

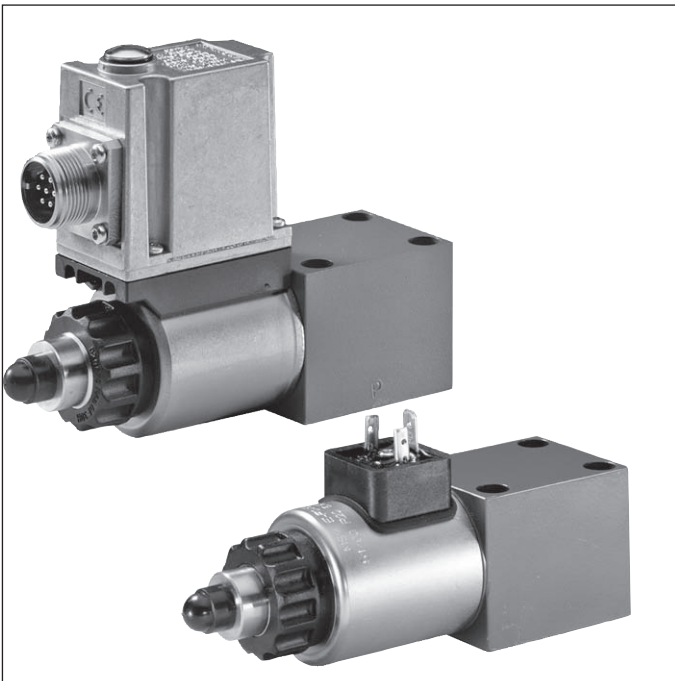
# Proportional pressure relief valve, directly operated, without/with integrated electronics (OBE)

## Type DBET and DBETE

**RE 29162**

Edition: 2013-06

Replaces: 04.13



- ▶ Size 6
- ▶ Component series 6X
- ▶ Maximum operating pressure 420 bar
- ▶ Maximum flow: 2 l/min

### Features

- ▶ Directly operated valves for limiting a system pressure
- ▶ Operation by means of proportional solenoid
- ▶ Proportional solenoid with central thread and detachable coil
- ▶ For subplate mounting:  
Porting pattern according to ISO 4401
- ▶ Integrated electronics (OBE) with type DBETE:  
Little manufacturing tolerance of the command value pressure characteristic curve
- ▶ External control electronics with type DBET:  
Amplifier with modular design, Euro-card format and as plug-in amplifier, individually adjustable upwards and downwards ramp, fine adjustment of the command value pressure characteristic curve is possible

### Contents

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**Ordering code**

01	02	03	04	05	06	07	08	09	10	11
<b>DBET</b>		<b>- 6X</b>	<b>/</b>		<b>G24</b>					<b>*</b>

01	Proportional pressure relief valve	<b>DBET</b>
02	For external control electronics	<b>no code</b>
	With integrated electronics	<b>E</b>
03	Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions)	<b>6X</b>

**Maximum pressure rating**

04	Up to 50 bar	<b>50</b>
	Up to 100 bar	<b>100</b>
	Up to 200 bar	<b>200</b>
	Up to 315 bar	<b>315</b>
	Up to 350 bar	<b>350</b>
	Up to 420 bar	<b>420</b>
05	Pilot oil return internal	<b>no code</b>
	Pilot oil return, external	<b>Y</b>

**Supply voltage of the integrated electronics (OBE)**

06	24 V DC voltage	<b>G24</b>
07	1600 mA coil	<b>no code</b>
	800 mA coil (only possible for DBET-6X (external control electronics))	<b>-8<sup>1)</sup></b>

**Electrical connection**

08	<b>For type DBET:</b>	
	<b>Without</b> mating connector; connector DIN EN 175301-803	<b>K4<sup>2)</sup></b>
	<b>For type DBETE:</b>	
	<b>Without</b> mating connector; connector DIN EN 175201-804	<b>K31<sup>2)</sup></b>

**Electronics interface**

09	Command value 0 to 10 V	<b>A1</b>
	Command value 4 to 20 mA	<b>F1</b>
	with DBET	<b>no code</b>

**Seal material**

10	NBR seals	<b>M</b>
	FKM seals	<b>V</b>
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
11	Further details in the plain text	

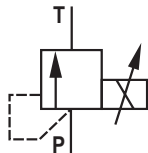
<sup>1)</sup> Replacement for series 5X (for comparison, see characteristic curve on page 9). All hydraulic characteristics specified in the data sheet refer to the version with a 1600 mA coil.

<sup>2)</sup> Mating connectors, separate order, see pages 7 and 14.

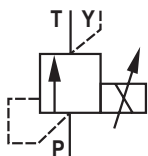
## Symbols

For external control electronics (type DBET)

Pilot oil return internal

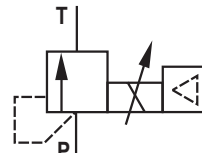


Pilot oil return, external (Y)

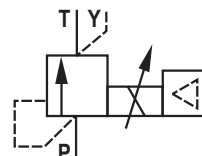


With integrated electronics (type DBETE)

Pilot oil return internal



Pilot oil return, external (Y)



## Function, section

### General information

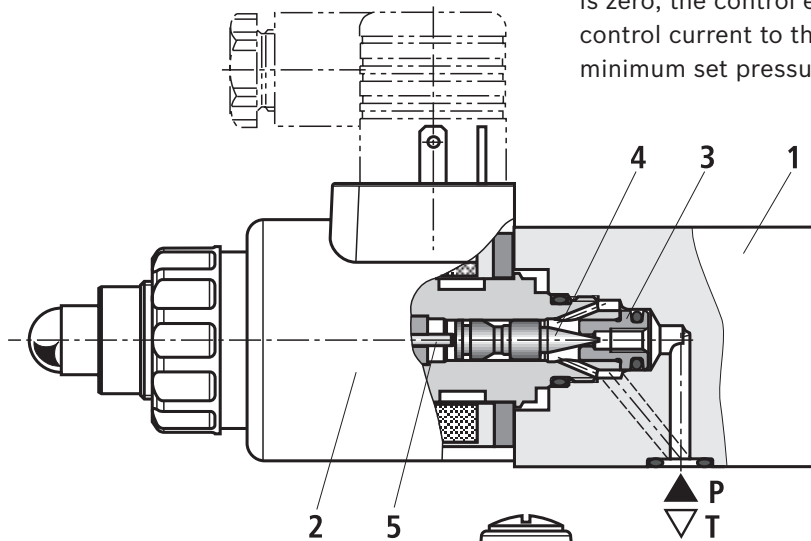
Type DBET proportional pressure relief valves are remote control valves with seat design and are used to limit a system pressure. Operation by means of a proportional solenoid with central thread and detachable coil. The interior of the solenoid is connected to port T or Y and is filled with the hydraulic fluid. Depending on the electric command value, these valves can be used to smoothly set the system pressure to be limited.

The valves mainly consist of the housing (1), the proportional solenoid (2), the valve seat (3) and the valve poppet (4).

### Basic principle

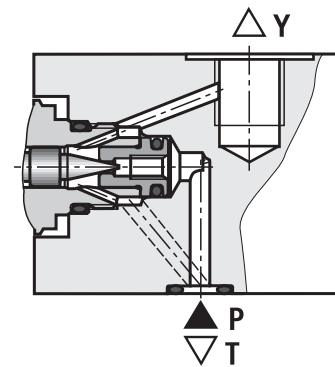
For the setting of the system pressure, a command value is specified at the control electronics. Depending on the command value, the electronics actuate the solenoid with electric current. The proportional solenoid converts the electric current into mechanical force that acts on the valve poppet (4) via the armature plunger (5). The valve poppet (4) presses on the valve seat (3) and interrupts the connection between port P and T or Y. If the hydraulic force on the valve poppet (4) equals the solenoid force, the valve controls the set pressure by lifting the valve poppet (4) off the valve seat (3) and thus enabling hydraulic fluid to flow from port P to T or Y. If the command value is zero, the control electronics only applies the minimum control current to the proportional solenoid (2) and the minimum set pressure is applied.

**Type DBET**

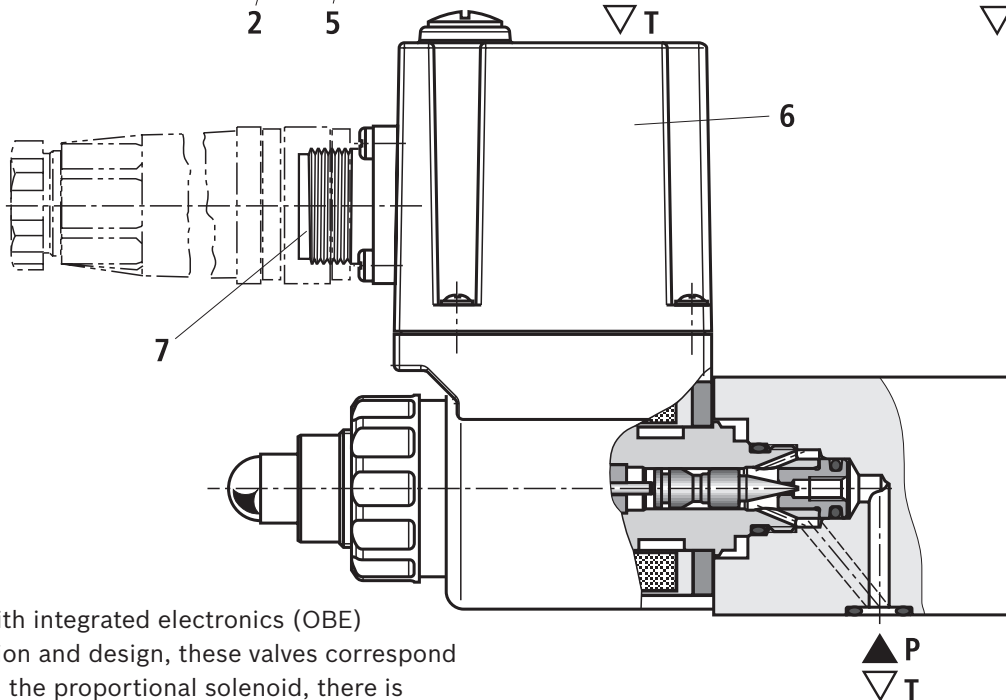


**Type DBET...Y**

Pilot oil return, external



**Type DBETE**



### Type DBETE – with integrated electronics (OBE)

In terms of function and design, these valves correspond to type DBET. On the proportional solenoid, there is a housing (6) with the control electronics.

Supply and command value voltage are applied at the connector (7). At the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information on the control electronics, see page 8.

**Technical data**

(for applications outside these parameters, please consult us.)

<b>general</b>			
Weight	- Type DBET	kg	2.0
	- Type DBETE	kg	2.15
Mounting orientation			Any
Ambient temperature range		°C	-20 to +70 (DBET) -20 to +50 (DBETE)
<b>hydraulic</b>			
Maximum operating pressure	- Port P	bar	420
Maximum set pressure	- Pressure rating 50 bar	bar	50
	- Pressure rating 100 bar	bar	100
	- Pressure rating 200 bar	bar	200
	- Pressure rating 315 bar	bar	315
	- Pressure rating 350 bar	bar	350
	- Pressure rating 420 bar	bar	420
Minimum set pressure (at command value 0 V or 4 mA)		bar	See characteristic curves on page 11
Return flow pressure	Port T and/or Y	bar	Separately at zero pressure to the tank
Maximum flow		l/min	2 <sup>1)</sup>
Hydraulic fluid <sup>1)</sup>			See table on page 6
Hydraulic fluid temperature range		°C	-20 to +80
Viscosity range		mm <sup>2</sup> /s	20 to 380, preferably 30 to 46
Maximum permitted degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15 <sup>2)</sup>
Hysteresis		%	< 4 of the maximum set pressure
Range of inversion		%	< 0.5 of the maximum set pressure
Response sensitivity		%	< 0.5 of the maximum set pressure
Linearity (flow 0.8 l/min)		%	±3 of the maximum set pressure
Manufacturing tolerance of the command value pressure characteristic curve, related to 0.8 l/min; pressure increasing	at command value 20 %	%	< ±1.5 of the maximum set pressure <sup>3)</sup>
	at command value 100 %	%	< ±5 of the maximum set pressure (type DBET) <sup>4)</sup>
		%	< ±1.5 of the maximum set pressure (type DBETE)
Step response (Tu + Tg) 0 → 100 % or 100 % → 0 line volume < 20 cm <sup>3</sup> ; Q = 0.8 l/min		ms	80 (depending on the system)

<sup>1)</sup> Observe flow limitation for pressure ratings 315, 350 and 420 bar (page 10).

<sup>2)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

For the selection of the filters, see [www.boschrexroth.com/filter](http://www.boschrexroth.com/filter).

<sup>3)</sup> Zero point calibration at the factory.

<sup>4)</sup> Possible comparison of the external control electronics.

**Technical data**

(for applications outside these parameters, please consult us.)

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	– Insoluble in water	HEES	FKM	VDMA 24568
Flame-resistant	– Water-free	HFDU	FKM	ISO 12922
	– Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

 **Important information on hydraulic fluids!**

- ▶ For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- ▶ The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.


**▶ Flame-resistant – containing water:**

- The maximum pressure differential per control edge is 210 bar. Otherwise, there is increased cavitation erosion.
- Life cycle as compared to operation with mineral oil HLP 30 to 100 %
- Maximum fluid temperature 60 °C

- ▶ **Bio-degradable:** When using bio-degradable hydraulic fluids that are zinc-solvent, zinc may accumulate in the fluid (700 mg zinc per pole tube).

electric		G24	G24-8
Minimum solenoid current	mA	≤ 100	≤ 100
Maximum solenoid current	mA	1600 ± 10 %	800 ± 5 %
Solenoid coil resistance	– Cold value at 20 °C	Ω	5,5
	– Maximum hot value	Ω	8,05
Switch-on duration	%	100	100

electric, integrated electronics (OBE)			
Supply voltage	– Nominal voltage	VDC	24
	– Lower limit value	VDC	21
	– Upper limit value	VDC	35
Current consumption		A	≤ 1,5
Required fuse protection		A	2, slow-blowing
Inputs	– Voltage	V	0 to 10
	– Current	mA	4 to 20
Output	– Actual current value	mV	1 mV ± 1 mA
Protection class of the valve according to EN 60529		IP 65 with mating connector mounted and locked	

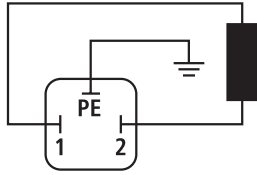
 **Notice!**

Information on the environment simulation testing for the areas EMC (electromagnetic compatibility), climate and mechanical load, see data sheet 29162-U (declaration on environmental compatibility).

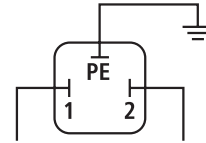
**Electrical connection** (dimensions in mm)

**Type DBET**

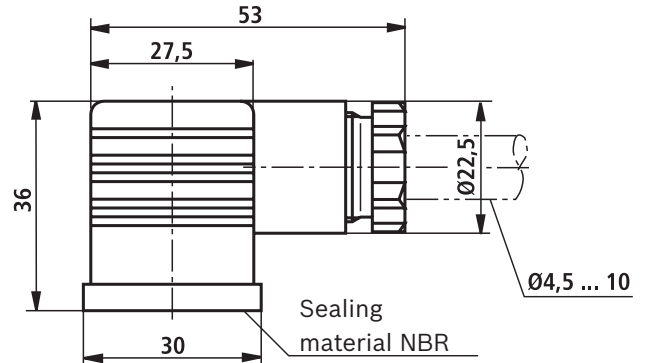
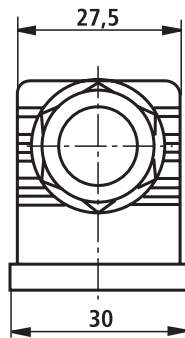
Connection at the connector



Connection at mating connector



Mating connector (black) according to DIN EN 175301-803, material no. **R901017011** (separate order)

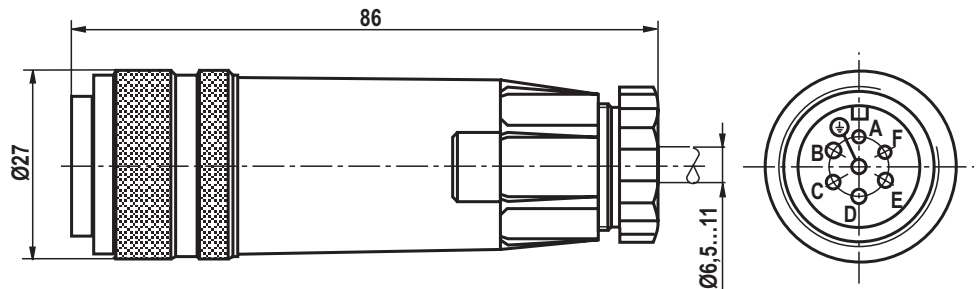


**Type DBETE**

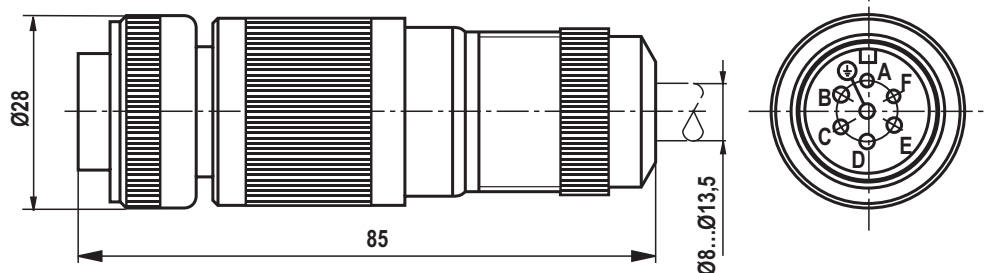
Connector pin assignment	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	A	24 VDC ( $u(t) = 21 \text{ V to } 35 \text{ V}$ ); $I_{\text{max}} \leq 1.5 \text{ A}$	
	B	0 V	
Reference potential actual value	C	Reference contact F; 0 V	Reference contact F; 0 V
Differential amplifier input	D	0 to 10 V; $R_E = 100 \text{ k}\Omega$	4 to 20 mA; $R_E = 100 \Omega$
	E	Reference potential command value	
Measuring output (actual value)	F	0 to 1.6 V actual value ( $1 \text{ mV} \pm 1 \text{ mA}$ )	
		Load resistance > 10 kΩ	
Protective ground	PE	Connected to solenoid and valve housing	

Mating connectors according to DIN EN 175201-804, solder contacts for line cross-section 0.5 to 1.5 mm<sup>2</sup>

Plastic version, material no. **R900021267** (separate order)



Metal version, material no. **R900223890** (separate order)

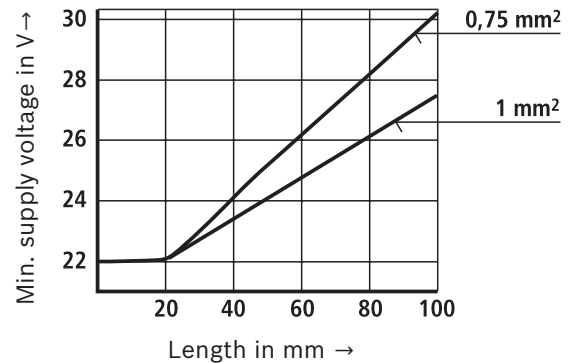


## Electrical connection

### Connection cable for type DBETE

- Recommendation 6-wire, 0.75 or 1 mm<sup>2</sup> plus protective grounding conductor and screening
- Only connect the screening to PE on the supply side
- Maximum admissible length = 100 m

The minimum supply voltage at the power supply unit depends on the length of the supply line (see diagram).



## Integrated integrated (OBE) with type DBETE

### Function

The electronics are supplied with voltage via ports A and B. The command value is applied to the differential amplifier ports D and E.

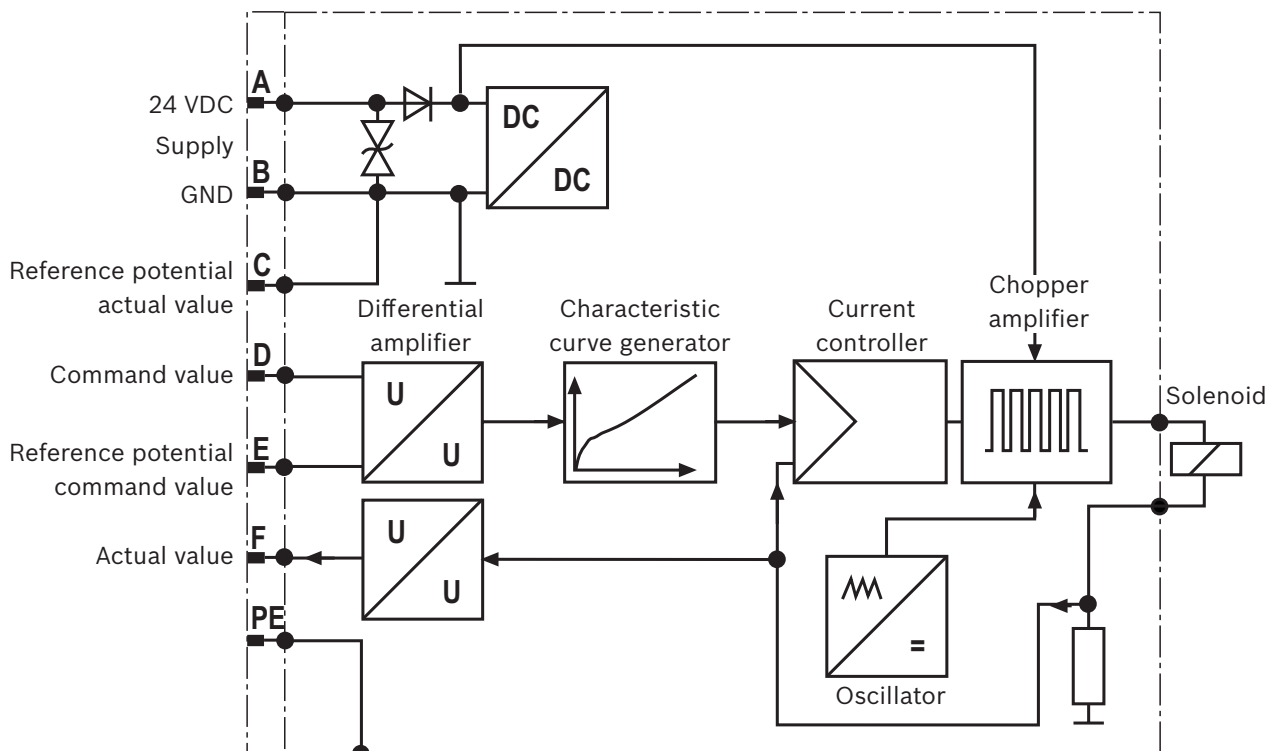
Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulic system are compensated and thus, a linear command value pressure characteristic curve is created.

The current controller controls the solenoid current independently of the solenoid coil resistance.

The power stage of the electronics for controlling the proportional solenoid is a chopper amplifier with a cycle frequency of approx. 180 Hz to 400 Hz. The output signal is pulse-width modulated (PWM).

In order to check the solenoid current, a voltage can be measured at the connector between pin F(+) and pin C(-) that is proportional to the solenoid current. **1 mV** corresponds to **1 mA** solenoid current.

### Block diagram

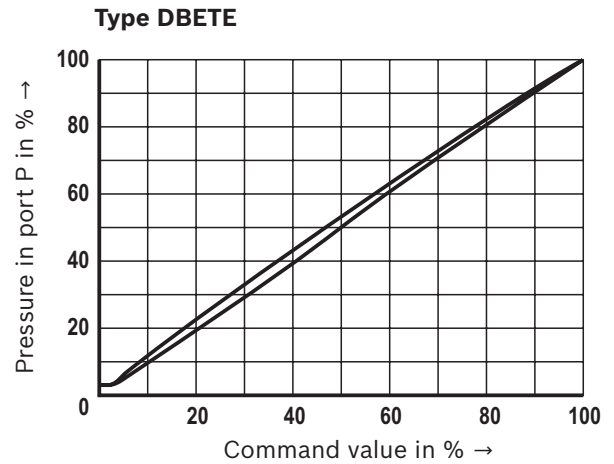
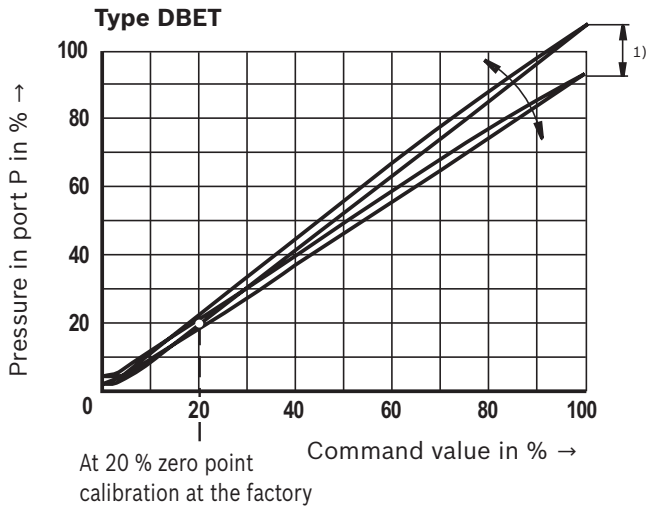




### Characteristic curves

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

Pressure in port P depending on the command value (flow = 0.8 l/min)



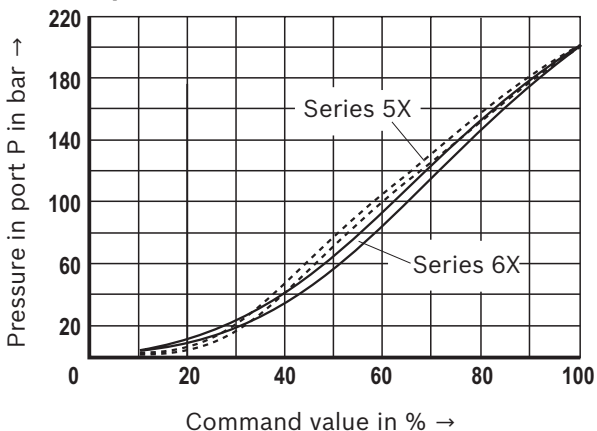
1) With valve type DBET, the manufacturing tolerance at the **external amplifier** (type and data sheet, see page 14) can be changed using the command value attenuator potentiometer "Gw". The digital amplifier is set using the parameter "Limit".

In this context, the control current according to the technical data must not be exceeded.

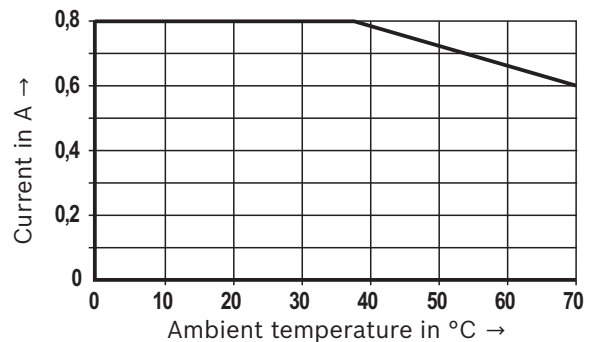
In order that several valves can be adjusted to the same characteristic curve, do not set the pressure higher than the maximum set pressure of the pressure rating with command value 100 %.

Pressure in port P depending on the command value

Comparison DBET series 5X-6X / pressure rating 200 bar (with amplifier VT-VSPA1-1-1X with 800 mA coil)



Current drop as ambient temperature rises, 24 V and 100 % duty cycle



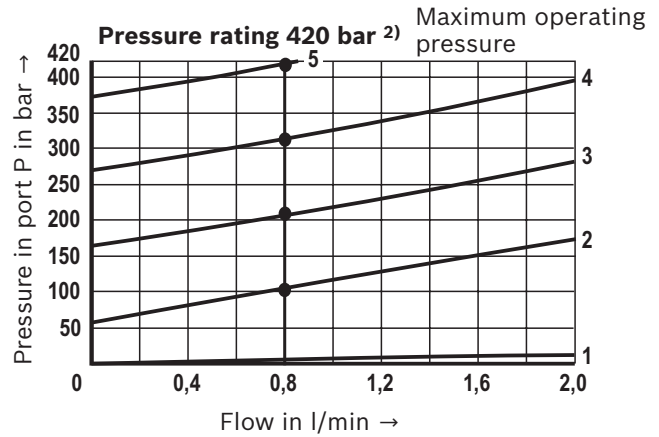
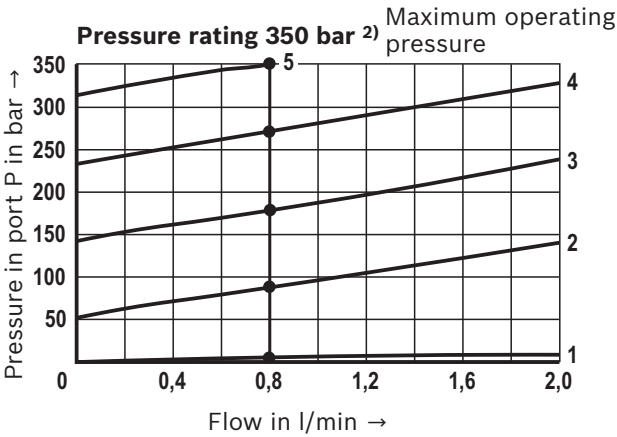
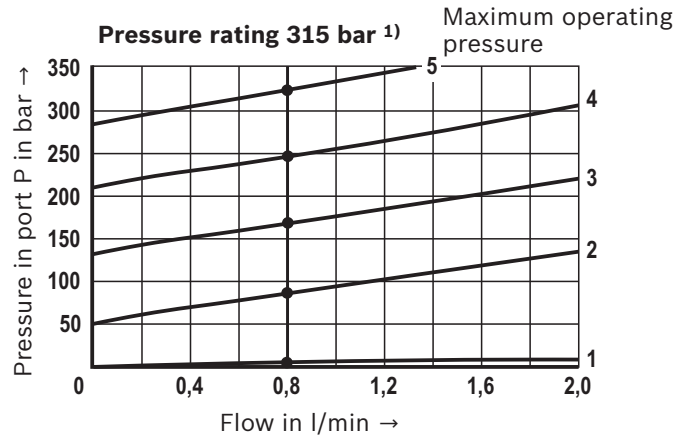
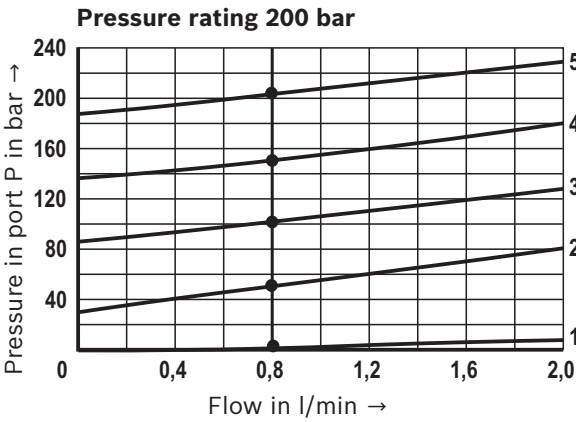
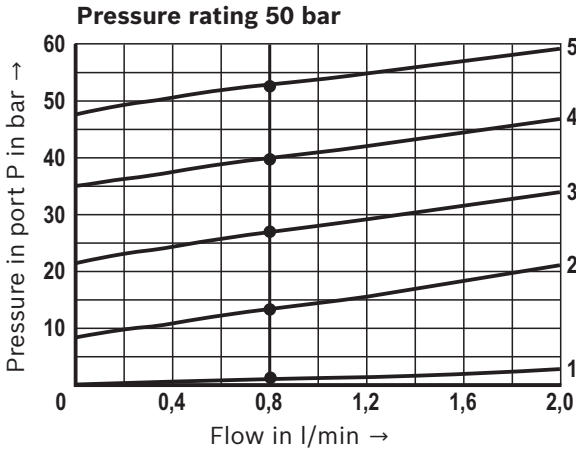
**Note!**

At increased temperature, the solenoid current drops, which results in a corresponding deviation of the set pressure.

**Characteristic curves**

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Pressure in port P depending on the flow**



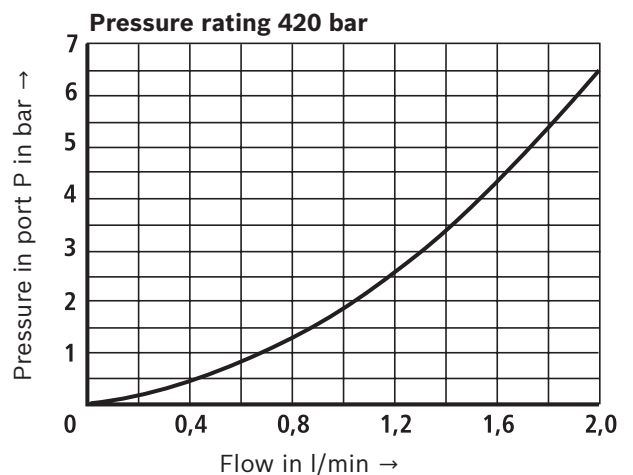
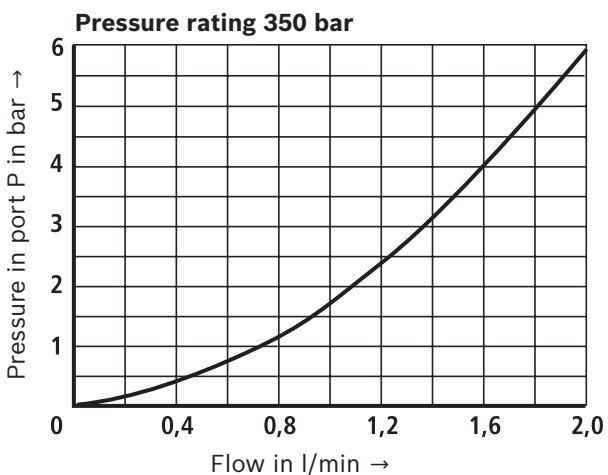
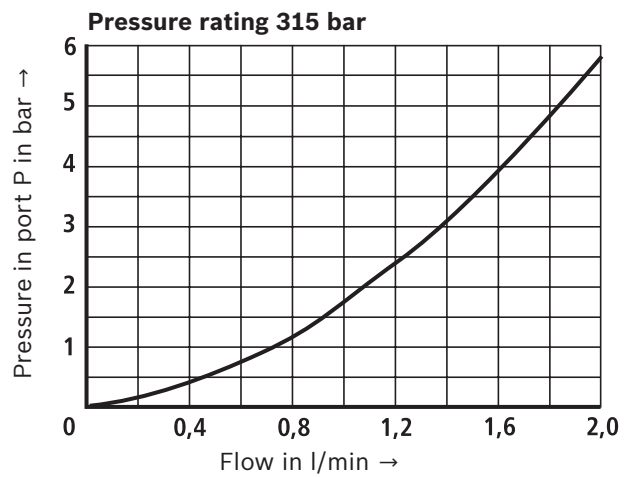
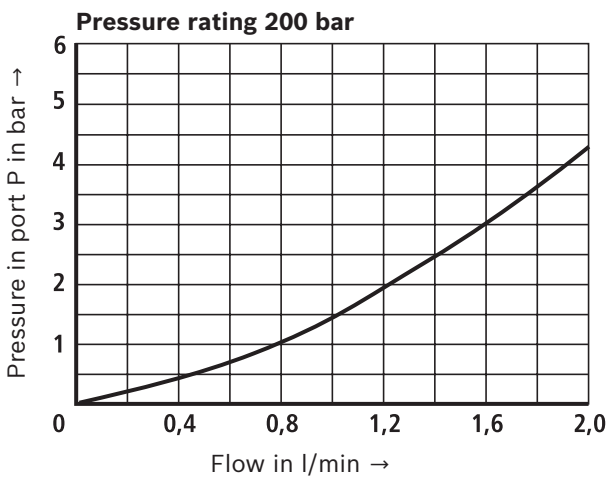
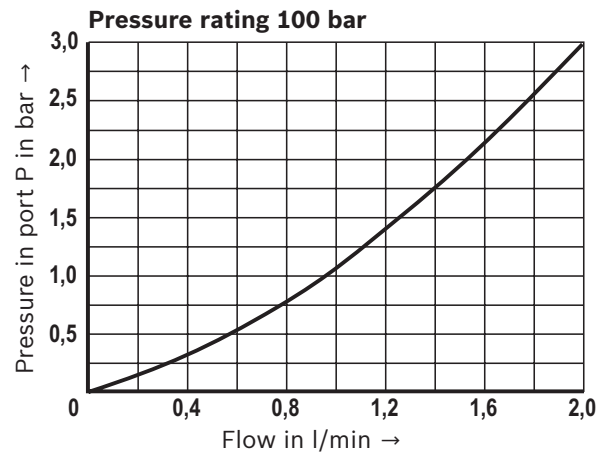
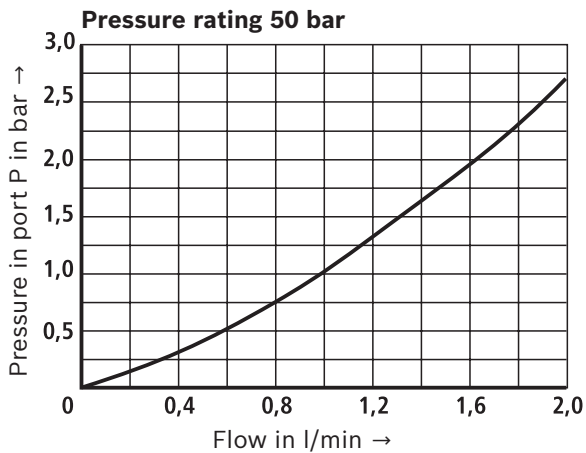
<sup>1)</sup> In the case of characteristic curve 5, the command value may not exceed the maximum flow of 1.4 l/min  
<sup>2)</sup> In the case of characteristic curve 5, the command value may not exceed the maximum flow of 0.8 l/min

Applicable for all pressure ratings:  
 Curve **1** at 0 % of the command value  
 Curve **2** at 25 % of the command value  
 Curve **3** at 50 % of the command value  
 Curve **4** at 75 % of the command value  
 Curve **5** at 100 % of the command value <sup>1; 2)</sup>  
 The characteristic curves were measured without counter pressure in port T. ( $p_T = 0 \text{ bar}$ )

## Characteristic curves

(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

Minimum set pressure in port P with command value 0 V and/or 4 mA depending on the flow



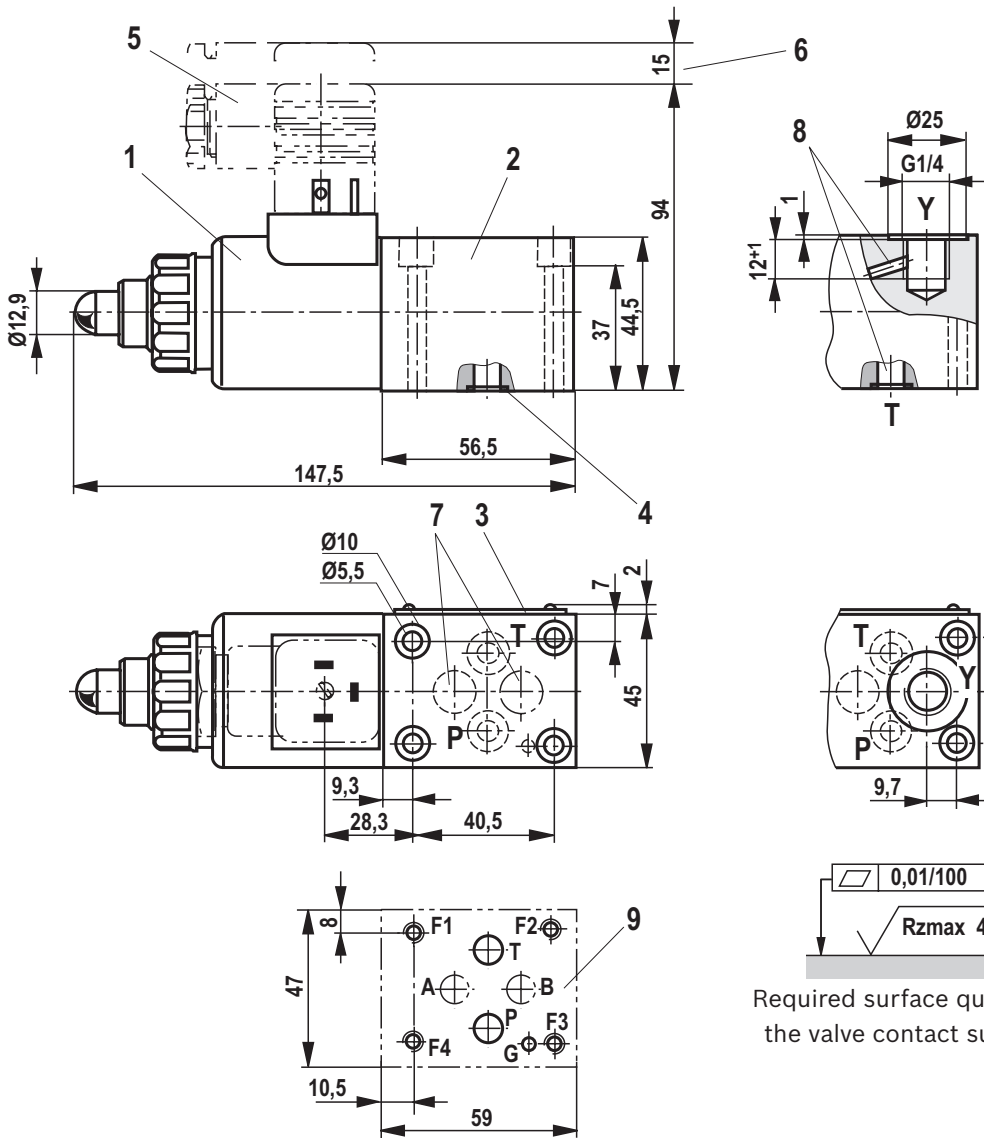
### Notice

The characteristic curves were measured without counter pressure in port T. ( $p_T = 0 \text{ bar}$ )

Minimum control current  $\leq 100 \text{ mA}$

(This current is reached with a command value of 0 V and/or 4 mA.)

**Dimensions: Type DBET**  
(dimensions in mm)



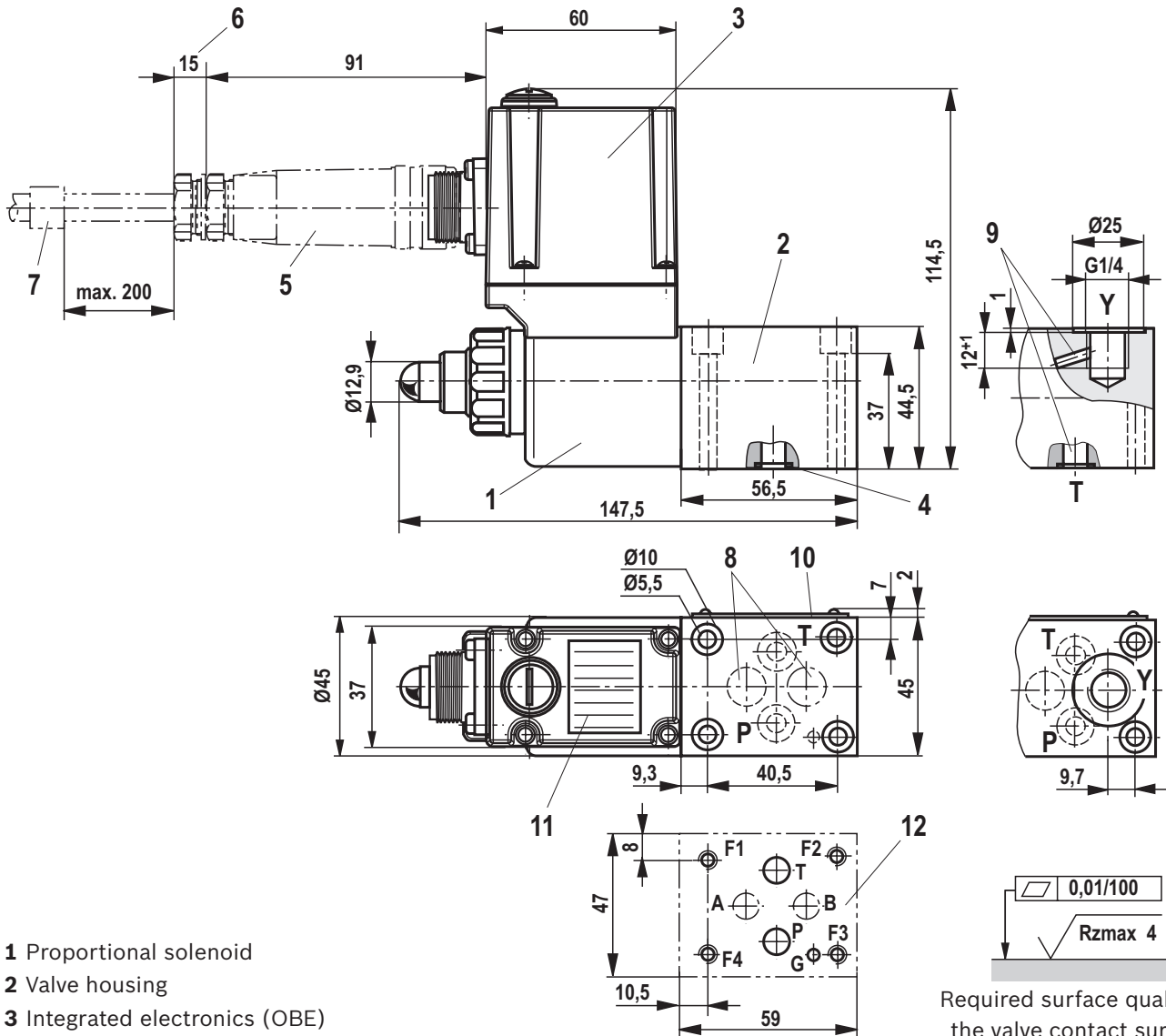
Required surface quality of the valve contact surface

- 1 Proportional solenoid
- 2 Valve housing
- 3 Name plate
- 4 Identical seal rings for ports P, T, A and B
- 5 Mating connector according to DIN EN 175301-803
- 6 Space required for removing the mating connector
- 7 Blind counterbores A and B
- 8 With version ..Y.. (external pilot oil return) port Y is internally connected to port T. Port T is not plugged.
- 9 Machined valve contact surface, porting pattern according to ISO 4401-03-02-0-05 Deviating from the standard: "A" and "B" channels not drilled locating pin not included in the scope of delivery

**For valve mounting screws and subplates, see page 14.**

## Dimensions: Type DBETE

(dimensions in mm)



- 1 Proportional solenoid
- 2 Valve housing
- 3 Integrated electronics (OBE)
- 4 Identical seal rings for ports P, T, A and B
- 5 Mating connectors according to DIN EN 175301-804
- 6 Space required for removing the mating connector
- 7 Cable fastening
- 8 Blind counterbores A and B
- 9 With version ..Y.. (external pilot oil return) port Y is internally connected to port T. Port T is not plugged.
- 10 Name plate
- 11 Block diagram of the integrated electronics (OBE)
- 12 Machined valve contact surface, porting pattern according to ISO 4401-03-02-0-05 Deviating from the standard: "A" and "B" channels not drilled locating pin not included in the scope of delivery

Required surface quality of the valve contact surface

**For valve mounting screws and subplates, see page 14.**

## Dimensions

Hexagon socket head cap screws		Material number
Size 6	4x ISO 4762 - M5 x 45 - 10.9-fZn-240h-L Tightening torque $M_A = 7 \text{ Nm} \pm 10 \%$	R913000140

**Notice:** The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure!

Subplates	Data sheet	Material number
G 341/01 (G1/4)	45052	R900424447
G 341/60 (G3/8)	45052	R901027119

## Accessories (not included in the scope of delivery)

External control for type DBET	Data sheet	Material number
VT-MSPA1-1-1X/V0/... in modular design (analog)	30223	
VT-VSPD-1-2X/V0/.0-1 in euro-card format (digital)	30523	
VT-VSPA1-2-1X/V0/...in euro-card format (analog)	30115	
VT-SSPA1-1-1X/V0/0-24 as a plug-in amplifier (analog)	30265	
Limitations: No linearization of the command value pressure characteristic curve, higher hysteresis and range of inversion		

External control for type DBET ...G24-8...	Data sheet	Material number
VT-2000-5X/... in euro-card format	29904	
VT-MSPA1-1-30 with modular design	30224	

Mating connectors (details see page 7)	Data sheet	Material number
For type DBET: Mating connectors according to DIN EN 175301-803	08006	R901017011
For type DBETE: Mating connectors according to DIN EN 175201-804	08006	R900021267 (plastic) R900223890 (metal)

Bosch Rexroth AG  
Hydraulics  
Zum Eisengießer 1  
97816 Lohr am Main, Germany  
Phone +49 (0) 93 52/18-0  
documentation@boschrexroth.de  
www.boschrexroth.de

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It must be remembered that our products are subject to a natural process of wear and aging.

Bosch Rexroth AG  
Hydraulics  
Zum Eisengießer 1  
97816 Lohr am Main, Germany  
Phone +49 (0) 93 52/18-0  
documentation@boschrexroth.de  
www.boschrexroth.de

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