

# 4/3 directional high-response control valves, direct operated, with integrated control electronics (OBE)

**RE 29067/11.05**  
Replaces: 02.03

1/14

## Type 4WRSE

Sizes 6 and 10  
Series 3X  
Maximum operating pressure 315 bar  
Maximum flow 180 l/min



Type 4WRSE 6 -...-3X/... with  
integrated control electronics (OBE)



Type 4WRSE 10 -...-3X/... with  
integrated control electronics (OBE)

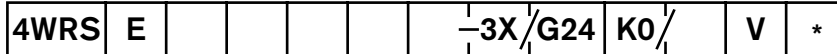
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## Features

- Direct operated directional high-response control valve with integrated control electronics (OBE) for controlling the direction and magnitude of a flow
- Suitable for position and velocity control
- Actuation by control solenoids
- Electrical position feedback
- High response sensitivity and low hysteresis
- Integrated control electronics (OBE) with interface  $\pm 10$  V or 4 ... 20 mA
- For subplate mounting:
  - Porting pattern to DIN 24340 form A and ISO 4401
  - Subplates to data sheets RE 45052 and RE 45054 (separate order), see pages 12 and 13

**Ordering code**

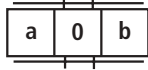


Integrated control electronics (OBE) = E

Without sleeve = No code

Size 6 = 6  
 Size 10 = 10

**Spool symbols**



**With symbol V1:-**

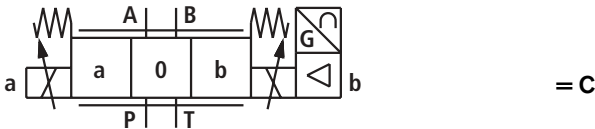
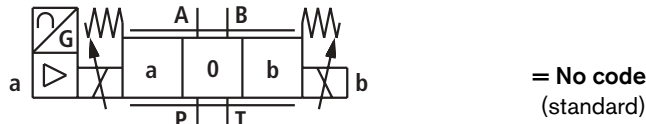
P → A:  $q_V$       B → T:  $q_V/2$   
 P → B:  $q_V/2$       A → T:  $q_V$

**With symbol Q2:-**

P → A:  $q_V$       B → T:  $q_V$   
 P → B:  $q_V/3$       A → T:  $q_V$

**Note:**  
 Spools V and V1 have an overlap of -1.0 % ... +1.0 %.

**Side of inductive position transducer**



Further details in clear text

**Seal material**

**V =** FKM seals, suitable for mineral oils (HL, HLP) to DIN 51524 and phosphate ester (HFD-R)

**Interface of control electronics**

**A1 =** Command value input ±10 V  
**F1 =** Command value input 4 ... 20 mA

**Electrical connection**

**K0 =** With component plug to DIN EN 175201-804  
 Without cable socket  
 Cable socket – separate order, see page 5

**Supply voltage of control electronics**

**G24 =** 24 V DC

**3X =** Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)

**Nominal flow at 10 bar valve pressure differential**

**Size 6**

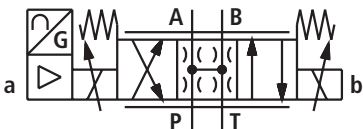
**04 =** 4 l/min (only with symbol V)  
**10 =** 10 l/min  
**20 =** 20 l/min  
**35 =** 35 l/min

**Size 10**

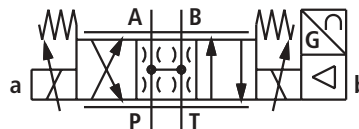
**25 =** 25 l/min  
**50 =** 50 l/min  
**80 =** 75 l/min

**Symbols**

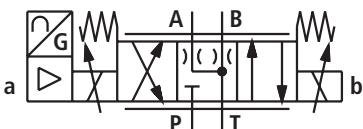
Type 4WRSE..V (standard)



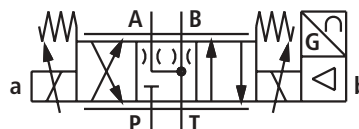
Type 4WRSE..VC



Type 4WRSE..Q2 (standard)



Type 4WRSE..Q2C



## Standard types

Size 6		Size 10	
Type	Material number	Type	Material number
4WRSE 6 V04-3X/G24K0/A1V	R900938307	4WRSE 10 Q2-50-3X/G24K0/A1V	R900916872
4WRSE 6 V1-10-3X/G24K0/A1V	R900909078	4WRSE 10 V1-80-3X/G24K0/A1V	R900556812
4WRSE 6 V1-20-3X/G24K0/A1V	R900906155	4WRSE 10 V1-25-3X/G24K0/A1V	R900922997
4WRSE 6 V1-35-3X/G24K0/A1V	R900904794	4WRSE 10 V1-50-3X/G24K0/A1V	R900579140
4WRSE 6 V10-3X/G24K0/A1V	R900558830	4WRSE 10 V25-3X/G24K0/A1V	R900579637
4WRSE 6 V20-3X/G24K0/A1V	R900576060	4WRSE 10 V50-3X/G24K0/A1V	R900579943
4WRSE 6 V35-3X/G24K0/A1V	R900579447	4WRSE 10 V80-3X/G24K0/A1V	R900579286

## Function, section

These 4/3 directional high-response valves are direct operated components of sandwich plate design. They are actuated by control solenoids. The solenoids are controlled by integrated control electronics (OBE).

### Structure:

The valve basically consists of:

- Housing (1) with connection face
- Control spool (2) with compression springs (3 and 4)
- Solenoids (5 and 6)
- Position transducer (7)
- Integrated control electronics (OBE) (8)
- Zero point adjustment (9) accessible via Pg9 cover

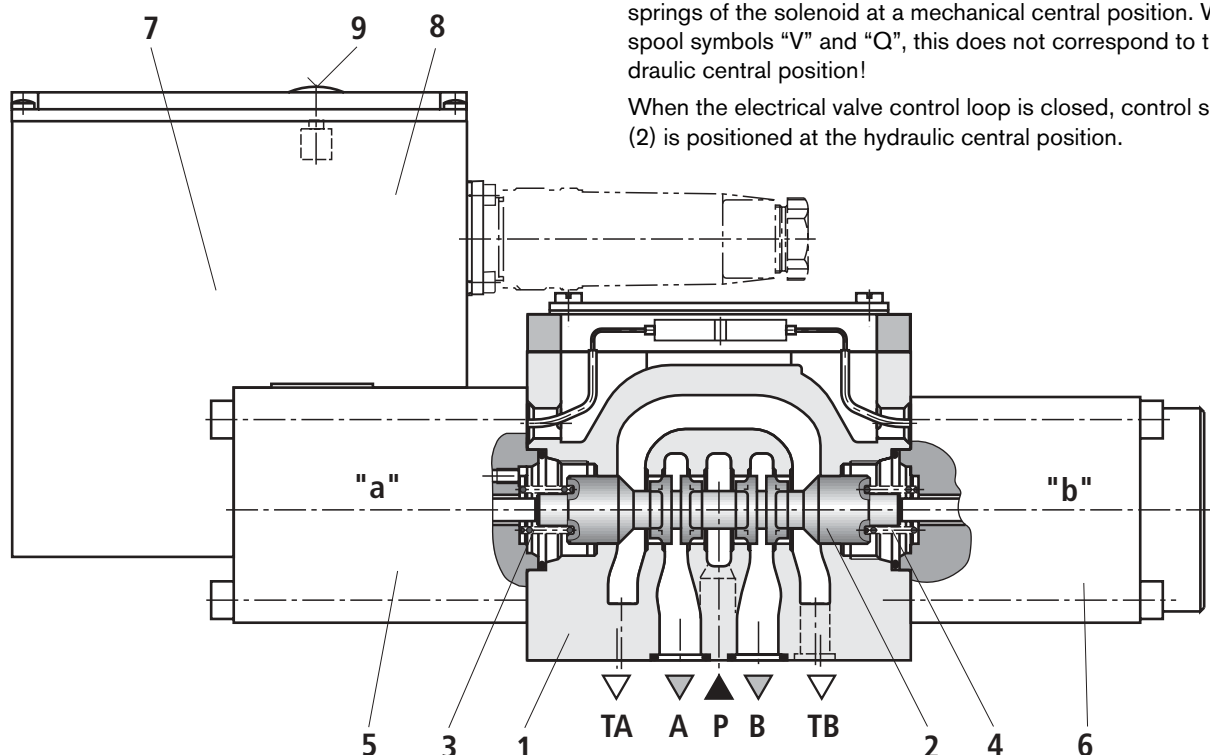
### Functional description:

- When solenoids (5 and 6) are de-energised, control spool (2) is held by compression springs (3 and 4) in the central position
- Direct operation of control spool (2) through energisation of the control solenoid
  - e.g. controlling of solenoid "b" (6)
    - Control spool (2) is pushed to the left in proportion to the electrical input signal
    - Connection open from P → A and B → T via orifice-like cross-sections with linear flow characteristics
- De-energisation of solenoid (6)
  - Control spool (2) is returned by compression spring (3) to the central position

In the de-energised state, control spool (2) is held by the return springs of the solenoid at a mechanical central position. With spool symbols "V" and "Q", this does not correspond to the hydraulic central position!

When the electrical valve control loop is closed, control spool (2) is positioned at the hydraulic central position.

### Type 4WRSE 10 V...



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


<b>General</b>		
Sizes		<b>Size 6</b> <b>Size 10</b>
Weight	kg	3.0                              7.3
Installation orientation		Optional, preferably horizontal
Ambient temperature range	°C	-20 ... +50
Storage temperature range	°C	-20 ... +80

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

Operating pressure	Ports P, A, B	bar	up to 315	up to 315
	Port T	bar	up to 315	up to 315
Nominal flow $q_{V \text{ nom}} \pm 10 \%$ at $\Delta p = 10 \text{ bar}$ ( $\Delta p =$ valve pressure differential)		l/min	4	25
			10	50
			20	75
			35	–
Max. permissible flow		l/min	80	180
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 and phosphate ester (HFD-R), further hydraulic fluids on enquiry	
Hydraulic fluid temperature range		°C	-20 ... +80	
Viscosity range		mm <sup>2</sup> /s	20 ... 380, preferably 30 ... 46	
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 18/16/13 <sup>1)</sup>	
Hysteresis		%	≤ 0.05	
Range of inversion		%	≤ 0.03	
Response sensitivity		%	≤ 0.03	
Zero point balancing		%	≤ 1	
Zero point drift with change in:			<b>Size 6</b>	<b>Size 10</b>
	Hydraulic fluid temperature	%/10 K	< 0.1	< 0.1
	Operating pressure	%/100 bar	< 0.5	< 0.3

<b>Electrical</b>				
Operating voltage	Nominal value (limits)	VDC	24	(19.4 ... 35)
Current consumption	Size 6	A	max. 2	Impulse load: 4 A
	Size 10	A	max. 2.8	Impulse load: 4 A
Interface "A1"	Command value signal	V	±10	$R_i > 50 \text{ k}\Omega$
	Actual value signal	V	±10	$I_{\text{max}} = 2 \text{ mA}$
Interface "F1"	Command value signal	mA	4 ... 20	$R_e > 100 \Omega$
	Actual value signal	mA	4 ... 20	max. load resistance 500 $\Omega$
Duty cycle		%	100	
Coil temperature <sup>1)</sup>		°C	up to 150	
Type of protection of valve to EN 60529			IP 65 with cable socket correctly mounted and locked	

1) Due to the surface temperatures of solenoid coils, observe European standards EN 563 and EN 982!

 **Note:** For details with regard to environment simulation testing in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 29067-U (declaration on environmental compatibility).

## Electrical connection

Component plug pin assignment	Contact	Signal	
		Interface A1	Interface F1
Supply voltage	A	24 VDC (19.4 ... 35 VDC), $I_{\max} = 2 \text{ A}$ (size 6), $I_{\max} = 2.8 \text{ A}$ (size 10), impulse load: 4 A	
	B	0 V	
Actual value reference potential	C	Connect reference potential for contact F to $\perp$ on the control side (star-shape)	Reference potential for contact F
Command value signal	D	$\pm 10 \text{ V}$ , $R_i > 50 \text{ k}\Omega$	4 ... 20 mA, $R_i > 100 \Omega$
	E	Reference potential for contact D	
Actual value	F	$\pm 10 \text{ V}$ $I_{\max} = 2 \text{ mA}$	4 ... 20 mA, max. load resistance 500 $\Omega$
Protective conductor	PE	Connected to heat sink and valve body	

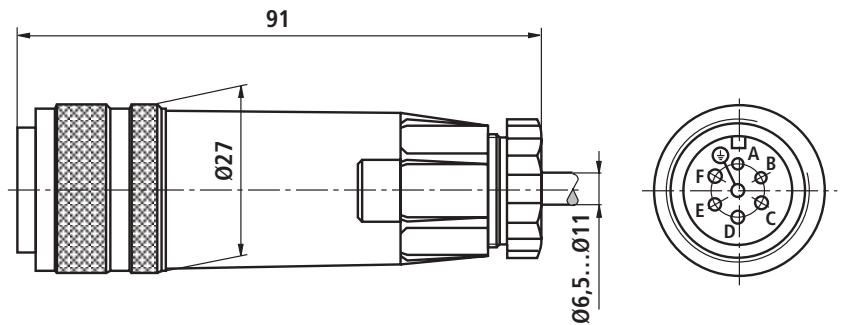
**Command value:** Positive command value at D (interface A1) or 12 ... 20 mA (interface F1) and reference potential at E causes a flow from P → A and B → T.  
Negative command value at D (interface A1) or 12 ... 4 mA (interface F1) and reference potential at E causes a flow from P → B and A → T.

**Actual value:** Interface A1: Positive signal at F and reference potential at C means flow from P → A.  
Interface F1: 12 ... 20 mA means flow from P → A.

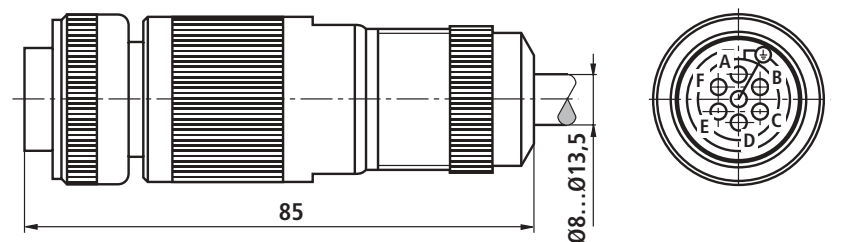
**Connecting cable:** Recommendation: – up to 25 m cable length: Type LiYCY 7 x 0.75 mm<sup>2</sup>  
– up to 50 m cable length: Type LiYCY 7 x 1.0 mm<sup>2</sup>  
Outer diameter 6.5 ... 11 mm or 8 ... 13.5 mm, respectively  
Connect shield to  $\perp$  only on the supply side.

## Cable sockets

**Cable socket (plastic version)**  
to DIN EN 175201-804  
Separate order,  
material no. **R900021267**



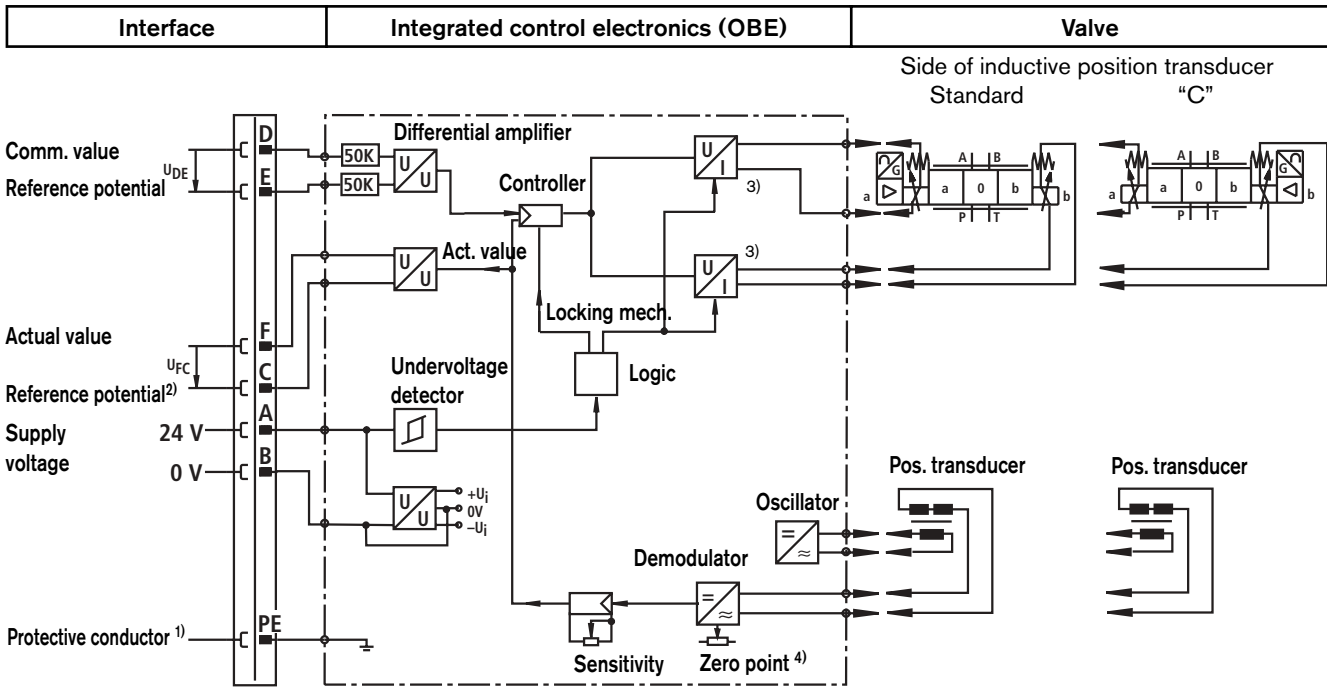
**Cable socket (metal version)**  
to DIN EN 175201-804  
Separate order,  
material no. **R900223890**



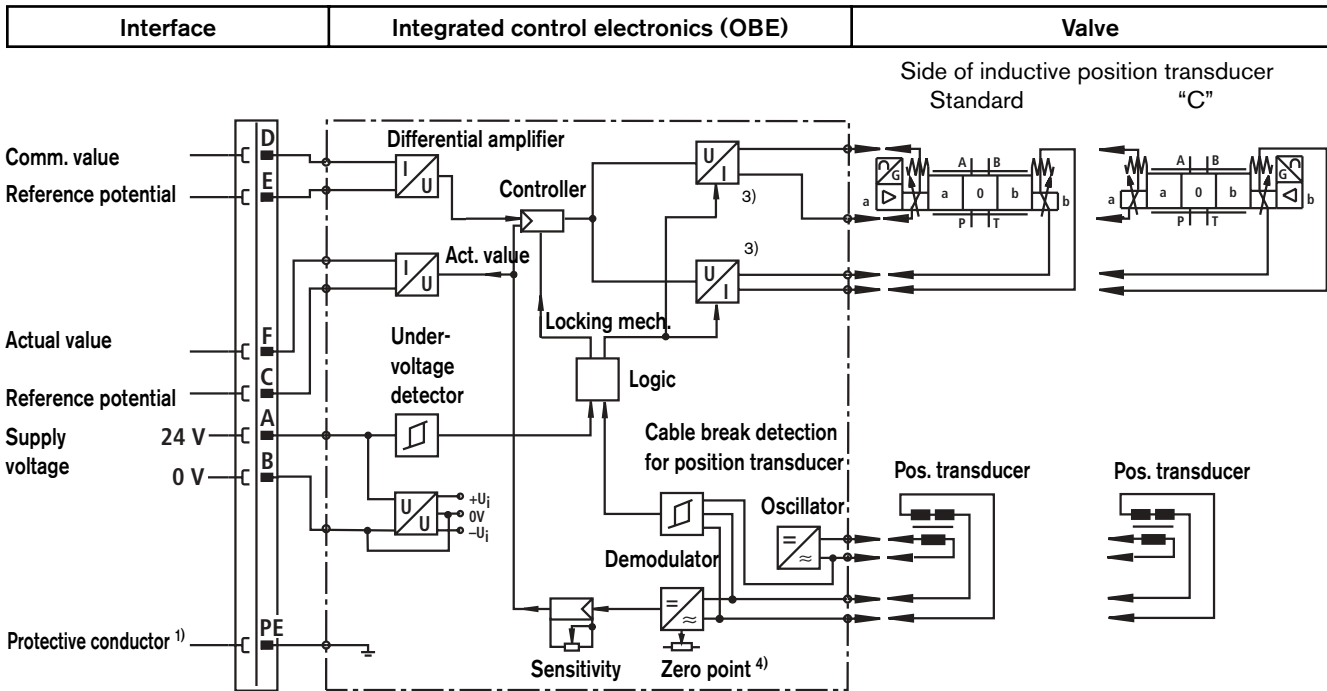
## Integrated control electronics (OBE)

### Block circuit diagram / pin assignment of integrated control electronics (OBE)

#### Interface A1



#### Interface F1



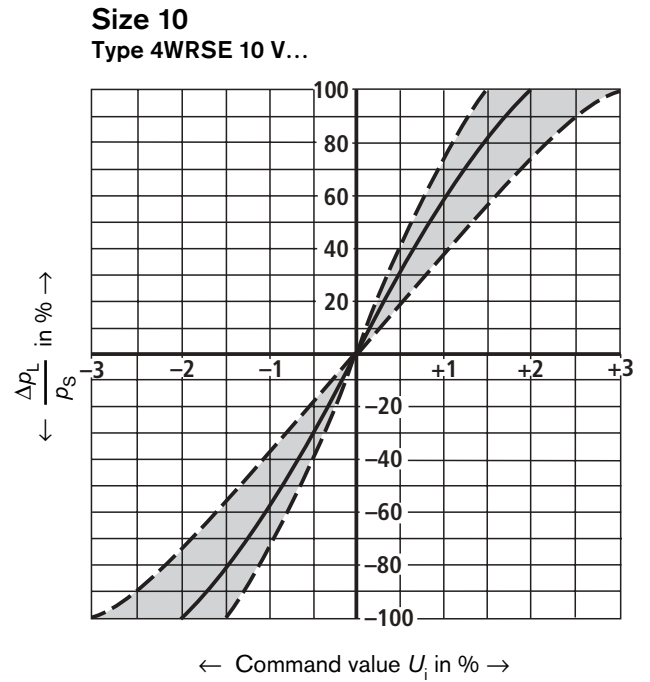
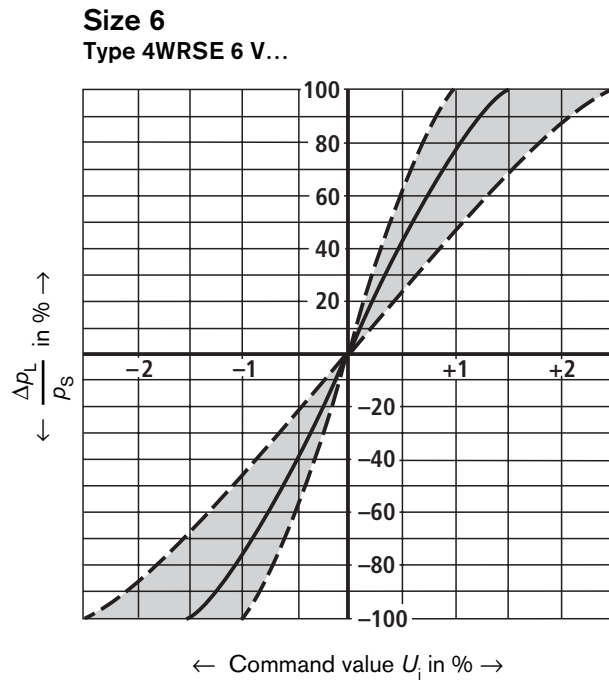
**Note:**

Electrical signals brought out via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions! (See also European standard EN 982, "Safety requirements for fluid power systems and components - hydraulics")

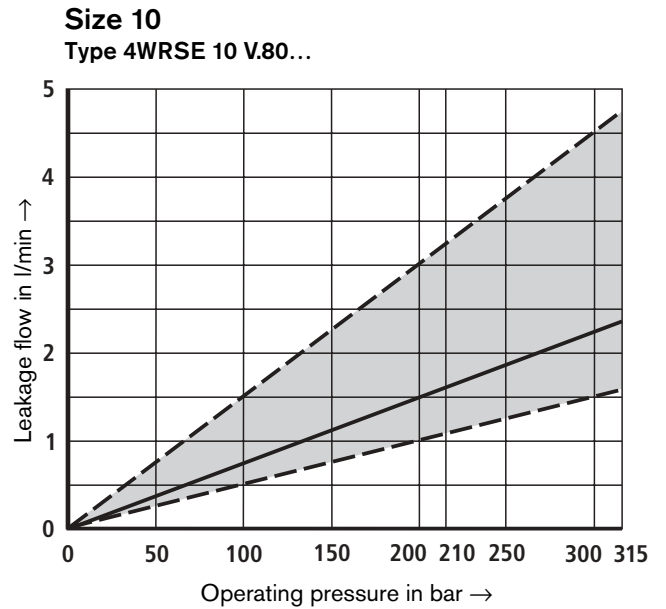
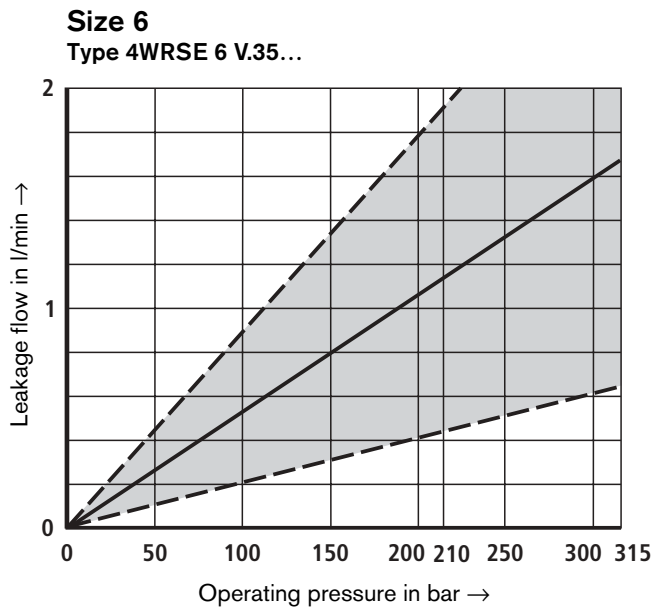
- 1) PE connection connected to heat sink and valve body
- 2) Connect pin C to ⊥ on the control side
- 3) Output stage current regulated
- 4) Zero point externally adjustable

**Characteristic curves** (measured with HLP46,  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ )

**Pressure/signal characteristic curves (V spool)  $p_S = 100\text{ bar}$**



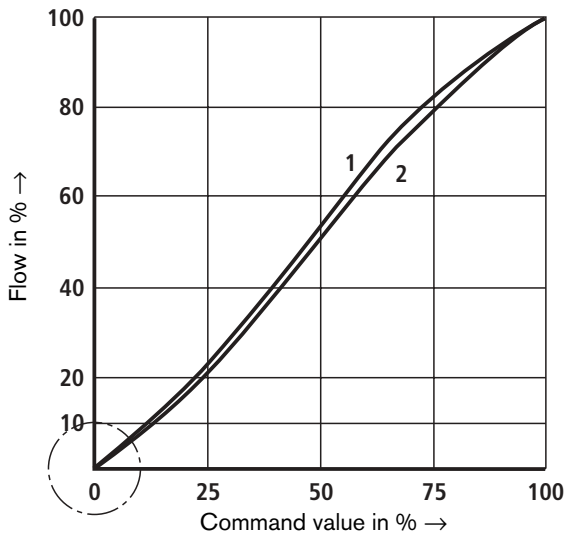
**Typical leakage flow**



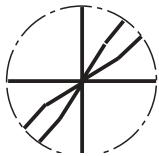
**Characteristic curves of size 6 (measured with HLP46,  $\vartheta_{oil} = 40\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ )**

**Typical flow characteristic curve (V, V1 spool)**

at 10 bar valve pressure differential or 5 bar per control land



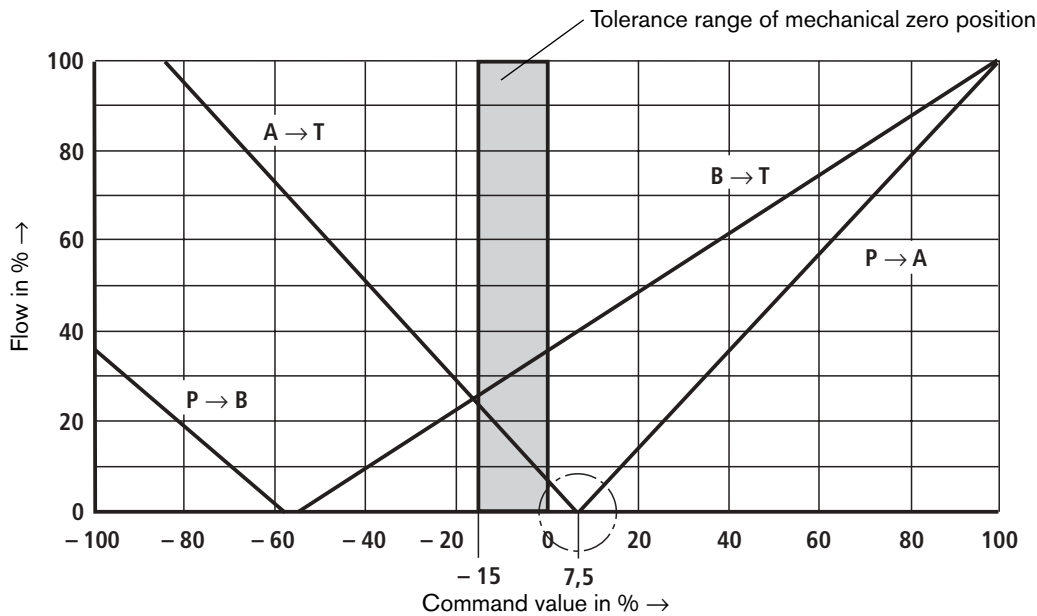
1 = Nominal flow 35 l/min  
 2 = Nominal flow 10 l/min  
 Spool ... 20 between characteristic curves 1 and 2



Zero point passage depending on manufacturing tolerance  
 Valve overlap -1 % ... +1 %

**Typical flow characteristic curve (Q2 spool)**

at 10 bar valve pressure differential or 5 bar per control land

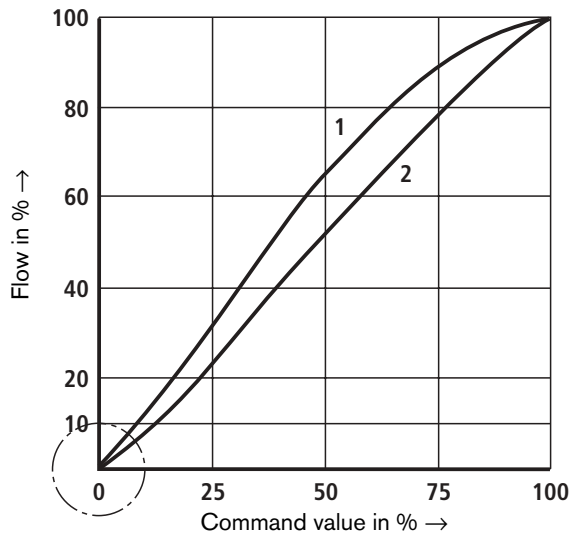




**Characteristic curves of size 10 (measured with HLP46,  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ )**

**Typical flow characteristic curve (V, V1 spool)**

at 10 bar valve pressure differential or 5 bar per control land



1 = Nominal flow 75 l/min

2 = Nominal flow 25 l/min

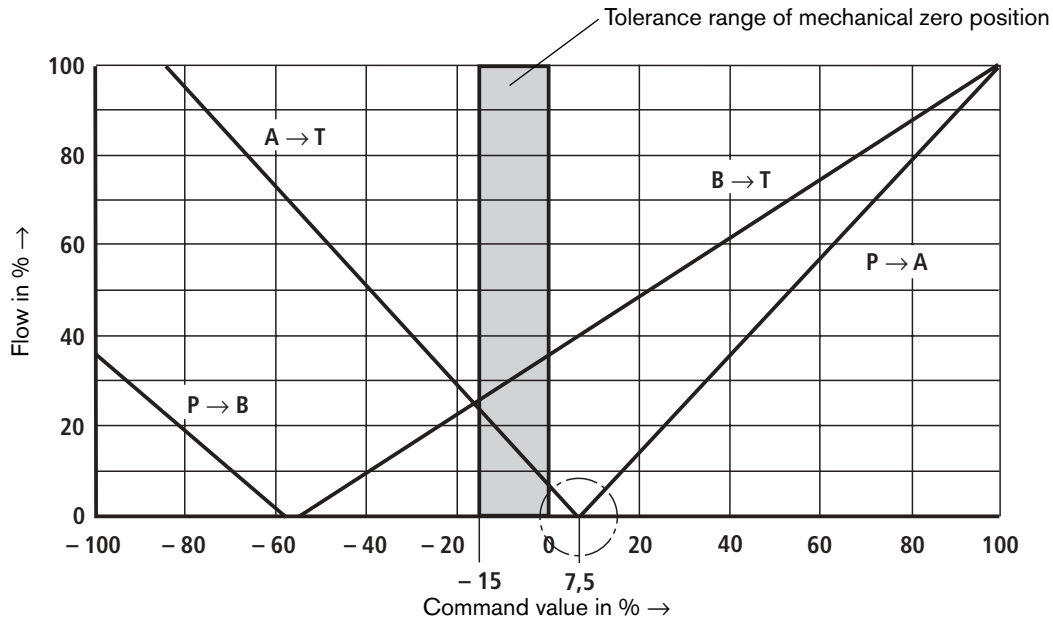
Spool ... 50 between characteristic curves 1 and 2



Zero point passage depending on manufacturing tolerance  
Valve overlap -1 % ... +1 %

**Typical flow characteristic curve (Q2 spool)**

at 10 bar valve pressure differential or 5 bar per control land

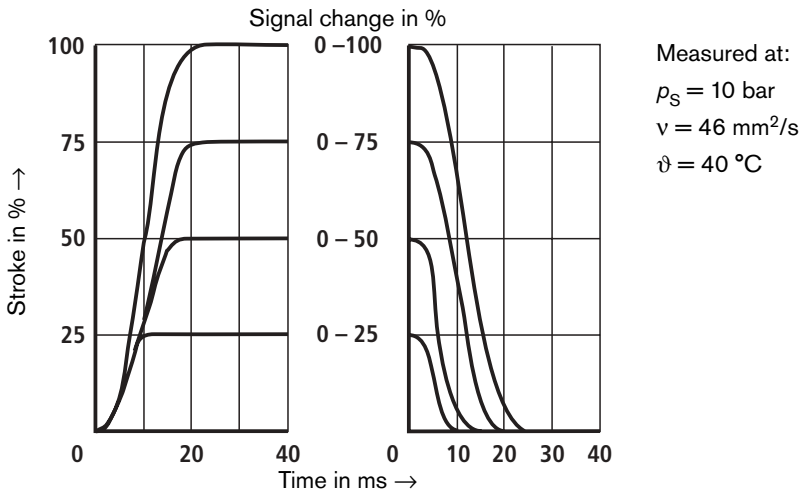


Tolerance range of mechanical zero position

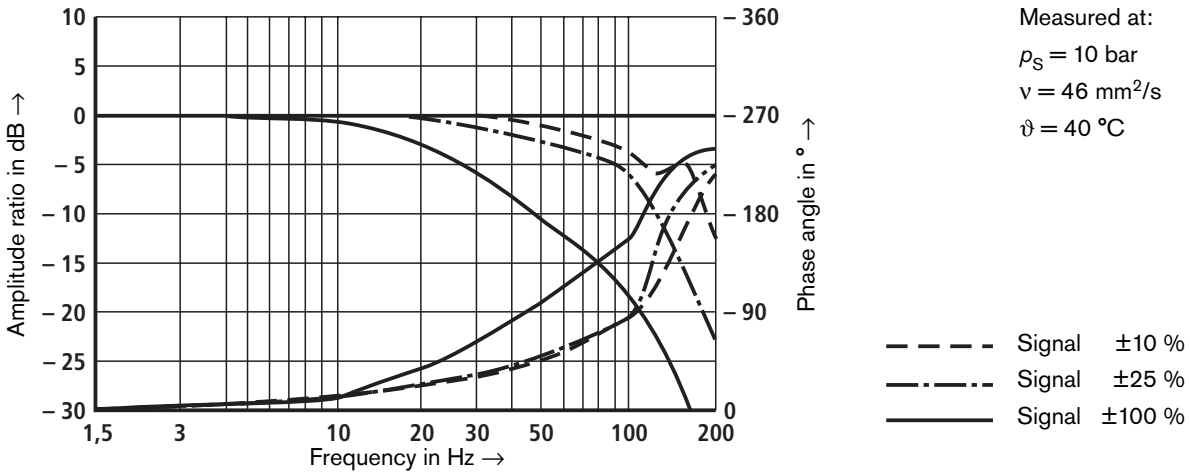


**Characteristic curves of size 6 (measured with HLP46,  $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ )**

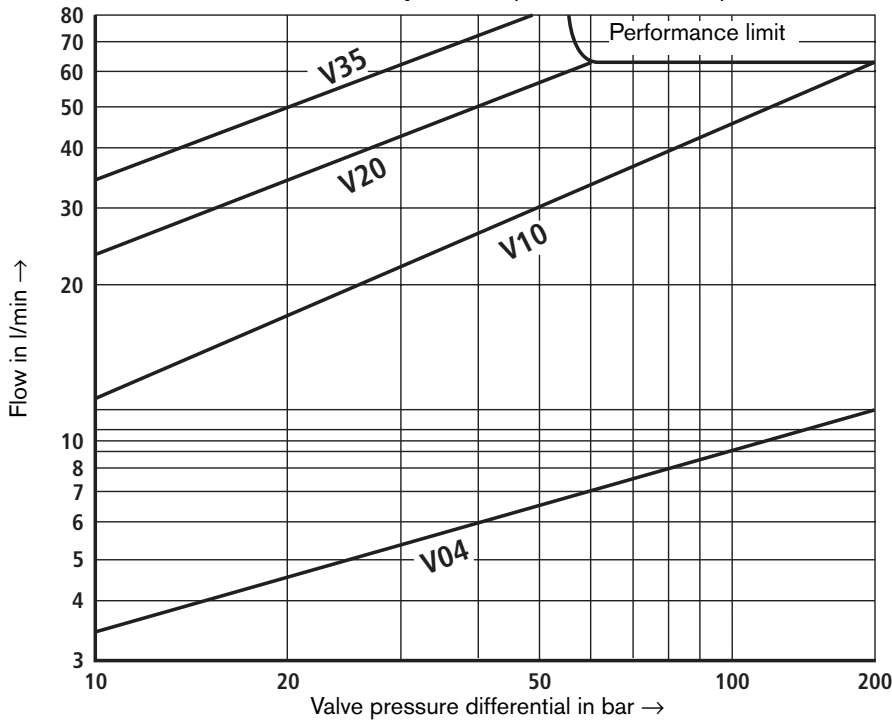
**Transient function with stepped electrical input signals**



**Frequency response characteristic curves**

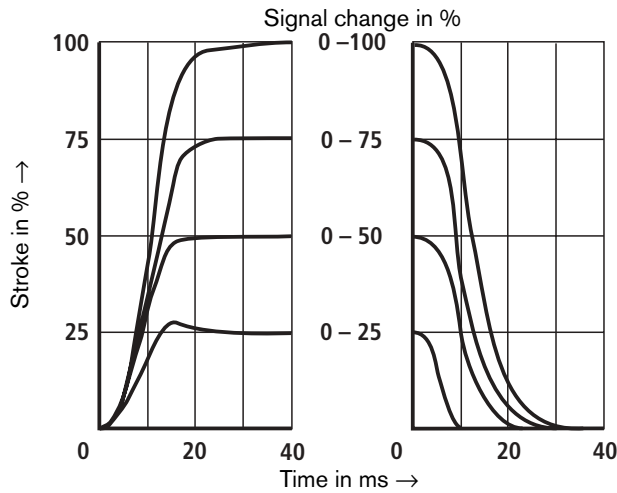


**Flow/load function at max. valve aperture (tolerance  $\pm 10\%$ )**



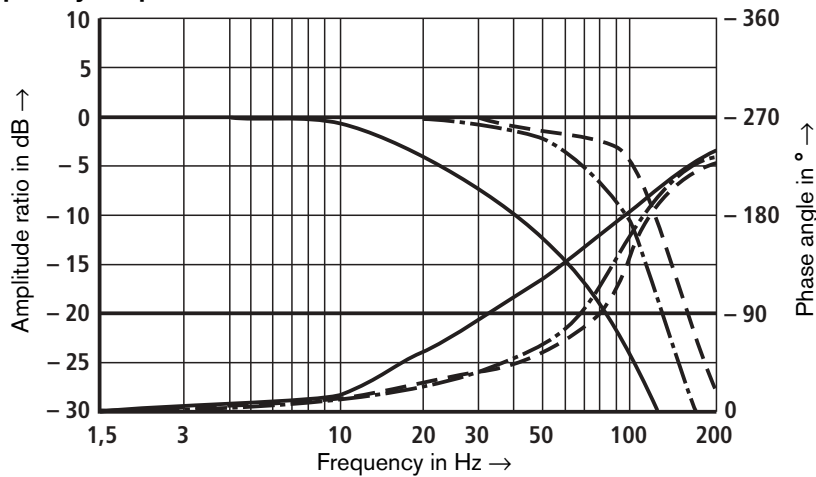
**Characteristic curves of size 10 (measured with HLP46,  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ )**

**Transient function with stepped electrical input signals**



Measured at:  
 $p_S = 10\text{ bar}$   
 $v = 46\text{ mm}^2/\text{s}$   
 $\vartheta = 40\text{ °C}$

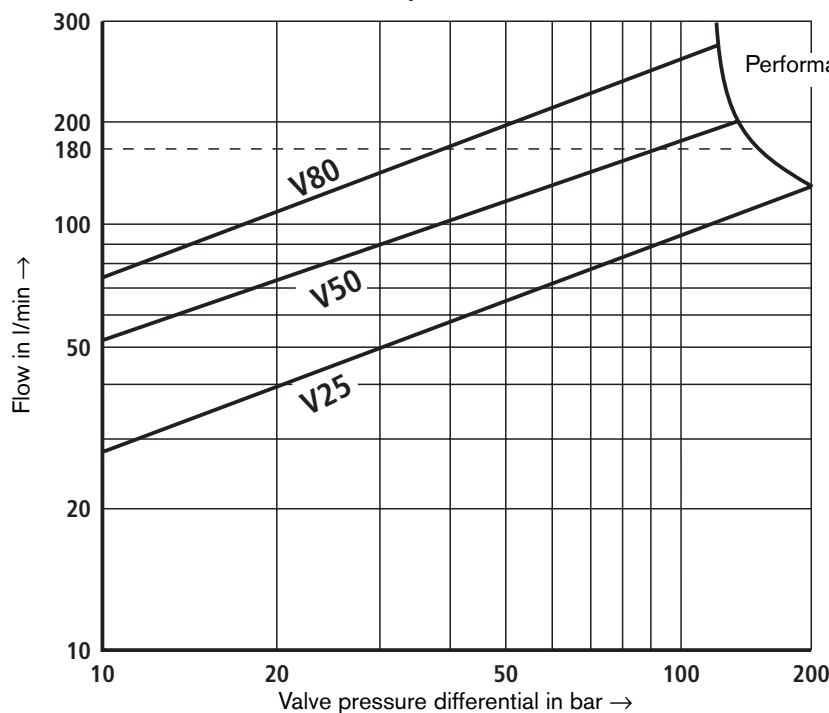
**Frequency response characteristic curves**



Measured at:  
 $p_S = 10\text{ bar}$   
 $v = 46\text{ mm}^2/\text{s}$   
 $\vartheta = 40\text{ °C}$

--- Signal  $\pm 10\%$   
 - · - Signal  $\pm 25\%$   
 ——— Signal  $\pm 100\%$

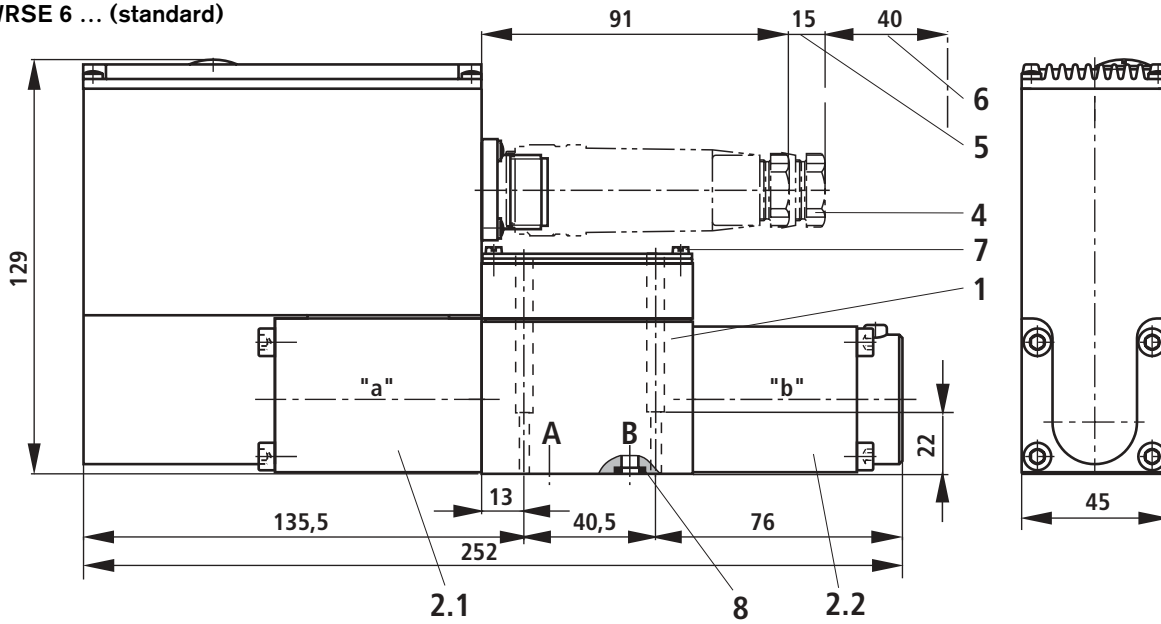
**Flow/load function at max. valve aperture (tolerance  $\pm 10\%$ )**



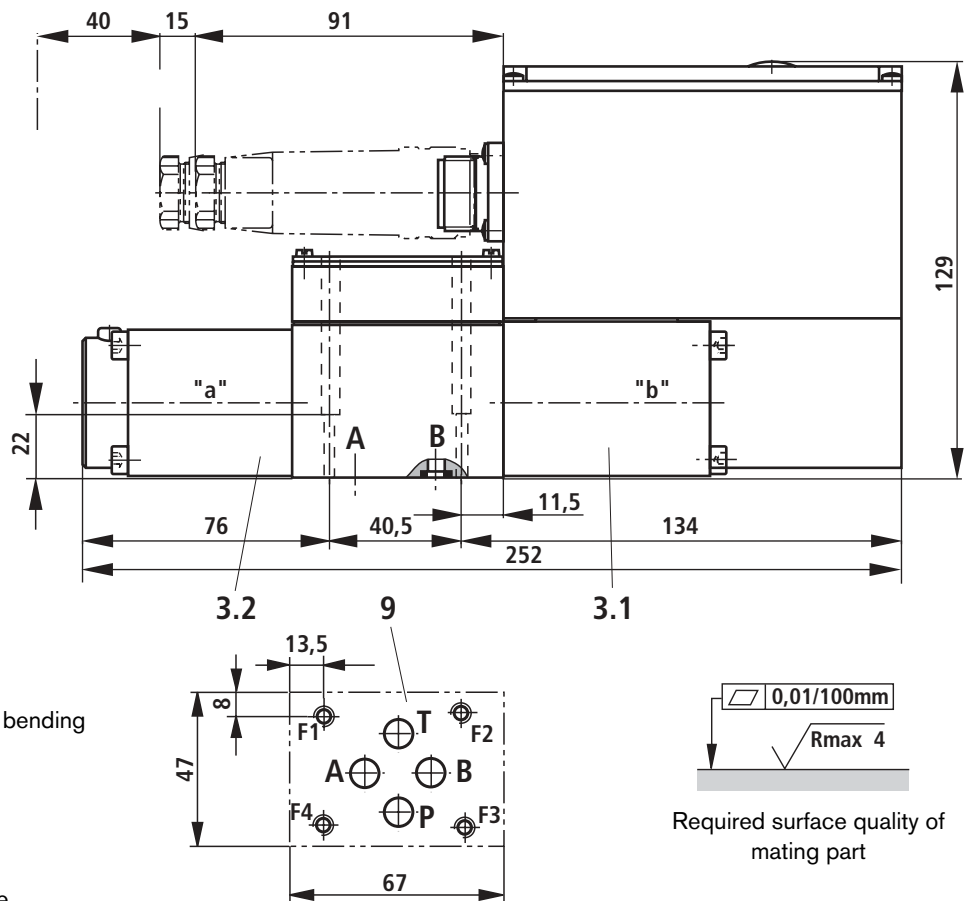
--- Recommended flow li-  
 mitation  
 $q_V = 180\text{ l/min}$

### Unit dimensions of size 6 (nominal dimensions in mm)

#### Type 4WRSE 6 ... (standard)



#### Type 4WRSE 6 C...



- 1 Valve housing
- 2.1 Control solenoid "a" with inductive position transducer
- 2.2 Control solenoid "b" with inductive position transducer
- 3.1 Control solenoid "b" with inductive position transducer
- 3.2 Control solenoid "a" with inductive position transducer
- 4 Cable socket to DIN EN 175201-804 (separate order, see page 5)
- 5 Space required to remove cable socket
- 6 Additional space required for bending radius of connecting cable
- 7 Nameplate
- 8 R-ring 9.81 x 1.5 x 1.78 (ports P, A, B, T)
- 9 Machined valve mounting face, position of ports to DIN 24340 form A6 and ISO 4401-03-02-0-94 without locating bore

Subplates to data sheet RE 45052 and valve fixing screws must be ordered separately.

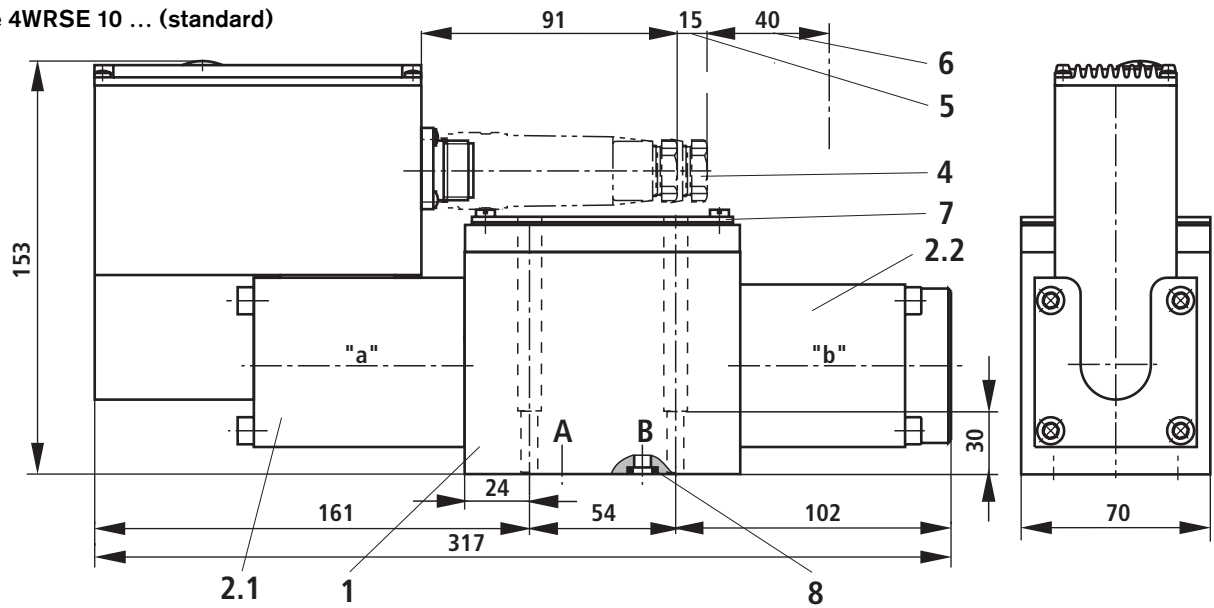
- Subplates:**
- G 341/01 (G1/4)
  - G 342/01 (G3/8)
  - G 502/01 (G1/2)

4 hexagon socket head cap screws  
 ISO 4762 – M5x30-10.9-fZn-240h-L  
 (friction coefficient total = 0.09 to 0.14)  
 Tightening torque  $M_T = 7 \text{ Nm} \pm 10\%$   
 material no. R913000316 (separate order)

Required surface quality of mating part

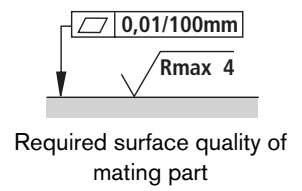
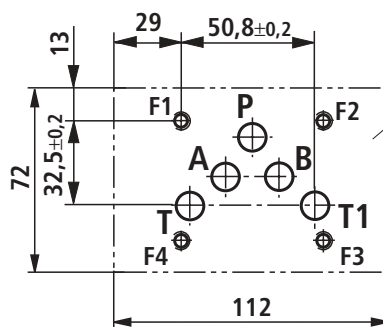
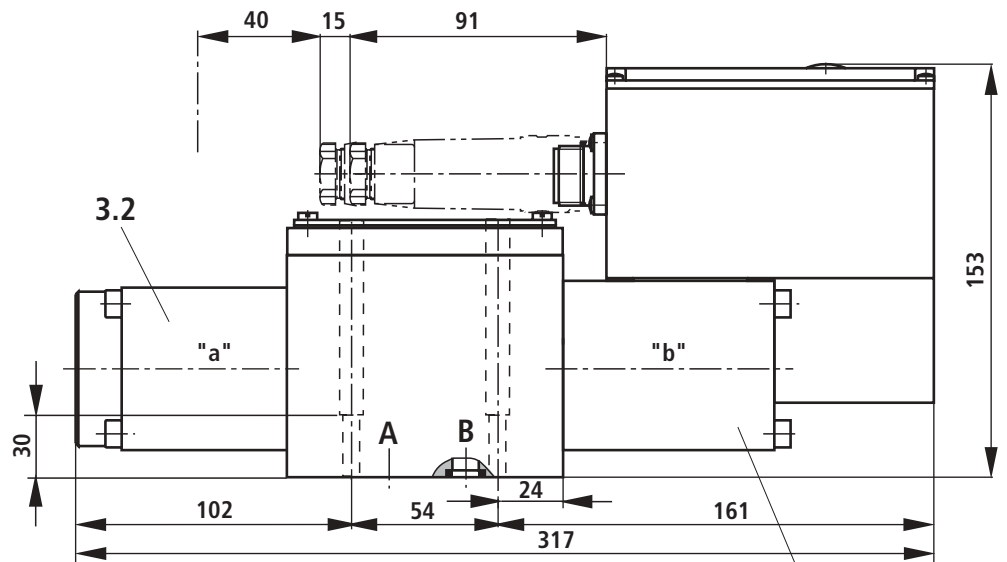
Unit dimensions of size 10 (nominal dimensions in mm)

Type 4WRSE 10 ... (standard)



Type 4WRSE 10 C...

- 1 Valve housing
- 2.1 Control solenoid "a" with inductive position transducer
- 2.2 Control solenoid "b" with inductive position transducer
- 3.1 Control solenoid "b" with inductive position transducer
- 3.2 Control solenoid "a" with inductive position transducer
- 4 Cable socket to DIN EN 175201-804 (separate order, see page 5)
- 5 Space required to remove cable socket
- 6 Additional space required for bending radius of connecting cable
- 7 Nameplate
- 8 R-ring 13.0 x 1.6 x 2.0 (ports A, B, P, T)
- 9 Machined valve mounting face, position of ports to DIN 24340 form A10 and ISO 4401-05-04-0-94



Subplates to data sheet RE 45054 and valve fixing screws must be ordered separately.

- Subplates:**
- G 66/01 (G3/8)
  - G 67/01 (G1/2)
  - G 534/01 (G3/4)

4 hexagon socket head cap screws  
 ISO 4762 – M6x40-10.9-flZn-240h-L  
 (friction coefficient total = 0.09 to 0.14)  
 Tightening torque  $M_T = 12.5 \text{ Nm} \pm 10\%$   
 material no. R913000058 (separate order)

## Notes

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