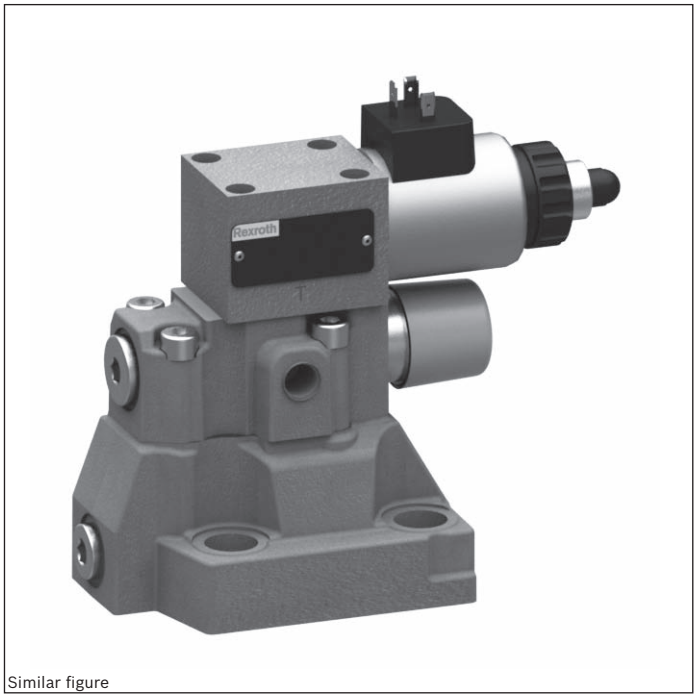
The Drive & Control Company

Rexroth
Bosch Group

Proportional pressure relief valve, pilot operated

Type DBEM and DBEME

RE 29361
Edition: 2013-07
Replaces: 2012-12



Similar figure

- Size 10 to 32
- Component series 7X
- Maximum operating pressure 350 bar
- Maximum flow: 700 l/min

Features

- Pilot operated valves for limiting a system pressure
- Operation by means of proportional solenoid
- For subplate mounting and threaded connection: Porting pattern according to ISO 6264
- Maximum pressure limitation
- Valve and control electronics from a single source
- Integrated electronics (OBE) with type DBEME: Little manufacturing tolerance of the command value pressure characteristic curve
- External control electronics with type DBEM (separate order)

Contents

Ordering code

01	02	03	04	05		06		07	08	09	10	11	12	13	14	15
DBE	**M**				**–**	**7X**	**/**			**G24**						*****

01	Proportional pressure relief valve	**DBE**
02	**With** maximum pressure limitation	**M** [1]
03	For external control electronics	**no code**
	With integrated electronics (OBE)	**E**

Size

04	Size 10	**10**
	Size 25	**20**
	Size 32	**30**
05	Subplate mounting	**no code**
	Threaded connection	**G**
06	Component series 70 to 79 (70 to 79: Unchanged installation and connection dimensions)	**7X**

Pressure rating [2]

07	Up to 50 bar	**50**
	Up to 100 bar	**100**
	Up to 200 bar	**200**
	Up to 315 bar	**315**
	Up to 350 bar	**350**
08	Pilot oil return external	**Y**
	Unloading port X, pilot oil return external	**XY**

Supply voltage

09	24 V DC voltage	**G24**
10	1600 mA coil	**no code**
	800 mA coil	**–8** [3]

[1] The maximum pressure limitation only serves as protection against overpressure in case of an error in the pilot valve (e.g. in case of contamination or overcurrent).

[2] Special version DBEME-SO699 in size 10 and 20 available up to pressure rating 500 bar.

[3] Replacement for series 3X and series 5X SO1 (comparison see characteristic curve page 12). All characteristics (hydraulic and electric) specified in the data sheet refer to the version with 1600 mA coil.

Ordering code

01	02	03	04	05	06		07	08	09	10	11	12	13	14	15
DBE	**M**				**–**	**7X**	**/**			**G24**						*****

Electrical connection

11	**For type DBEM:**	
	Without mating connector; connector DIN EN 175301-803	**K4** [4]
	For type DBEME:	
	Without mating connector; connector DIN EN 175201-804	**K31** [4]

Electronics interface

12	Command value 0 to 10 V	**A1**
	Command value 4 to 20 mA	**F1**
	With DBEM	**no code**

Seal material

13	NBR seals	**M**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used!	

14	Pipe thread to DIN ISO228-1	**no code** [5]
	UNF-thread to ASME B1.1	**/12** [5]

15	Further details in the plain text	

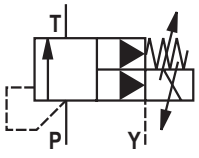
[4] Mating connectors, separate order, see page 8 and 19

[5] possible only for version G

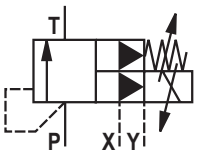
Symbols

For external control electronics:

Type DBEM...-7X/...Y...

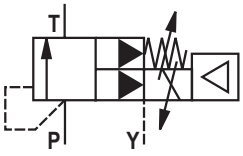


Type DBEM...-7X/...XY...

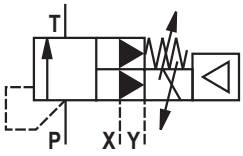


With integrated electronics:

Type DBEME...-7X/...Y...



Type DBEME...-7X/...XY...



Function, section

Valves of type DBEM are pilot operated pressure relief valves. They are used to limit the operating pressure in hydraulic systems. By means of these valves, the pressure to be limited can be continuously adjusted depending on the electric command value.

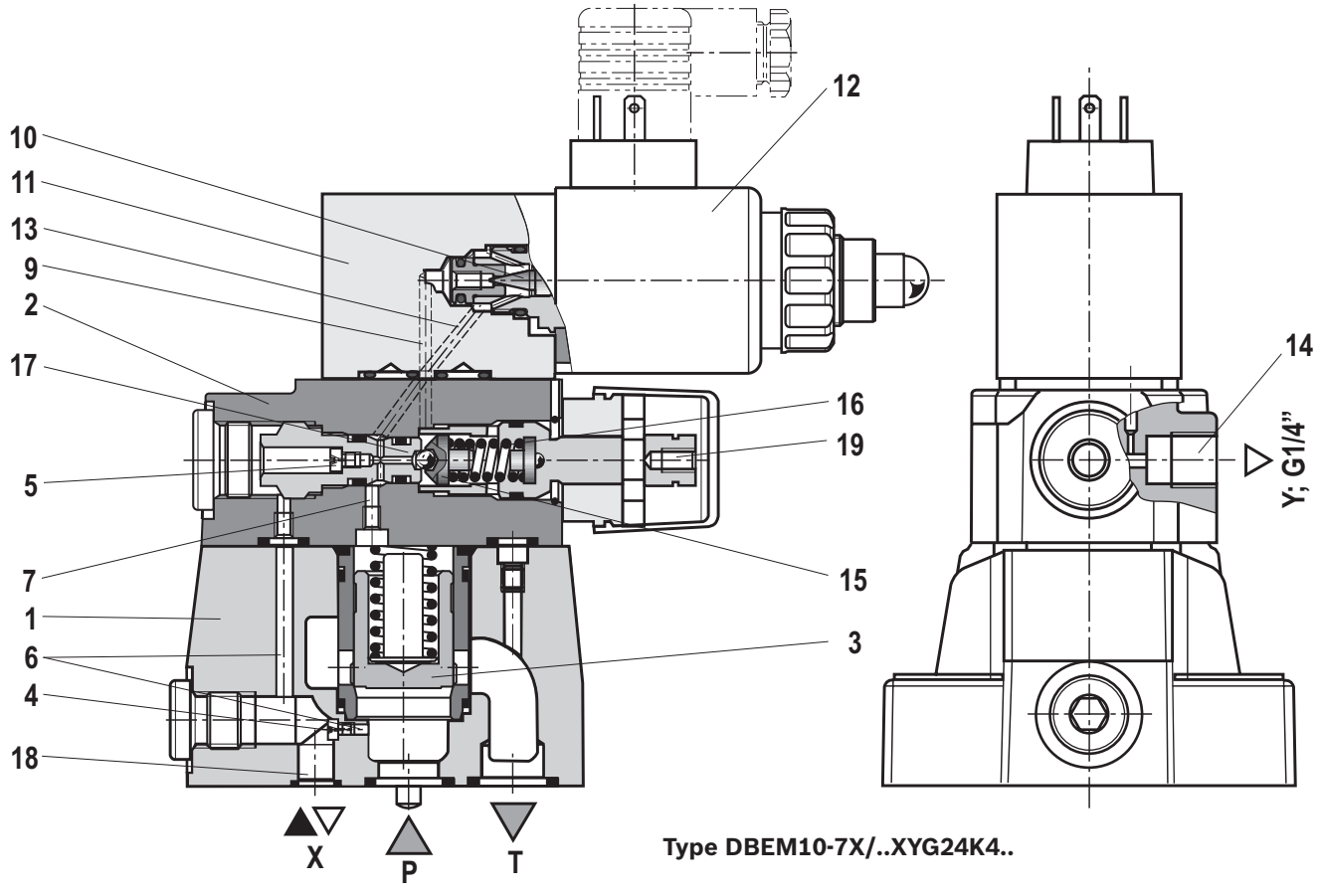
These valves basically consist of the housing (1) with main spool insert (3), the sandwich plate valve with maximum pressure limitation (2) and the proportional pilot control valve (11).

Type DBEM...

The pressure applied to channel P acts on the main spool (3). At the same time, the pressure at port P is applied to the spring loaded side of the main spool (3) via the control lines (6, 7) provided with nozzles (4, 5). Via the connection bore (9), the pressure is simultaneously applied to the poppet (10) of the proportional pilot control valve (11). The hydraulic force at the pilot poppet (10) acts against the command value-dependent force of the proportional solenoid (12).

If the hydraulic force exceeds the solenoid force, the pilot poppet is opened (10). The pilot oil can now flow via the control line (13) into port Y (14) and to the tank; thus, a pressure drop results at the main spool (3) over the control lines (6, 7). The connection from port P to T is released. The main spool (3) controls the set operating pressure at port P.

As hydraulic protection against inadmissibly high pressures, a spring-loaded pressure relief valve (2) has been integrated. This maximum pressure limitation is pre-set to the relevant pressure rating (see table page 6). In the operating range of the valve, the poppet (15) is held on the valve seat (17) by the spring (16) and is thus closed. If the pressure in the spring chamber of the main spool (3) exceeds the maximum admissible set pressure of the valve, the poppet (15) is pressed against the compression spring (16) and the connection into the spring chamber is opened. Via port Y (14), the pilot oil flows into the tank. Due to the control lines (6, 7), a pressure drop occurs at the main spool (3). The connection from port P to T is released. The main spool (3) controls the set maximum operating pressure in port P. Via the adjustment element (19), the pre-set pressure can be reduced, if necessary. Port Y (14) must be externally piped to the tank. The connection to the tank should be pressureless. Via port X (18), the valve may be unloaded or the maximum pressure may be limited.



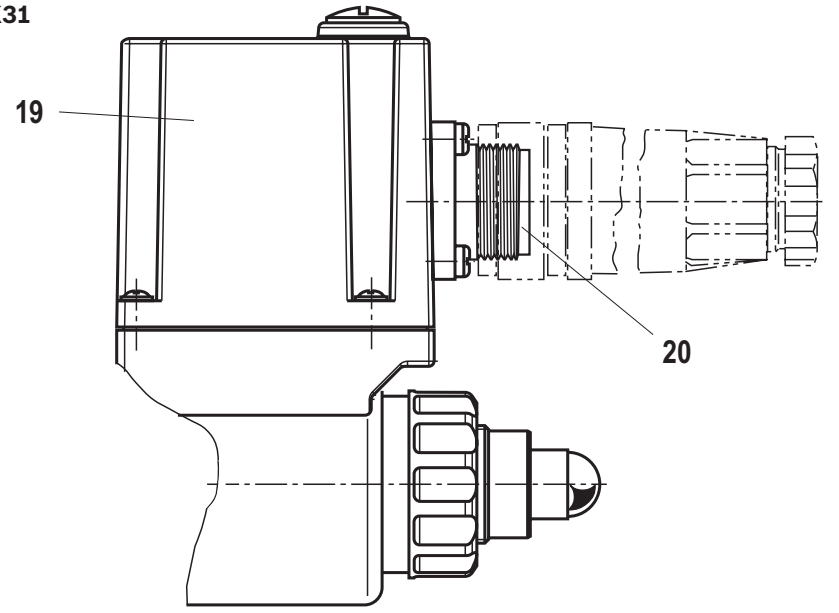
Type DBEM10-7X/..XYG24K4..

Function, section

Type DBEME – with integrated electronics (OBE)
In terms of function and design, these valves correspond to type DBEM. On the proportional solenoid, there is moreover a housing (19) with the control electronics.
Supply and command value voltage are applied to the connector (20).
In the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information on the control electronics, see page 9.

Type DBEME...-7X/...YG24K31



Technical data

(For applications outside these parameters, please consult us!)

general			**Size 10**	**Size 25**	**Size 32**
Weight	– Type DBEM	kg	4.5	5.3	6.4
	– Type DBEME	kg	4.7	5.5	6.6
	– Type DBEMG	kg	7	6,74	6.4
	– Type DBEMEG	kg	7,2	6,94	6.6
Installation position			Any		
Storage temperature range		°C	–20 to +80		
Ambient temperature range	– Type DBEM	°C	–20 to +70		
	– Type DBEME	°C	–20 to +50		

hydraulic (measured with HLP46, ϑ_{Oil} = 40 ±5 °C)			**Size 10**	**Size 25**	**Size 32**
Maximum operating pressure	– Port P and X	bar	350		
	– Port T	bar	315		
	– Port Y	bar	Separately and to the tank at zero pressure		
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		
Minimum set pressure with command value zero		bar	See characteristic curve page 10		
Maximum pressure limitation, set upon delivery			If necessary, the value may be reduced		
	– Pressure rating 50 bar	bar	to 75 bar		
	– Pressure rating 100 bar	bar	to 135 bar		
	– Pressure rating 200 bar	bar	to 240 bar		
	– Pressure rating 315 bar	bar	to 350 bar		
	– Pressure rating 350 bar	bar	to 390 bar		
Maximum flow		l/min	275 [1]	550	700
Pilot flow		l/min	0.4 to 1	0.4 to 1.5	0.4 to 1.5
Hydraulic fluid			See table page 7		
Hydraulic fluid temperature range		°C	–20 to +80		
Viscosity range		mm^2/s	15 to 380		
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]		
Hysteresis (see command value pressure characteristic curve)		%	≤ 5 of the maximum set pressure		
Linearity		%	±3.5 of the maximum set pressure		
Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve; pressure increasing	– Type DBEM	%	±5 of the maximum set pressure		
	– Type DBEME	%	±1.5 of the maximum set pressure		
Step response $T_u + T_g$	10 % → 90 %	ms	~100	Measured with standing hydraulic fluid column, 0.2 liters at port A	
	90 % → 10 %	ms	~100		
Step response $T_u + T_g$	10 % → 90 %	ms	~200	Measured with standing hydraulic fluid column, 5 liters at port A	
	90 % → 10 %	ms	~200		

1) Version G to 200 l/min

2) 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.

Technical data

(For applications outside these parameters, please consult us!)

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	– Insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– Soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Containing water	HFC	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**: Maximum pressure differential per control edge 210 bar, otherwise, increased cavitation erosion. Life cycle as compared to HLP 30 to 100 %
  Fluid temperature maximum 60 °C
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

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	20.6
	– Maximum hot value	Ω	8.05	33
Duty cycle		%	100	100

electrical, integrated electronics (OBE)			
Supply voltage	– Nominal voltage	VDC	24
	– Lower limit	VDC	21
	– Upper limit	VDC	35
Current consumption		A	≤ 1.5
Required fuse protection		A	2, time-lag
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

Caution!

At an ambient temperature of 70 °C and a duty cycle of 100 % with max. current, the coil reaches temperatures of up to 170 °C. Contact with the coil may lead to burns.

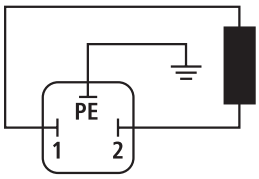
☞ **Notice!**

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

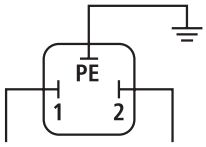
Electrical connection
(dimensions in mm)

Type DBEM

Connection at the connector

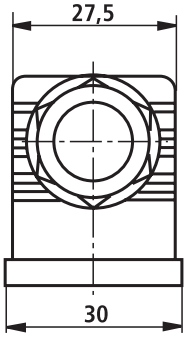


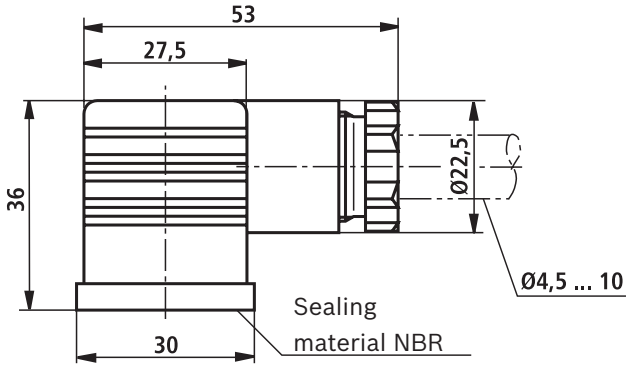
Connection at mating connector



to the amplifier

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



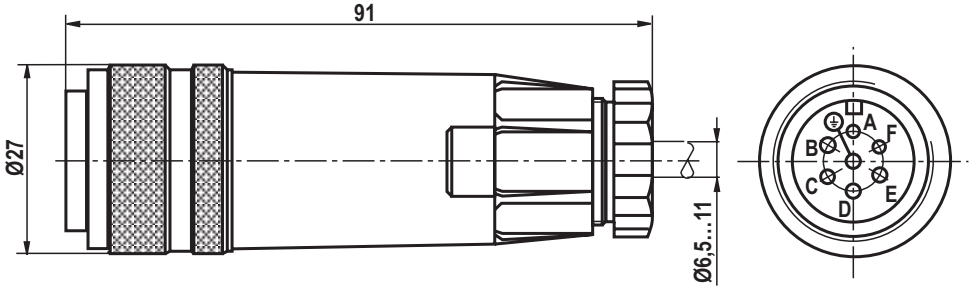


Type DBEME

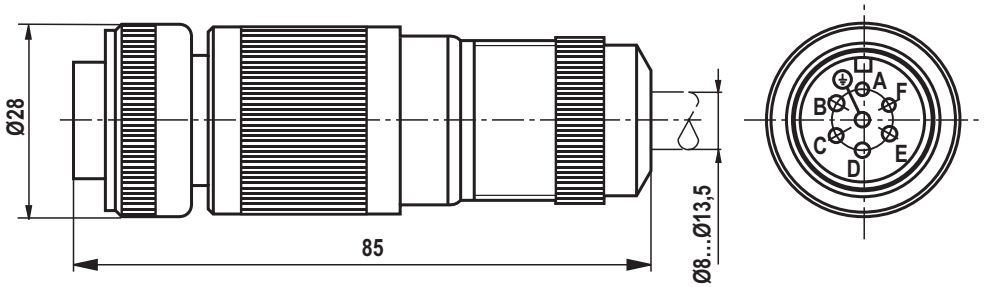
Device connector allocation	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	A	24 VDC (u(t) = 21 V to 35 V); I_{max} ≤ 1.5 A	
	B	0 V	
Reference potential actual value	C	Reference contact F; 0 V	Reference contact F; 0 V
Differential amplifier input	D	0 to 10 V; R_E = 100 kΩ	4 to 20 mA; R_E = 100 Ω
	E	Reference potential command value	
Measuring output (actual value)	F	0 to 1.6 V actual value (1 mV ≙ 1 mA) load resistance > 10 kΩ	
Protective earth	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 mm²

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



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

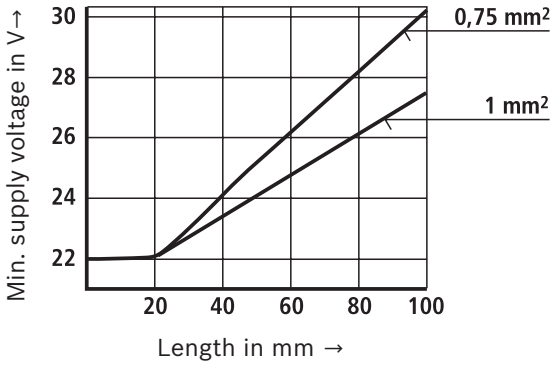


Electrical connection

Connection cable for type DBEME

– Recommendation 6-wire, 0.75 or 1 mm² plus protective earthing 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 electronics (OBE) for type DBEME

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.

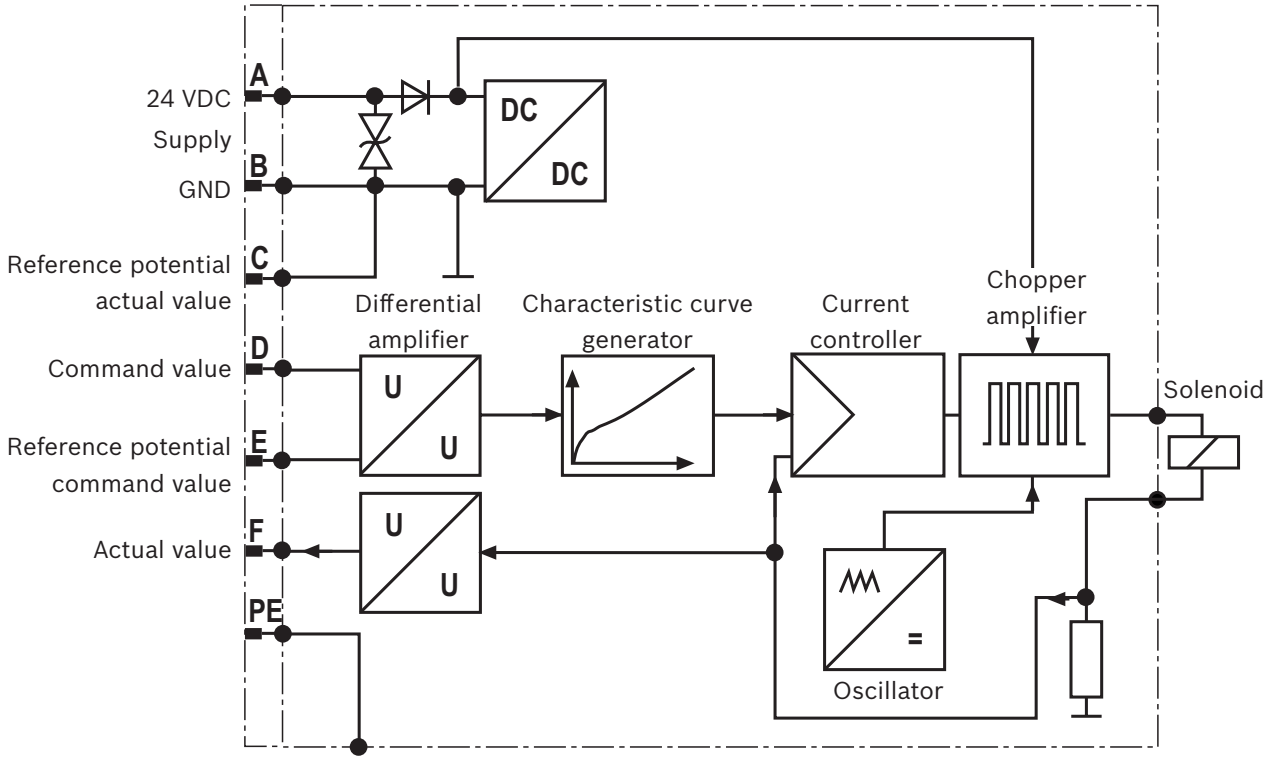
Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulic system are compensated for and a linear command value pressure characteristic curve is created.

The current controller controls the solenoid current independent 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).

For checking 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

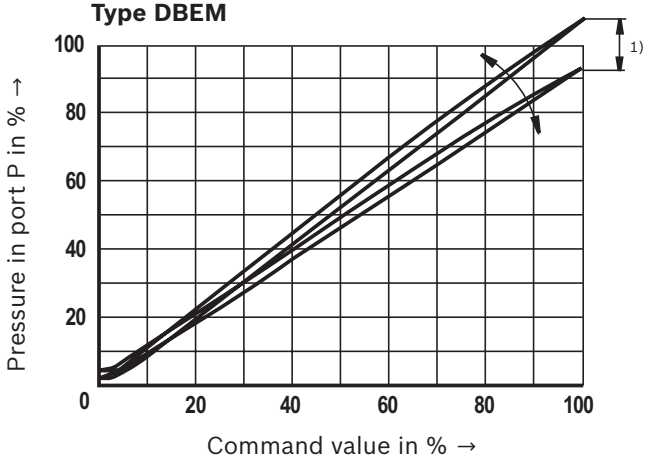


Characteristic curves

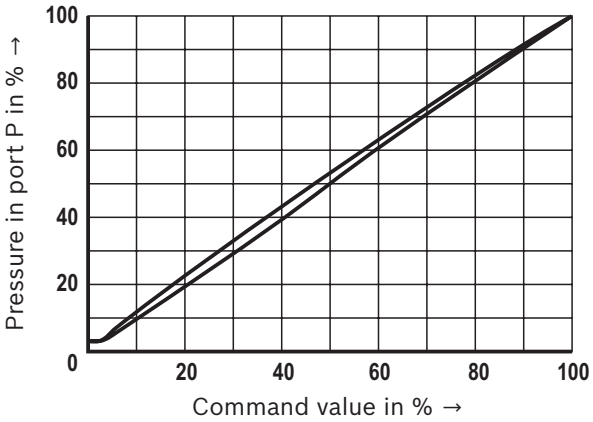
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Pressure in port P depending on the command value (flow = 24 l/min)

Type DBEM

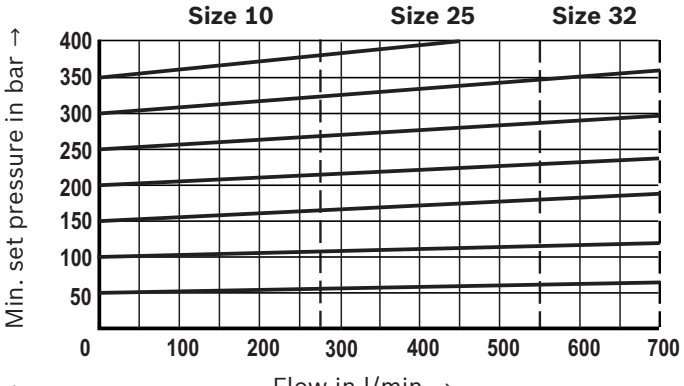


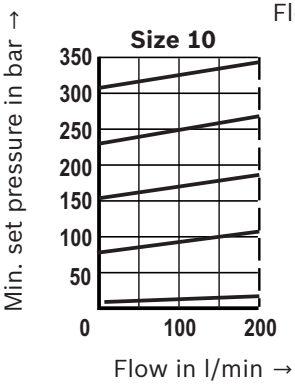
Type DBEME



1) With valve type DBEM, the manufacturing tolerance at the **external amplifier** (type and data sheet see page 16) can be changed using the command value attenuator potentiometer "**Gw**". The digital amplifier is set using the parameter "Limit".
In this connection, the control current according to the technical data must not be exceeded.
In order to be able to adjust several valves to the same characteristic curve, don't set the pressure higher than the maximum set pressure of the pressure rating with command value 100 %.

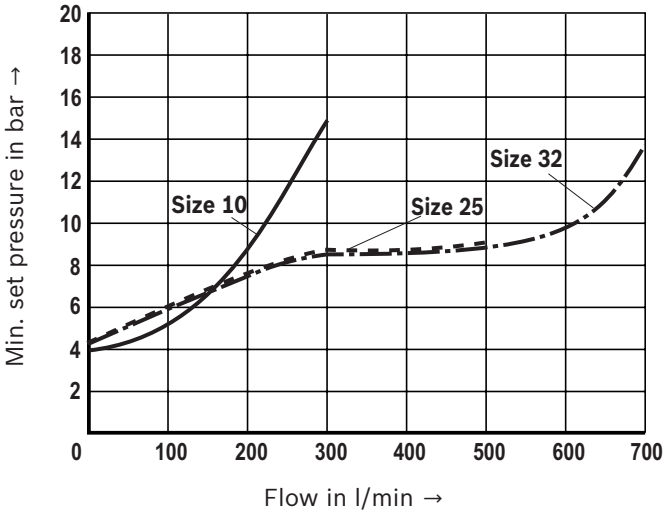
Set pressure depending on the flow





Version G
(Characteristic curves for size 25 and size 30 identical to version „subplate mounting“)

Min. set pressure with command value 0



The characteristic curves apply to output pressure in T or Y = 0 bar in the total flow range.

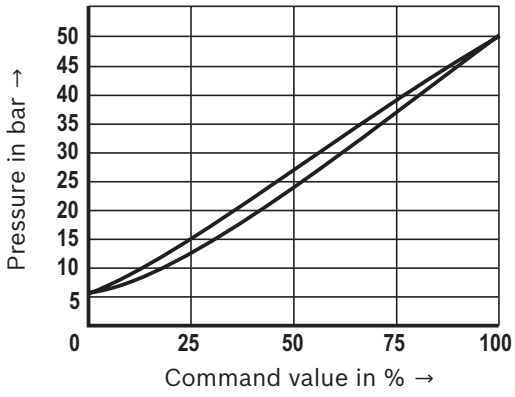
Notice: So that the minimum set pressure is achieved, the pilot current must not exceed 100 mA.

Characteristic curves

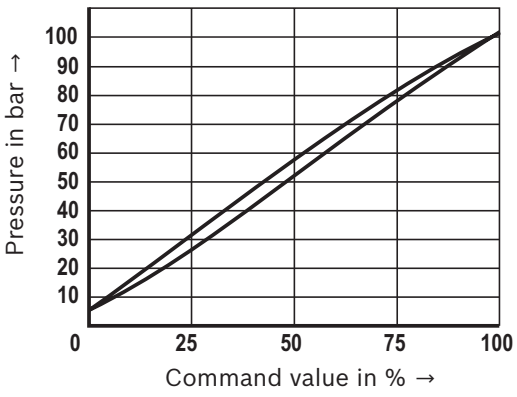
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Command value pressure characteristic curves (measured with a flow of 24 l/min and with amplifier VT-MSPA1-1)

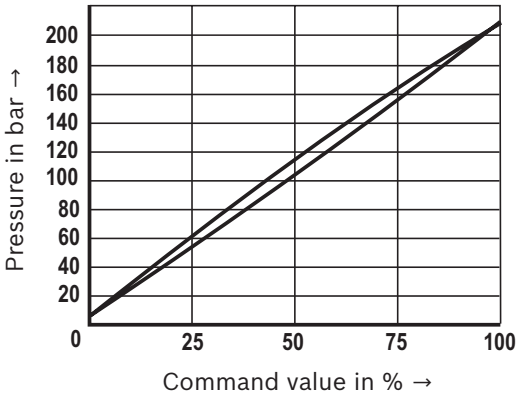
Pressure rating 50 bar



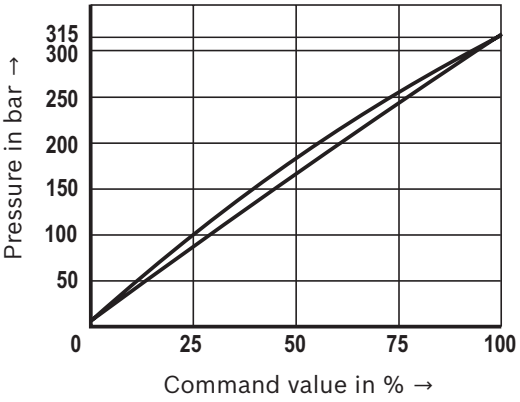
Pressure rating 100 bar



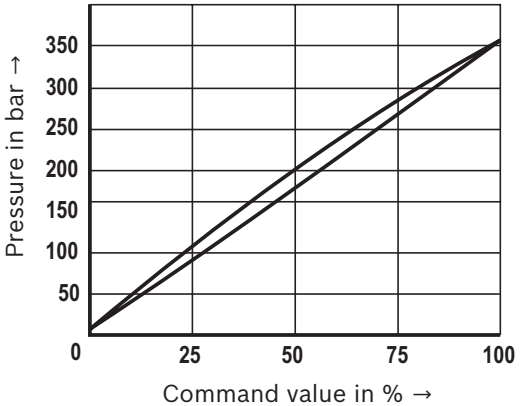
Pressure rating 200 bar



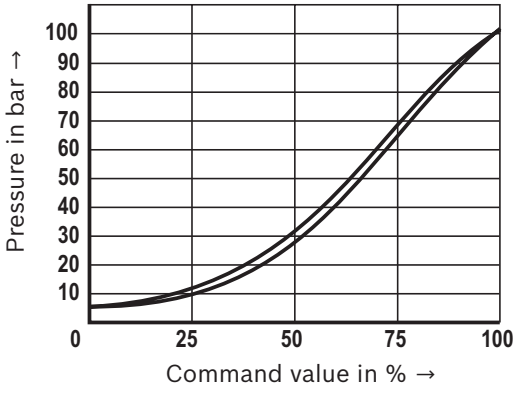
Pressure rating 315 bar



Pressure rating 350 bar



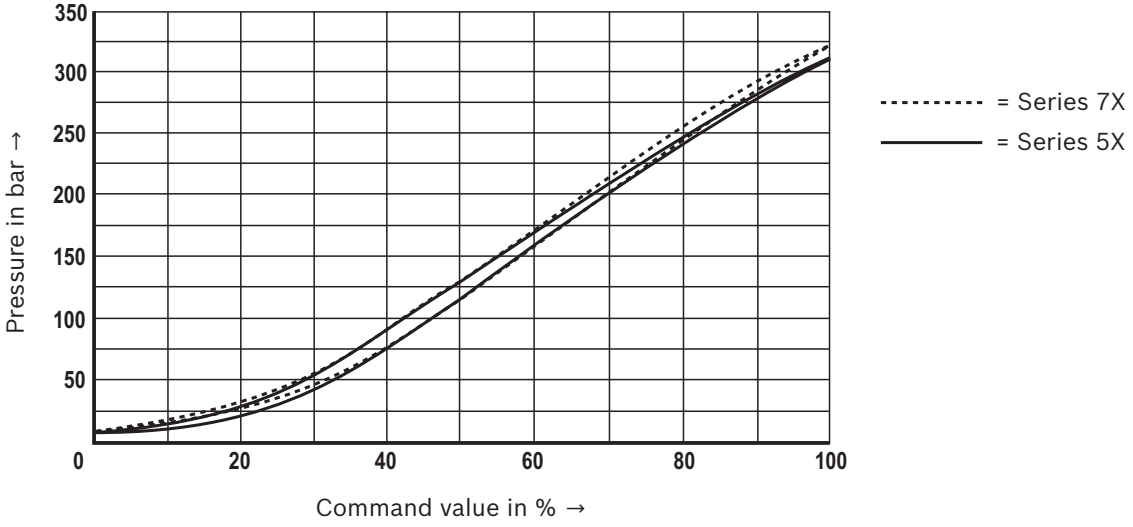
Pressure rating 100 bar (with amplifier VT-VSPA1-1)



Characteristic curves

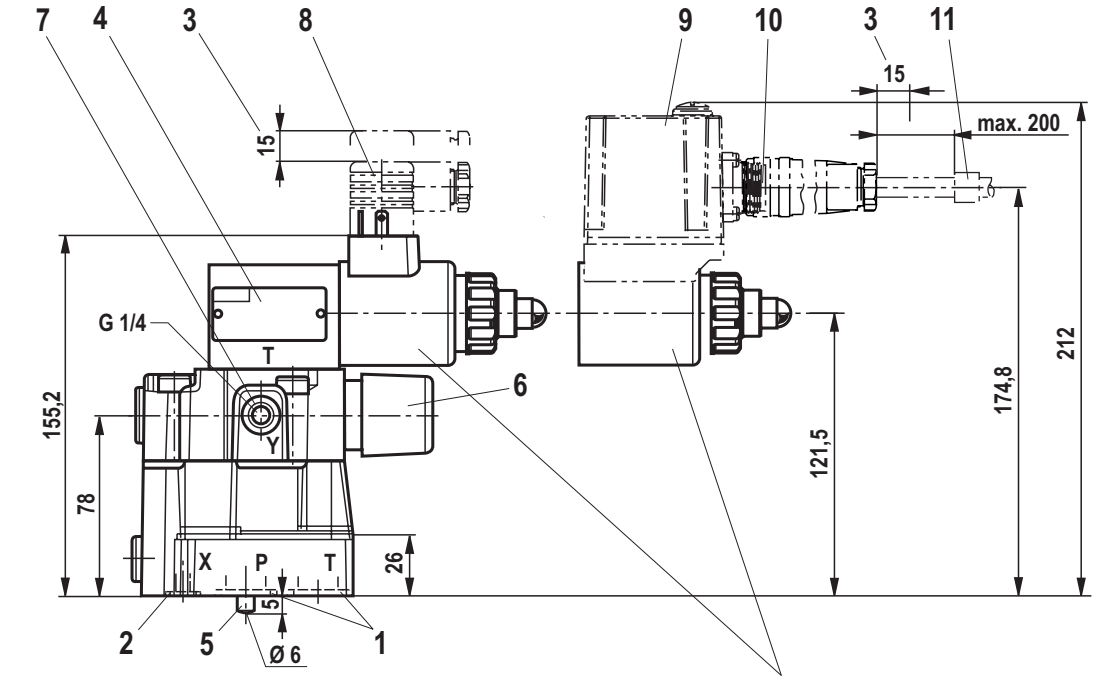
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

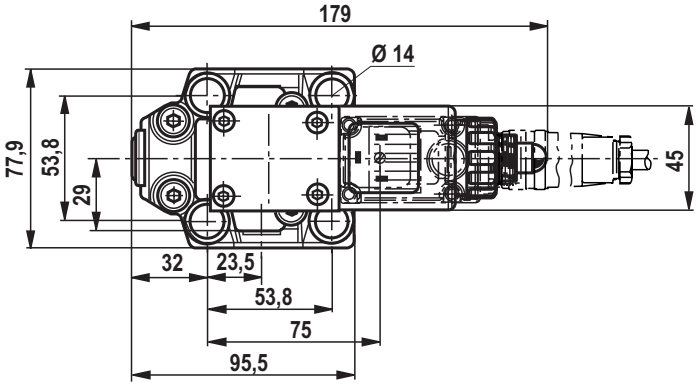
Comparison series 5X and 7X using the pressure rating 315 bar as example (with amplifier VT-SSPA1-1-1X with 800 mA coil)



Dimensions: Type DBEM(E) 10

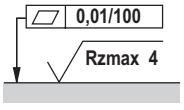
(dimensions in mm)





Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.



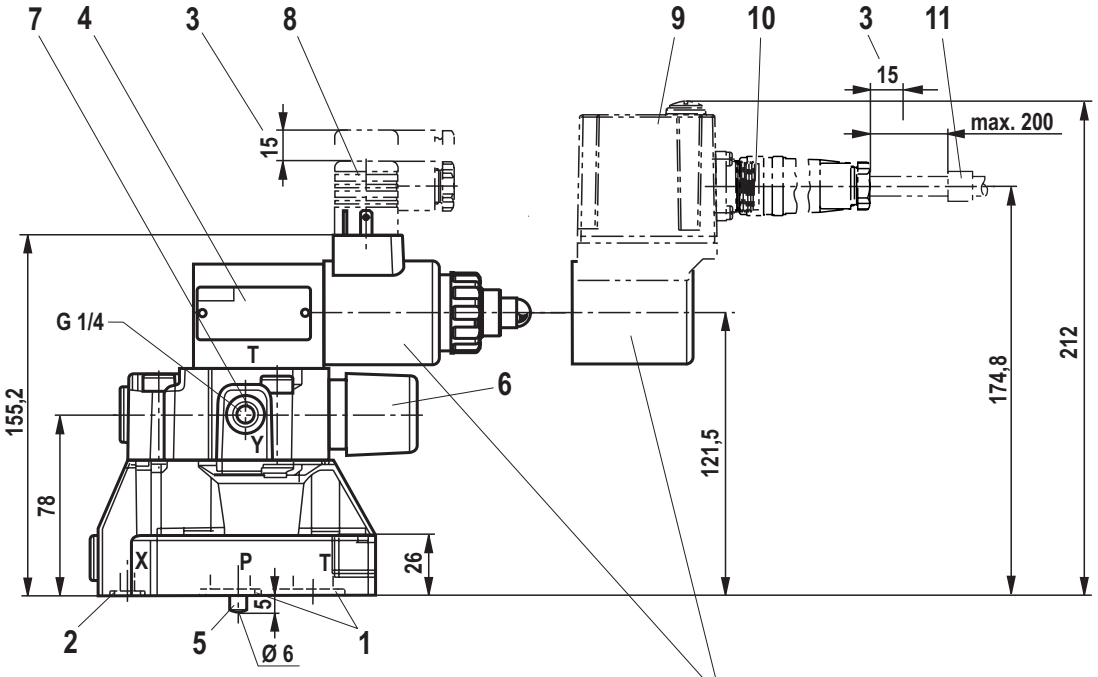
Required surface quality of the valve contact surface

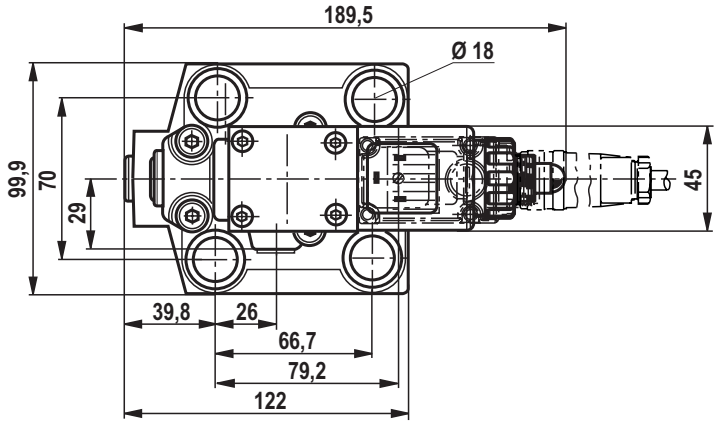
1 Seal rings for ports P and T
2 Seal ring for ports X
3 Space required to remove the mating connector
4 Name plate
5 Locating pin
6 Maximum pressure limitation
7 External pilot oil return, separately and to the tank at zero pressure
8 Mating connector for type DBEM
9 Integrated electronics (OBE)
10 Mating connector for type DBEME
11 Cable fastening

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws and **subplates** see page 19.

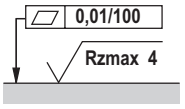
Dimensions: Type DBEM(E) 25
(dimensions in mm)





Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.



Required surface quality of the valve contact surface

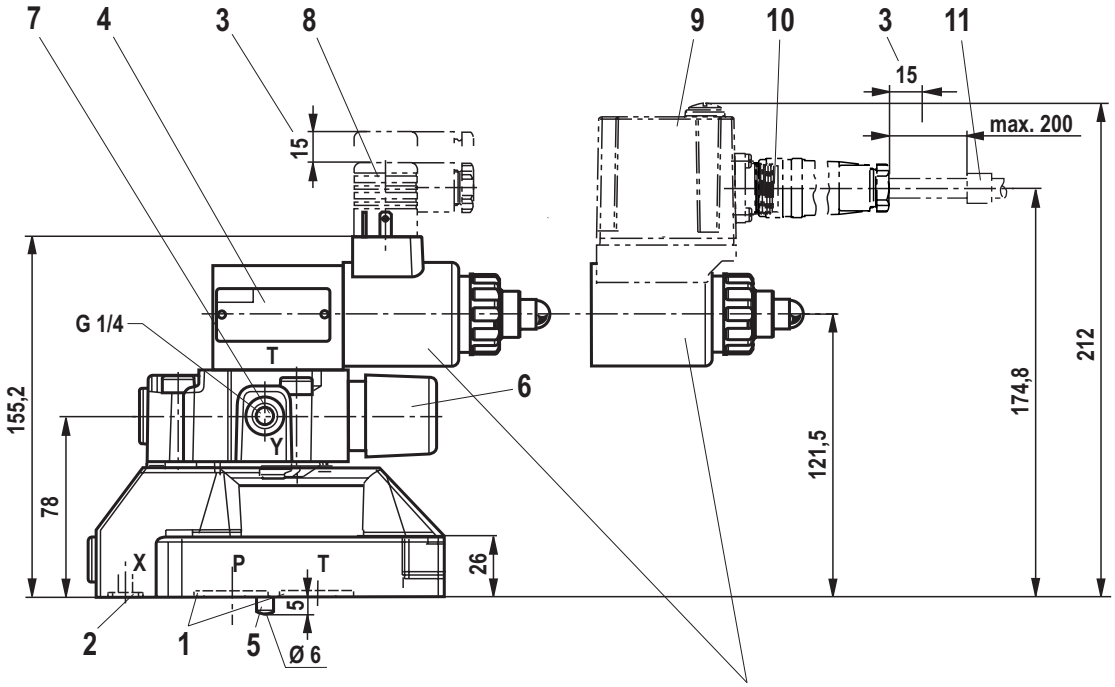
1 Seal rings for ports P and T
2 Seal ring for ports X
3 Space required to remove the mating connector
4 Name plate
5 Locating pin
6 Maximum pressure limitation
7 External pilot oil return, separately and to the tank at zero pressure
8 Mating connector for type DBEM
9 Integrated electronics (OBE)
10 Mating connector for type DBEME
11 Cable fastening

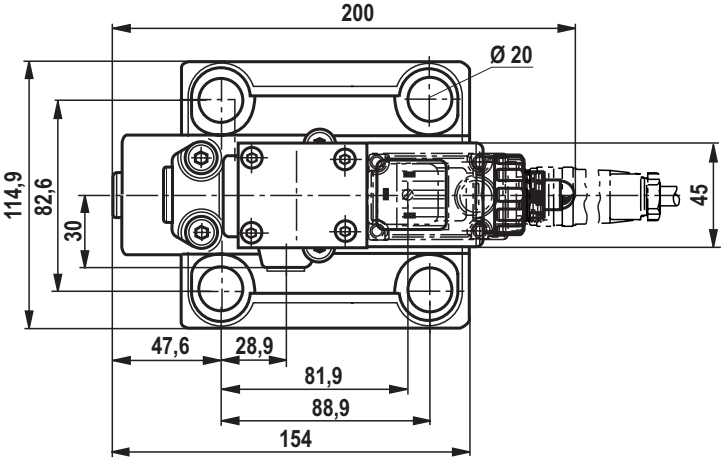
Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws and **subplates** see page 19.

Dimensions: Type DBEM(E) 32

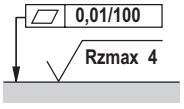
(dimensions in mm)





Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.



Required surface quality of the valve contact surface

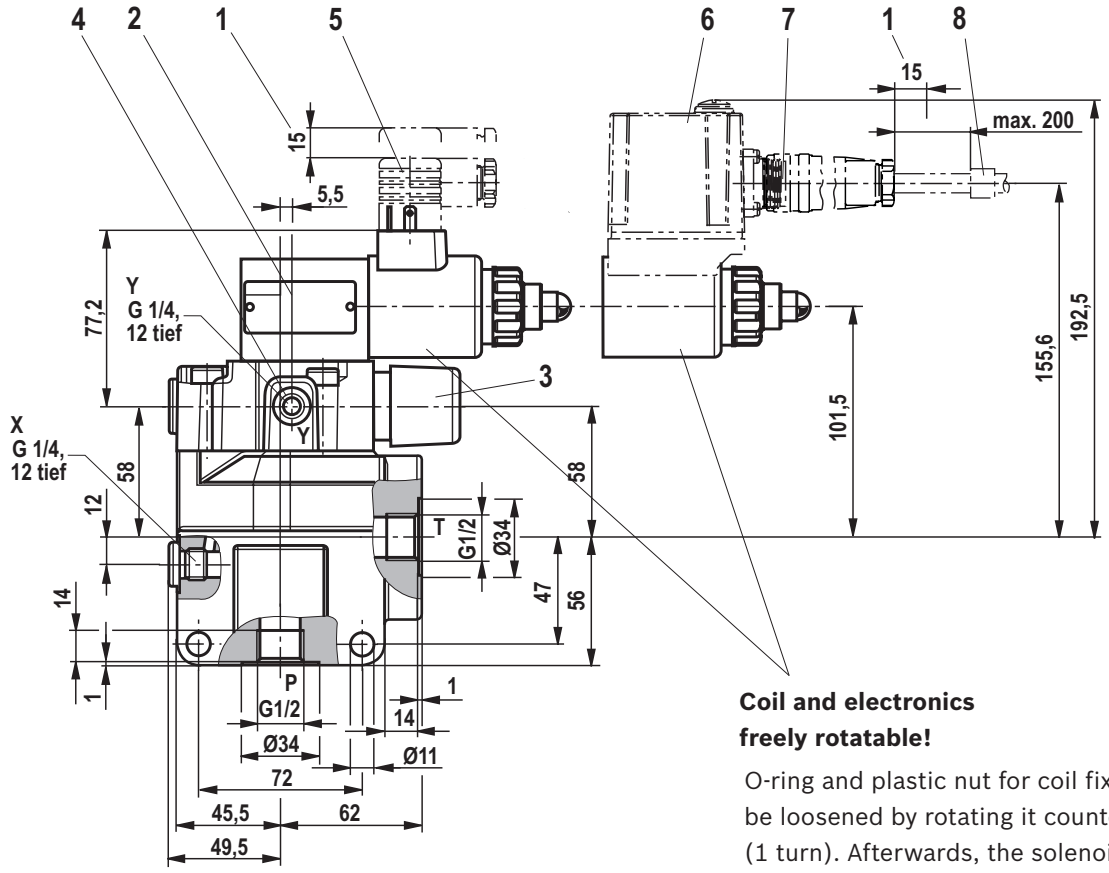
1 Seal rings for ports P and T
2 Seal ring for ports X
3 Space required to remove the mating connector
4 Name plate
5 Locating pin
6 Maximum pressure limitation
7 External pilot oil return, separately and to the tank at zero pressure
8 Mating connector for type DBEM
9 Integrated electronics (OBE)
10 Mating connector for type DBEME
11 Cable fastening

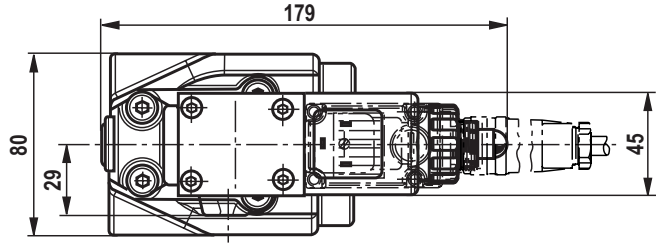
Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws and **subplates** see page 19.

Dimensions: Type DBEM(E) 10G

(dimensions in mm)





Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.

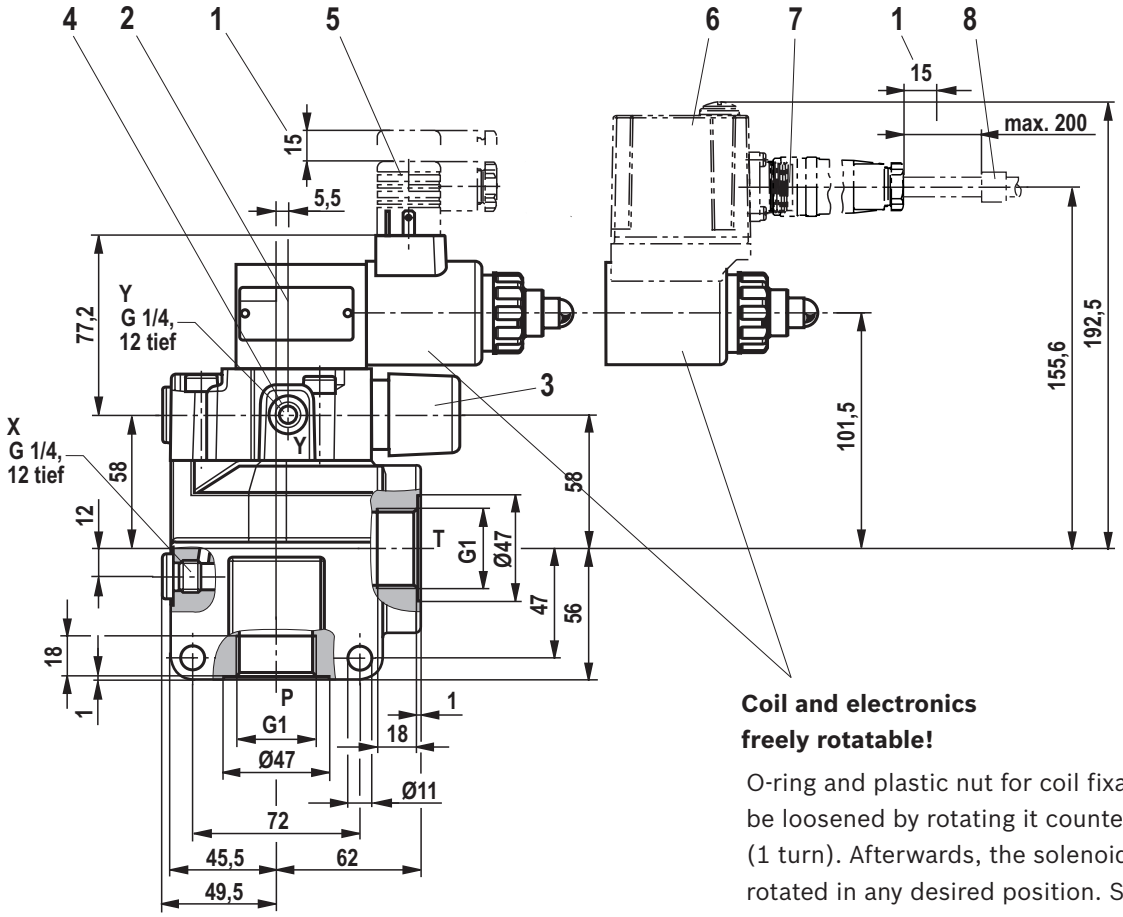
1 Space required to remove the mating connector
2 Name plate
3 Maximum pressure limitation
4 External pilot oil return, separately and to the tank at zero pressure
5 Mating connector for type DBEM
6 Integrated electronics (OBE)
7 Mating connector for type DBEME
8 Cable fastening

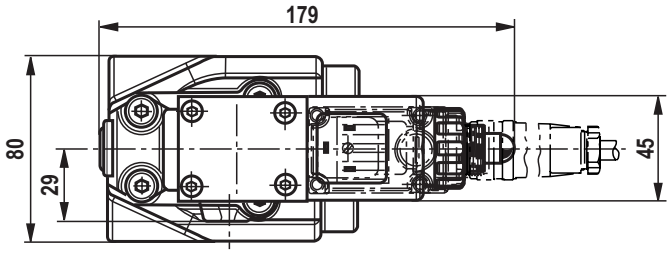
Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws and **subplates** see page 19.

Dimensions: Type DBEM(E) 25G

(dimensions in mm)





Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.

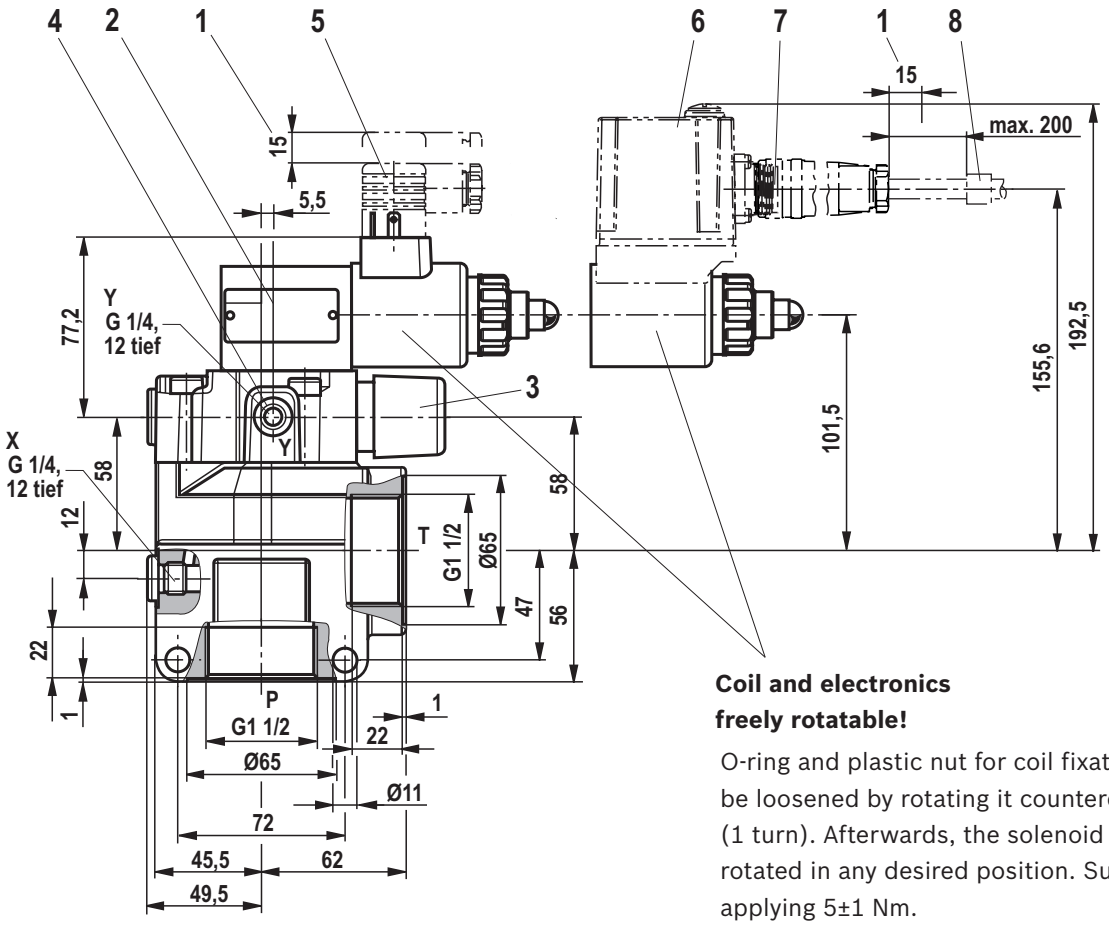
1 Space required to remove the mating connector
2 Name plate
3 Maximum pressure limitation
4 External pilot oil return, separately and to the tank at zero pressure
5 Mating connector for type DBEM
6 Integrated electronics (OBE)
7 Mating connector for type DBEME
8 Cable fastening

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws and **subplates** see page 19.

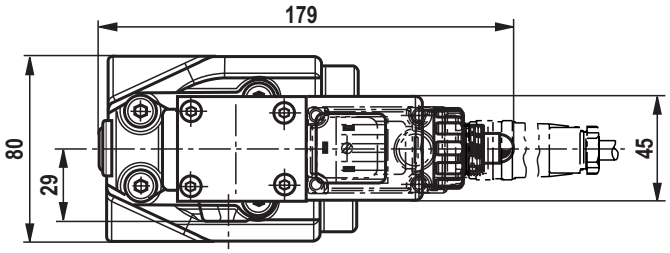
Dimensions: Type DBEM(E) 32G

(dimensions in mm)



Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.



1 Space required to remove the mating connector
2 Name plate
3 Maximum pressure limitation
4 External pilot oil return, separately and to the tank at zero pressure
5 Mating connector for type DBEM
6 Integrated electronics (OBE)
7 Mating connector for type DBEME
8 Cable fastening

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws and **subplates** see page 19.

Dimensions

Hexagon socket head cap screws (separate order)		**Material number**
Size 10	4x ISO 4762 - M12 x 50 - 10.9-flZn-240h-L Friction coefficient μ_{total} = 0.09 to 0.14; Tightening torque M_A = 75 Nm ±10 %	R913000283
Size 25	4x ISO 4762 - M16 x 50 - 10.9-flZn-240h-L Friction coefficient μ_{total} = 0.09 to 0.14; Tightening torque M_A = 185 Nm ±10 %	R913000378
Size 32	4x hexagon socket head cap screw DIN 912 - M18 x 50 - 10.9-flZnnc-240h-L Friction coefficient μ_{total} = 0.09 to 0.14; Tightening torque M_A = 248 Nm ±10 %	R913031952

Notice: For reasons of stability, exclusively these valve mounting screws may be used. The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure!

Subplates	**Data sheet**	**Material number**
Size 10, 25, 32	45064	

Accessories
(not included in the delivery)

External control for type DBEM (only standard version G24)	**Data sheet**	**Material number**
VT-MSPA1-1-1X/V0/... in modular design (analog) VT-VSPD-1-2X/V0/.-0-1 in Euro-card format (digital) VT-VSPA1-2-1X/V0/...in Euro-card format (analog) VT-SSPA1-1-1X/V0/0-24 as plug-in amplifier	30223 30523 30115 30116	

Additionally (800 mA version G24-8)	**Data sheet**	**Material number**
VT-2000-5X/X/V0/... in Euro-card format VT-MSPA1-30 in modular design (analog)	29904 30224	

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

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