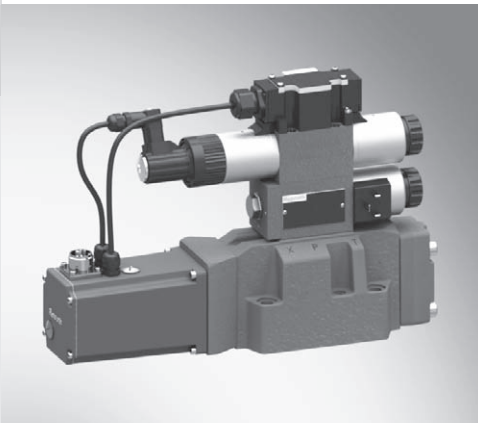
Rexroth
Bosch Group

4/3 directional control valves, pilot operated, with electrical position feedback and integrated electronics (OBE)

RE 29083/08.13 1/22
Replaces: 09.12

Type 4WRTE



Size 10 to 35
Component series 4X
Maximum operating pressure 350 bar

Table of contents

Features

- Pilot operated 2-stage directional control valve with electrical position feedback of the main control spool and integrated electronics (OBE)
- Suitable for the position, velocity, pressure and force control
- Control of flow direction and size
- Pilot control valve:
  Direct operated, position-controlled, with pressure feed back of the pilot pressures
- Main stage:
  Self-centering, position-controlled
- Subplate mounting:
  Porting pattern according to ISO 4401

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

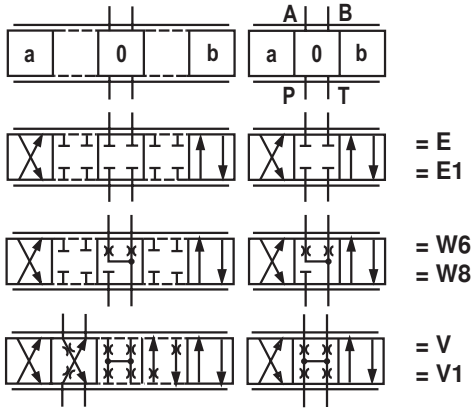
4WRTE [ ] [ ] [ ] **−4X/6E G24** [ ] **K31/** [ ] [ ] *

2-stage directional control valve with electrical position feedback and integrated electronics (OBE)

Size

Size 10	**= 10**
Size 16	**= 16**
Size 25	**= 25**
Size 27	**= 27**
Size 32	**= 32**
Size 35	**= 35**

Control spool symbols



= E
= E1
= W6
= W8
= V
= V1

Control spool symbols E1-, W8-, V1-:

P → A : q_V B → T: $q_V/2$

P → B: $q_V/2$ A → T: q_V

Rated flow at valve pressure differential Δp = 10 bar

Size 10	
25 l/min [1]	**= 25**
50 l/min [2]	**= 50**
90 l/min	**= 100**
Size 16	
125 l/min [3]	**= 125**
150 l/min [4]	**= 150**
180 l/min	**= 200**
220 l/min	**= 220**
Size 25	
220 l/min	**= 220**
350 l/min	**= 350**
Size 27	
500 l/min	**= 500**
Size 32	
400 l/min	**= 400**
600 l/min	**= 600**
Size 35	
1000 l/min	**= 1000**

Flow characteristics

L = Linear

P = Linear with fine control range

4X = Component series 40 to 49
(40 to 49: Unchanged installation and connection dimensions)

6E = Size 6
Proportional solenoid with detachable coil

Supply voltage

G24 = Direct voltage 24 V

Pilot oil supply and return

no code = Pilot oil supply external
Pilot oil return external

E = Pilot oil supply internal
Pilot oil return external

T = Pilot oil supply external
Pilot oil return internal

ET = Pilot oil supply internal
Pilot oil return internal

Electrical connection

K31 = **Without** mating connector
with connector according to DIN EN 175201-804
Mating connector – separate order, see page 21

Electronics interface

A1 = [5] Command value/actual value ±10 V

F1 = Command value/actual value 4 to 20 mA

Seal material

M = NBR seals

V = FKM seals

Further details in the plain text

[1] E, W6-, W8-, V only available with flow characteristics **L** (linear)

[2] E1-, W8-, V1- only available with flow characteristics **L** (linear)

[3] V1-125 only available with flow characteristics **L** (linear)

[4] V1-150 only available with flow characteristics **L** (linear)

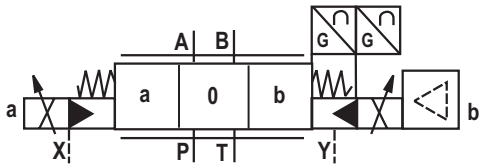
[5] When replacing the component series 3X by component series 4X, the electronics interface is to be defined with **A5** (enable signal at pin C).

Symbols

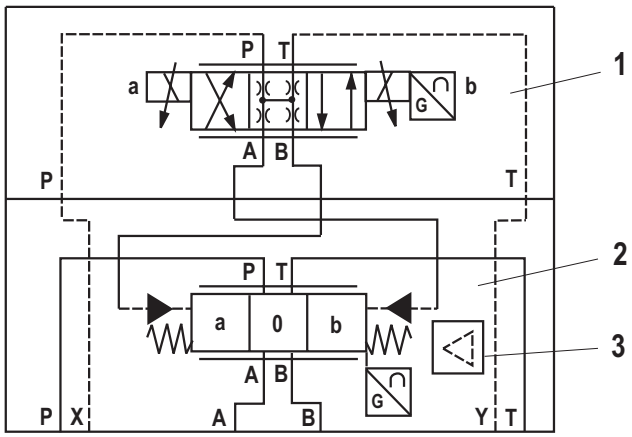
Simplified

Example:

Pilot oil supply external
Pilot oil return external



Detailed



1 Pilot control valve
2 Main valve
3 Integrated electronics (OBE)

Function, section

The 4/3 directional control valve is designed for subplate mounting, with position control and integrated electronics.

Set-up:

The valve consists of 3 main assemblies:

- Housing (1) with main stage control spool (2)
- Integrated electronics with inductive position transducer (3) of the main stage
- Pilot control valve (4) with control spool/socket unit (5), inductive position transducer (6) and pressure feed back for central position of the main stage control spool (2)

Function:

- With de-energized proportional solenoids (7; 8) central position of the main stage control spool (2) due to centering spring (9) and pressure feed back
- Control of the main stage control spool (2) via the pilot control valve (4)
  → the main stage control spool is positioned in a controlled manner
- Controlling the control spool of the pilot control valve (4) by changing the solenoid force of the proportional solenoids (7; 8)
- Connection of the command and actual values in the integrated electronics
- Pilot oil supply to the pilot control valve internally via port P or externally via port X
  Pilot oil return internally via port T or externally via Y to the tank
- With a command value of 0 V, the electronics control the main stage control spool (2) in central position.

Failure of supply voltage:

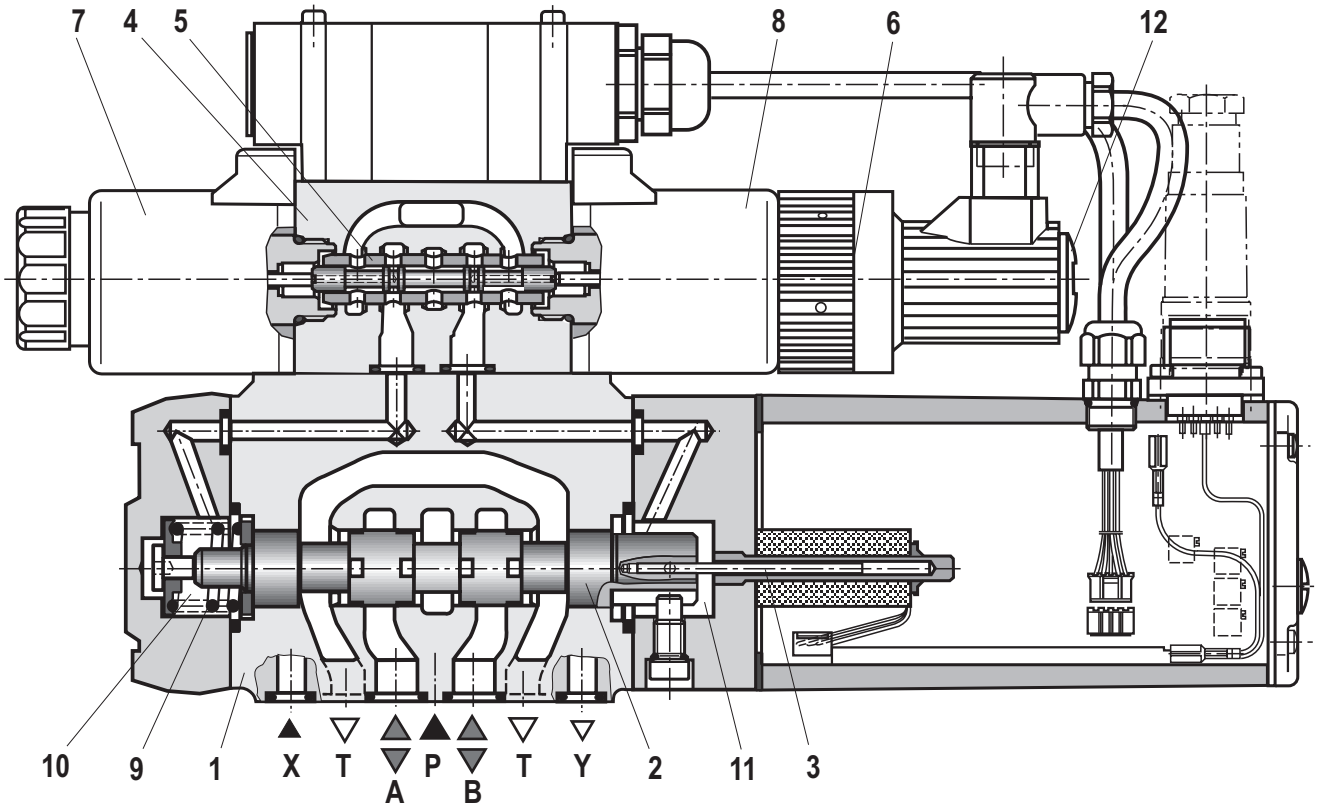
- Integrated electronics de-energizes the solenoid in case of supply voltage failure or cable break
- Automatic pressure control on the same level in the control chambers (10 and 11) by the pilot control valve
- In case of pressure supply failure, centering of the main stage control spool by centering spring (9)
- Central position of the main stage control spool (2)

Attention:

Failure of the supply voltage will lead to an abrupt standstill of the control axis. The accelerations occurring in this connection may cause machine damage.
With control spool symbols E, E1-, W6- and W8-, the centering spring (9) brings the main stage control spool (2) into the central position, V and V1 control spools are switched into the preferred direction P to B and A to T in the tolerance range from 1% to a maximum of 11% of the control spool stroke.

☞ **Important notice!**

The PG fitting (12) must not be opened. Mechanical adjustment of the adjustment nut located below is prohibited and damages the valve!



The zero point has been adjusted in the factory.

If the pilot control valve or the electronics is exchanged, the zero point has to be adjusted once again by instructed specialists.

☞ **Notice!**

Changes in the zero point may result in damage to the system and may only be implemented by instructed specialists!

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

general

Sizes	Size	10	16	25	27	32	35
Weight	kg	8.7	11.2	16.8	17	31.5	34
Installation position and commissioning information		Preferably horizontal, see data sheet 07700					
Ambient temperature range	°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)					
Sine test according to DIN EN 60068-2-6:2008		10 cycles, 10…2000.. 10 Hz with logarithmic frequency changing speed of 1 octave/min, 5 to 57 Hz, amplitude 1.5 mm (p-p), 57 to 2000 Hz, amplitude 10 g, 3 axes					
Random test according to DIN EN 60068-2-64:2009		20…2000 Hz, amplitude 0.05 g^2/Hz (10 g_{RMS}) 3 axes, testing time 30 min per axis					
Shock test according to DIN EN 60068-2-27:2010		Half-sine 15 g / 11 ms, 3 times in positive and 3 times in negative direction per axis, 3 axes					
Humid heat, cyclic according to DIN EN 60068-2-30:2006		Variant 2 +25 °C to +55 °C, 90% to 97% relative humidity, 2 cycles of 24 hours each					

hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Maximum operating pressure	– Pilot control valve	Pilot oil supply [2]	bar	25 to 315					
	– Main valve, port P, A, B		bar	315	350	350	210	350	350
Maximum return flow pressure	– Port T	Pilot oil return, internal	bar	Static < 10					
		Pilot oil return, external	bar	315	250	250	210	250	250
	– Port Y		bar	Static < 10					
Rated flow q_{Vnom} ±10% at Δp = 10 bar Δp = valve pressure differential in bar			l/min	– 25 50 100	125 150 200 220	– – 220 350	– – – 500	– – 400 600	– – – 1000
Recommended maximum flow			l/min	170	460	870	1000	1600	3000
Pilot oil flow at port X and/or Y with stepped input signal from 0 to 100% (315 bar)			l/min	7	14	20	20	27	29
Hydraulic fluid				See table page 6					
Hydraulic fluid temperature range (at the valve working ports)			°C	–20 to +80, preferably +40 to +80					
Viscosity range			mm^2/s	20 to 380, preferably 30 to 45					
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)				Pilot control valve: Class 18/16/13 [3] Main stage: Class 20/18/15 [3]					
Hysteresis			%	≤ 0.1					
Response sensitivity			%	≤ 0.05					
Zero point calibration (ex works) [4]			%	≤ 1					

[1] With control spool types E, E1, W6 and W8: 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] For perfect system behavior, we recommend an external pilot oil supply for pressures above 210 bar.

[3] 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

[4] Related to the pressure-signal characteristic curve (control spool V)

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
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, life cycle, 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 – containing water**: 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%

electric

Voltage type		Direct voltage
Duty cycle	%	100
Maximum coil temperature [1]	°C	150
Maximum power	W	72 (average = 24 W)
Electrical connection		With connector according to DIN EN 175201-804
Protection class of the valve according to EN 60529		IP65 with mating connector mounted and locked

[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!

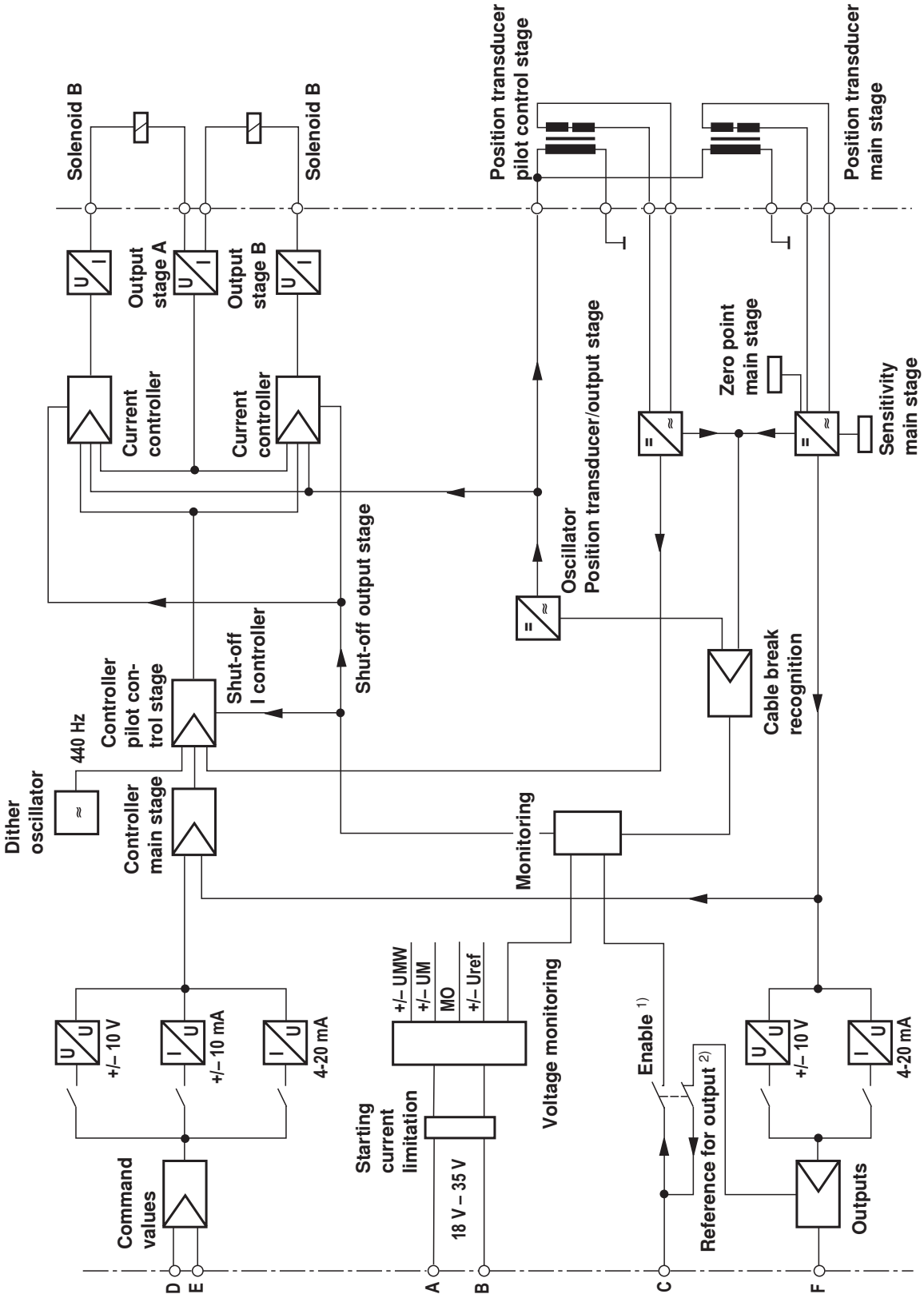
Connector pin assignment	Contact	Signal with A1	Signal with F1	Signal with A5
Supply voltage	A	24 VDC (18 to 35 VDC); I_{max} = 3 A; impulse load = 4 A		
	B	0 V		
Reference (actual value)	C	Reference potential for actual value (contact "F")		Enable 4 to 24 V
Differential amplifier input	D	±10 V	4 to 20 mA	±10 V
(Command value)	E	0 V reference potential (contact "D")		0 V reference potential for pin D and F
Measuring output (actual value)	F	±10 V	4 to 20 mA	±10 V
	PE	Connected to cooling element and valve housing		

Command value: Reference potential at E and positive command value at D result in flow from P → A and B → T.
Reference potential at E and negative command value at D result in flow from P → B and A → T.

Connection cable: Recommendation: – Up to 25 m line length: Type LiYCY 7 x 0.75 mm²
– Up to 50 m line length: Type LiYCY 7 x 1.0 mm²
Only connect the shield to PE on the supply side.

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

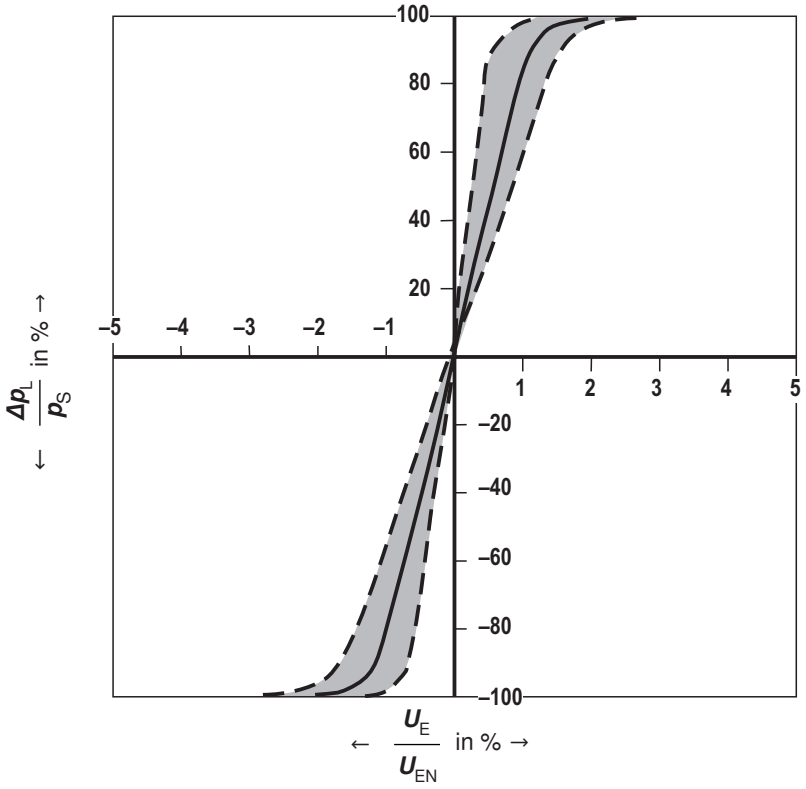
Block diagram of the integrated electronics (OBE) type VT 13060-3X/...



1) Only with electronics interface "A5"
2) Only with electronics interfaces "A1" and "F1"

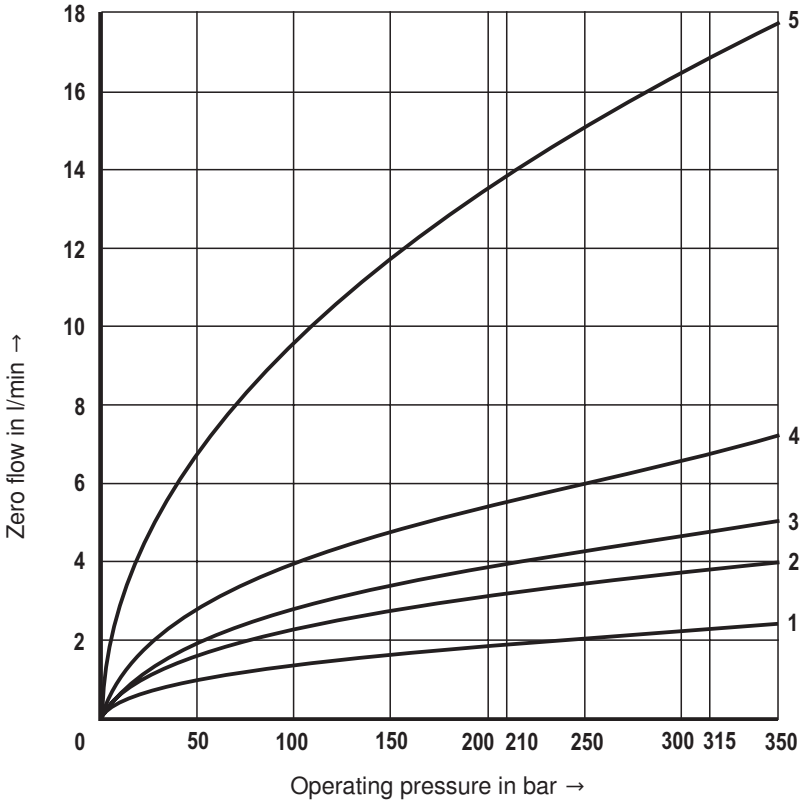
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C and p = 100 bar)

Pressure-signal characteristic curve (control spool V)



Pilot pressure p_S = 100 bar

Zero flow of the main stage (control spool V) with pilot control valve



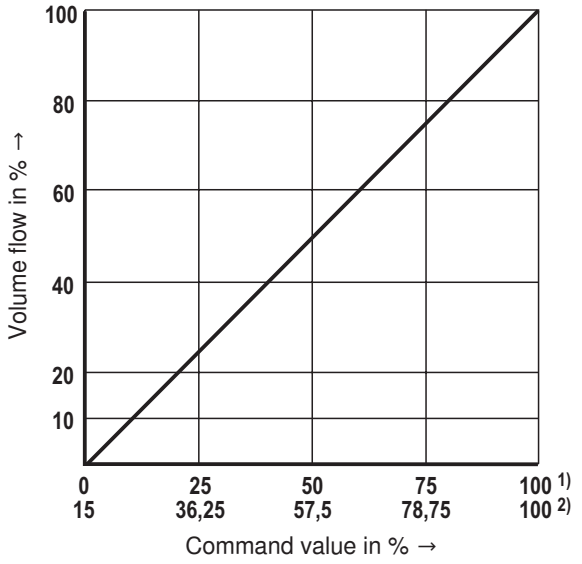
1 Size 10
2 Size 16
3 Sizes 25, 27
4 Size 32
5 Size 35

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

Flow command value function at e.g.
P → A / B → T 10 bar valve pressure differential or
P → A or A → T 5 bar per control edge

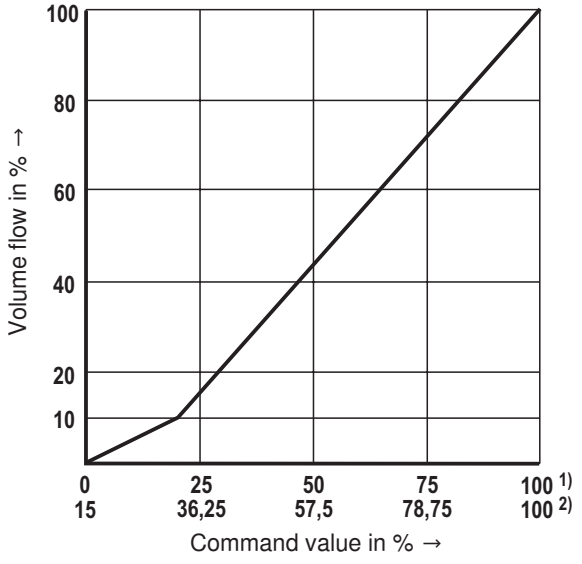
Control spool E, W, and V

Control spool with characteristic curve **L**



1) Positive overlap 0 to 0.5% with control spool **V**
2) Positive overlap 15% with control spools **E** and **W**

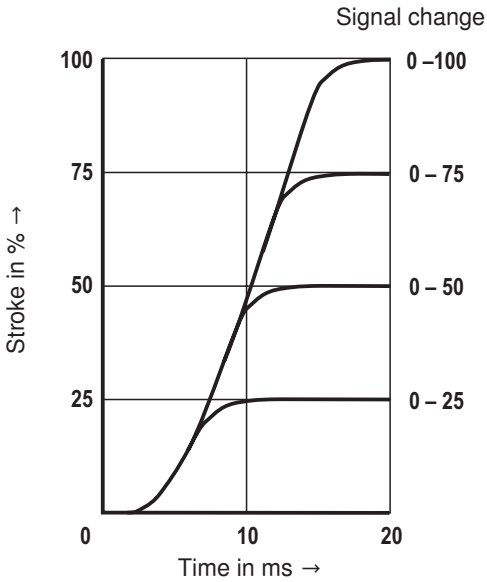
Control spool with characteristic curve **P**



1) Positive overlap 0 to 0.5% with control spool **V**
2) Positive overlap 15% with control spools **E** and **W**

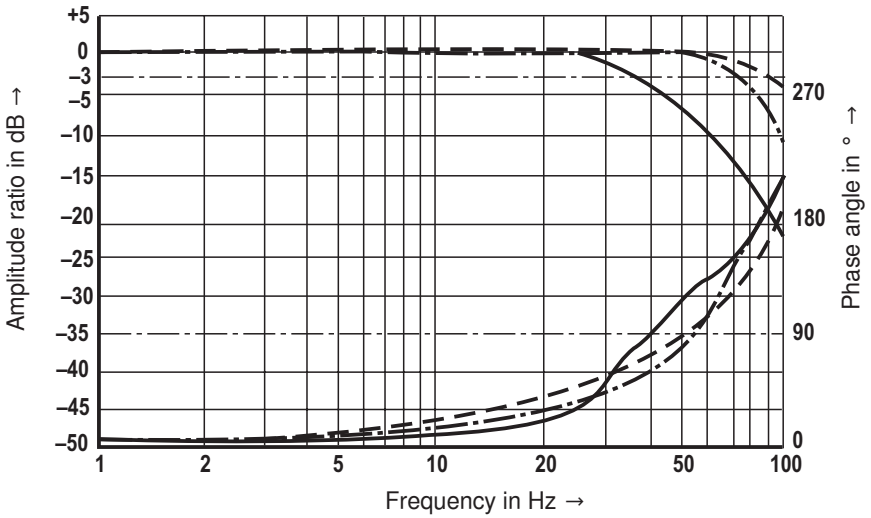
Characteristic curves: Size 10 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

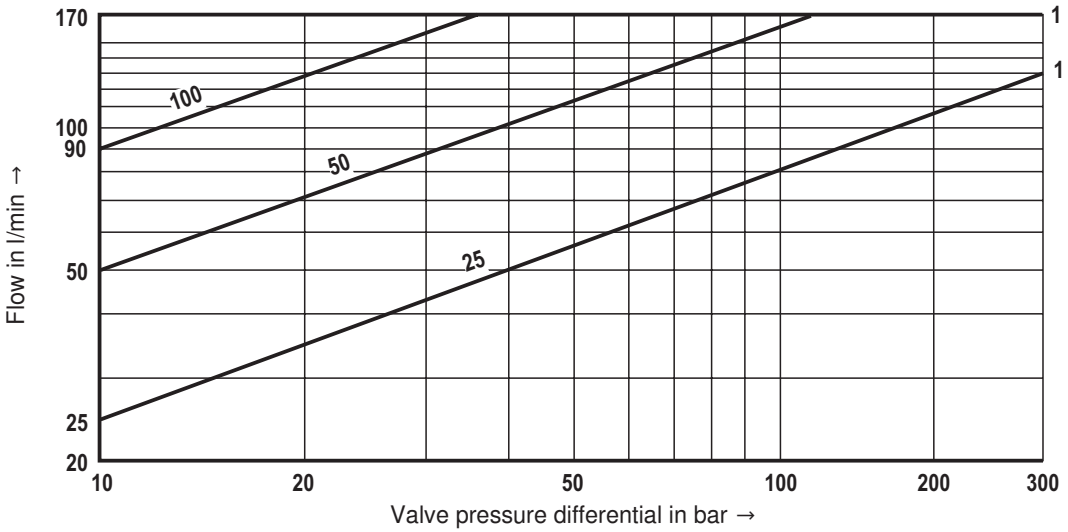
Frequency response characteristic curves



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

Signal ±5%
Signal ±25%
Signal ±100%

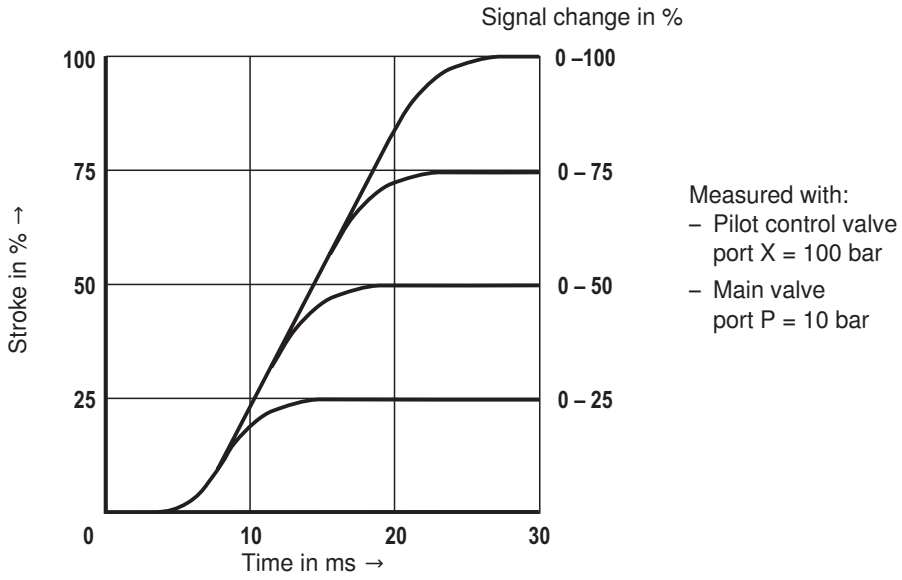
Flow/load function with maximum valve opening (tolerance ±10%)



1 Recommended flow limitation (flow velocity 30 m/s)

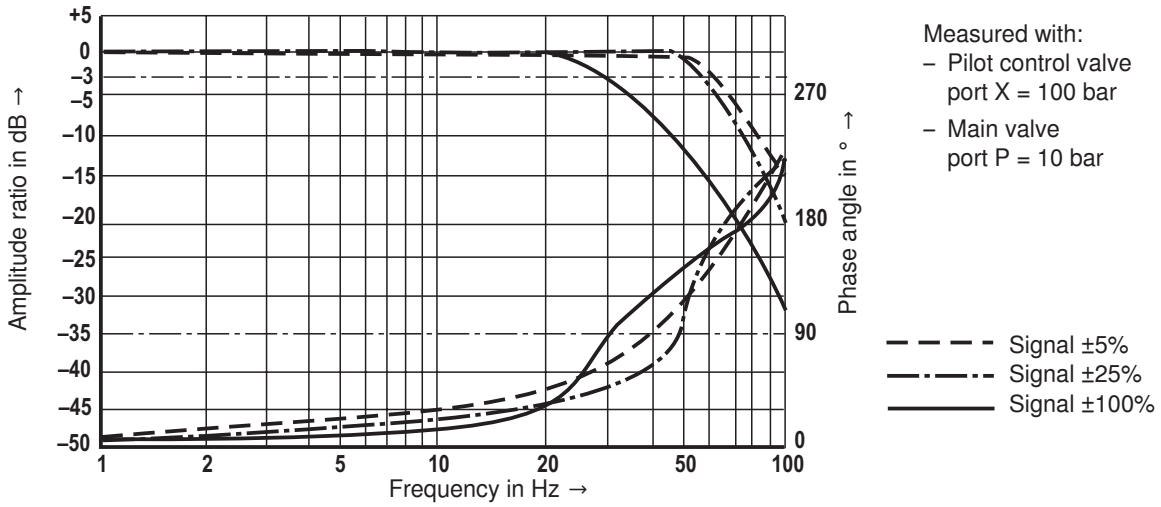
Characteristic curves: Size 16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



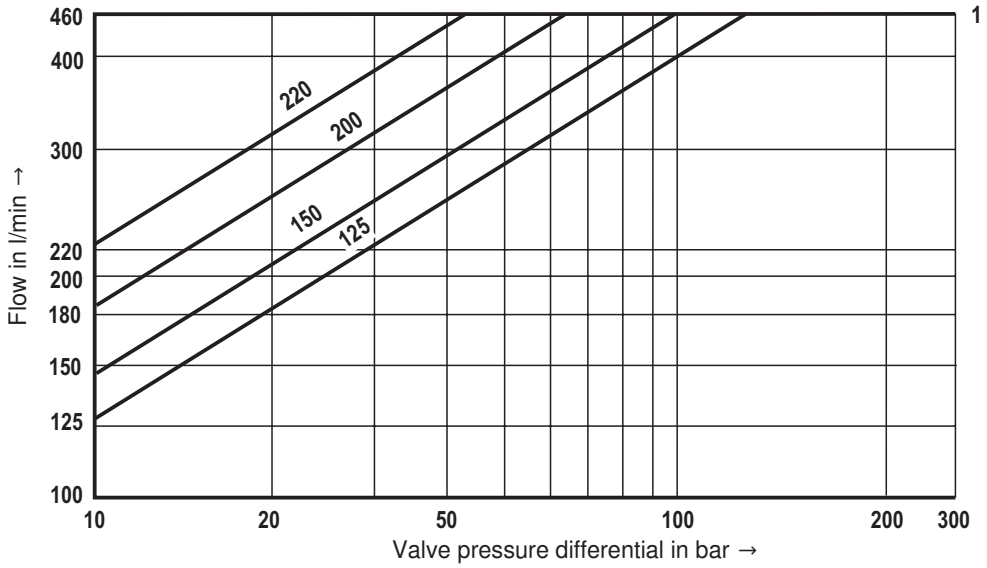
Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

Frequency response characteristic curves



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

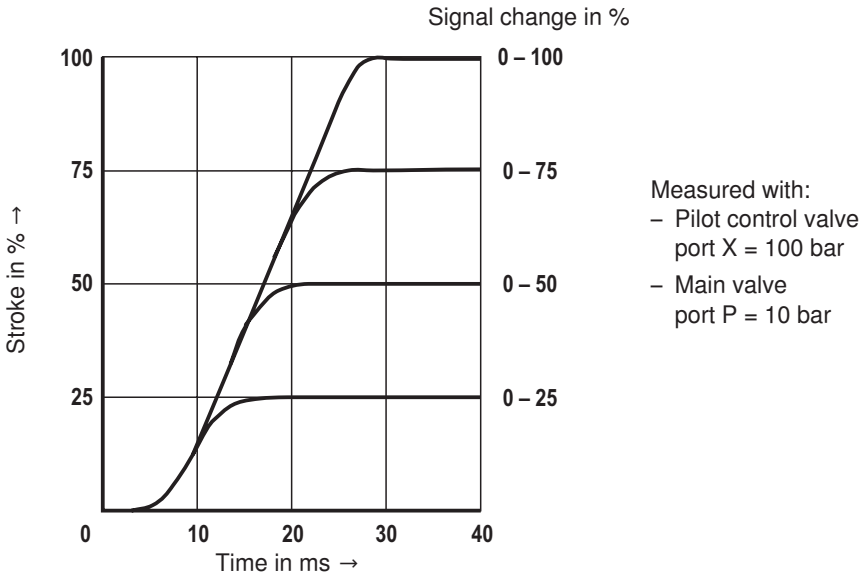
Flow/load function with maximum valve opening (tolerance ±10%)



1 Recommended flow limitation (flow velocity 30 m/s)

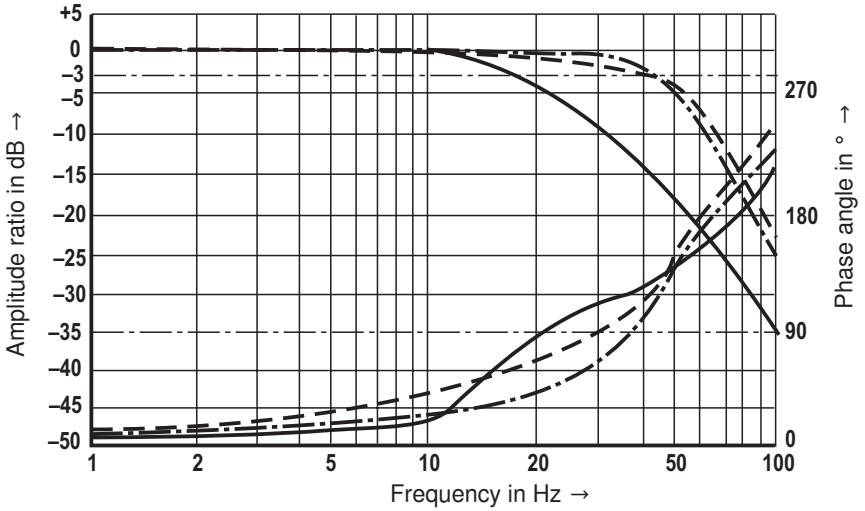
Characteristic curves: Sizes 25 and 27 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

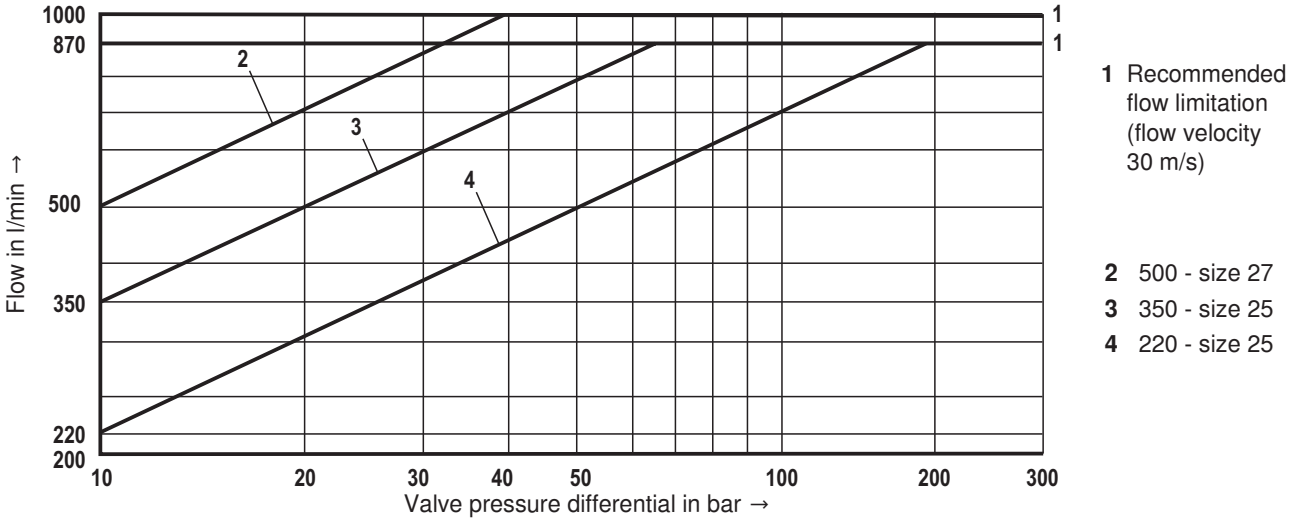
Frequency response characteristic curves



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

Signal ±5%
Signal ±25%
Signal ±100%

Flow/load function with maximum valve opening (tolerance ±10%)

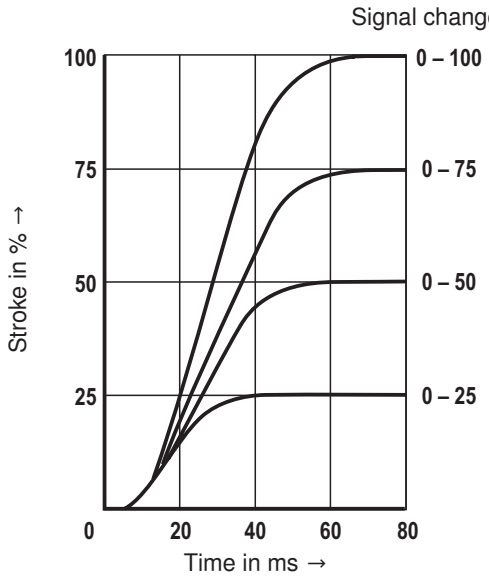


1 Recommended flow limitation (flow velocity 30 m/s)

2 500 - size 27
3 350 - size 25
4 220 - size 25

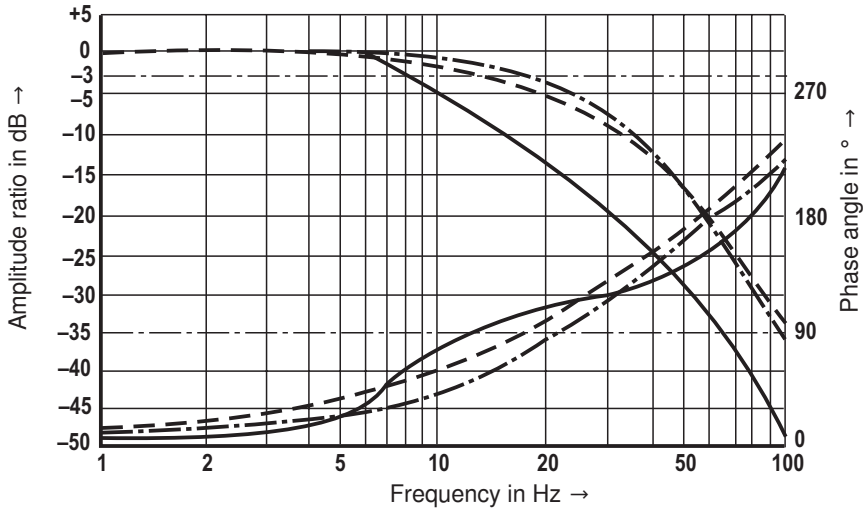
Characteristic curves: Size 32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

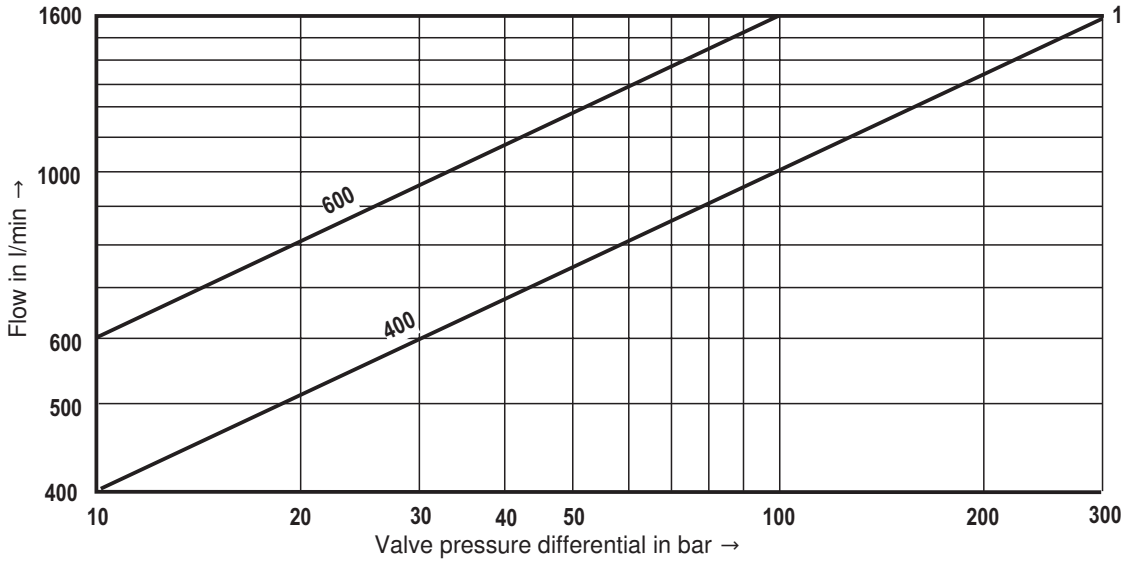
Frequency response characteristic curves



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

Signal ±5%
Signal ±25%
Signal ±100%

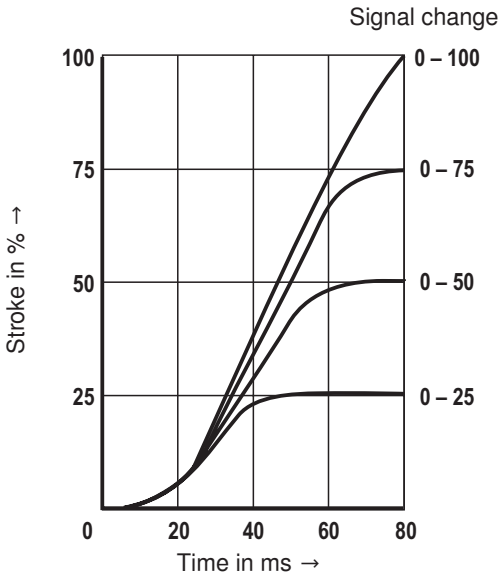
Flow/load function with maximum valve opening (tolerance ±10%)



1 Recommended flow limitation (flow velocity 30 m/s)

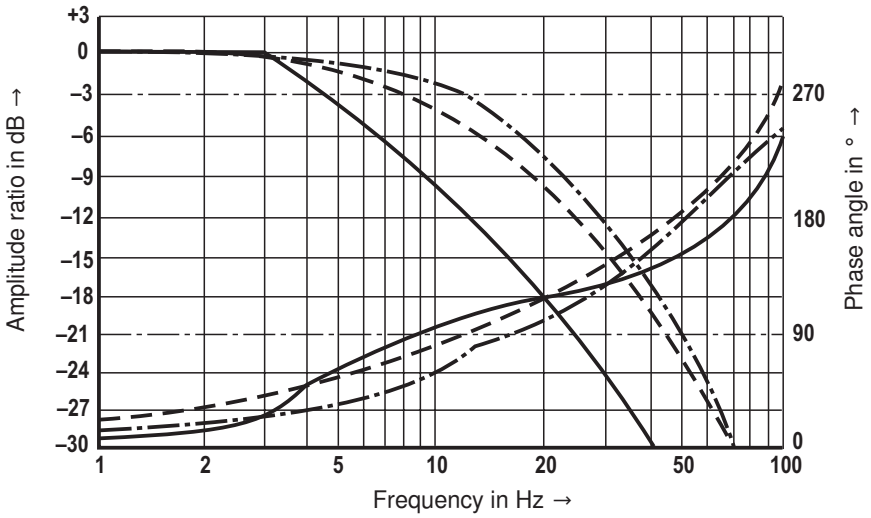
Characteristic curves: Size 35 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

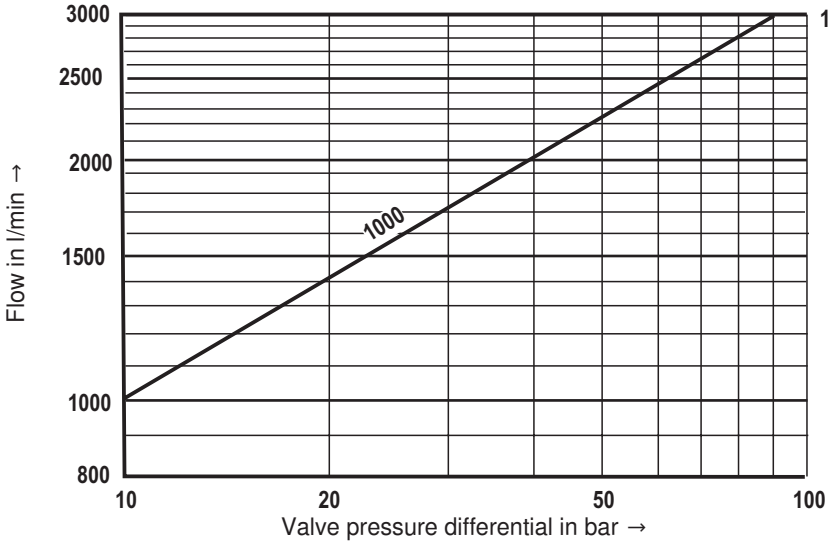
Frequency response characteristic curves



Measured with:
- Pilot control valve port X = 100 bar
- Main valve port P = 10 bar

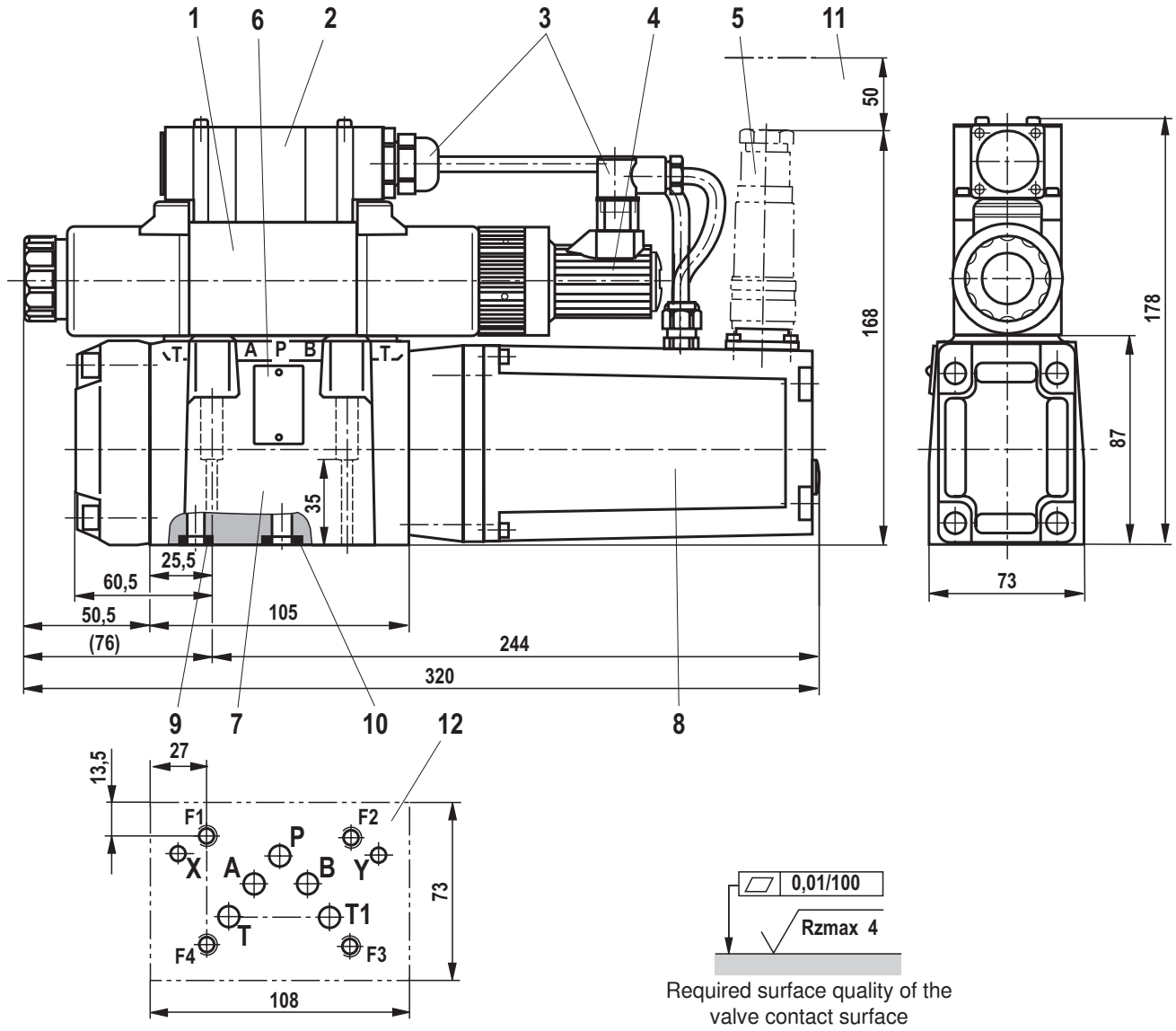
Signal ±5%
Signal ±25%
Signal ±100%

Flow/load function with maximum valve opening (tolerance ±10%)



1 Recommended flow limitation (flow velocity 30 m/s)

Dimensions: Size 10 (dimensions in mm)

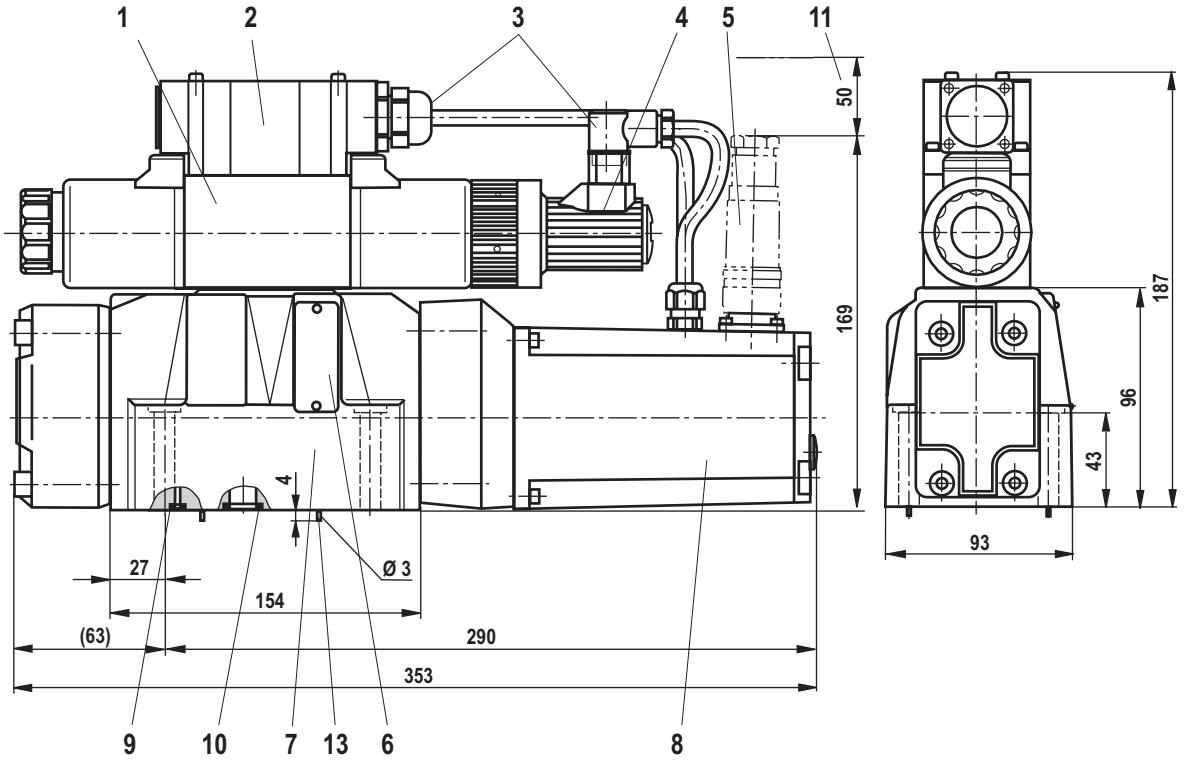


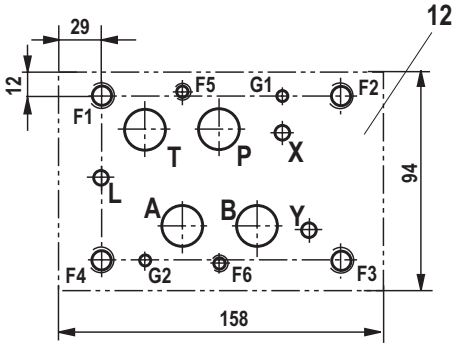
Required surface quality of the valve contact surface

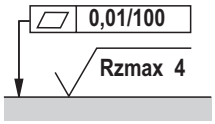
1 Pilot control valve
2 Electrical connection
3 Wiring and mating connector
4 Inductive position transducer (pilot control valve)
5 Mating connector 6-pole + PE (separate order, see page 21)
6 Name plate
7 Main valve
8 Integrated electronics (OBE) and inductive position transducer (main valve)
9 Identical seal rings for ports X, Y
10 Identical seal rings for ports A, B, P, T, T1
11 Space required for connection cable and to remove the mating connector
12 Machined valve contact surface, porting pattern according to ISO 4401-05-05-0-05 (ports X, Y as required)

Subplates and valve mounting screws see page 21.

Dimensions: Size 16 (dimensions in mm)





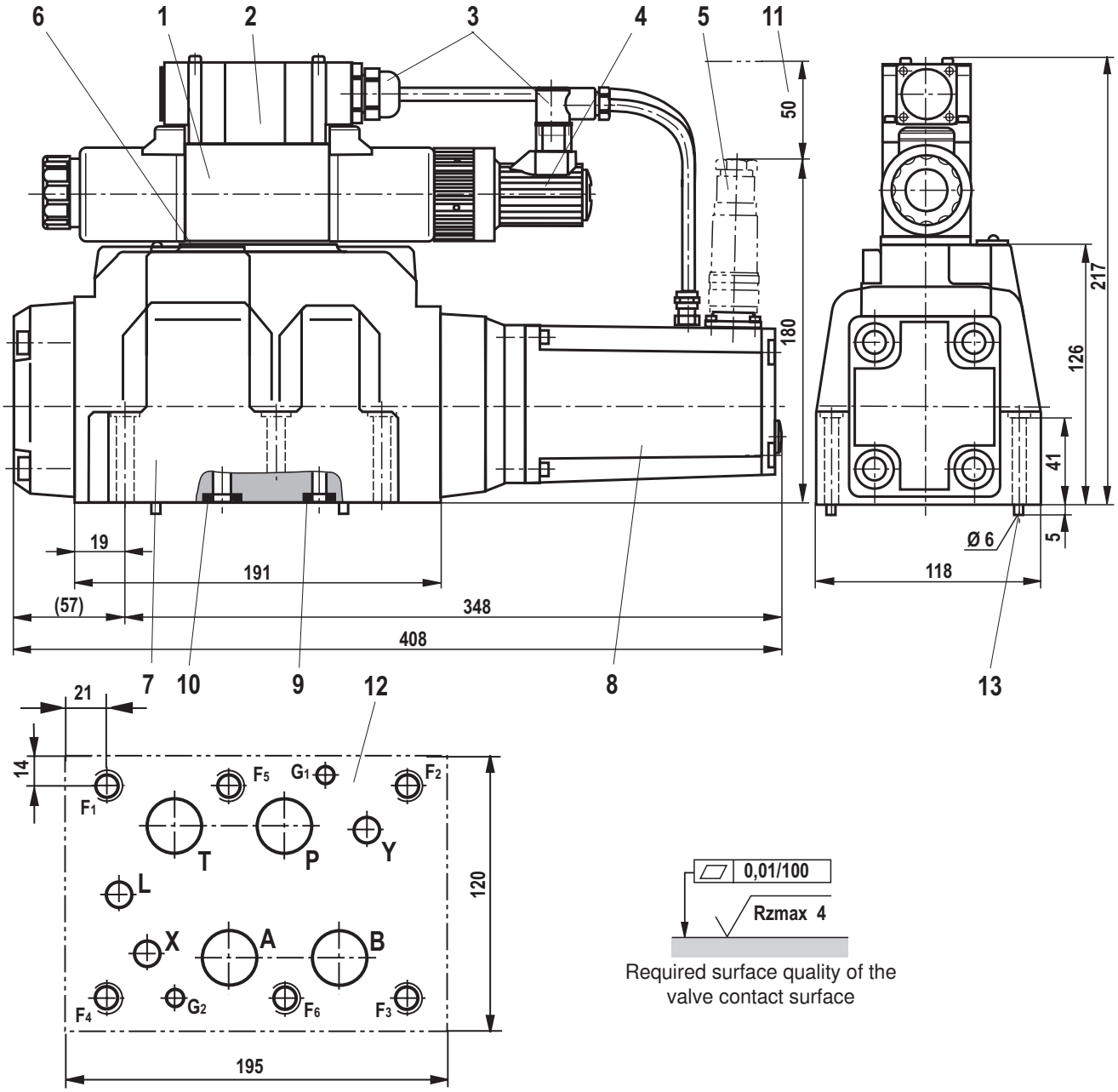


Required surface quality of the valve contact surface

1 Pilot control valve
2 Electrical connection
3 Wiring and mating connector
4 Inductive position transducer (pilot control valve)
5 Mating connector 6-pole + PE (separate order, see page 21)
6 Name plate
7 Main valve
8 Integrated electronics (OBE) and inductive position transducer (main valve)
9 Identical seal rings for ports X, Y
10 Identical seal rings for ports A, B, P, T, T1
11 Space required for connection cable and to remove the mating connector
12 Machined valve contact surface, porting pattern according to ISO 4401-07-07-0-05 (ports X, Y as required)
Deviating from the standard:
– Ports A, B, P T Ø 20 mm
13 Locking pin

Subplates and valve mounting screws see page 21.

Dimensions Size 25 (dimensions in mm)

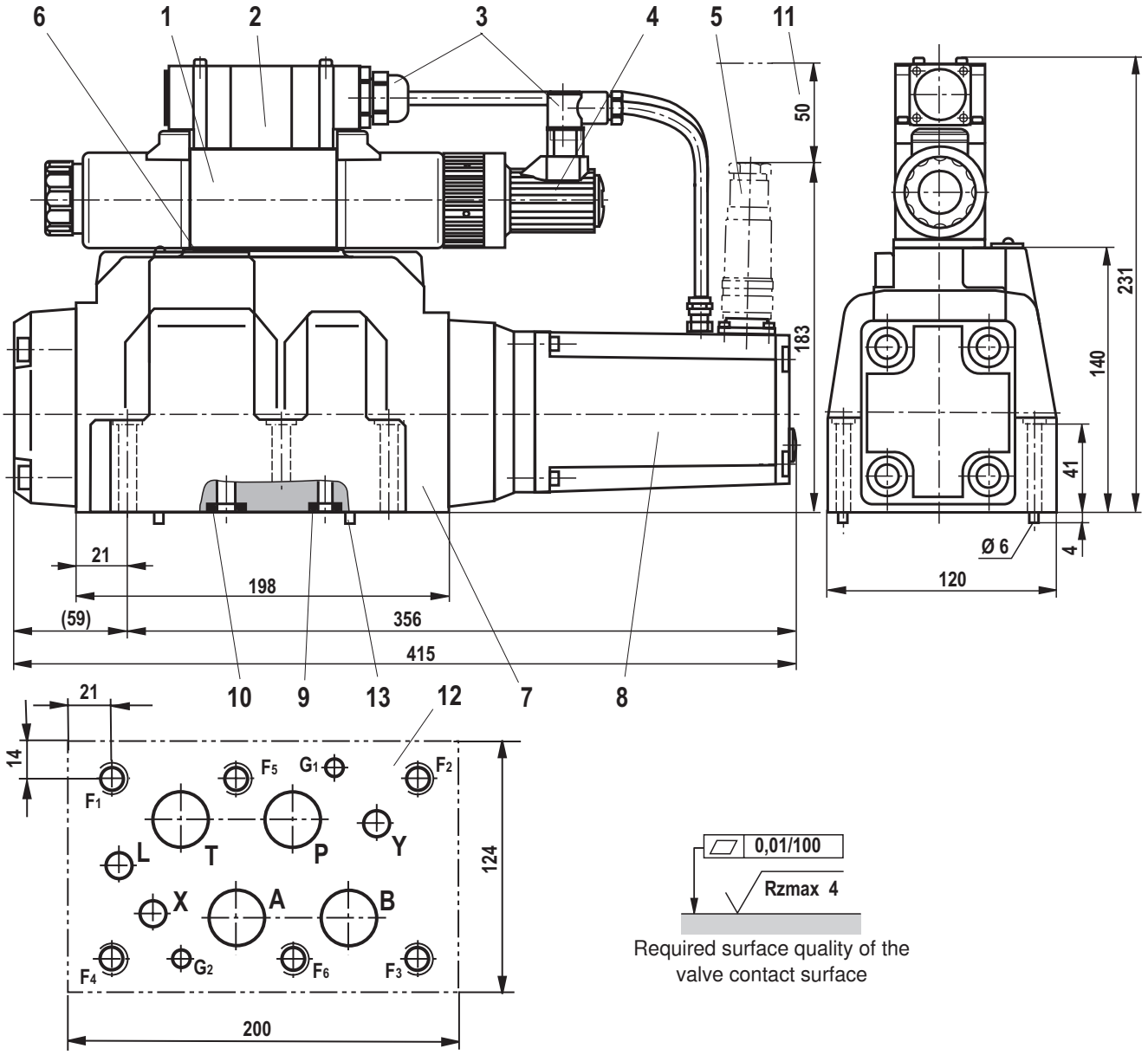


Required surface quality of the valve contact surface

1 Pilot control valve
2 Electrical connection
3 Wiring and mating connector
4 Inductive position transducer (pilot control valve)
5 Mating connector 6-pole + PE (separate order, see page 21)
6 Name plate
7 Main valve
8 Integrated electronics (OBE) and inductive position transducer (main valve)
9 Identical seal rings for ports X, Y, and L
10 Identical seal rings for ports A, B, P, T
11 Space required for connection cable and to remove the mating connector
12 Machined valve contact surface, porting pattern according to ISO 4401-08-08-0-05 (ports X, Y and L as required)
13 Locking pin

Subplates and valve mounting screws see page 21.

Dimensions Size 27 (dimensions in mm)

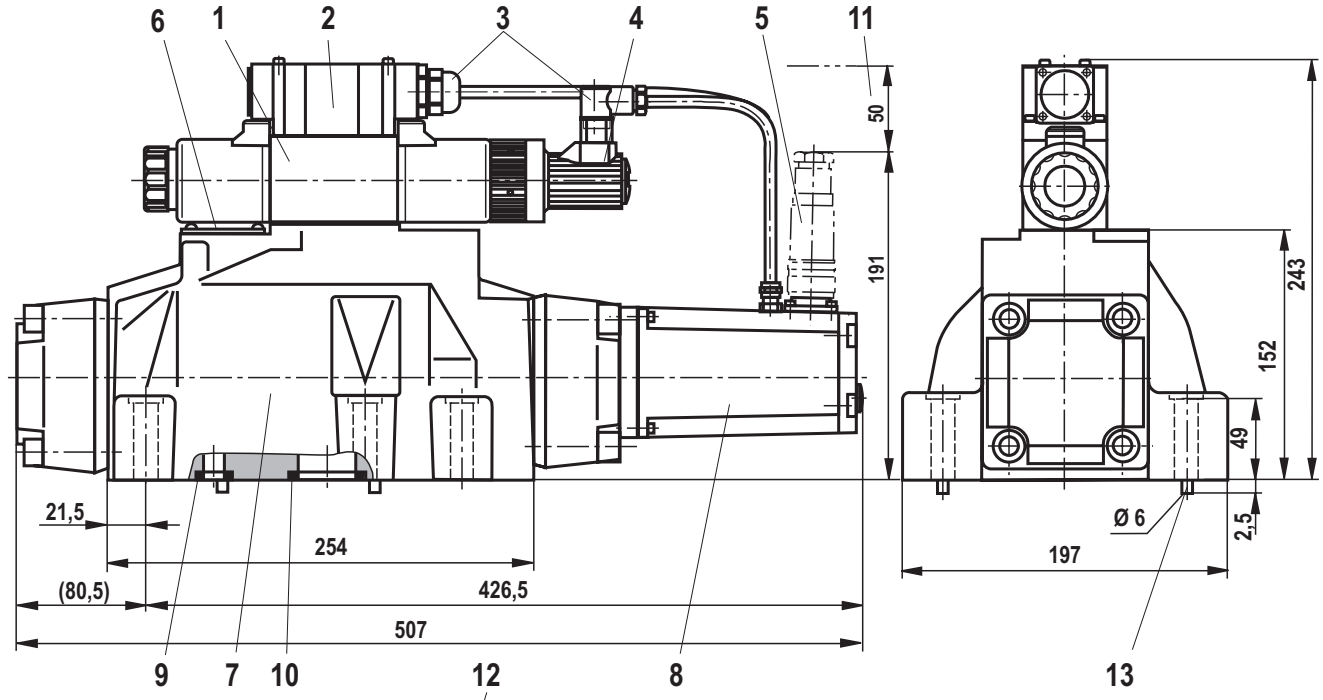


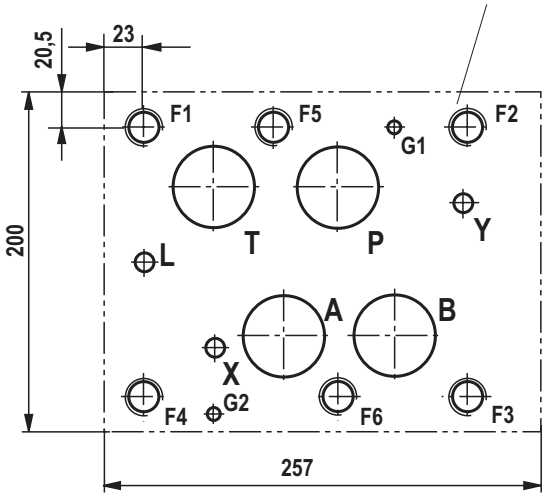
Required surface quality of the valve contact surface

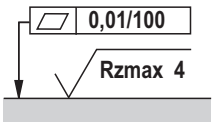
1 Pilot control valve
2 Electrical connection
3 Wiring and mating connector
4 Inductive position transducer (pilot control valve)
5 Mating connector 6-pole + PE (separate order, see page 21)
6 Name plate
7 Main valve
8 Integrated electronics (OBE) and inductive position transducer (main valve)
9 Identical seal rings for ports X, Y, and L
10 Identical seal rings for ports A, B, P, T
11 Space required for connection cable and to remove the mating connector
12 Machined valve contact surface, porting pattern according to ISO 4401-08-08-0-05 (ports X, Y, and L as required)
Deviating from the standard:
– Ports A, B, T and P Ø 32 mm
13 Locking pin

Subplates and valve mounting screws see page 21.

Dimensions Size 32 (dimensions in mm)





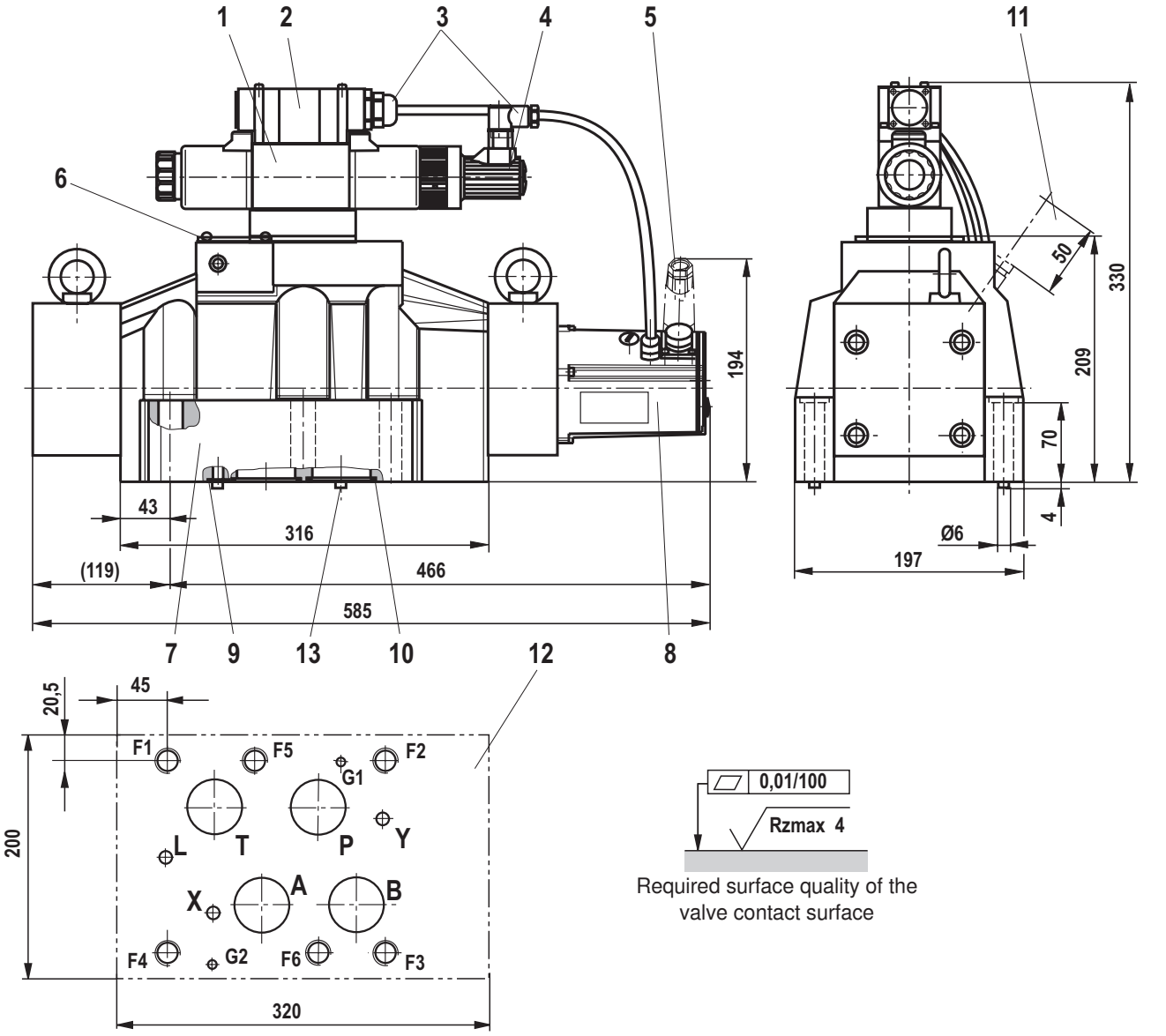


Required surface quality of the valve contact surface

1 Pilot control valve
2 Electrical connection
3 Wiring and mating connector
4 Inductive position transducer (pilot control valve)
5 Mating connector 6-pole + PE (separate order, see page 21)
6 Name plate
7 Main valve
8 Integrated electronics (OBE) and inductive position transducer (main valve)
9 Identical seal rings for ports X, Y, and L
10 Identical seal rings for ports A, B, P, T
11 Space required for connection cable and to remove the mating connector
12 Machined valve contact surface, porting pattern according to ISO 4401-10-09-0-05 (ports X, Y, and L as required)
Deviating from the standard:
– Ports A, B, T and P Ø 38 mm
13 Locking pin

Subplates and valve mounting screws see page 21.

Dimensions Size 35 (dimensions in mm)



Required surface quality of the valve contact surface

1 Pilot control valve
2 Electrical connection
3 Wiring and mating connector
4 Inductive position transducer (pilot control valve)
5 Mating connector 6-pole + PE (separate order, see page 21)
6 Name plate
7 Main valve
8 Integrated electronics (OBE) and inductive position transducer (main valve)
9 Identical seal rings for ports X, Y, and L
10 Identical seal rings for ports A, B, P, T
11 Space required for connection cable and to remove the mating connector
12 Machined valve contact surface, porting pattern according to ISO 4401-10-09-0-05 (ports X, Y, and L as required)
Deviating from the standard:
– Ports A, B, T and P Ø 50 mm
13 Locking pin

Subplates and valve mounting screws see page 21.

Dimensions

Hexagon socket head cap screws		Material number
Size 10	4x ISO 4762 - M6 x 45 - 10.9-flZn-240h-L Tightening torque M_A = 13.5 Nm ±10% or 4x ISO 4762 - M6 x 45 - 10.9 Tightening torque M_A = 15.5 Nm ±10%	R913000258
Size 16	2x ISO 4762 - M6 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 12.2 Nm ±10% 4x ISO 4762 - M10 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 58 Nm ±20% or 2x ISO 4762 - M6 x 60 - 10.9 Tightening torque M_A = 15.5 Nm ±10% 4x ISO 4762 - M10 x 60 - 10.9 Tightening torque M_A = 75 Nm ±20%	R913000115 R913000116
Sizes 25 and 27	6x ISO 4762 - M12 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 100 Nm ±20% or 6x ISO 4762 - M12 x 60 - 10.9 Tightening torque M_A = 130 Nm ±20%	R913000121
Size 32	6x ISO 4762 - M20 x 80 - 10.9-flZn-240h-L Tightening torque M_A = 340 Nm ±20% or 6x ISO 4762 - M20 x 80 - 10.9 Tightening torque M_A = 430 Nm ±20%	R901035246
Size 35	6x ISO 4762 - M20 x 100 - 10.9-flZn-240h-L Tightening torque M_A = 465 Nm ±20% or 6x ISO 4762 - M20 x 100 - 10.9 Tightening torque M_A = 610 Nm ±20%	R913000386

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

Subplates	Data sheet
Size 10	45054
Size 16	45056
Sizes 25 and 27	45058
Sizes 32 and 35	45060

Accessories (not included in the scope of delivery)

Mating connectors		Material number
Mating connector for high-response valve	DIN EN 175201-804, see data sheet 08006	e.g. R900021267 (plastic)
		e.g. R900223890 (metal)

Notes

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