the valve to be controlled and selection and configuration of the command value input, the ramp generator and the enable input as well as the setting of the command value call-up parameters are effected via the serial interface at the front-side D-Sub socket. Via the local bus, up to 32 valve amplifiers can be connected. Via BODAC, every valve amplifier is assigned a bus address. Reconnection of the serial interface cable is not required. Further information in the instructions 30523-01-B.
In the version with display, configuration, parameterization and diagnosis are possible without PC, directly at the display.

Digital outputs

DO 1	(d20)	Solenoid A active
DO 2	(d26)	Solenoid B active
DO 3	(z22)	Freely configurable
DO 4	(z24)	Freely configurable
DO 5	(z26)	Freely configurable
DO 6	(z28)	Freely configurable
DO 7	(f2)	Not assigned

Display elements and measuring sockets
The front plate of the command value card is equipped with measuring sockets for the two analog outputs:

Measuring socket "X1":	Valve current
Measuring socket "X2":	Valve command value (default)
Measuring socket "⊥":	Reference potential (corresponds to port z32)

LEDs display the following states:

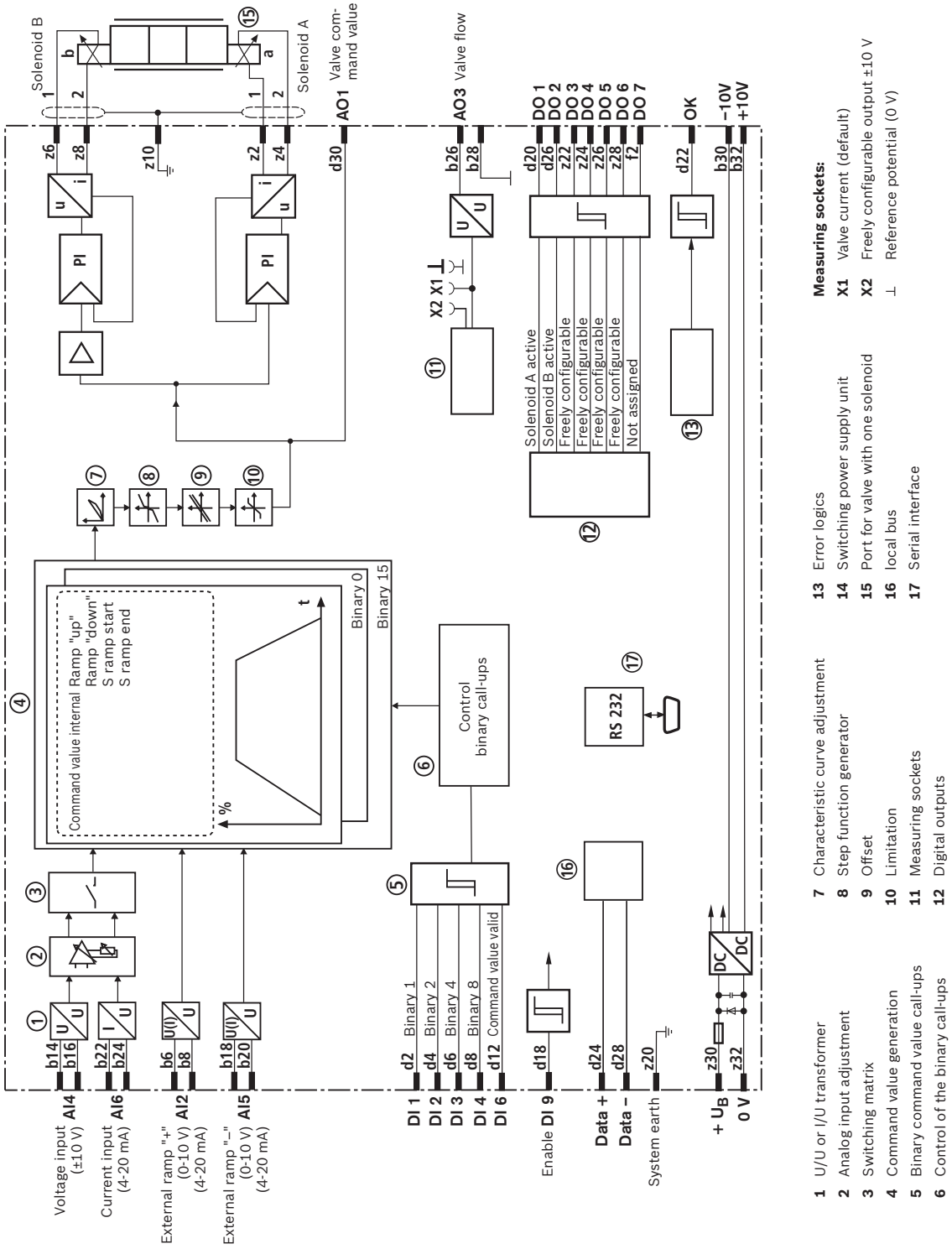
LED "🔓" (green):	Enable active
LED "OK" (green):	OK ready for operation
LEDs "I1"..."I4" (yellow):	Binarily coded command value call-ups
LED "I6" (yellow)	Command value valid
LED "I5, I7" (yellow)	Not assigned

Display functions:

Display, 4-digit	Configuration, parameterization and diagnosis in connection with the keys positioned above

[ ] = Assignment to the block diagram on page 4

Block diagram



1 U/U or I/U transformer
2 Analog input adjustment
3 Switching matrix
4 Command value generation
5 Binary command value call-ups
6 Control of the binary call-ups
7 Characteristic curve adjustment
8 Step function generator
9 Offset
10 Limitation
11 Measuring sockets
12 Digital outputs
13 Error logics
14 Switching power supply unit
15 Port for valve with one solenoid
16 local bus
17 Serial interface

Measuring sockets:
X1 Valve current (default)
X2 Freely configurable output ±10 V
⊥ Reference potential (0 V)

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

Operating voltage	U_B	24 VDC
Upper limit value	$u_B(t)_{max}$	30 V
Lower limit value	$u_B(t)_{min}$	21 V
Current consumption	I_{max}	1.5 A; standby current 270 mA
Fuse	I_S	4 A time-lag
Digital inputs	Signal	log 0 = 0 to 5 V
		log 1 = 16 V to U_B
Digital outputs	Signal	log 0 = 0 to 5 V
		log 1 = U_B – 3 V
		I_{max} = 30 mA, short-circuit protected
Analog inputs		
Voltage inputs AI4, AI2 and AI5		
Range	U	±10 V
Input resistance	R_e	> 100 kΩ, > 10 MΩ for input AI2
Resolution		5 mV for range ±10 V 2.5 mV for range 0...10 V
Non-linearity		< 10 mV
Current inputs AI6, AI2 and AI5		
Range	I	4...20 mA
Input resistance	R_e	100 Ω
Leakage current		0.15 % (with 500 Ω between pin b24, b8, b20 and 0 V)
Resolution	I	5 µA
Analog outputs		
Voltage outputs AO1 and AO3		
Output voltage	U	±10 V
Load	R_{Lmin}	1 kΩ
Resolution	U	1.25 mV (14 bit)
Residual ripple		±15 mV (without noise)
Ramp time	s	Max. 300
Valve output stage		
Solenoid current per solenoid	I_{max}	2.5 A
Solenoid resistance	R_{max}	19 Ω
Reference voltage	U	±10 V, 30 mA, short-circuit-proof
Residual ripple		< 20 mV
Scan time for command value preparation	t	2 ms
Serial interface		RS 232 (front plate), D-Sub socket
Type of connection		64-pole male multipoint connector, DIN 41612, design G
Local bus, distance to the furthermost device	l	Max. 280 m line length
Card dimensions		Euro-card 100 x 160 mm, DIN 41494
Front plate dimensions:		
Height		3 HE (128.4 mm)
Width soldering side		1 TE (5.08 mm)
Component side width		7 TE
Admissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	–20 to +70 °C
Weight	m	0.2 kg

Notice:
Information on the **environment simulation testing** for the areas EMC (electro-magnetic compatibility), climate and mechanical load, see data sheet 30523-U (environmental compatibility statement).

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Pin assignment of the male multipoint connector

Row d		
Pin	**Short denomination**	**Description**
2	DI 1	Binary 1
4	DI 2	Binary 2
6	DI 3	Binary 4
8	DI 4	Binary 8
10	DI 5	n. c.
12	DI 6	Command value valid
14	DI 7	n. c.
16	DI 8	n. c.
18	DI 9	Enable
20	DO 1	Solenoid A active
22	OK	OK output
24	Data+	Local bus
26	DO 2	Solenoid B active
28	Data–	Local bus
30	AO 1	Valve command value
32	n. c.	n. c.

Row b		
Pin	**Short denomination**	**Description**
2	n. c.	n. c.
4	n. c.	n. c.
6	AI 2+	Ramp + (U/I) +
8	AI 2–	Ramp + (U/I) –
10	n. c.	n. c.
12	n. c.	n. c.
14	AI 4+	Command value (U) +
16	AI 4–	Command value (U) –
18	AI 5+	Ramp – (U/I) +
20	AI 5–	Ramp – (U/I) –
22	AI 6+	Command value (I) +
24	AI 6–	Command value (I) –
26	AO 3	Valve current ±10V
28	AGND	Analog GND
30	REF–	–10 V
32	REF+	+10 V

Row z		
Pin	**Short denomination**	**Description**
2	MA+	Solenoid A+ [1]
4	MA–	Solenoid A– [1]
6	MB+	Solenoid B+
8	MB–	Solenoid B–
10	Shield	Shield
12	n. c.	n. c.
14	n. c.	n. c.
16	n. c.	n. c.
18	n. c.	n. c.
20	System earth	System earth
22	DO 3	Freely configurable
24	DO 4	Freely configurable
26	DO 5	Freely configurable
28	DO 6	Freely configurable
30	UB	Supply voltage
32	LO	Weight

Row f		
Pin	**Short denomination**	**Description**
2	DO 7	n. c.
4	n. c.	n. c.
6	n. c.	n. c.
8	n. c.	n. c.
10	n. c.	n. c.
12	n. c.	n. c.
14	n. c.	n. c.
16	n. c.	n. c.
18	n. c.	n. c.
20	n. c.	n. c.
22	n. c.	n. c.
24	n. c.	n. c.
26	n. c.	n. c.
28	n. c.	n. c.
30	n. c.	n. c.
32	n. c.	n. c.

[1] Port for valve with one solenoid

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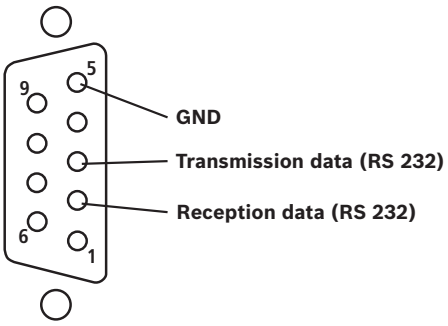
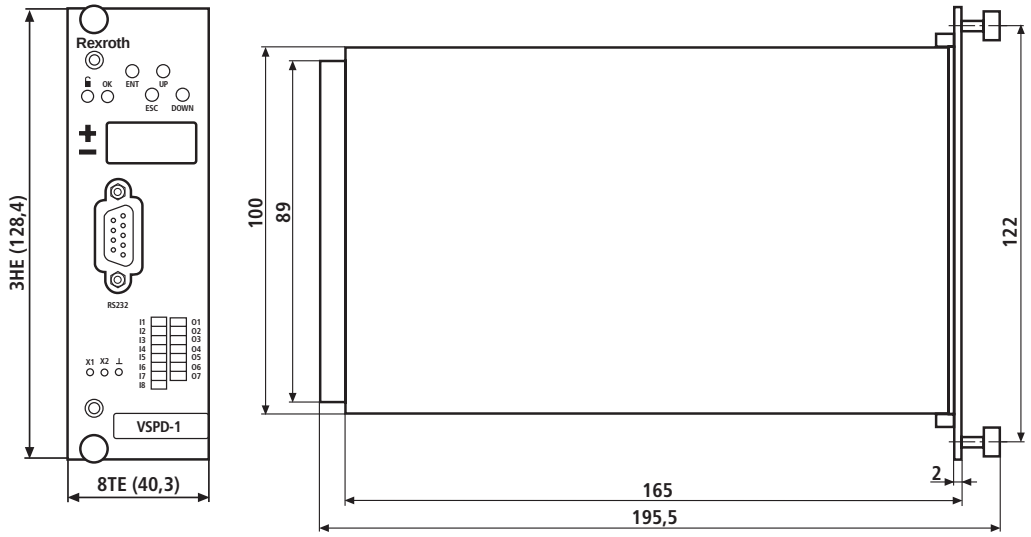
Pin assignment of the D-Sub socket



RS 232

Dimensions (dimensions in mm)



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Project planning / maintenance instructions / additional information

Product documentation for valve amplifier VT-VSPD-1-2X/

- 30523
  Technical data sheet (this document)
- 30523-B
  Installation and operating instructions
- 30523-01-B
  Commissioning and operating instructions
- 30523-U
  Environmental compatibility statement
- 30523-Z
  Additional information for replacing the VT-VSPD-1-1X by VT-VSPD-1-2X

- The amplifier card may only be unplugged and plugged when de-energized.
- No connectors with free-wheeling diodes or LED indicators must be used for 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 (low voltages, low currents).
- Always shield command value lines and lead them separately; connect shielding to port z10 on the card-side, other side open (risk of ground loops).
- For solenoid conductors up to 50 m in length, use the line type LiYCY 1.5 mm². With greater lengths, please contact us. Also shield the solenoid conductors.
- Use highly flexible CU conductors (at least 2.5 mm²) in order to connect the system earth
  The system earth is a main part of the EMC protection of the amplifier card. It is intended to eliminate interferences which are transported via the data and supply lines. However, this is only possible if the system earth itself does not introduce interferences into the command value card.
- The distance to aerial lines, radios, and radar systems has to be 1 m at least.
- Do not lay solenoid conductors and signal lines near power lines.
- The charging power of the smoothing capacitor on the card requires the pre-fuses to be of a slow-blowing nature.
- **Notice:** If a **differential input** is used, **both inputs must always be connected or disconnected at the same time**.

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