

4/2 and 4/3 proportional directional valves, direct operated, with electrical position feedback, without/with integrated electronics (OBE)

RE 29061/11.12
Replaces: 05.12

1/22

Type 4WRE and 4WREE

Size 6 and 10
Component series 2X
Maximum operating pressure 315 bar
Maximum flow: 80 l/min (size 6)
180 l/min (size 10)

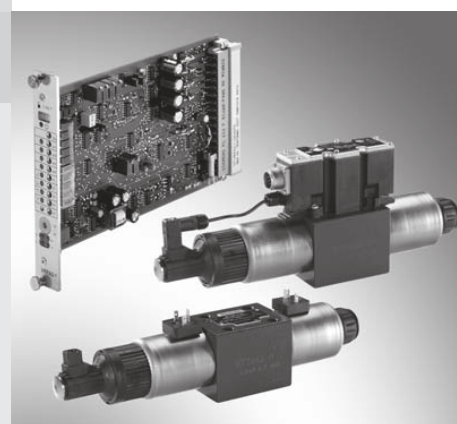


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Features

- Direct operated proportional directional valve with electrical position feedback and integrated electronics (OBE) with type 4WREE
- Control of flow direction and size
- Operation by means of proportional solenoids with central thread and detachable coil
- For subplate mounting: Porting pattern according to ISO 4401
- Spring-centered control spool
- Control electronics
 - Type 4WREE: integrated electronics (OBE) with voltage or current input (A1 and/or F1)
 - Type 4WRE (4/3 version), separate order:
 - digital and analog amplifier in Euro-card format
 - analog amplifier in modular design
 - Type 4WRE...A (4/2 version), separate order:
 - analog amplifier in modular design

Ordering code

4WRE						-2X/ G24			/		V	*
Without integrated electronics (OBE)		= no code										Further details in the plain text
With integrated electronics (OBE)		= E								V =		Seal material FKM seals ¹⁾
Size 6		= 6										Electronic interface
Size 10		= 10								A1 =		Command value ± 10 V
Control spool symbols										F1 =		Command value 4 to 20 mA
										no code =		Type 4WRE
												Electrical connection
												Type 4WRE:
										K4 =		Without mating connector, with connector according to DIN EN 175301-803
												Mating connector (solenoid, position transducer), separate order, see page 8
												Type 4WREE:
										K31 =		Without mating connector, with connector according to DIN EN 175201-804
												Mating connector – separate order, see page 9
												Supply voltage
										G24 =		Direct voltage 24 V
										2X =		20 to 29
												(20 to 29: unchanged installation and connection dimensions)
												Rated flow at valve pressure differential $\Delta p = 10$ bar
												Size 6
										04 =		4 l/min
										08 =		8 l/min
										16 =		16 l/min
										32 =		32 l/min
												Size 10
										25 =		25 l/min
										50 =		50 l/min
										75 =		75 l/min

With symbol E1–, V1– and W1–:

P → A: $q_{V \max}$ B → T: $q_V/2$
P → B: $q_V/2$ A → T: $q_{V \max}$

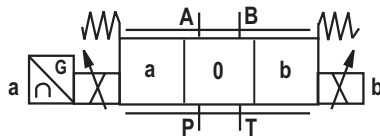
Notice:

In the zero position, spools W and WA have a connection from A to T and B to T with approx. 3 % of the relevant nominal cross-section.

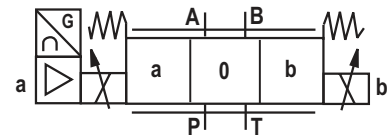
¹⁾ Design SO660 with NBR seals at the valve connection surface

Symbols

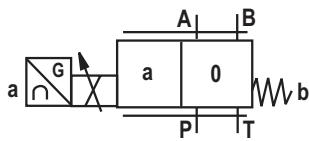
Proportional directional valve without integrated electronics
Type 4WRE...



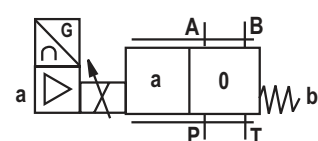
Proportional directional valve with integrated electronics
Type 4WREE...



Type 4WRE...A...



Type 4WREE...A...



Function, section

Type 4WRE ...-2X/...

The 4/2 and 4/3 proportional directional valves are designed as direct operated devices in plate design. Operation is effected by proportional solenoids with central thread and detachable coil. The solenoids are controlled by external electronics.

Set-up:

The valve basically consists of:

- Housing (1) with connection surface
- Control spool (2) with compression springs (3 and 4) and spring plate (5 and 6)
- Solenoids (7 and 8) with central thread
- Position transducer (9)

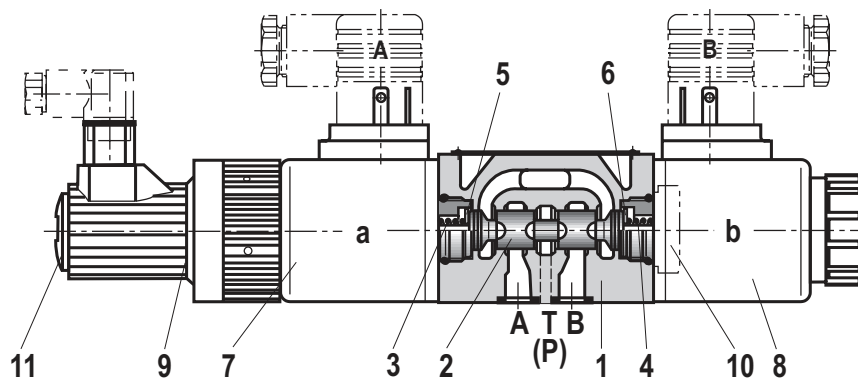
Function:

- With de-energized solenoids (7 and 8), central position of the control spool (2) by compression springs (3 and 4) between spring plates (5 and 6)
- Direct operation of the control spool (2) by controlling a proportional solenoid, e.g. solenoid "b" (8)
 - Displacement of the control spool (2) to the left proportional to the electric input signal
 - Connection from P to A and B to T via orifice-type cross-sections with progressive flow characteristic
- Switching off of the solenoid (8)
 - The compression spring (3) brings the control spool (2) back into the central position

In the de-energized condition, the control spool (2) is held in a mechanical central position by the return springs. With control spool symbol "V", this position does not correspond to the hydraulic central position! When the electric valve control loop is closed, the control spool is positioned in the hydraulic central position.

Important note!

The PG fitting (11) must not be opened. Mechanical adjustment of the adjustment nut located below is prohibited and damages the valve!



Valve with 2 spool positions: (Type 4WRE...A...)

The function of this valve design basically corresponds to the valve with three spool positions. The 2 spool position valves are, however, only equipped with solenoid "a" (7). Instead of the 2nd proportional solenoid, there is a plug screw (10).

Notice!

Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.

Notice!

The tank line must not be allowed to run empty. With corresponding installation conditions, a pre-charge valve (pre-charging pressure approx. 2 bar) is to be installed.

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- Integrated electronics (13)
- Electric zero point adjustment (12) accessible via Pg7

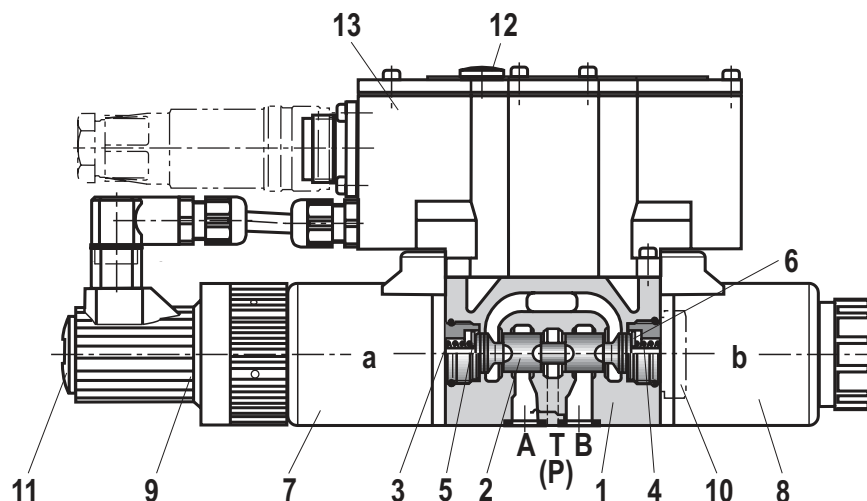
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Technical data (For applications outside these parameters please consult us!)**general**

Sizes		Size	6	10
Weight	– Type 4WRE	kg	2.2	6.3
	– Type 4WREE	kg	2.4	6.5
Installation position			Any, preferably horizontal	
Ambient temperature range	– Type 4WRE	°C	–20 to +70	
	– Type 4WREE	°C	–20 to +50	
Storage temperature range		°C	–20 to +80	
MTTF _d values according to EN ISO 13849		Years	150 ¹⁾ (for more information see data sheet 08012)	

hydraulic (measured with HLP46, $\vartheta_{\text{Oil}} = 40 \text{ °C} \pm 5 \text{ °C}$ and $p = 100 \text{ bar}$)

Maximum operating pressure	– Port A, B, P	bar	315	
	– Port T	bar	210	
Rated flow $q_{V \text{ rated}}$ with $\Delta p = 10 \text{ bar}$		l/min	4, 8, 16, 32	25, 50, 75
Recommended maximum flow		l/min	80	180
Hydraulic fluid			See table below	
Hydraulic fluid temperature range		°C	–20 to +80 (preferably +40 to +50)	
Viscosity range		mm ² /s	20 to 380 (preferably 30 to 46)	
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15 ²⁾	
Hysteresis		%	≤ 0.1	
Range of inversion		%	≤ 0.05	
Response sensitivity		%	≤ 0.05	
Zero shift upon change of hydraulic fluid temperature and operating pressure		%/10 K	≤ 0.15	
		%/100 bar	≤ 0.1	

¹⁾ With control spool types E, E1, EA, W, W1, WA; in longitudinal control spool direction, there is sufficient positive overlap without shock/vibration load; observe the installation orientation with regard to the main direction of acceleration.

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 service life of the components.

For the selection of the filters see www.boschrexroth.com/filter

Hydraulic fluid	Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons	HL, HLP	NBR, FKM	DIN 51524
Flame-resistant – 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, service life, maintenance intervals, etc.)!
- The flash point of the process and operating medium used must be 40 K higher than the maximum solenoid surface temperature.

- **Flame-resistant – water-containing:** Maximum pressure differential per control edge 175 bar. Pressure pre-loading at the tank port > 20 % of the pressure differential; otherwise, increased cavitation.
Life cycle as compared to operation with mineral oil HL, HLP 50 % to 100 %.

Technical data (For applications outside these parameters please consult us!)**electric**

Size	Size	6	10	
Voltage type		Direct voltage		
Solenoid coil resistance	– Cold value at 20 °C	Ω	2.65	4.55
	– Maximum hot value	Ω	4.05	6.82
Duty cycle		%	100	
Maximum coil temperature ¹⁾		°C	up to 150	
Electrical connection see page 8 and 9	– Type 4WRE	With connector according to DIN EN 175301-803 and ISO 4400		
		Mating connector according to DIN EN 175301-803 and ISO 4400 ²⁾		
	– Type 4WREE	With connector DIN EN 175201-804		
		Mating connector DIN EN 175201-804 ²⁾		
Protection class of the valve according to EN 60529		IP65 with mating connector mounted and locked		

Control electronics

Type 4WRE	4/3 version			
	Amplifier in euro-card format ²⁾	Digital	VT-VRPD-2-2X/V0/0 according to RE 30126	
		Analog	VT-VRPA2-1-1X/V0 according to data sheet 30119	VT-VRPA2-2-1X/V0 according to data sheet 30119
	Module amplifier ²⁾	Analog	VT-MRPA2-1 according to data sheet 30219	VT-MRPA2-2 according to data sheet 30219
Type 4WRE...A...	4/2 version			
	Module amplifier ²⁾	Analog	VT-MRPA1-1 according to data sheet 30219	VT-MRPA1-2 according to data sheet 30219
Type 4WREE			Integrated in the valve, see page 9	
	analog command value module		VT-SWMA-1-1X/... according to data sheet 29902	
	analog command value module		VT-SWMAK-1-1X/... according to data sheet 29903	
	analog command value card		VT-SWKA-1-1X/... according to data sheet 30255	
	digital command value card		VT-HACD -1-1X/... according to data sheet 30143	
Supply voltage	Nominal voltage	VDC	24	
	lower limit value	V	19.4	
	upper limit value	V	35	
Current consumption of the amplifier	$I_{\max}$	A	< 2	
	Pulse current	A	3	

¹⁾ Due to the temperatures occurring at the surfaces of the solenoid coils, the European standards ISO 13732-1 and EN ISO 4413 need to be adhered to!

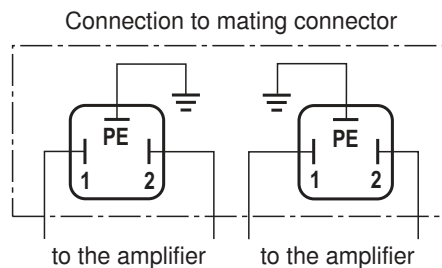
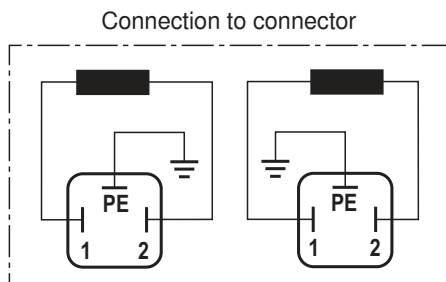
²⁾ Separate order



Notice: For information on the **environmental simulation testing** for the areas EMC (electromagnetic compatibility), climate and mechanical load see data sheet 29061-U (declaration on environmental compatibility).

Electrical connection, mating connectors (dimensions in mm)

Type 4WRE (without integrated electronics)



Mating connector CECC 75 301-803-A002FA-H3D08-G according to DIN EN 175301-803 and ISO 4400

Solenoid **a**, color gray

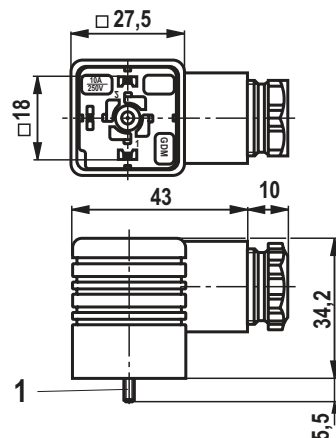
separate order under the Material no. **R901017010**

Solenoid **b**, color black

separate order under the Material no. **R901017011**

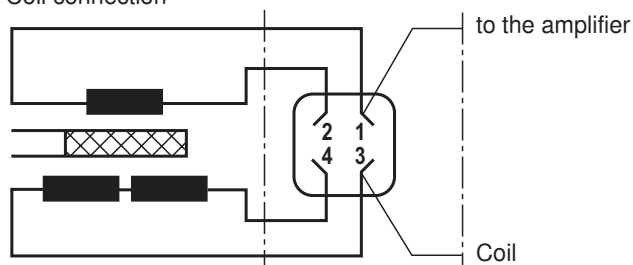
1 Mounting screw M3

Tightening torque $M_A = 0.5 \text{ Nm} + 0.1 \text{ Nm}$

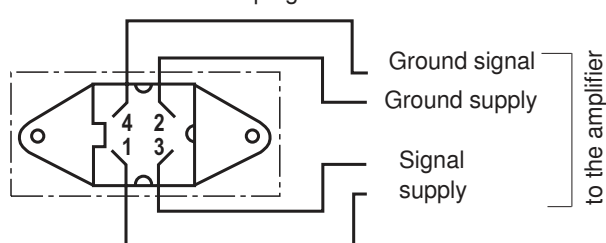


Inductive position transducer

Coil connection



Connection to plug-in connector



Mating connector 4-pole Pg7-G4W1F

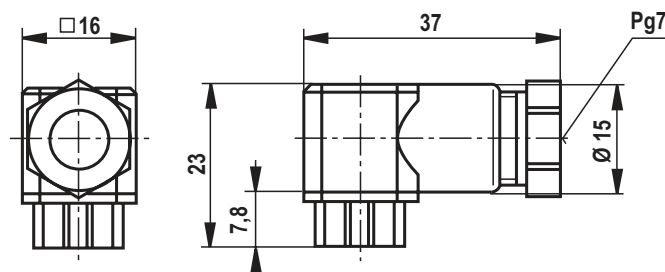
separate order under the Material no. **R900023126**

Connection cable:

Recommendation:

up to 50 m cable length type LiYCY 4 x 0.25 mm²

Connect shield to PE only on the supply side.



Electrical connection, mating connectors (dimensions in mm)

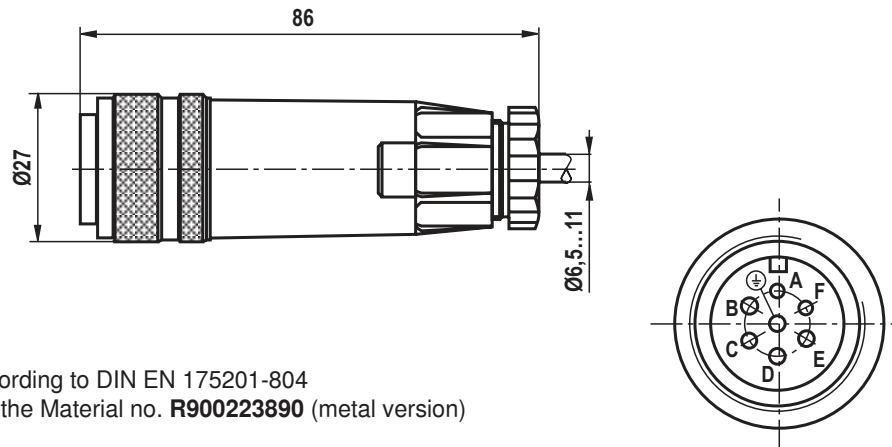
Type 4WREE (with integrated electronics (OBE))

Mating connector according to DIN EN 175201-804

separate order under the Material no. **R900021267** (plastic version)

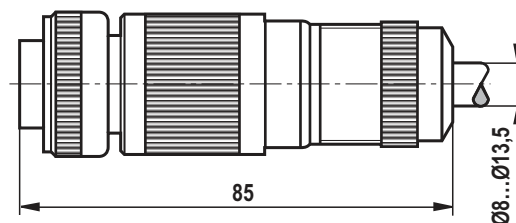
Angular design – separate order under the Material no. **R900217845**

Pin assignment see also block diagram page 10



Mating connector according to DIN EN 175201-804

separate order under the Material no. **R900223890** (metal version)



Device connector allocation	Contact	Signal with A1 interface	Signal with F1 interface
Supply voltage	A	24 VDC ($u(t) = 19.4$ to 35 V); $I_{\max} = 2$ A	
	B	0 V	
Reference potential actual value	C	Reference contact F; $R_e > 50$ k Ω	Reference contact F; $R_e < 10$ Ω
Differential amplifier input	D	± 10 V command value; $R_e > 50$ k Ω	4 to 20 mA command value; $R_e > 100$ Ω
	E	Reference potential command value	
Measuring output (actual value)	F	± 10 V actual value (limit load 5 mA)	4 to 20 mA actual value, load resistance max. 300 Ω
	PE	Connected to cooling element and valve housing	

Command value: Positive command value 0 to +10 V (or 12 to 20 mA) at D and reference potential at E result in flow from P → A and B → T.

Negative command value 0 to –10 V (or 12 to 4 mA) at D and reference potential at E result in flow from P → B and A → T.

For valves with 1 solenoid on side a (e. g. variant **EA** and **WA**), a positive command value 0 to +10 V (or 4 to 20 mA) at D and reference potential at E result in flow from P → B and A → T.

Actual value: Actual value 0 to +10 V (or 12 to 20 mA) at F and reference potential at C result in flow from P → A and B → T, actual value 0 to –10 V (or 4 to 12 mA) result in flow from P → B and A → T.

With valves with 1 solenoid, a positive actual value 0 to +10 V (or 4 to 20 mA) at F and reference potential at C result in flow from P → B and A → T.

Connection cable: Recommendation: – up to 25 m cable length type LiYCY 7 x 0.75 mm²

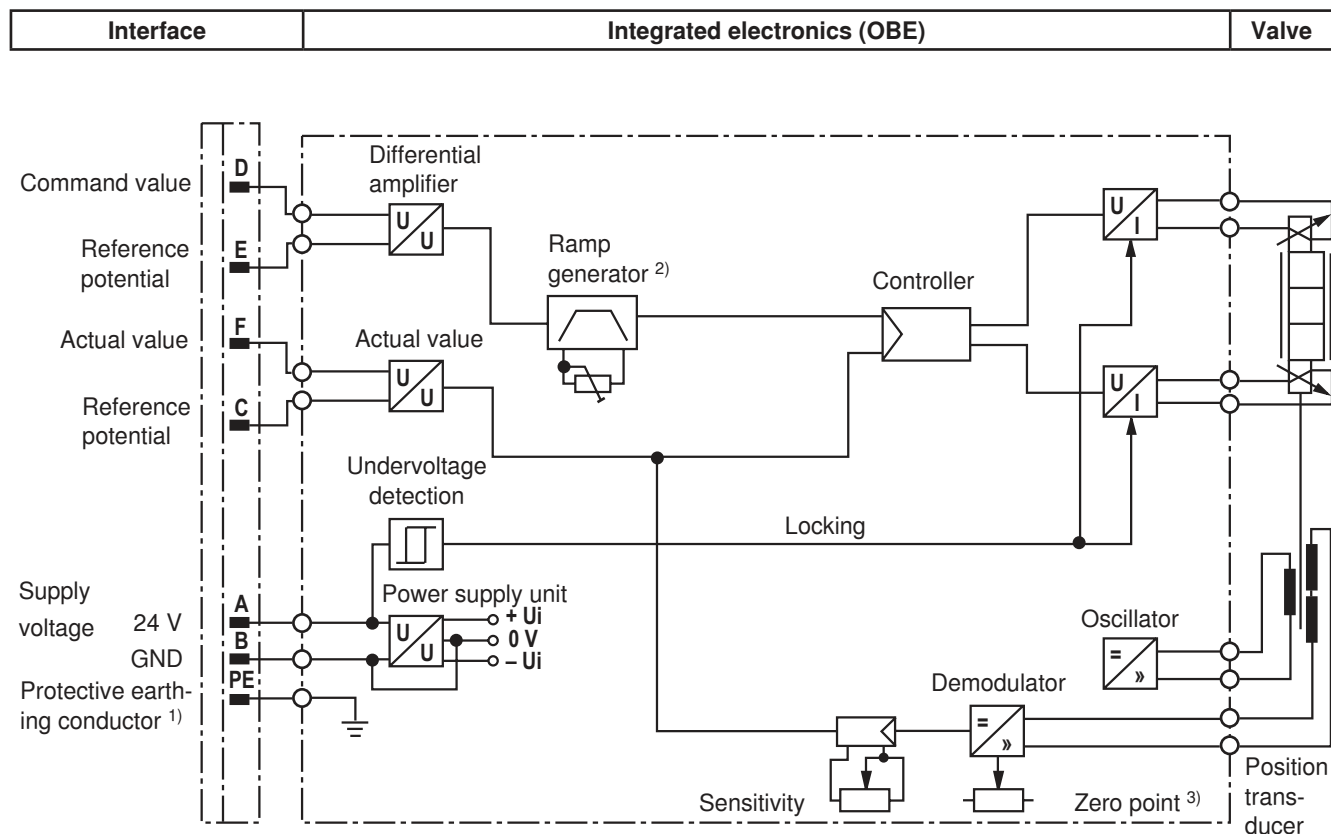
– up to 50 m cable length type LiYCY 7 x 1.0 mm²

External diameter see sketch of mating connector

Connect shield to PE only on the supply side.

Integrated electronics (OBE) type 4WREE

Block diagram / pin assignment

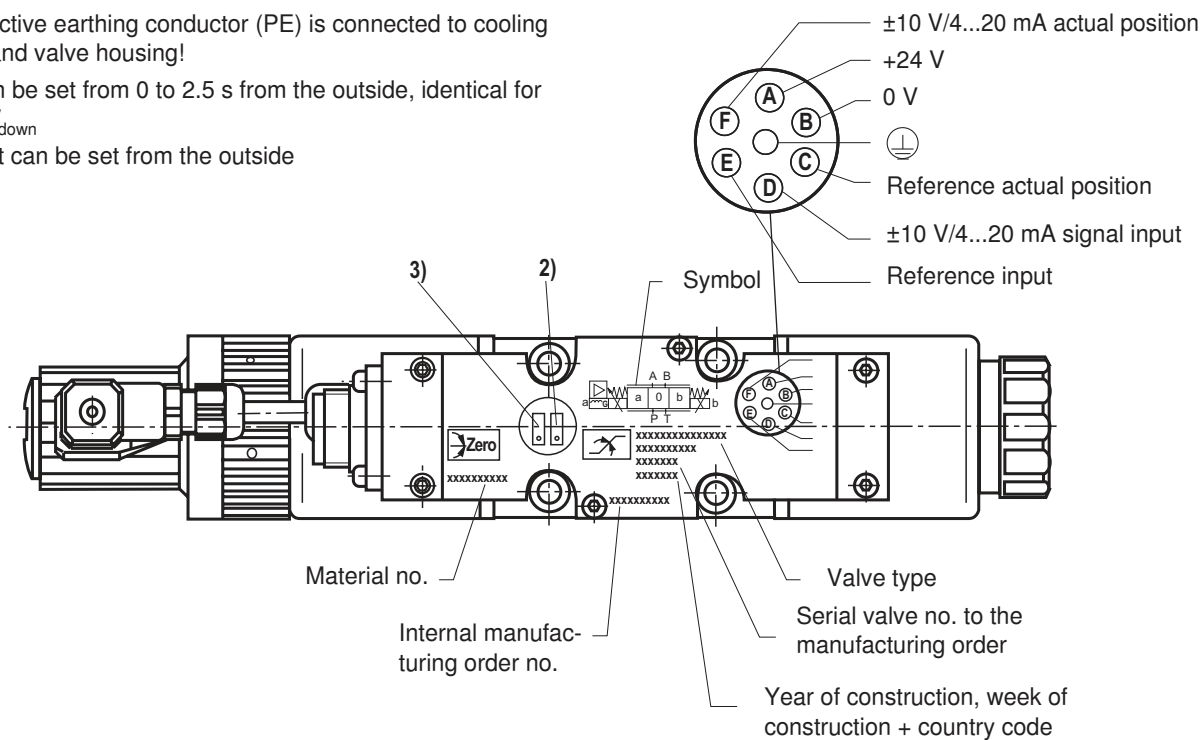


Notice: Electric signals taken out via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions!

¹⁾ The protective earthing conductor (PE) is connected to cooling element and valve housing!

²⁾ Ramp can be set from 0 to 2.5 s from the outside, identical for T_{up} and T_{down}

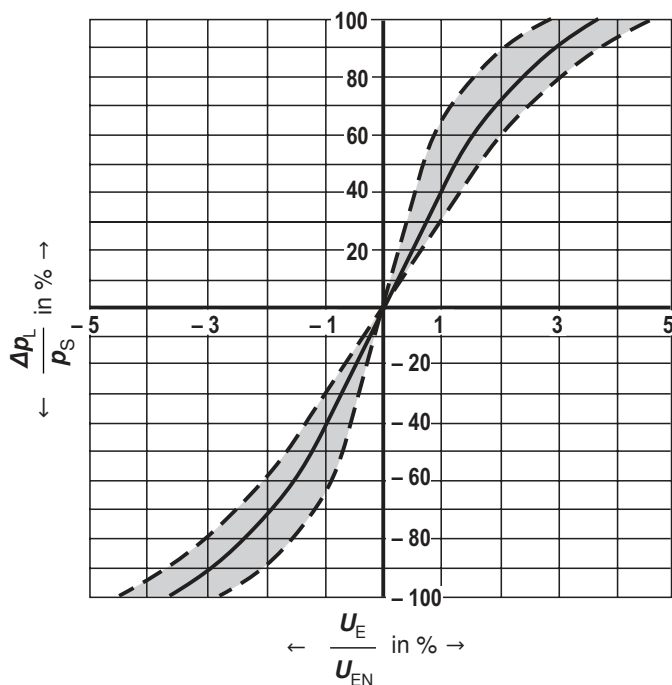
³⁾ Zero point can be set from the outside



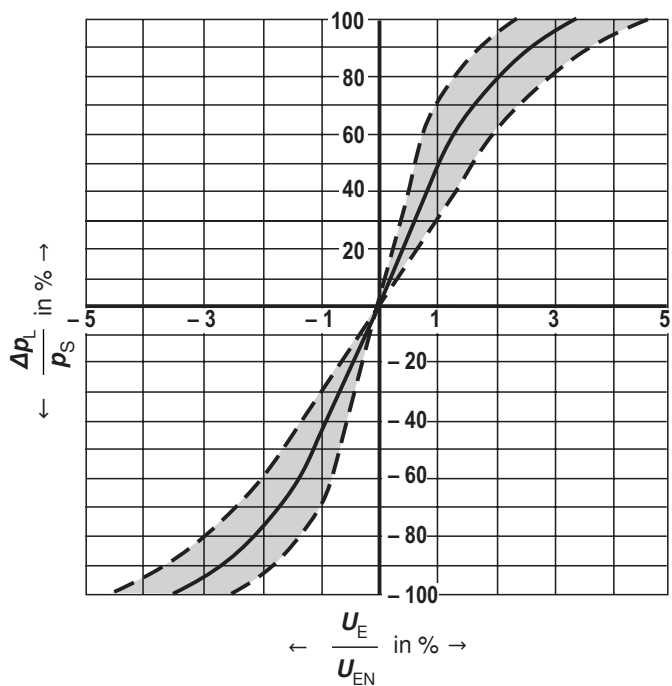
Characteristic curves: Type 4WREE (measured with HLP46, $\vartheta_{\text{Oil}} = 40\text{ °C} \pm 5\text{ °C}$) Size 6 and 10

Pressure signal characteristic curve (control spool V),
 $p_s = 100\text{ bar}$

Size 6

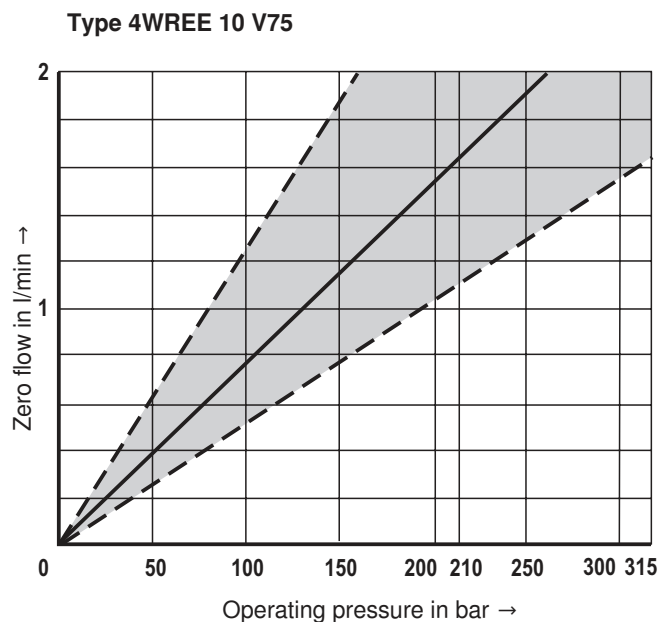
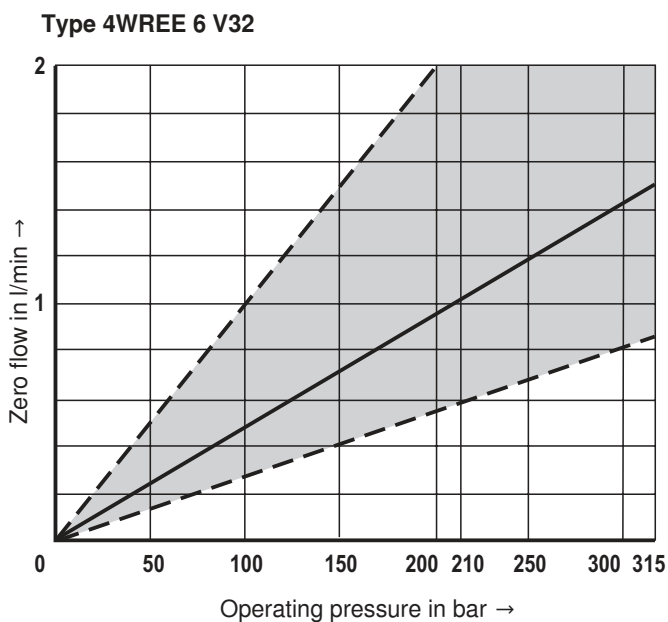


Size 10



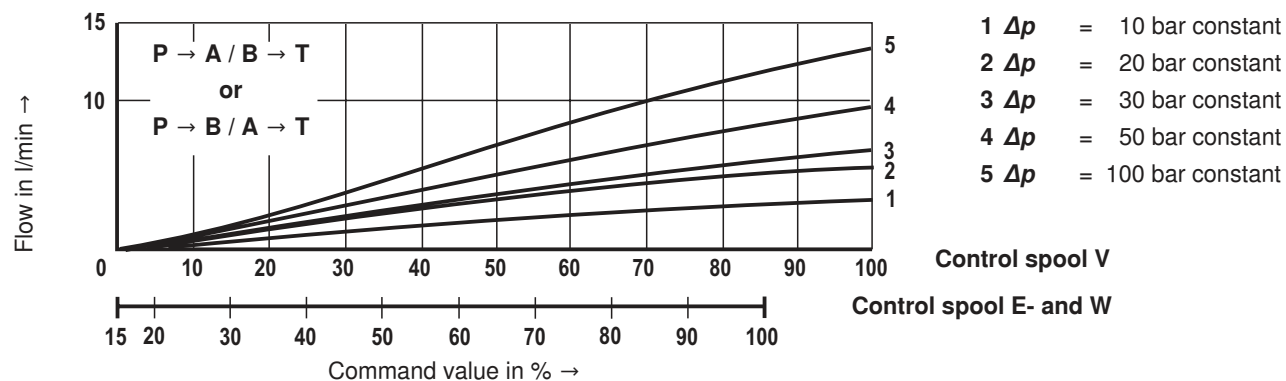
Characteristic curves: Type 4WREE (measured with HLP46, $\vartheta_{Oil} = 40\text{ °C} \pm 5\text{ °C}$) Size 6 and 10

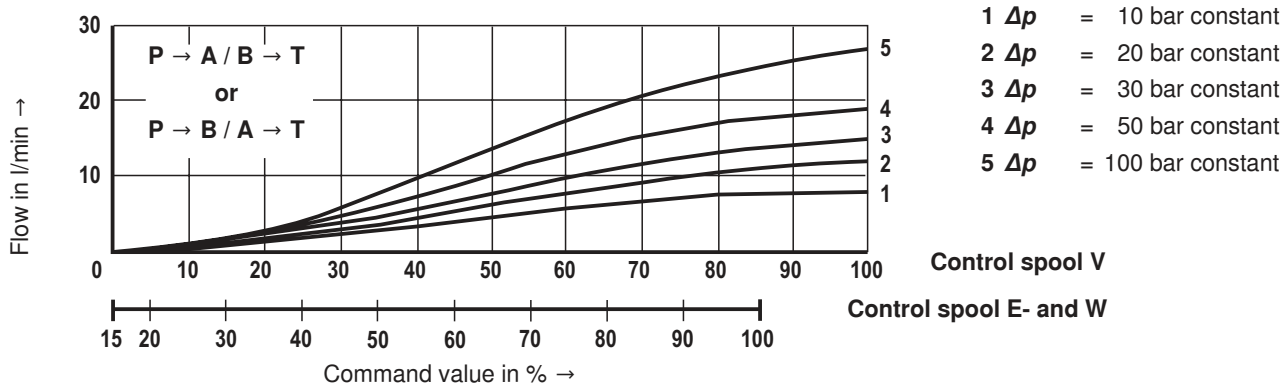
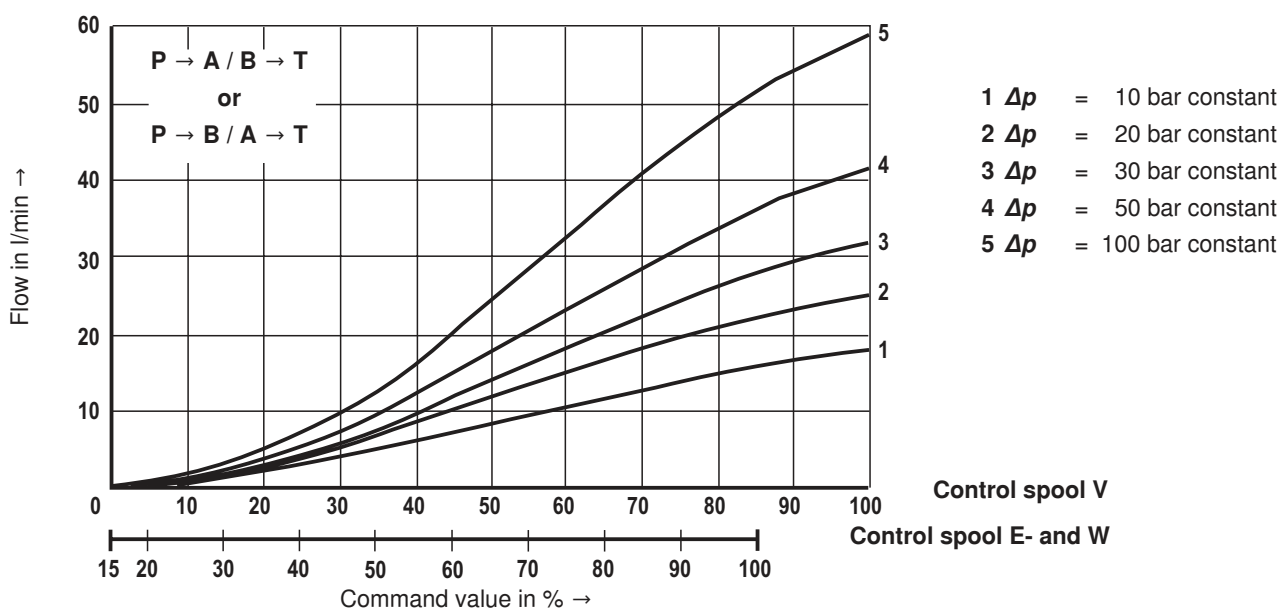
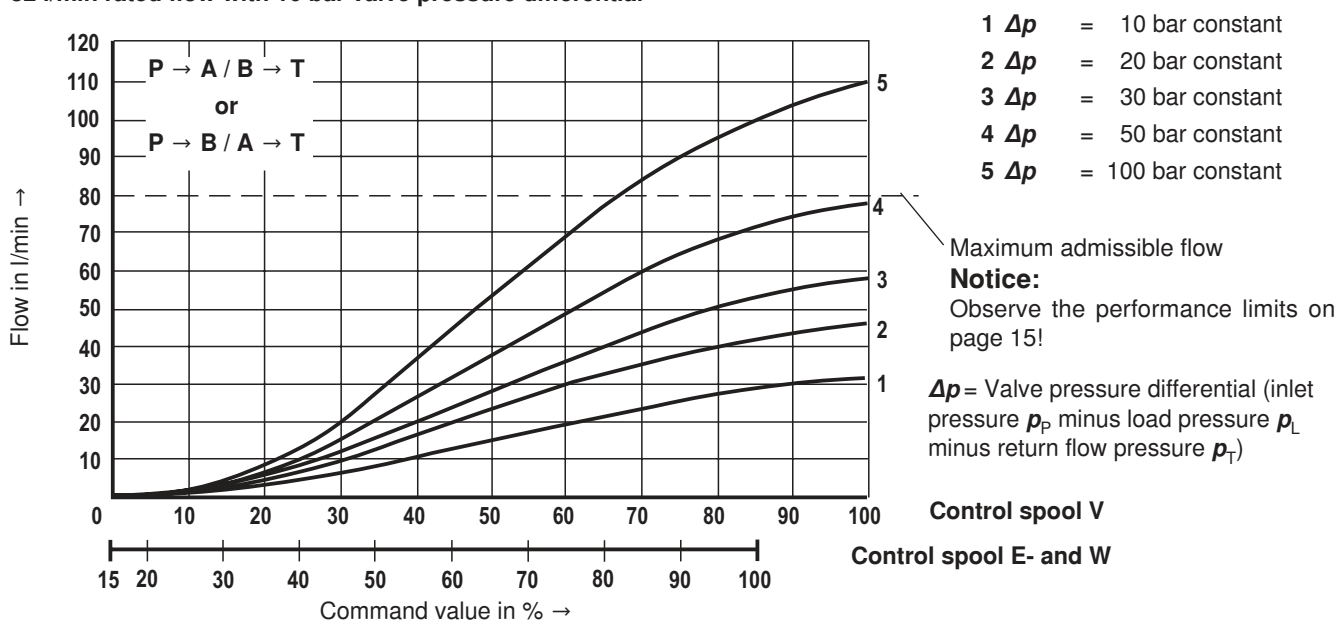
Zero flow with central control spool position

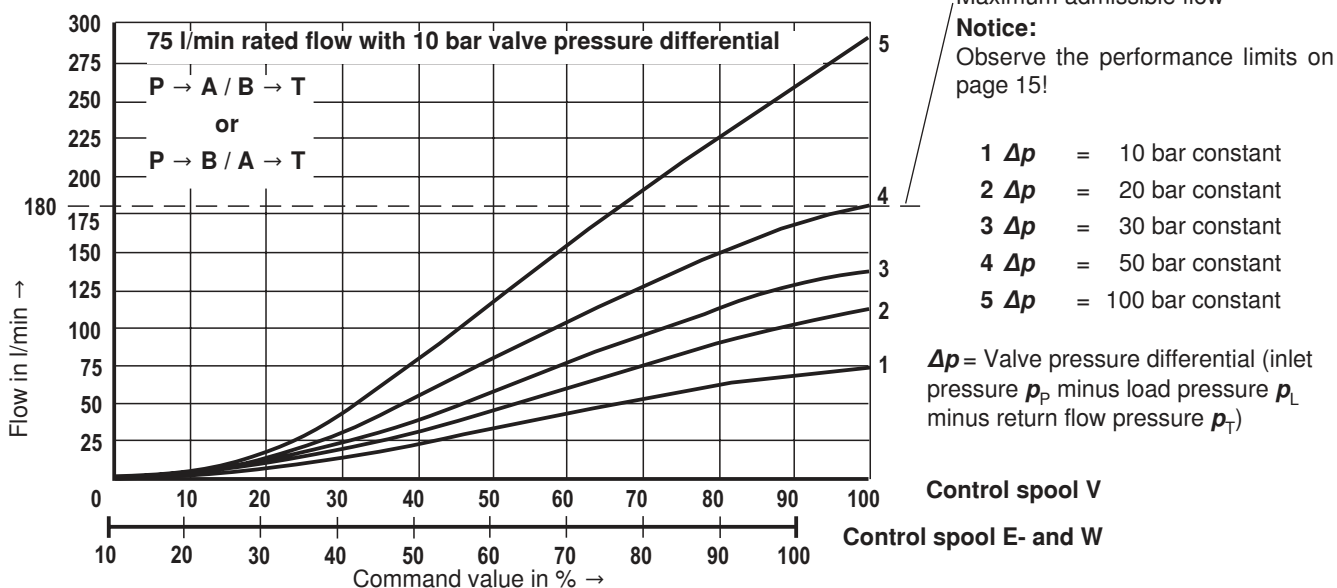
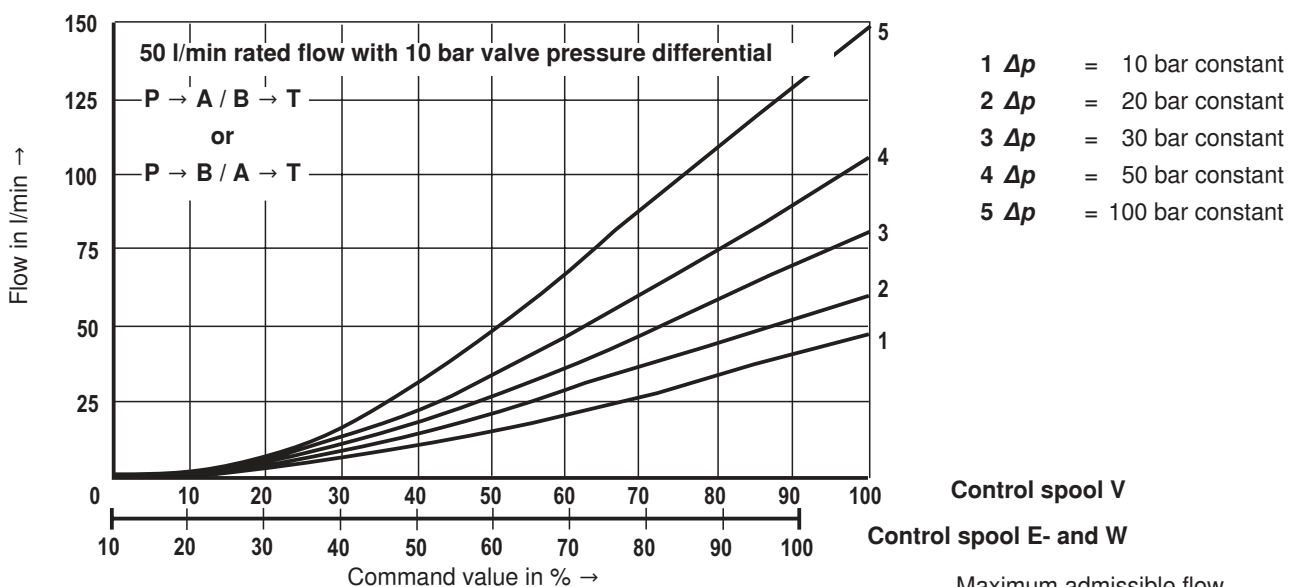
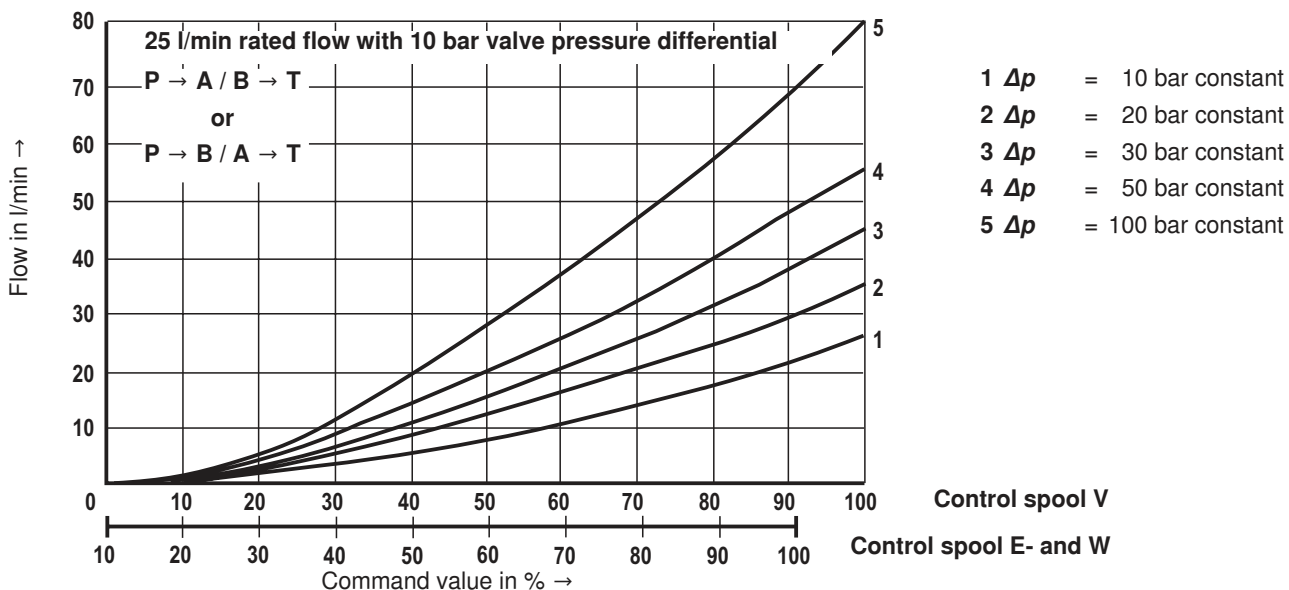


Characteristic curves: Type 4WREE (measured with HLP46, $\vartheta_{Oil} = 40\text{ °C} \pm 5\text{ °C}$ and $p = 100\text{ bar}$) Size 6

4 l/min rated flow with 10 bar valve pressure differential



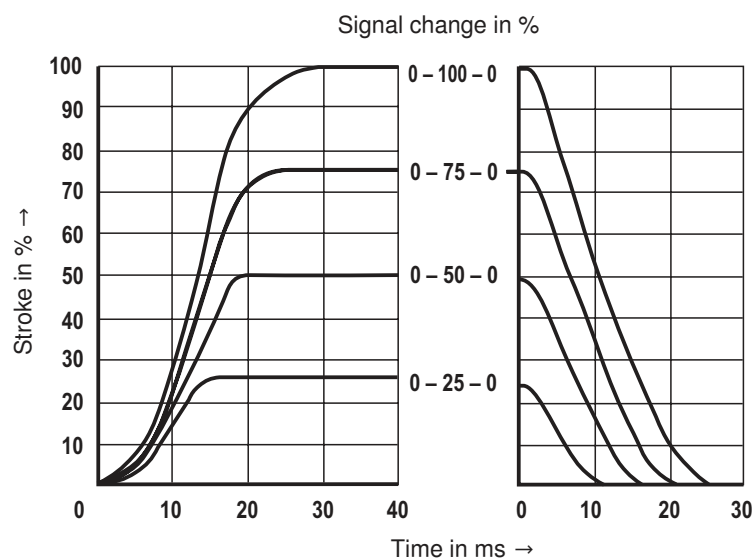
Characteristic curves: Type 4WREE (measured with HLP46, $\vartheta_{\text{Oil}} = 40 \text{ }^{\circ}\text{C} \pm 5 \text{ }^{\circ}\text{C}$ and $p = 100 \text{ bar}$) **Size 6****8 l/min rated flow with 10 bar valve pressure differential****16 l/min rated flow with 10 bar valve pressure differential****32 l/min rated flow with 10 bar valve pressure differential**

Characteristic curves: Type 4WREE (measured with HLP46, $\vartheta_{\text{Oil}} = 40\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and $p = 100\text{ bar}$) Size 10


Transition function with stepped electric input signals: Type 4WREE**Size 6**(measured with HLP46, $\vartheta_{Oil} = 40\text{ °C} \pm 5\text{ °C}$ and $p_s = 10\text{ bar}$)

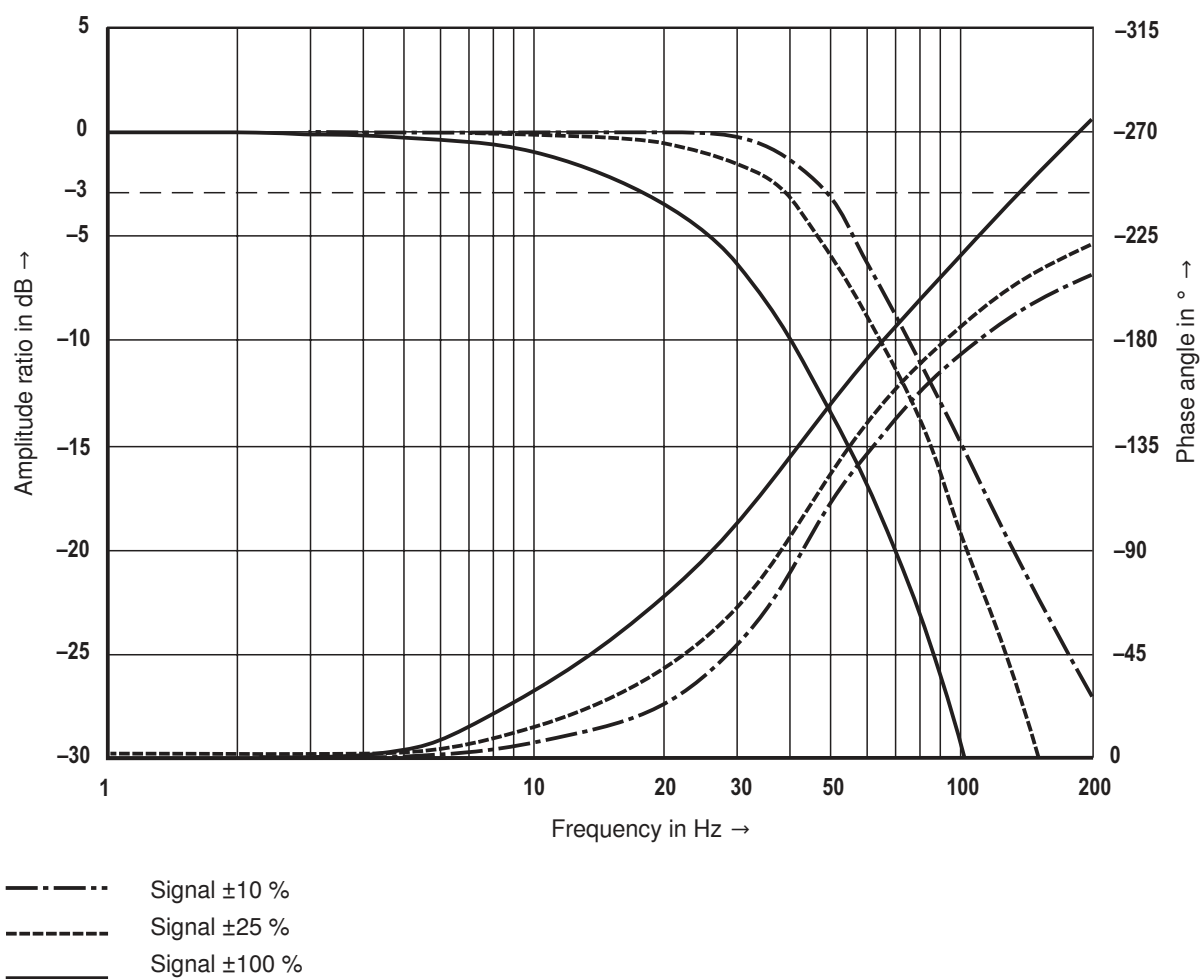
4/3 valve version

Control spool E

**Frequency response characteristic curves: Type 4WREE****Size 6**(measured with HLP46, $\vartheta_{Oil} = 40\text{ °C} \pm 5\text{ °C}$, $p_s = 10\text{ bar}$)

4/3 valve version

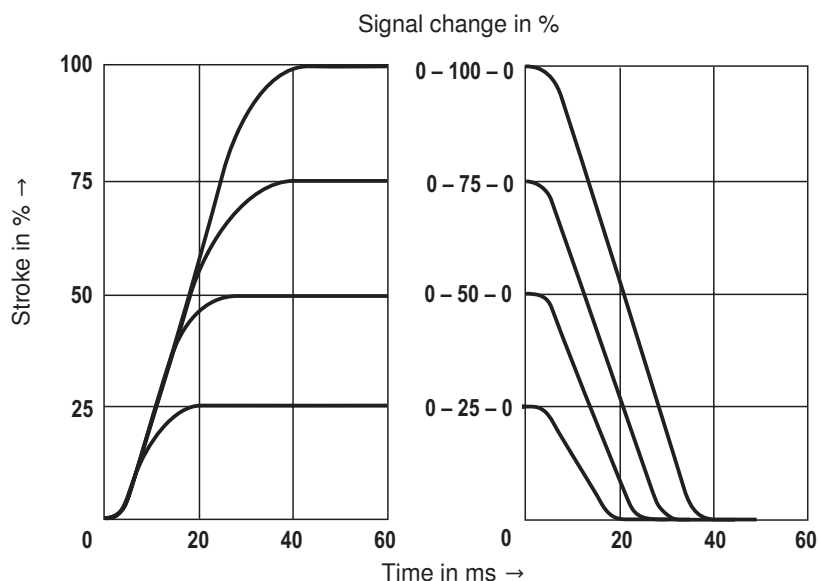
Control spool V



Transition function with stepped electric input signals: Type 4WREE**Size 10**(measured with HLP46, $\vartheta_{Oil} = 40\text{ °C} \pm 5\text{ °C}$ and $p_s = 10\text{ bar}$)

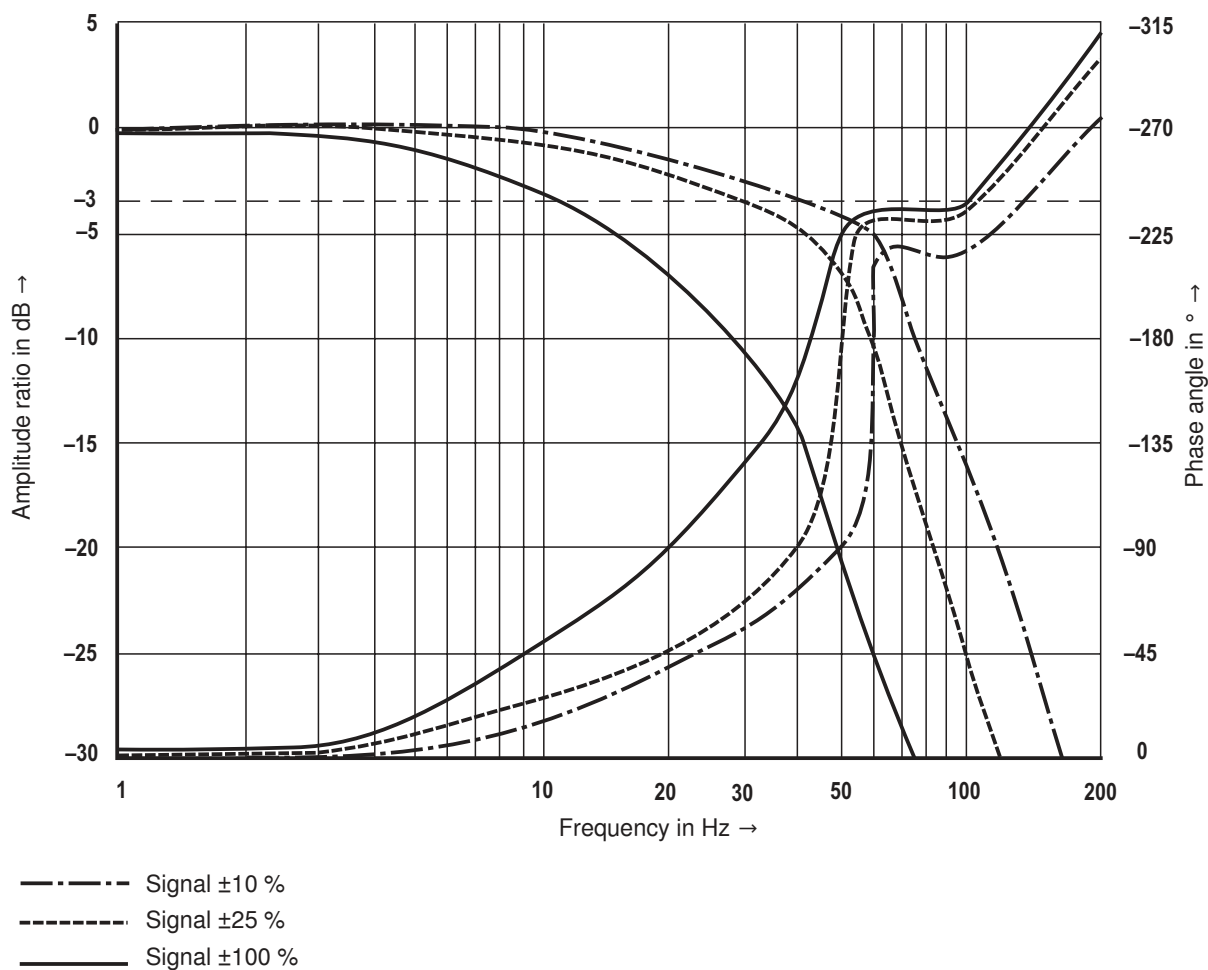
4/3 valve version

Control spool E

**Frequency response characteristic curves: Type 4WREE**(measured with HLP46, $\vartheta_{Oil} = 40\text{ °C} \pm 5\text{ °C}$, $p_s = 10\text{ bar}$)**Size 10**

4/3 valve version

Control spool V

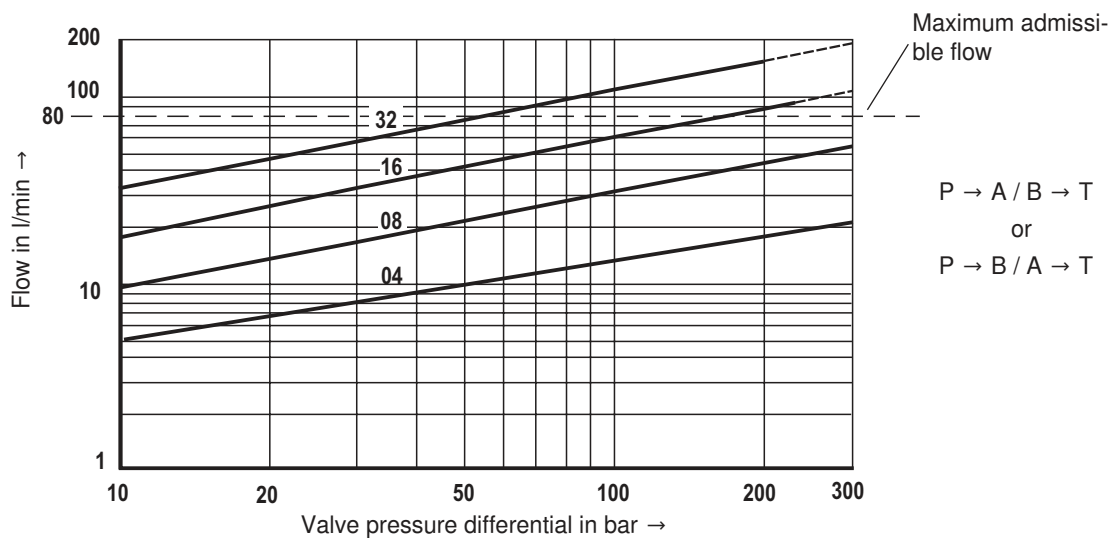


Flow: Type 4WREE (measured with HLP46, $\vartheta_{\text{Oil}} = 40\text{ °C} \pm 5\text{ °C}$)**Size 6**

Load function with maximum valve opening

Rated flow 4, 8, 16 and 32 l/min

Control spool V



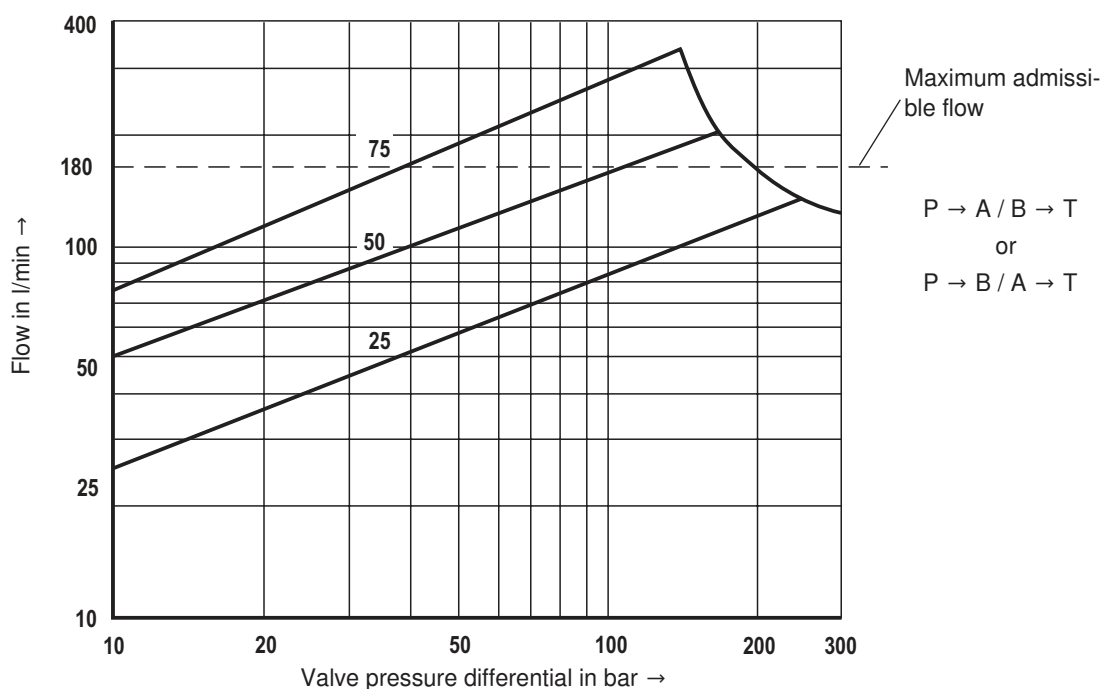
Observe the maximum admissible flow of 80 l/min!

Flow: Type 4WREE (measured with HLP46, $\vartheta_{\text{Oil}} = 40\text{ °C} \pm 5\text{ °C}$)**Size 10**

Load function with maximum valve opening

Rated flow 25, 50 and 75 l/min

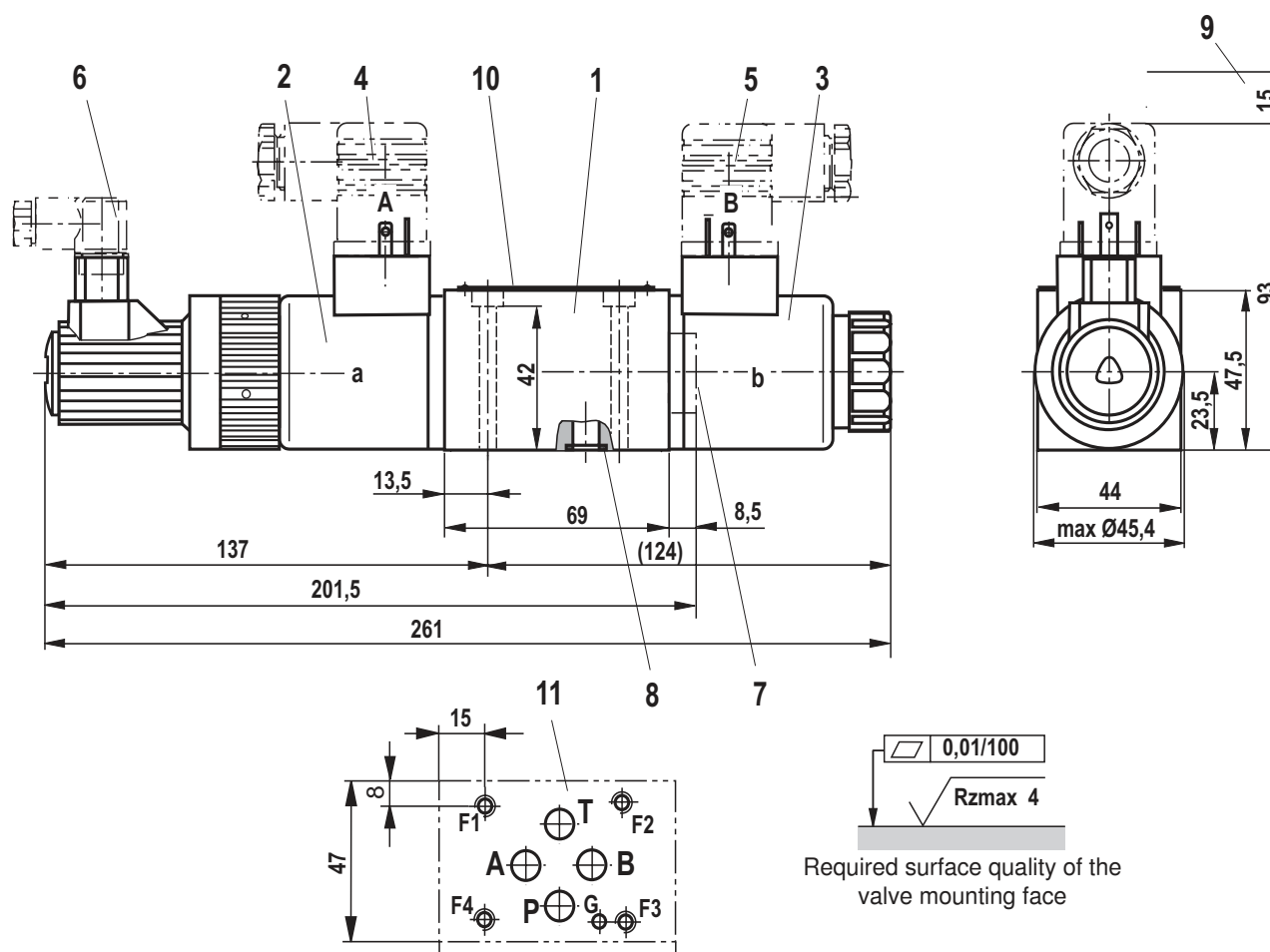
Control spool V



Observe the maximum admissible flow of 180 l/min!

Unit dimensions: Type 4WRE (dimensions in mm)

Size 6

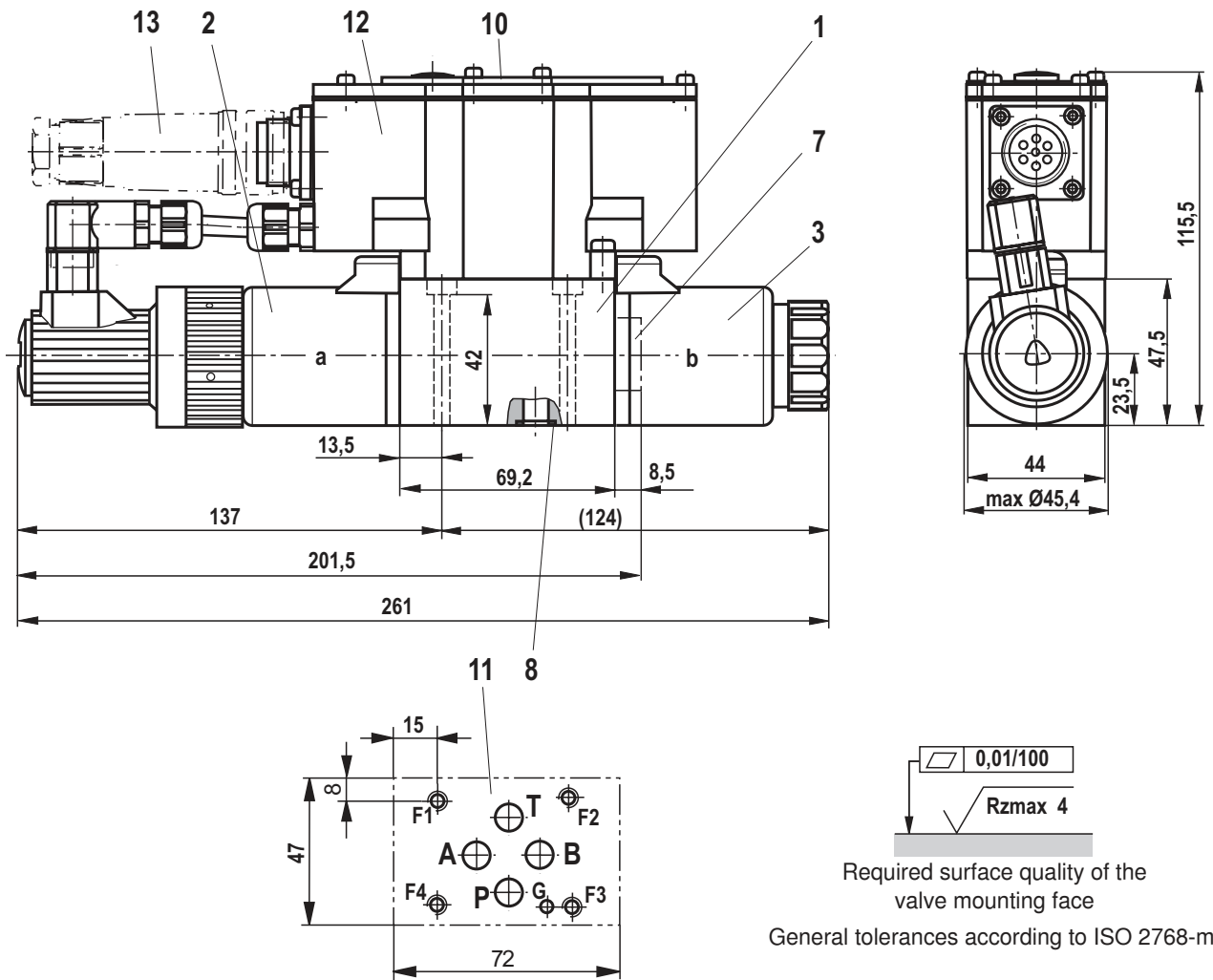


- 1 Valve housing
- 2 Proportional solenoid "a" with inductive position transducer
- 3 Proportional solenoid "b"
- 4 Mating connector "A", color gray, separate order – see page 8
- 5 Mating connector "B", color black, separate order – see page 8
- 6 Mating connector for inductive position transducer, separate order – see page 8
- 7 Plug screw for valve with one solenoid (2 spool positions, version **EA** or **WA**)
- 8 Identical seal rings for ports A, B, P, and T
- 9 Space required to remove the mating connector
- 10 Name plate
- 11 Machined valve mounting face, porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole)
 Deviating from the standard:
 - without locating hole "G"
 - Ports P, A, B and T with $\varnothing 8$ mm

Subplates and valve mounting screws see page 22

Unit dimensions: Type 4WREE (dimensions in mm)

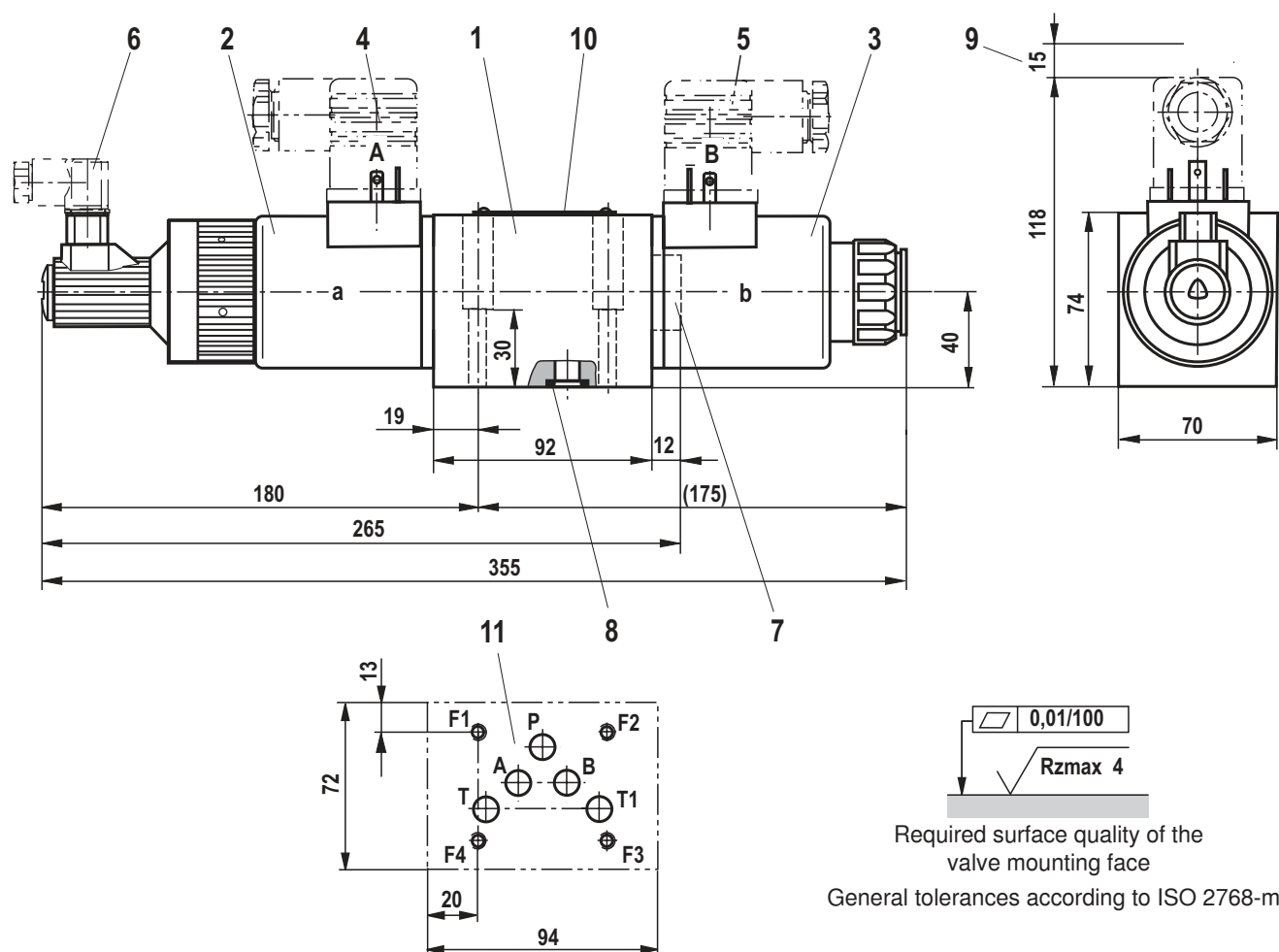
Size 6



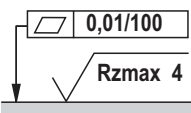
Subplates and valve mounting screws see page 22

Unit dimensions: Type 4WRE (dimensions in mm)

Size 10



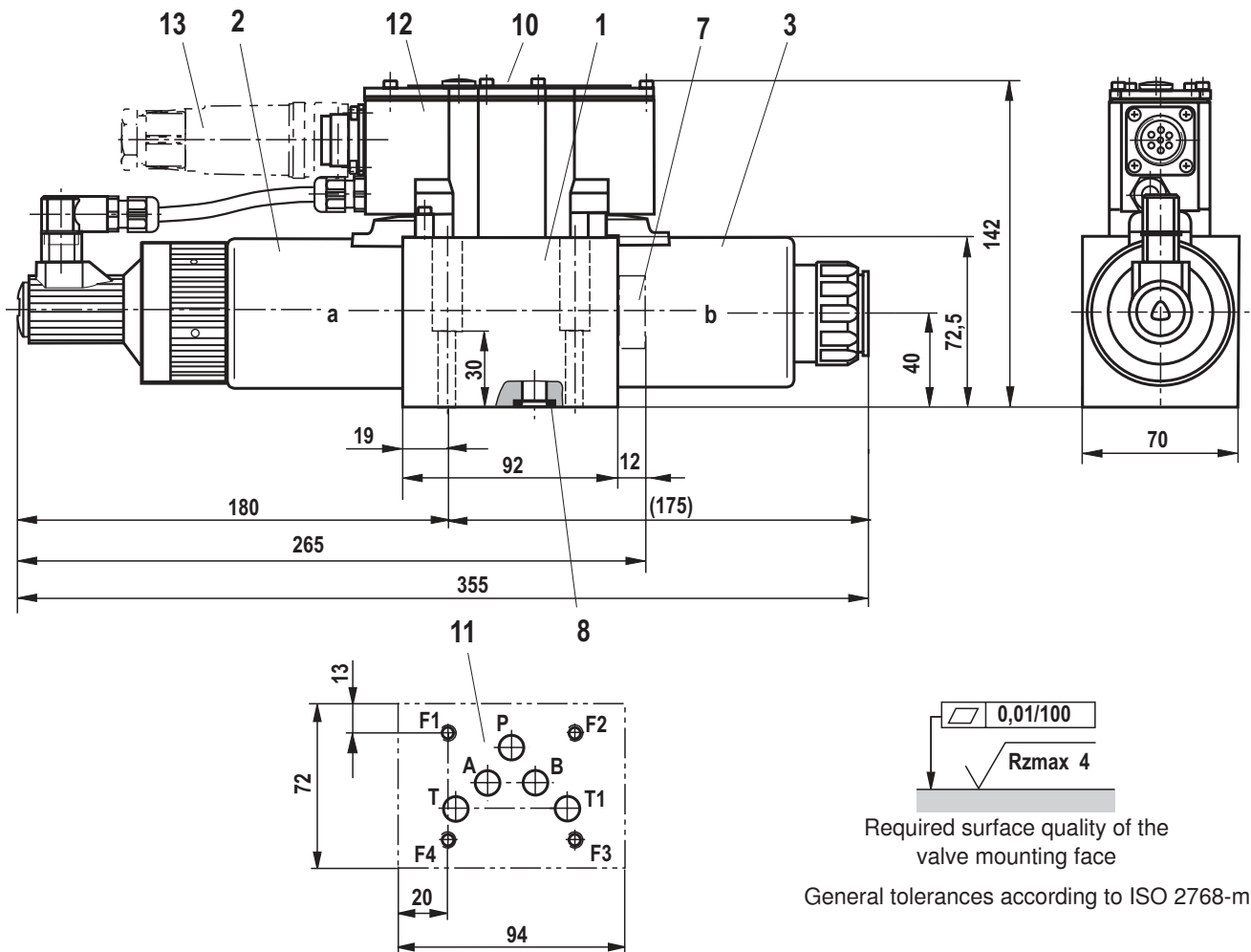
- 1 Valve housing
- 2 Proportional solenoid "a" with inductive position transducer
- 3 Proportional solenoid "b"
- 4 Mating connector "A", color gray, separate order – see page 8
- 5 Mating connector "B", color black, separate order – see page 8
- 6 Mating connector for inductive position transducer, separate order – see page 8
- 7 Plug screw for valve with one solenoid (2 spool positions, version **EA** or **WA**)
- 8 Identical seal rings for ports A, B, P, T and T1
- 9 Space required to remove the mating connector
- 10 Name plate
- 11 Machined valve contact surface, porting pattern according to ISO 4401-05-04-0-05 differing from the standard: Connection T1 Ø 11.2 mm


 Required surface quality of the valve mounting face
 General tolerances according to ISO 2768-mK

Subplates and valve mounting screws see page 22

Unit dimensions: Type 4WREE (dimensions in mm)

size 10



- 1 Valve housing
- 2 Proportional solenoid "a" with inductive position transducer
- 3 Proportional solenoid "b"
- 7 Plug screw for valve with one solenoid
(2 spool positions, version **EA** or **WA**)
- 8 Identical seal rings for ports A, B, P, T and T1
- 10 Name plate
- 11 Machined valve contact surface,
porting pattern according to ISO 4401-05-04-0-05 differ-
ing from the standard: Connection T1 Ø 11.2 mm
- 12 Integrated electronics (OBE)
- 13 Mating connector,
separate order – see page 9

Subplates and valve mounting screws see page 22

Unit dimensions

Hexagon socket head cap screws		Material number
Size 6	4x ISO 4762 - M5 x 50 - 10.9-flZn-240h-L Tightening torque $M_A = 7 \text{ Nm} \pm 10 \%$ or 4x ISO 4762 - M5 x 50 - 10.9 Tightening torque $M_A = 8.9 \text{ Nm} \pm 10 \%$	R913000064
Size 10	4x ISO 4762 - M6 x 40 - 10.9-flZn-240h-L Tightening torque $M_A = 12.5 \text{ Nm} \pm 10 \%$ or 4x ISO 4762 - M6 x 40 - 10.9 Tightening torque $M_A = 15.5 \text{ Nm} \pm 10 \%$	R913000058

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

Subplates	Data sheet
Size 6	45052
Size 10	45054

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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