RE 29286
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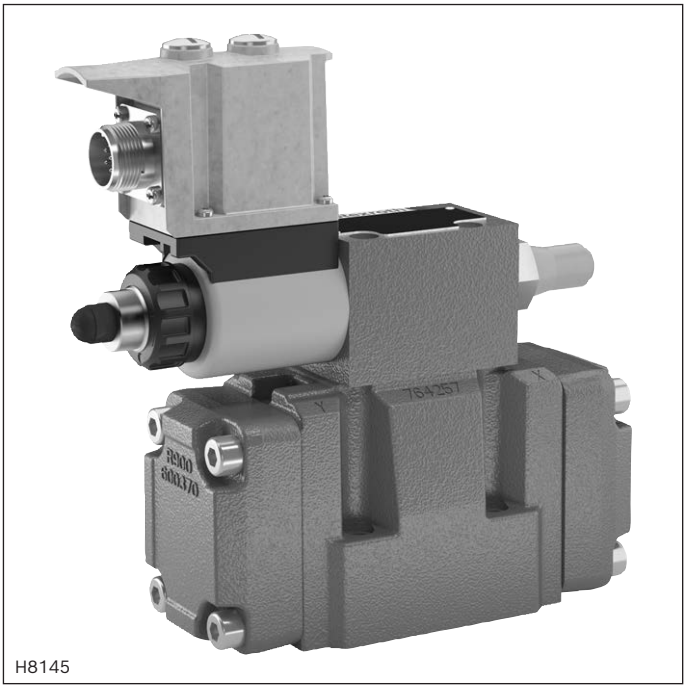
Replaces: 2014-02

rexroth
A Bosch Company

Proportional pressure reducing valve, pilot-operated

Type 3DRE(M) and 3DRE(M)E



H8145

- Sizes 10 and 16
- Component series 7X
- Maximum set pressure 315 bar
- Maximum flow 300 l/min

Features

- 3-way version
- Operation by means of proportional solenoid with rotatable coil
- For subplate mounting
- Porting pattern according to ISO 4401
- Maximum pressure limitation, optional
- Valve and control electronics from a single source
- Integrated electronics (OBE) (type 3DRE(M)E):
  - Little manufacturing tolerance of the command value pressure characteristic curve
- External control electronics (type 3DRE(M)
- Linear command value pressure characteristic curve

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Ordering code

01	02	03	04	05		06		07	08	09	10	11	12	13	14
3DRE				**P**	**–**	**7X**	**/**			**G24**					*****

01	Proportional pressure reducing valve in 3-way version	**3DRE**
02	**Without** maximum pressure limitation	**no code**
	With maximum pressure limitation	**M**
03	For external control electronics	**no code**
	With integrated electronics (OBE)	**E**

Size

04	Size 10	**10**
	Size 16	**16**
05	Subplate mounting	**P**
06	Component series 70 ... 79 (70 ... 79: unchanged installation and mounting dimensions)	**7X**

Pressure rating

07	Up to 50 bar	**50**
	Up to 100 bar	**100**
	Up to 200 bar	**200**
	Up to 250 bar (only size 16)	**250**
	Up to 315 bar (only size 10)	**315**
08	Internal pilot oil supply, external pilot oil return	**Y**
	External pilot oil supply, external pilot oil return	**XY**

Supply voltage

09	24 VDC voltage	**G24**

Coil

10	1600 mA	**no code**
	800 mA (only for external control electronics)	**-8**

Electrical connection

11	**– Type 3DRE(M)**	
	Without mating connector; connector DIN EN 175301-803	**K4**
	– Type DBE(M)E	
	Without mating connector; connector DIN EN 175201-804	**K31**

Interfaces of the control electronics

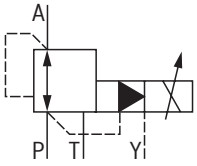
12	Command value input 0 ... 10 V	**A1**
	Command value input 4 ... 20 mA	**F1**
	External control electronics	**no code**

Seal material (observe compatibility of seals with hydraulic fluid used, see page 7)

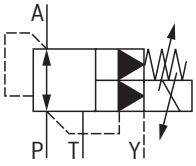
13	FKM seals	**V**
	NBR seals	**M**
14	Further details in the plain text	

Symbols

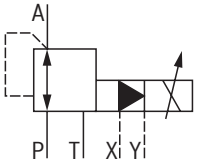
"3DRE....**Y**..."



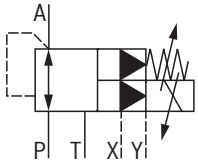
"3DREM....**Y**..."



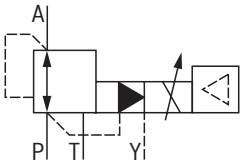
"3DRE....**XY**..."



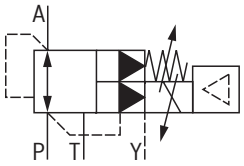
"3DREM....**XY**..."



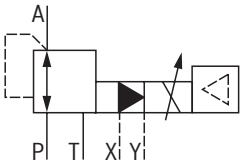
"3DREE....**Y**..."



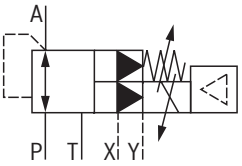
"3DREME....**Y**..."



"3DREE....**XY**..."



"3DREME....**XY**..."



Function, section

The valve types 3DRE(M) and 3DRE(M)E are electrically pilot-operated 3-way pressure reducing valves with pressure limitation of the actuator.
They are used for reduction (P to A) and limitation (A to T) of a system pressure.

Set-up

The valves consist of two main assemblies:

- Pilot control valve (1) with proportional solenoid (2), optionally with maximum pressure limitation (15)
- Main valve (3) with main control spool (4)

Function

- Command value-dependent setting of the pressure to be reduced in port A via the pilot control valve (1).
- With depressurized port P, the springs (5) and (6) hold the main control spool (4) in its central position. In this way, a start-up jump at the actuator is prevented.
- Pilot fluid flows from bore (7) via the flow controller (8), via the control chamber (11) to the throttle gap (9), via line (10) to port Y. This connection is to be led into the tank at zero pressure.

Pressure reduction

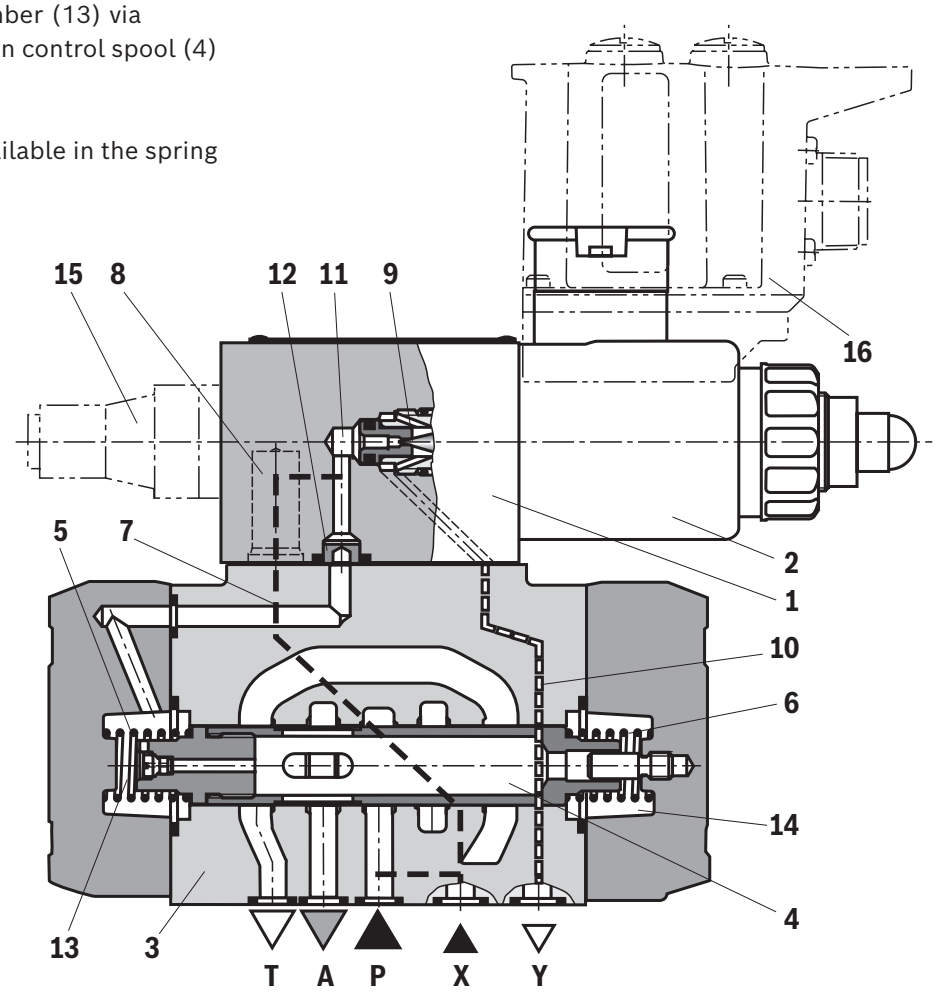
- Build-up of the pilot pressure in the control chamber (11) as a function of the command value.
- Pressure build-up in the spring chamber (13) via nozzle (12) and movement of the main control spool (4) to the right.
  Hydraulic fluid flows from P to A.
- The actuator pressure in port A is available in the spring chamber (14).
- Increase in the pressure in port A to the set pressure of the pilot control valve (1) leads to the movement of the main spool (4) to the left. Pressure in port A is almost identical with the set pressure at the pilot control valve (1).

Pressure limitation

- If the pressure in port A exceeds the set pressure of the pilot control valve (1), the main control spool (4) is moved further to the left.
- This opens the connection from A to T and limits the pressure pending in port A to the set command value.

Type 3DREM

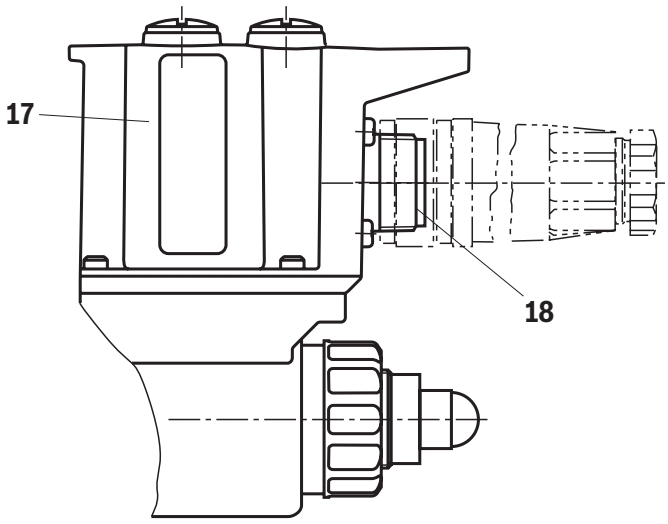
For hydraulic protection against an inadmissibly high electric control current at the proportional solenoid, which imperatively results in increased pressures in port A, you can optionally install a spring-loaded pressure relief valve as maximum pressure limitation (15).
The maximum pressure limitation is pre-set, referred to the relevant pressure rating (see page 6).



Function, section

Type 3DREE and 3DREME (with integrated electronics (OBE))
With regard to function and set-up, these valves correspond to types 3DRE and 3DREM. At the pilot control valve, there is moreover a housing (17) with the control electronics.
Supply and command value voltage are applied to the connector (18).
At the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information, see page 9.



Type 3DRE(M)E...YG24K31

Pilot oil supply

Type 3DRE...XY
External pilot oil supply, external pilot oil return
The pilot oil is supplied externally from a separate pilot circuit.
The pilot oil return is implemented externally via port Y into the tank.

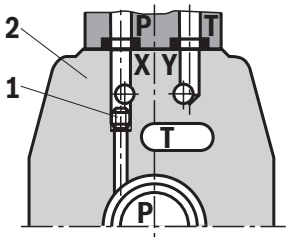
Type 3DRE...Y
Internal pilot oil supply, external pilot oil return
The pilot oil supply is implemented internally from channel P of the main valve.
The pilot oil return is implemented externally via port Y into the tank.
In the subplate, port X is closed.

1 Plug screw M6 according to DIN 906, wrench size 3 – pilot oil return
2 Main valve
3 Cover

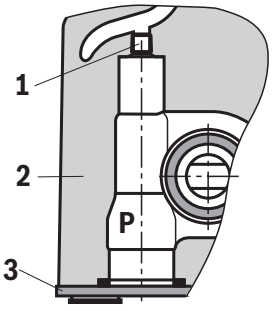
Pilot oil supply
External: **1** closed
Internal: **1** open

Pilot oil return
external

Size 10



Size 16



Technical data
(For applications outside these values, please consult us!)

General				
Size		NG	10	16
Weight	▶ Type 3DRE and 3DREM	kg	7.5	10.3
	▶ Type 3DREE and 3DREME	kg	7.6	10.4
Installation position			any, preferably horizontal	
Storage temperature range		°C	–20 ... +80	
Ambient temperature range	▶ Type 3DRE and 3DREM	°C	–20 ... +70	
	▶ Type 3DREE and 3DREME	°C	–20 ... +50	

Hydraulic				
Maximum operating pressure	▶ Port P and X	bar	350	315
	▶ Port A and T	bar	315	250
	▶ Port Y	bar	separate and depressurized to the tank	
Maximum set pressure in channel A	▶ Pressure rating 50 bar	bar	50	50
	▶ Pressure rating 100 bar	bar	100	100
	▶ Pressure rating 200 bar	bar	200	200
	▶ Pressure rating 250 bar	bar	–	250
	▶ Pressure rating 315 bar	bar	315	–
Minimum set pressure in channel A with flow, with command value zero, see characteristic curves page 8		bar	< 5	< 4
Maximum pressure limitation (continuously adjustable, set at the factory)	▶ Pressure rating 50 bar	bar	70	
	▶ Pressure rating 100 bar	bar	130	
	▶ Pressure rating 200 bar	bar	230	
	▶ Pressure rating 250 bar (size 16)	bar	270	
	▶ Pressure rating 315 bar (size 10)	bar	350	
Maximum flow		l/min	125	300
Pilot flow		l/min	1.1	
Hydraulic fluid			see table page 7	
Hydraulic fluid temperature range		°C	–20 ... +80	
Viscosity range		mm^2/s	15 ... 380	
Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c)			class 20/18/15 [1]	
Hysteresis		%	±3 [2]	
Repetition accuracy		%	< ±2 [2]	
Linearity		%	±3.5 [2]	
Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve; pressure increasing	▶ Type 3DRE(M) [4]	%	< ±1.5 [2; 5]	
	▶ Type 3DRE(M)E [3]		< ±1.5 [2; 5]	
	▶ Type 3DRE(M) [4]	%	< ±5 [2; 6]	
	▶ Type 3DRE(M)E [3]	%	< ±1.5 [2; 6]	
Step response $T_u + T_g$	Command value 10 % → 90 %	ms	< 140 [7]	

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components. Available filters can be found at www.boschrexroth.com/filter.

[2] Of the maximum set pressure

[3] Comparison at the factory

[4] Details see page 10

[5] At 20 % of the command value

[6] At 100 % of the command value

[7] Measured with standing hydraulic fluid column, 1.0 liter at port A

Technical data

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	FKM	ISO 12922	90222
		HFDU (ester base)	FKM		
		HFDR	FKM		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	ISO 12922	90223

☞ **Important information on hydraulic fluids:**

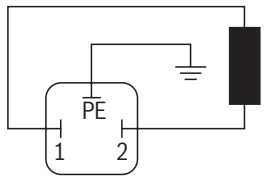
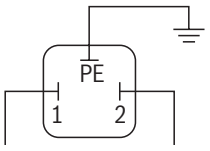
- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- **Bio-degradable and flame-resistant – containing water:**
  If components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.
- **Flame-resistant – containing water:**
  - Due to increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30 % as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended – if possible specific to the installation – to back up the return flow pressure in ports T to approx. 20 % of the pressure differential at the component.
  - Dependent on the hydraulic fluid used, the maximum environment and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, the command value profile is to be adjusted for proportional and high-response valves.

Electric				
Version			"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 value	VDC	21
	▶ Upper limit value	VDC	35
Current consumption		A	≤ 1.5
Fuse protection		A	2 (time-lag)
Inputs	▶ Voltage	V	0 ... 10
	▶ Current	mA	4 ... 20
Output	▶ Actual current value	mV / mA	1
Protection class of the valve according to EN 60529			IP65 (with correctly installed electrical connection)

Electrical connections and assignment

▶ Type 3DRE and 3DREM

Connection to	
Connector	**Mating connector**
	 to the amplifier

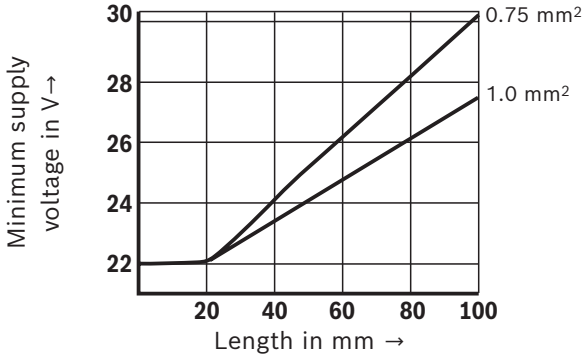
▶ Type 3DREE and 3DREME

Connector pin assignment	Contact	Interface assignment	
		"A1"	**"F1"**
Supply voltage	A	24 VDC (u(t) = 21 V ... 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 ... 10 V; R_E = 100 kΩ	4 ... 20 mA; R_E = 100 Ω
	E	reference potential command value	
Measuring output (actual value)	F	0 ... 1.6 V actual value (1 mV ≙ 1 mA) load resistance > 10 kΩ	
Protective ground	PE	functional ground (directly connected to the valve housing)	

☞ **Notice:**
Mating connectors, separate order, see page 18 and data sheet 08006.

Connection cable for type 3DRE(M)E
- ▶ Recommendation 6-wire, 0.75 or 1 mm² 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).



Block diagram: Integrated electronics (OBE)

Function

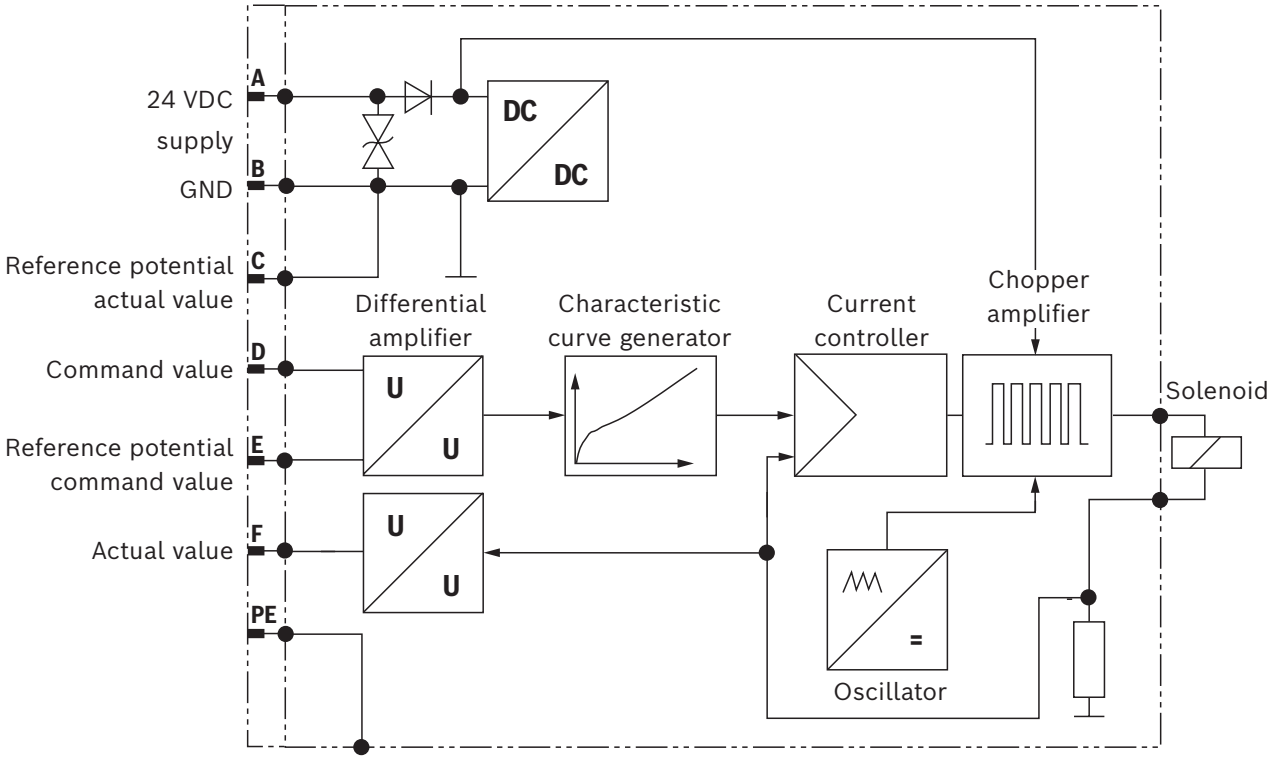
The electronics are supplied with voltage via ports A and B. The command value is applied to the differential amplifier ports D and E.

Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulics are compensated for and 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 clock 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.

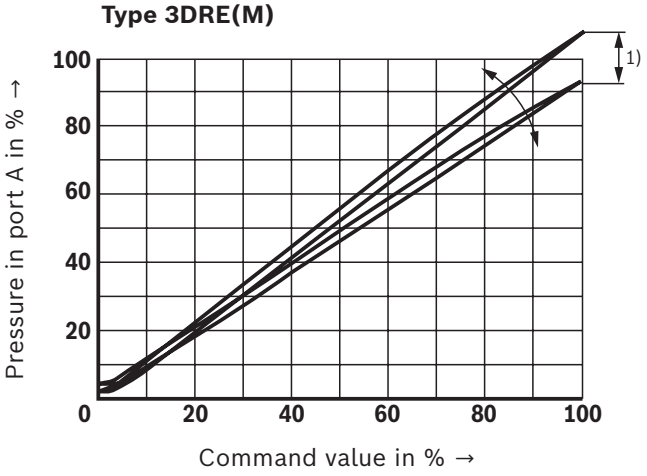


Characteristic curves

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

Pressure in port A depending on the command value (manufacturing tolerance) – Without flow

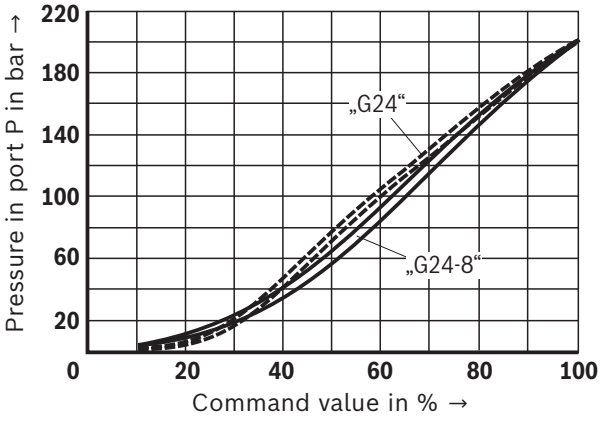
Type 3DRE(M)



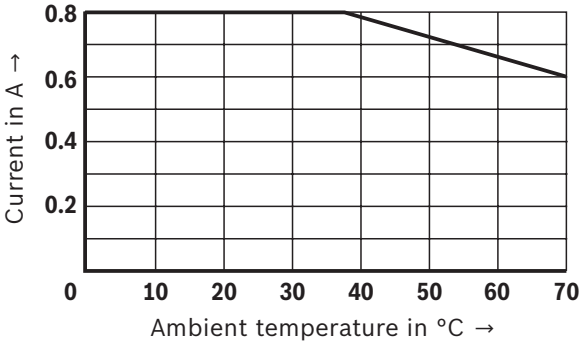
1) In order to be able to adjust several valves to the same characteristic curve, the manufacturing tolerance can - with version 3DRE(M) - be changed at the external amplifier (see page 18) using the command value attenuator "G". In this connection, do not set the pressure higher than the maximum set pressure of the pressure rating with command value 100 %.

Pressure in port P depending on the command value

Comparison "G24" and "G24-8", pressure rating 200 bar
(with amplifier VT-VSPA1-1-1X, 800 mA coil)



Current drop with version "G24-8"
(increasing ambient temperature, 24 V, 100 % duty cycle)

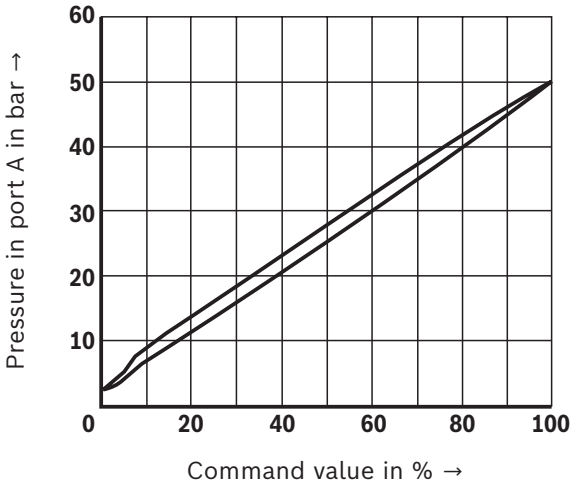


☞ **Notice:**
- ▶ Valve body and hydraulic fluid temperature-compensated. Large temperature differences may lead to differing characteristic curves/values.
- ▶ With version "G24-8", the solenoid current drops in case of increased temperature. Thus, the set pressure differs accordingly.

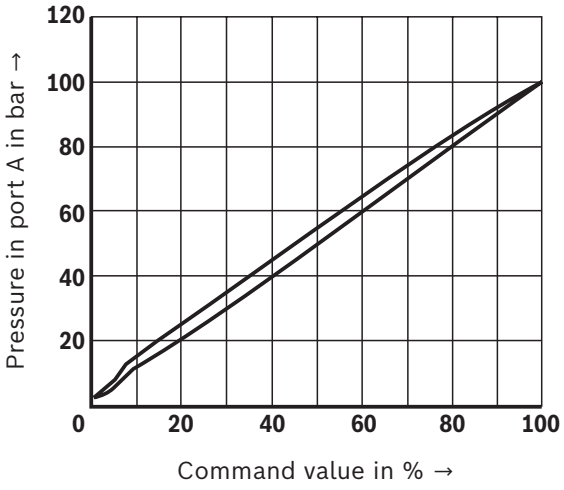
Characteristic curves: Size 10
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Pressure in port A depending on the command value – flow 0 l/min

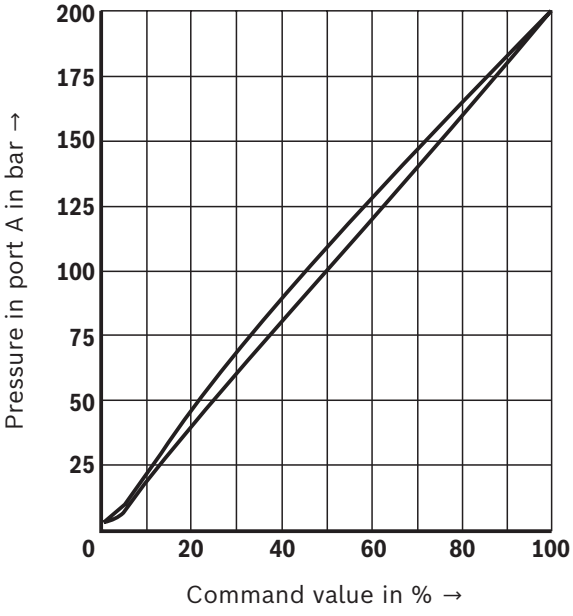
Pressure rating 50 bar



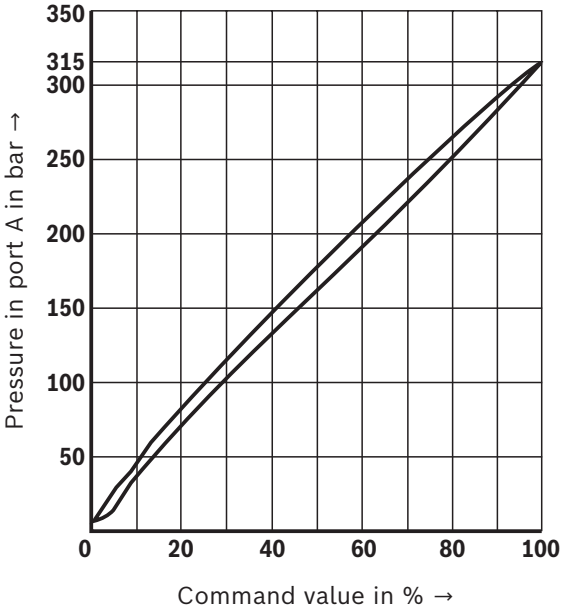
Pressure rating 100 bar



Pressure rating 200 bar



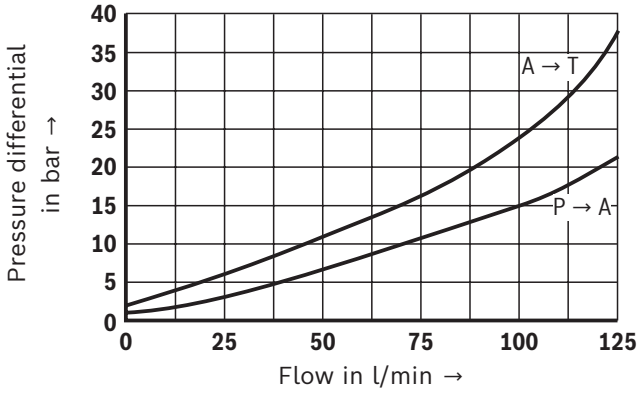
Pressure rating 315 bar



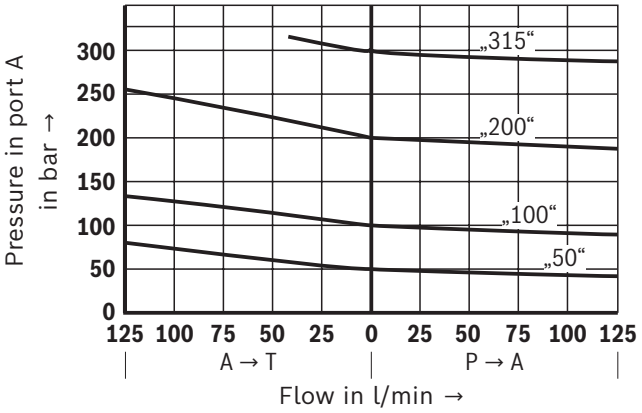
☞ **Notice:**
Valve body and hydraulic fluid temperature-compensated.
Large temperature differences may lead to differing characteristic curves/values.

Characteristic curves: Size 10
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

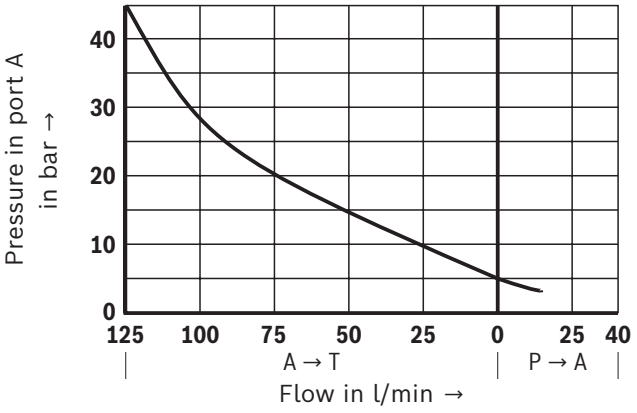
Δp-q_V characteristic curves



Pressure in port A depending on the flow



Minimum set pressure depending on the flow
(command value zero)

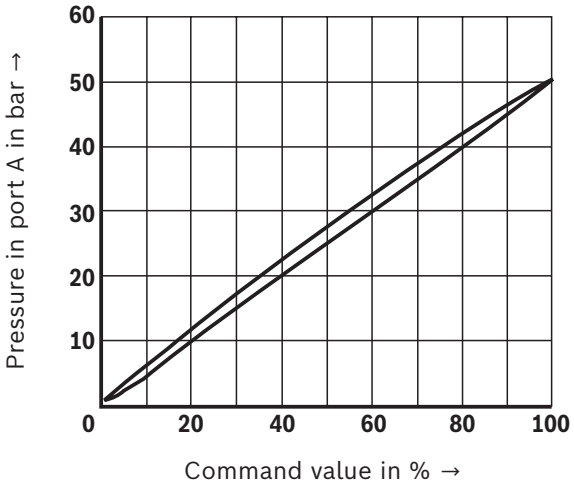


☞ **Notice:**
Valve body and hydraulic fluid temperature-compensated.
Large temperature differences may lead to differing characteristic curves/values.

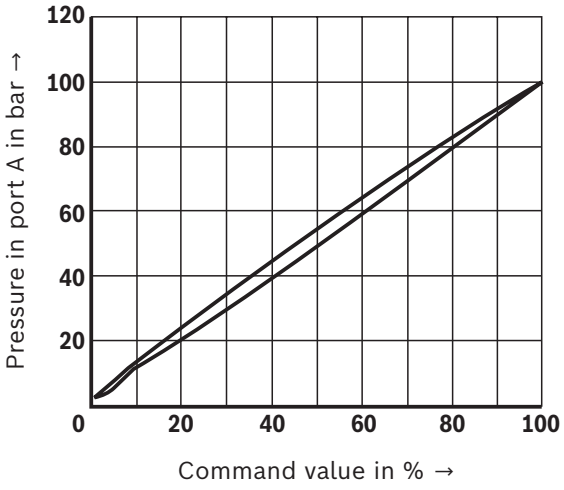
Characteristic curves: Size 16
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Pressure in port A depending on the command value – flow 0 l/min

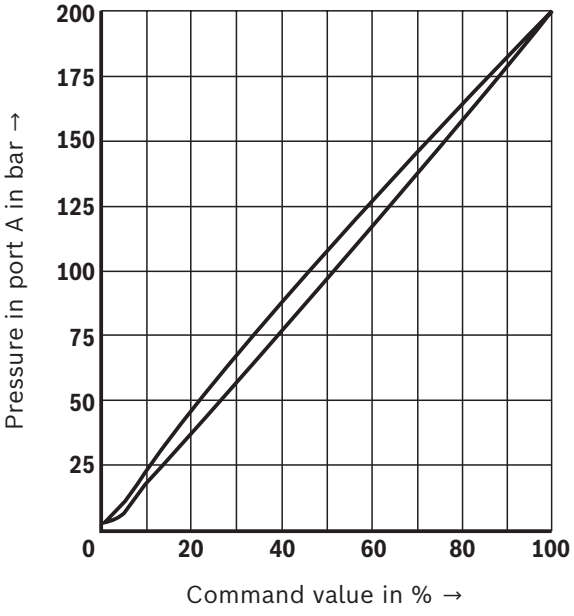
Pressure rating 50 bar



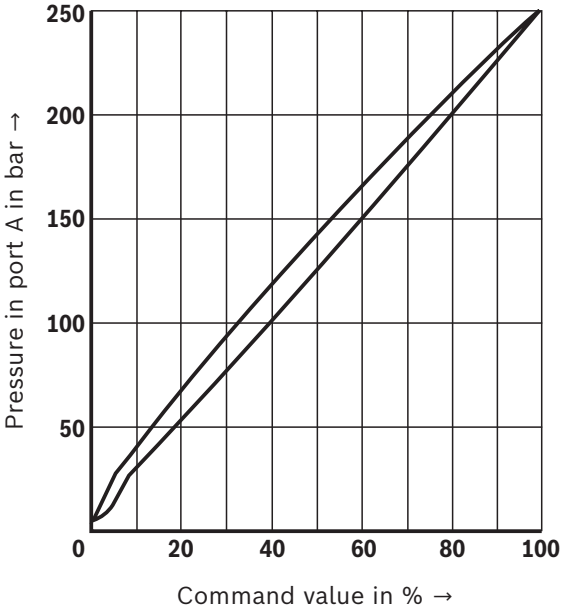
Pressure rating 100 bar



Pressure rating 200 bar



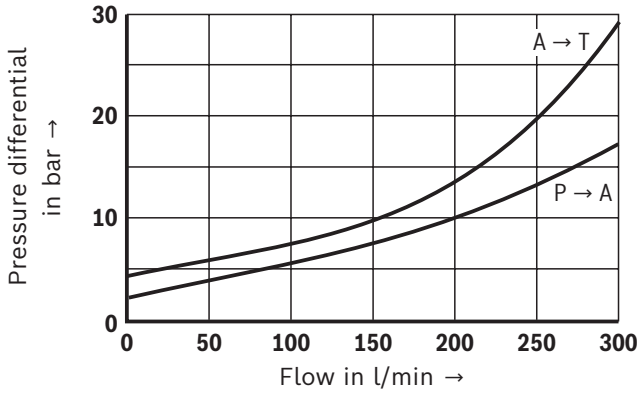
Pressure rating 250 bar



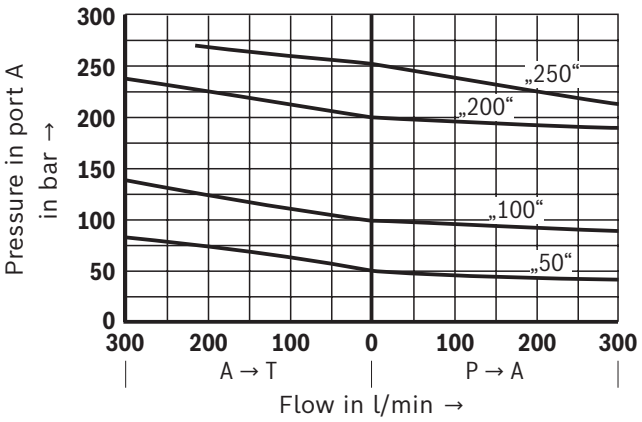
☞ **Notice:**
Valve body and hydraulic fluid temperature-compensated.
Large temperature differences may lead to differing characteristic curves/values.

Characteristic curves: Size 16
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

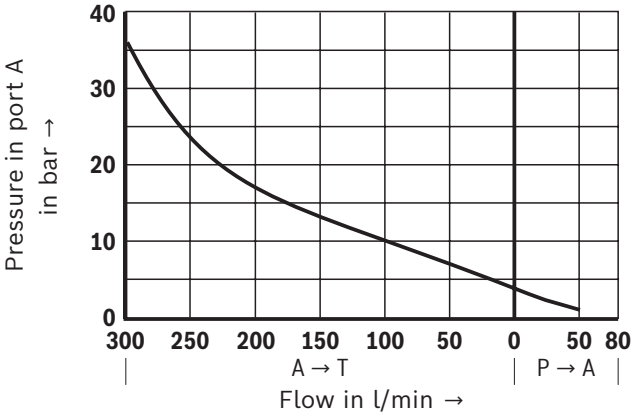
Δp-q_V characteristic curves



Pressure in port A depending on the flow

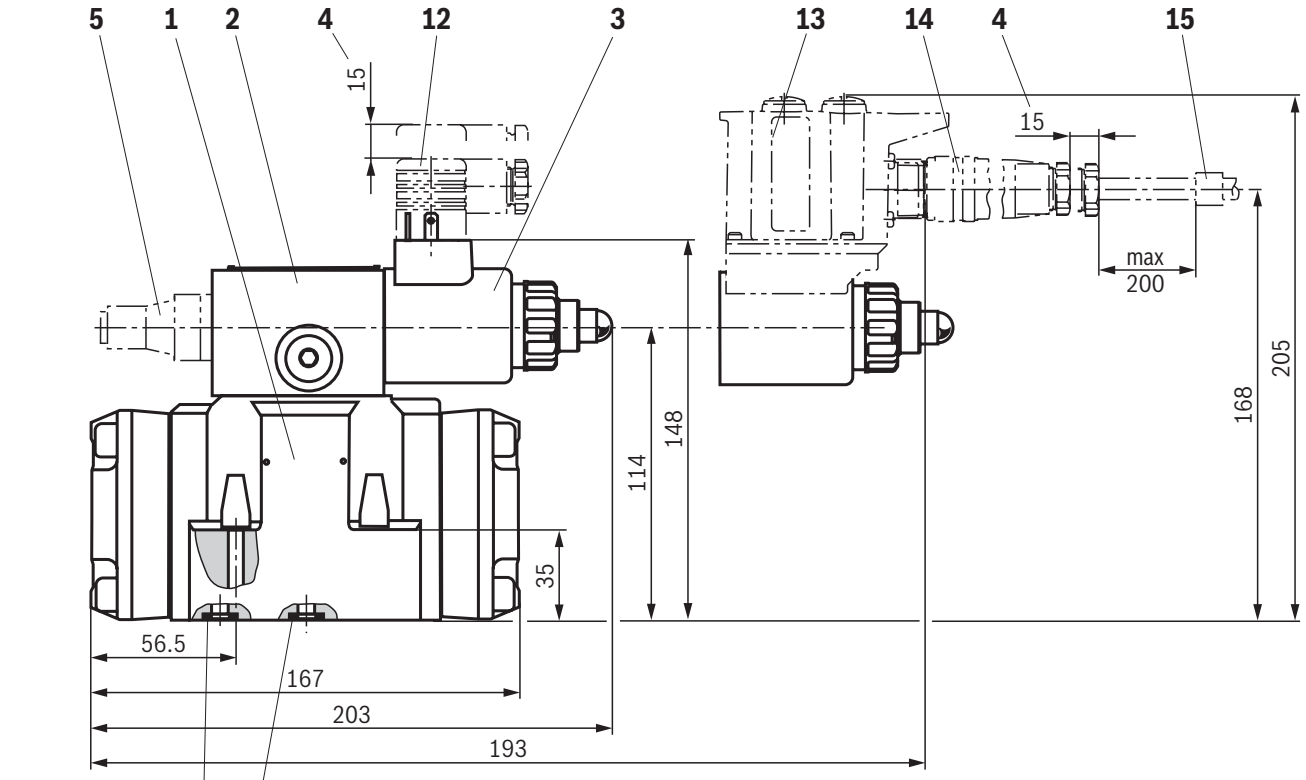


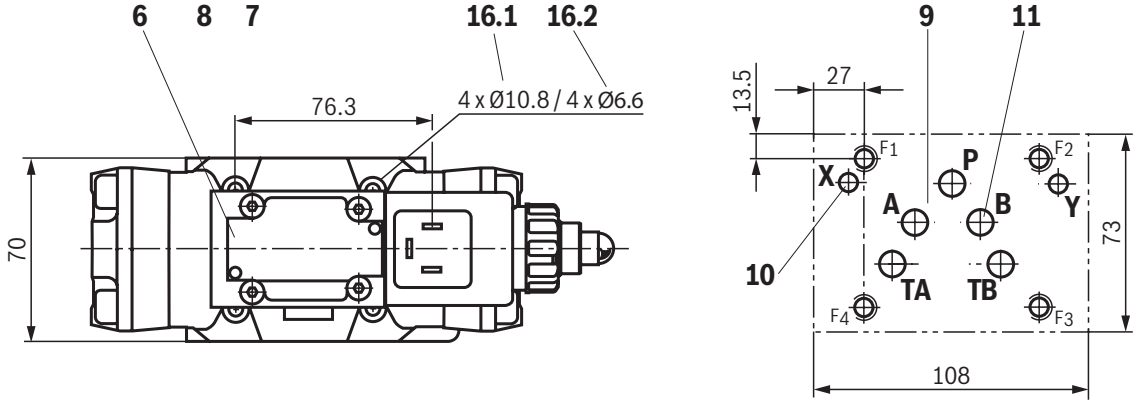
Minimum set pressure depending on the flow
(command value zero)

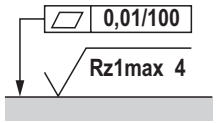


☞ **Notice:**
Valve body and hydraulic fluid temperature-compensated.
Large temperature differences may lead to differing characteristic curves/values.

Dimensions: Size 10
(dimensions in mm)





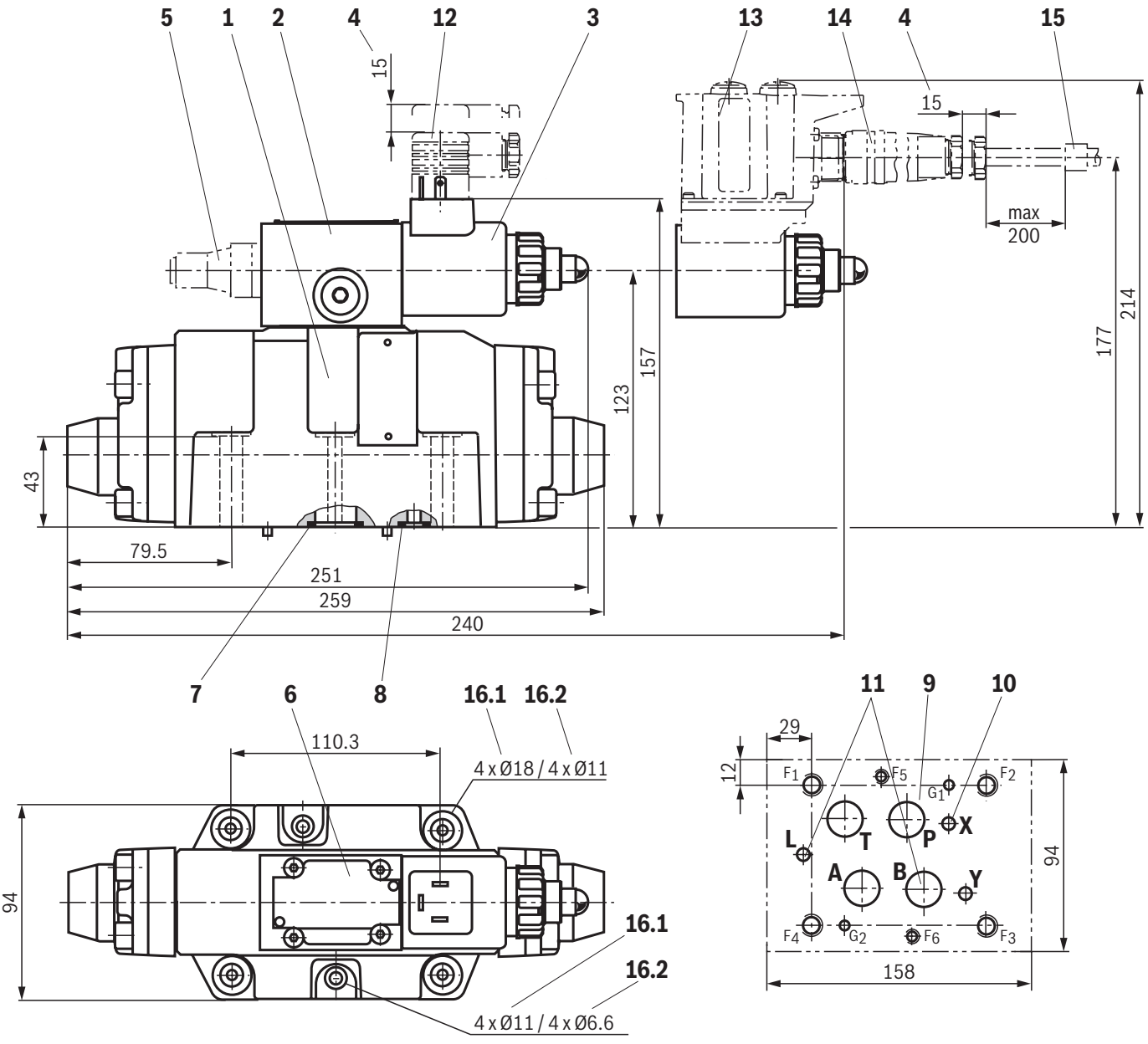


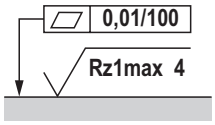
Required surface quality of the valve contact surface

For item explanations, valve mounting screws and **subplates,** see page 17.

☞ **Notice:**
- Deviating from ISO 4401, port T is called TA and port T1 is called TB in this data sheet.
- The dimensions are nominal dimensions which are subject to tolerances.

Dimensions: Size 16
(dimensions in mm)





Required surface quality of the valve contact surface

For item explanations, valve mounting screws and **subplates,** see page 17.

Notice:
- Deviating from ISO 4401, port T is called TA and port T1 is called TB in this data sheet.
- The dimensions are nominal dimensions which are subject to tolerances.

Dimensions

1 Main valve
2 Pilot valve
3 Proportional solenoid
4 Space required to remove the mating connector
5 Maximum pressure limitation (type 3DREM...)
6 Name plate
7 Identical seal rings for port A, B, P, TA and TB
8 Identical seal rings for ports X and Y
9 Machined valve contact surface; porting pattern according to ISO 4401-05-05-0-05
10 With "internal" pilot oil supply (version "Y"), port X in the subplate must be closed.
11 Port B must be closed in the subplate
12 Mating connector for type 3DRE(M) (separate order, see page 18 and data sheet 08006)
13 Integrated electronics (type 3DREE, 3DREME) with connector
14 Mating connector for type 3DRE(M)E, plastic or metal version (separate order, see page 18 and data sheet 08006)
15 Cable fastening
16.1 Recess
16.2 Bore

Valve mounting screws (separate order)

Size	Quantity	Hexagon socket head cap screws	Material number
10	4	**ISO 4762 - M6 x 45 - 10.9** Friction coefficient μ_{total} = 0.09 ... 0.14; tightening torque M_A = 12.5 Nm ±10 %	**R913043777**
	or		
	4	**ISO 4762 - M6 x 45 - 10.9** Friction coefficient μ_{total} = 0.12 ... 0.17; tightening torque M_A = 15.5 Nm ±10 %	Not included in the Rexroth delivery range
16	2	**ISO 4762 - M6 x 60 - 10.9** Friction coefficient μ_{total} = 0.09 ... 0.14; tightening torque M_A = 12.2 Nm ±10 %	**R913043410**
	4	**ISO 4762 - M10 x 60 - 10.9** Friction coefficient μ_{total} = 0.09 ... 0.14; tightening torque M_A = 59 Nm ±20 %	**R913014770**
	or		
	2	**ISO 4762 - M6 x 60 - 10.9** Friction coefficient μ_{total} = 0.12 ... 0.17; tightening torque M_A = 15.5 Nm ±10 %	Not included in the Rexroth delivery range
	4	**ISO 4762 - M10 x 60 - 10.9** Friction coefficient μ_{total} = 0.12 ... 0.17; tightening torque M_A = 75 Nm ±10 %	Not included in the Rexroth delivery range

☞ **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 (separate order) with porting pattern according to ISO 4401, see data sheet 45100.

Accessories (separate order)

Mating connectors and cable sets

Item [1]	Designation	Version	Short designation	Material number	Data sheet
12	Mating connector; for valves with round connector, 6-pole + PE	straight, metal	7PZ31...M	**R900223890**	08006
		straight, plastic	7PZ31...K	**R900021267**	
14	Mating connector; for valves with "K4" connector, 2-pole + PE, design A	without circuitry, M16 x 1.5, 12 ... 240 V, "b"		**R901017011**	

[1] See dimensions on page 15 and 16.

External control electronics

Designation	Data sheet
Valve amplifier for proportional valves without electrical position feedback; type VT-MSPA.2X	30232

Further information

- Valve amplifier for proportional valves without electrical position feedback — Data sheet 30232
- Subplates — Data sheet 45100
- Hydraulic fluids on mineral oil basis — Data sheet 90220
- Environmentally compatible hydraulic fluids — Data sheet 90221
- Flame-resistant, water-free hydraulic fluids — Data sheet 90222
- Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC) — Data sheet 90223
- Mating connectors and cable sets for valves and sensors — Data sheet 08006
- Hydraulic valves for industrial applications
- Selection of the filters
- Information on available spare parts