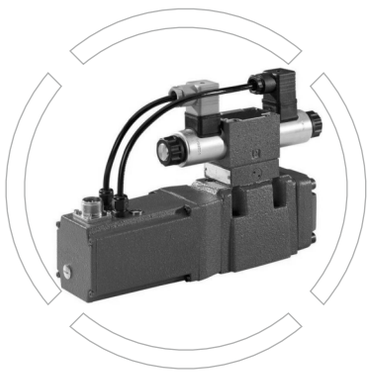
4WRKE-3X

With electrical position feedback and built-in amplifier (OBE)
Size 10 ... 32
Component series 3X
Maximum working pressure 350 bar
Rated flow 25 ... 600 l/min



Index

Features

- Pilot operated proportional directional valve, main spool with electrical position feedback.
- Used to control the flow and direction.
- Threaded type replaceable solenoid coil.
- Spring centered main spool.
- Integrated control electronics.
- Bottom plate installation: installation face with ISO4401 (Size 10 to 32)
- Actuation via proportional solenoids stage.
- Electrical position feedback on main spool.

Ordering code

Further Details in clear text

4 main ports = 4

Pilot operated proportional directional valve = WRK

Built-in amplifier (OBE) = E

Size

NG10	= 10
NG16	= 16
NG25	= 25
NG27	= 27
NG32	= 32

Seals

M =	NBR
V =	FKM

D3 = With pressure reducing valve ZDR 6 DP0-4X/40YM-W80 (non-adjustable)

Electronics interface

A1[3] =	Command value/ actual value ±10 V
F1 =	Command value/ actual value 4 to 20 mA

Electrical connections

K31 = Without 7-pin plug (to be ordered separately), with component plug connector according to DIN EN 175201-804

Pilot oil supply and drain

No code =	Pilot oil supply external, pilot oil drain external
E =	Pilot oil supply internal, pilot oil drain external
ET =	Pilot oil supply internal, pilot oil drain internal
T =	Pilot oil supply external, pilot oil drain internal

Built-in amplifier power supply

G24 = DC voltage 24 V

Pilot control valve

6E = Proportional solenoid with removable coil (NG 6)

Component series

3x = 30 … 39 (30 … 39: installation and connection dimensions unchanged)

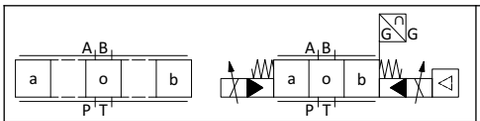
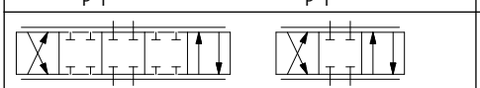
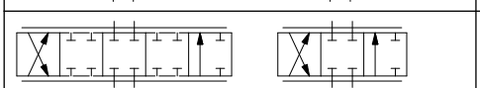
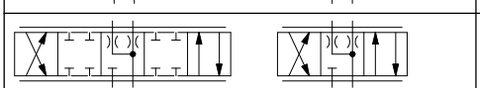
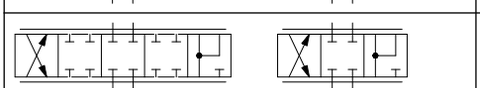
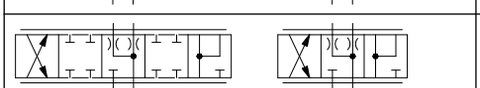
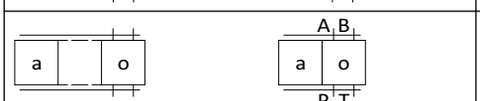
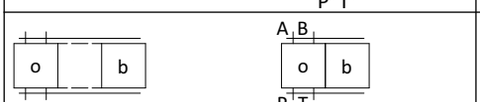
Flow Characteristics

L =	Linear L
P =	Characteristic curve for double gain, linear

Rated flow at valve differential pressure of 10 bar (5 bar per side)

25[1] =	25 l/min (for size 10)
50[2] =	50 l/min (for size 10)
100 =	100 l/min (for size 10)
125[2] =	125 l/min (for size 16)
150[2] =	150 l/min (for size 16)
200 =	200 l/min (for size 16)
220 =	220 l/min (for size 16)
220[2] =	220 l/min (for size 25)
350 =	350 l/min (for size 25)
500 =	500 l/min (for size 27)
400 =	400 l/min (for size 32)
600 =	600 l/min (for size 32)

Symbols

	
	E E1-
	E3-
	W6- W8-
	R
	R3-
	EA[1] W6A
	EB[1] W6B

With symbol E1-, W8-:

P→A : q_V B→T: $q_V/2$

P→B: $q_V/2$ A→T: q_V

With symbol R; R3:

P→A : q_V B→P: $q_V/2$

P→B : $q_V/2$ A→T: q_V

1) Example: Spool for switching position "a" (P→B) Ordering details…EA … or W6A
Ordering details for spool (P→A) in switching position "b"…EB

1) E, W6 can only be used for characteristic curve form L (linear)
2) E1, W8 can only be used for characteristic curve form L (linear)
3) When replacing component series 2X with component series 3X, A5 will be used to define the electrical interface (enable signal of pin C).

Symbol

<table>
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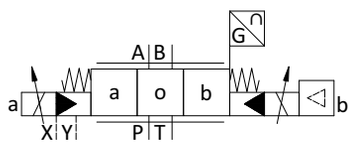
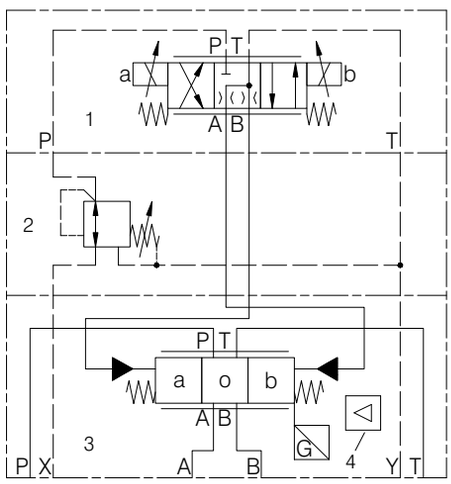
(external control efflux)</td><td> 
</td><td rowspan="3"> 

Remarks: This pilot oil control form is externally controlled and discharged</td></tr>
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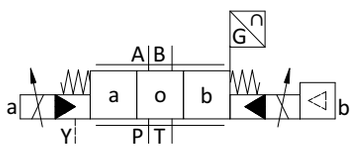
(internal control and external discharge)</td><td> 
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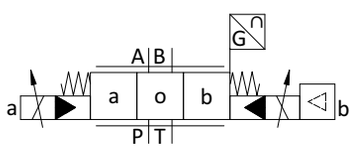
(Internal control and internal row)</td><td> 
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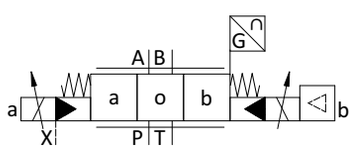
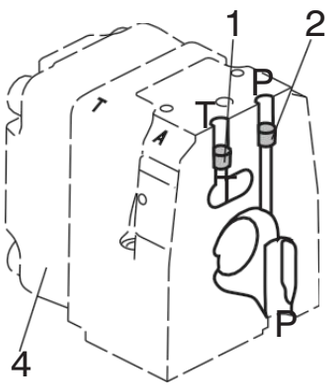
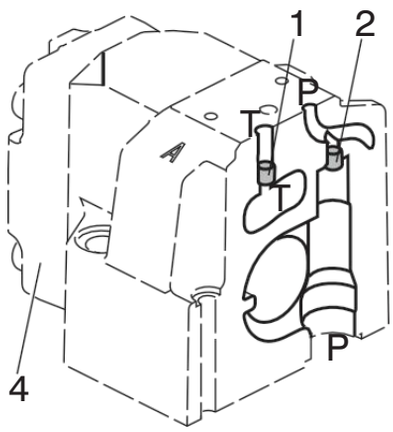
(external control and inner row)</td><td> 
</td><td>1. Pilot valve 4 WRAP 6 …
2. Pressure reducing valve ZDR 6 DP0 - 4X/40YM-W80
3. Main valve
4. Built-in amplifier (OBE)</td></tr>
</table>

Pilot oil control form

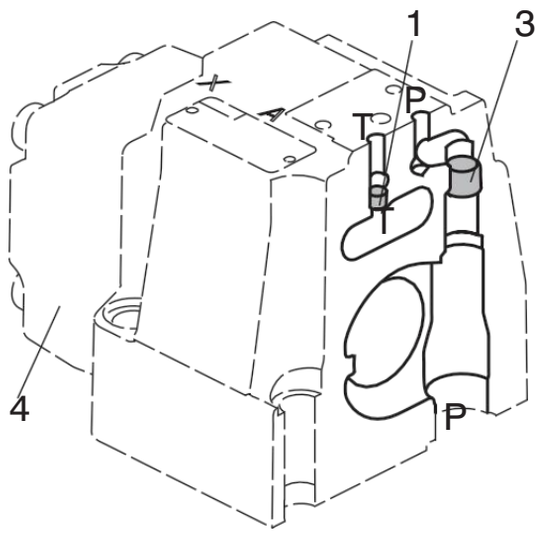
NG10



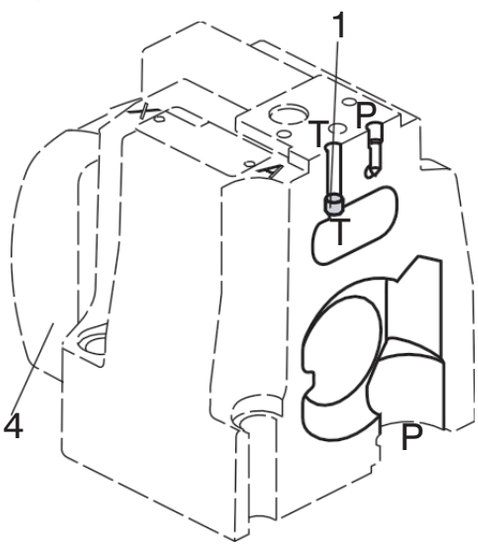
NG16



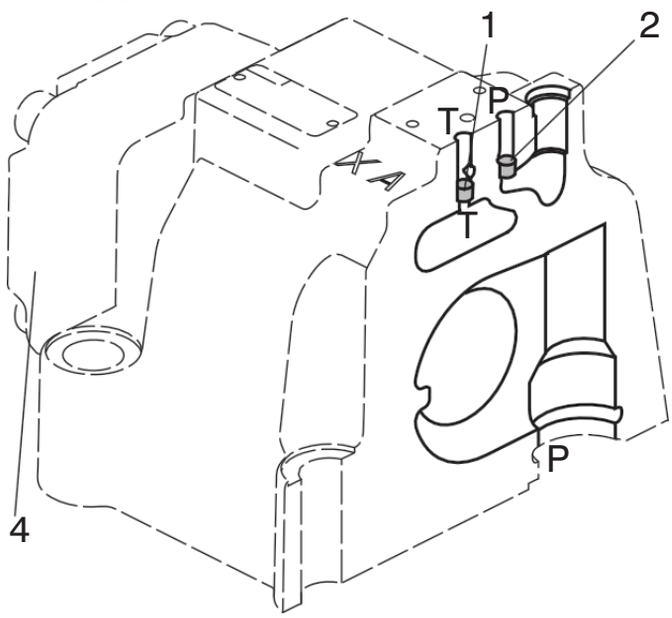
NG25



NG27



NG32



Main valve body pilot circuit configuration
1 M 6 plug
2 M6 plug
3 M 12.5 x 1.5 plug
4 end caps

Pilot oil form	External pilot oil supply	Internal pilot oil supply	External pilot oil return	Internal pilot oil return
oil plug	2, 3 block	2, 3 open	1 block	1 open

Functional structure

Pilot valve 4WRAP 6 W7-3X/G24 ...

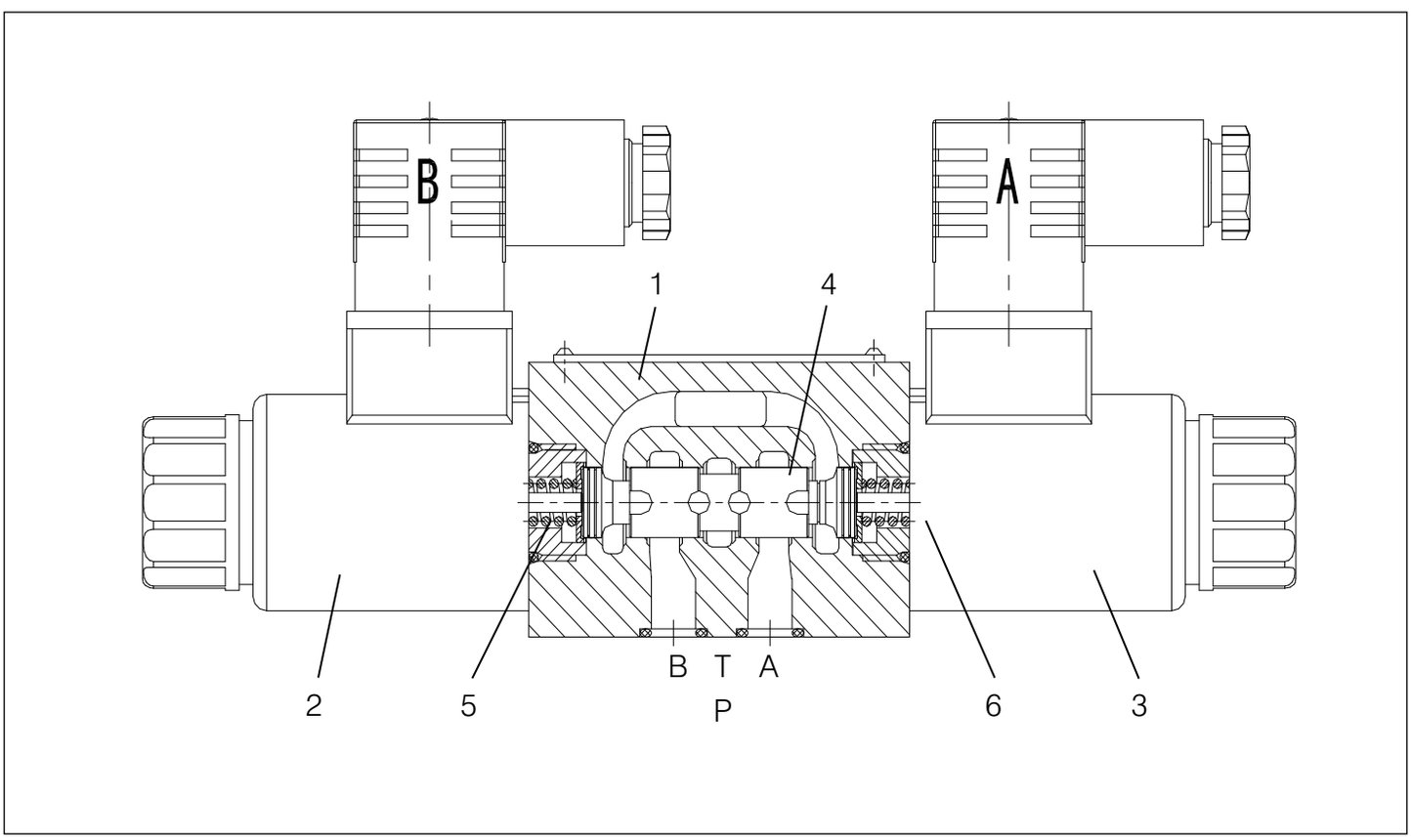
Structure

4WRAP 6 pilot valve mainly includes:

- Body with mounting surface (1)
- Control spool (4) with compression springs (5 and 6)
- Proportional solenoid with centering thread (2)

Function Description

- In the case of de-energized proportional solenoids (2 and 3), the control spool (4) is held in the mechanical center position by the compression springs (5 and 6); the ports A, B are now connected to T
- Direct- acting commutation of the control spool (4) by controlling the proportional solenoid (eg "2" proportional solenoid energized)
  - moving the control spool (4) to the right in proportion to the input signal
  - when the control The spool (4) goes over the covered area and opens the connection from ports P→A; B→T



Functional structure

Structure

4WRKE proportional directional valve mainly includes:

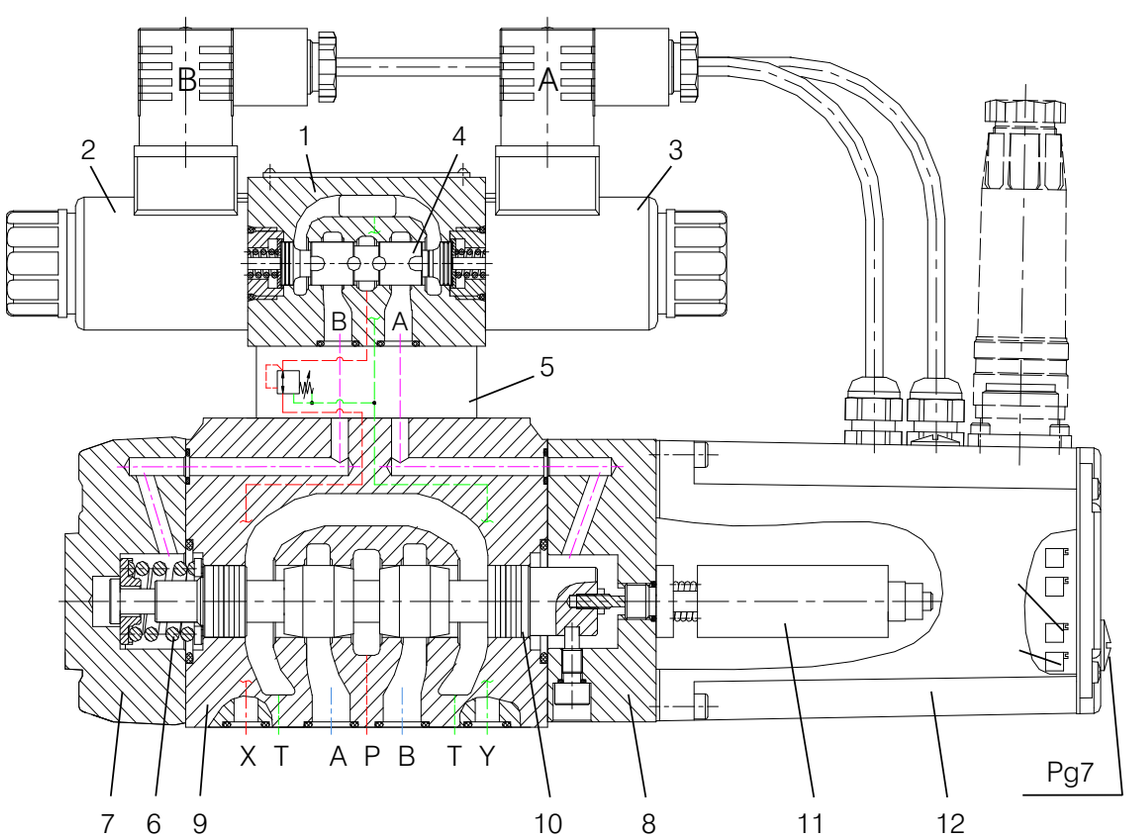
- With main stage body (9) main stage spool (10)
- With primary position sensor (11)
- Pilot valve (1)
- Pressure reducing valve (5)

Function Description

- With the pilot valve (1) proportional solenoids (2 and 3) de-energized, the main stage spool (10) is held in the mechanical center position by the centering spring (6)
  - the The two control oil chambers are connected to the oil tank through the pilot spool (4)
- Main stage spool (10) is controlled by pilot valve (1)
- Control the pilot spool (4) by changing the coil magnetic force of the proportional solenoids (2 and 3)
- The built-in amplifier (OBE) (12) compares the specified command value with the actual position value; in the event of a control deviation, activates the proportional solenoid of the pilot valve (1)
  (2 or 3) The main spool (10) is adjusted against the centering spring (6) due to the change in the magnetic force of the coil
- The stroke/main spool opening area is controlled in proportion to the control value
- At a command value of 0 V (12 mA), the centering spring (6) holds the main spool in hydraulic zero position

Precautions

- Internal leakage is inherent to the valve, and its leakage will increase with the age of the valve
- Do not allow the tank line to run empty, provide a suitable back pressure (back pressure approx. 2 bar) under the appropriate installation conditions
- In practical application, the oil inlet pipeline and oil return pipeline must not be reversely connected to avoid damage to the proportional valve or abnormal function



① Flow gain adjustment potentiometer
② Electrical zero adjustment

Technical data

General information						
Size	NG	10	16	25	27	32
weight	Kg	8.7	11.2	16.8	17	31.5
Component series		3X				
Installation location		Any direction, preferably horizontal				
Storage temperature range	°C	–20 … +80				
Ambient temperature range	°C	–20 … +50				
MTTFd value according to EN ISO 13849		150				
Hydraulic parameters (test conditions: 46# anti-wear hydraulic oil, oil temperature 40 ± 5 °C)						
Hydraulic oil temperature range		-20...80; preferably +40...+50				
Oil viscosity		20...380; preferably 30...45				
Maximum permissible degree of contamination of hydraulic oil in accordance with cleanliness class according to ISO 4406©		Level 18/16/13 [1]				

Size				10	16	25	27	32
Maximum working pressure	Pilot valve	Pilot oil supply	bar	25...315				
	Main stage valve	Ports P, A, B	bar	315	350	350	270	350
Maximum return pressure	Port T	Internal pilot oil supply	bar	static < 10				
		External pilot oil supply	bar	315	250	250	210	250
	Port Y			static < 10				
Nominal flow q nominal ±10% at Δp = 10 bar 2) One-sided Δp = 5 b			l/min	25	-	-	-	-
				50	125	220	-	400
				100	180	350	500	600
Main stage valve maximum flow			l/min	170	460	870	1000	1600
Pilot flow Pilot flow at port X or Y With input step signal 0 to 100% (315 bar)			l/min	4.1	8.5	11.7	11.7	13.0

Static	
Hysteresis	≤1
Response sensitivity	≤0.5

1) The specified cleanliness levels of components must be observed in hydraulic systems. Effective filtration prevents breakdowns while increasing the life of the components.

2) Traffic at different Δp:

$$qx = qv\ \text{nominal.} \sqrt{\frac{\Delta px}{5}}$$

Technical data

Electrical, Integrated Electronic Components (OBE)			
Relative duty cycle		%	100 (continuous operation)
Protection according to EN 60529 etc.			IP 65, cable socket installed
voltage	Nominal voltage	VDC	24
	lower limit	VDC	18
	Upper limit	VDC	35
Maximum allowable residual ripple		Vpp	2.5
Maximum current consumption	Amplifier	A	1.5
	Amplifier (pulse current)	A	3
Maximum power consumption		VA	72 (average 24)
Fuse protected, external		A_T	4 (slow melting)
Maximum coil temperature		°C	150

Electrical connection and distribution

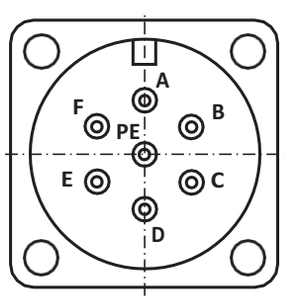
Connector pin points	Contact	Signal with A1	Signal with F1	Signal with A5
Supply voltage	A	24 VDC (18 to 35 VDC); I_{max} = 1.5 A; impulse load ≤ 3 A		
	B	0 V		
Reference (actual value)	C	Reference potential for actual value (contact "F")		Enable 4 to 24 V
Differential amplifier input	D	±10 V	4 to 20 mA	±10 V
(Command value)	E	0 V reference potential to pin 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 a positive command value at D results in a flow from P to A and B to T
Reference potential at E and a negative command value at D results in a flow from P to B and A to T

Connection cable:
Up to 25m cable length type LiYCY 7x0.75mm²
Up to 50m cable length type LiYCY 7x1.0mm²

External diameter:
6.5 to 11mm (plastic plug-in connection)

Connect screen to ⊥ only on supply side.

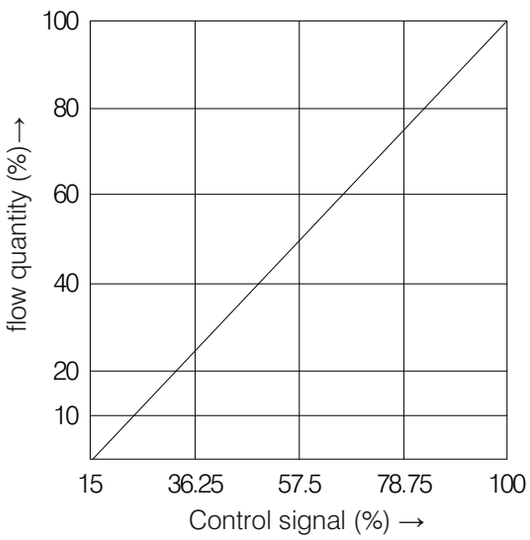


Note: Electrical signals (e.g. actual value or feedback signals) taken via valve electronics must not be used to switch off the machine safety functions!

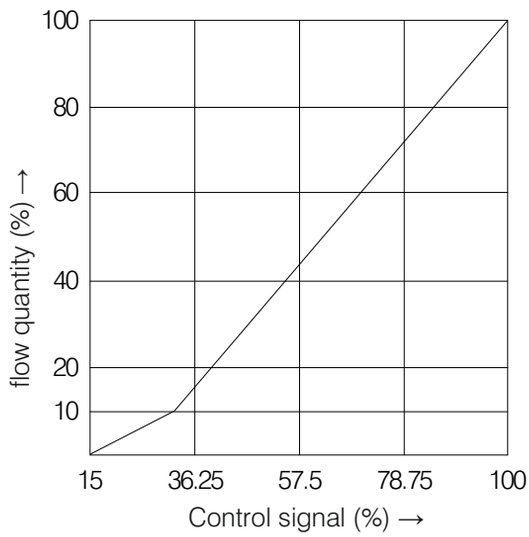
Characteristic curve (Measured with 46# anti-wear hydraulic oil, ϑoil = 40 ±5 °C)

- Flow characteristic curve (Δp = 5 bar/side)
  Function E,W,R

L: Linear

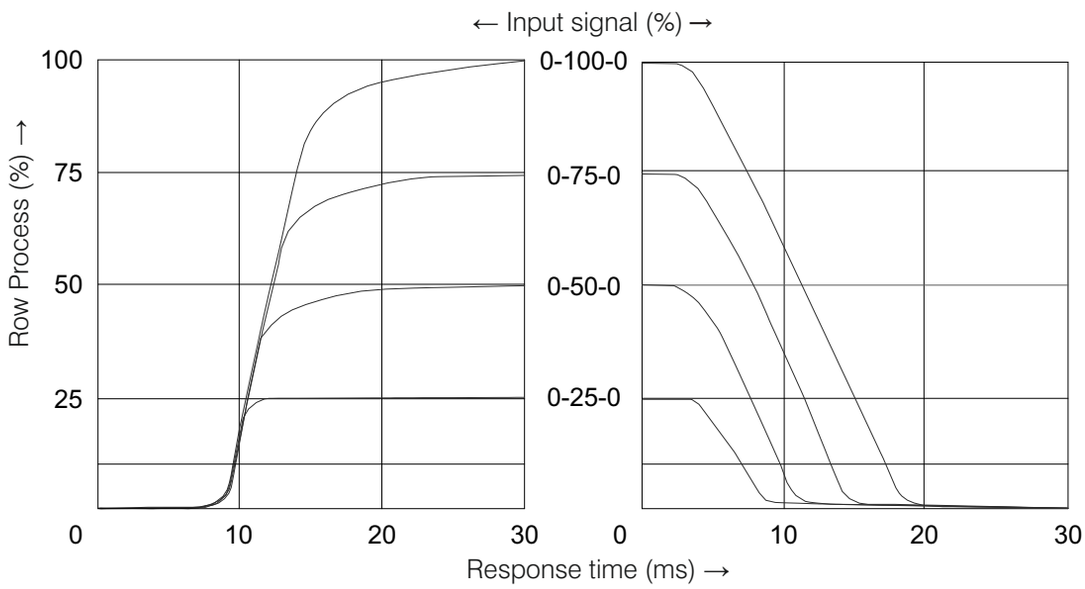


P: Double gain characteristic



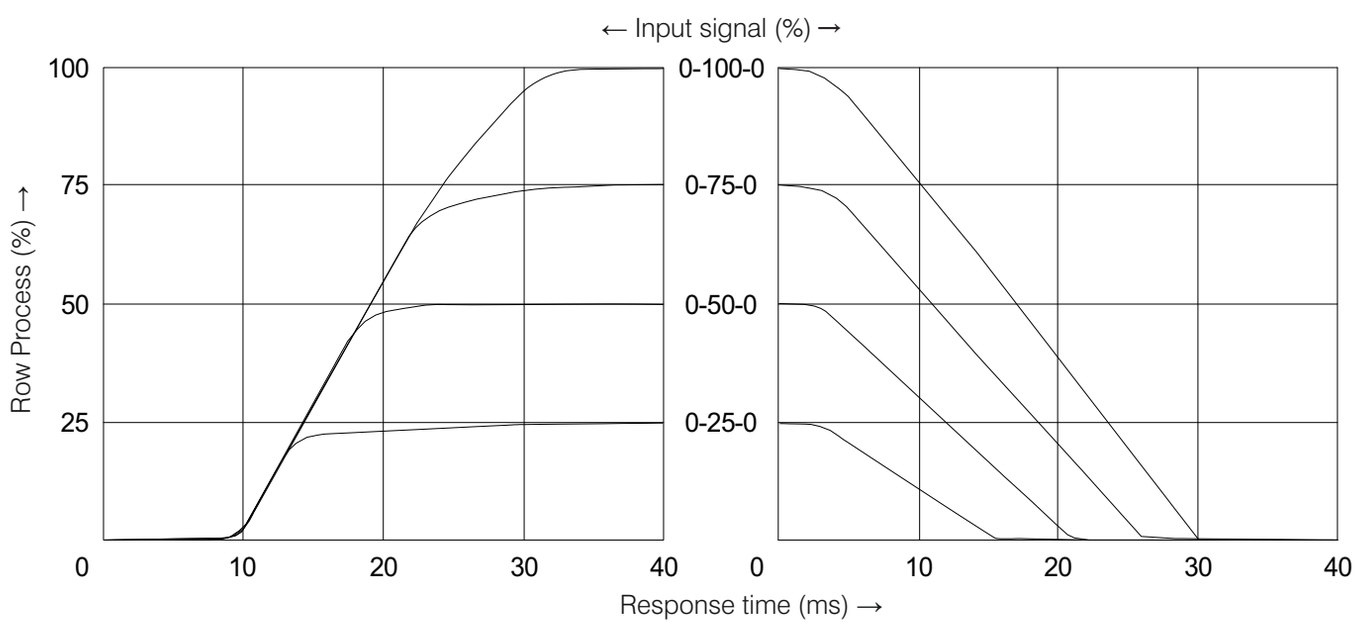
Characteristic curve (NG 10)

Measured with 46# anti-wear hydraulic oil, ϑ oil = 40 ±5 °C
Step Response Curve
Port Ps= 100 bar



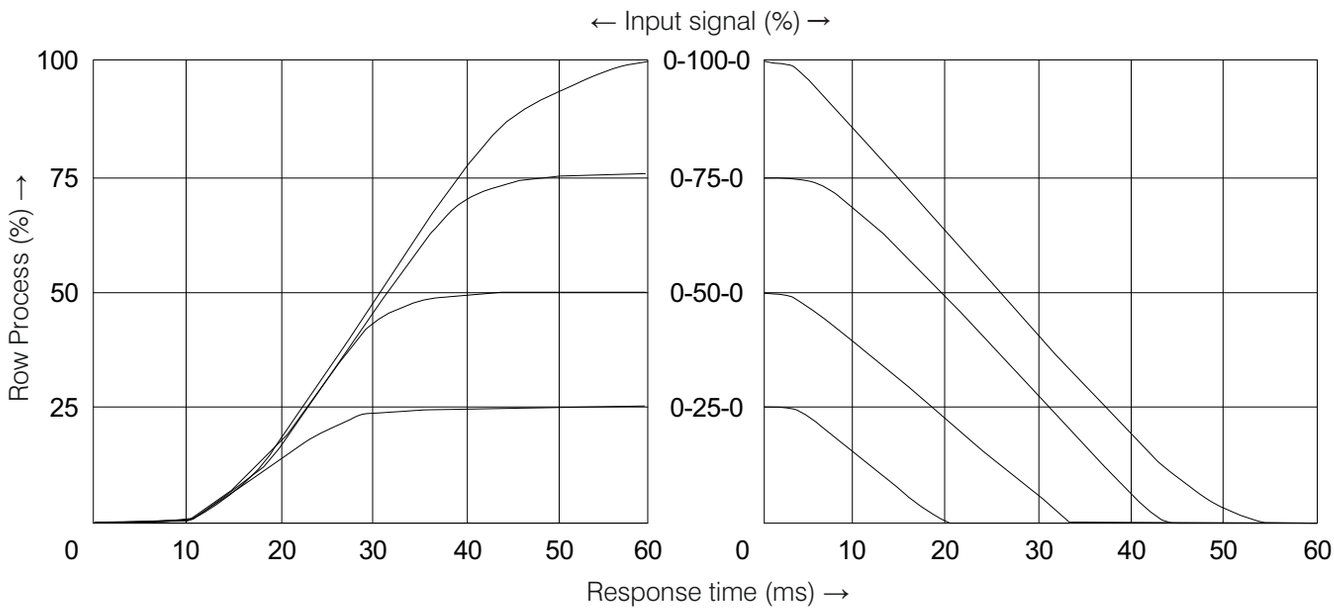
Characteristic curve (NG 16)

Measured with 46# anti-wear hydraulic oil, ϑ oil = 40 ±5 °C
Step Response Curve
Port Ps= 100 bar



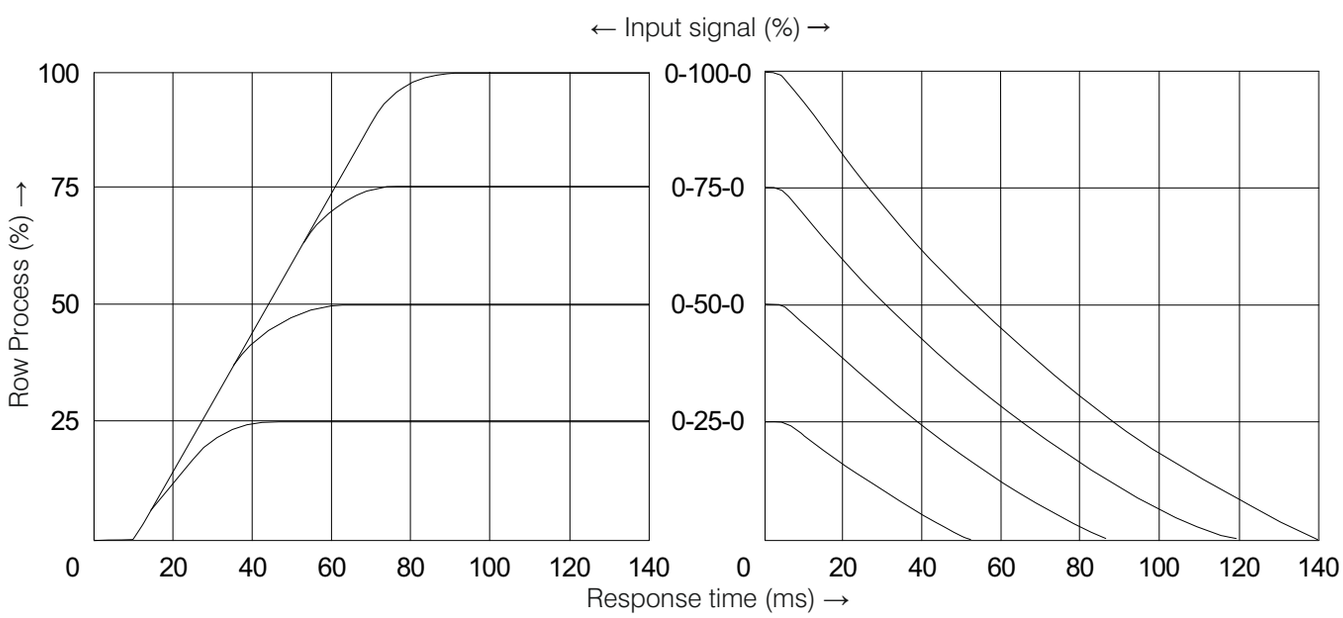
Characteristic curve (NG 25, 27)

Measured with 46# anti-wear hydraulic oil, ϑ oil = 40 ±5 °C
Step Response Curve
Port Ps= 100 bar

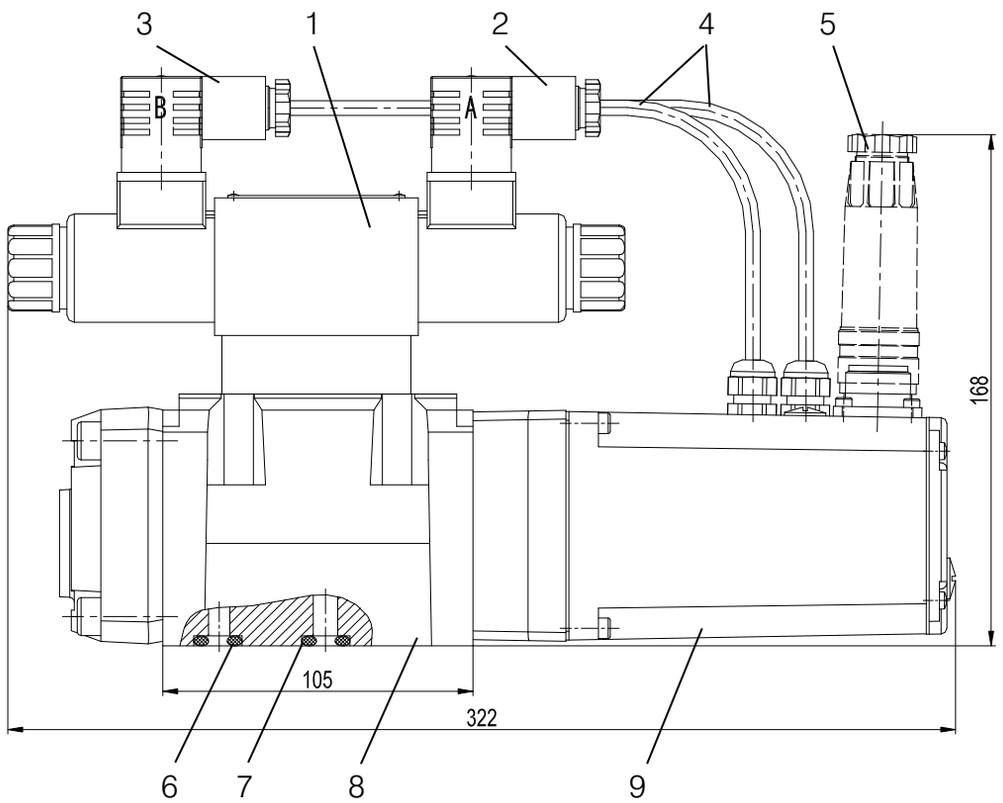


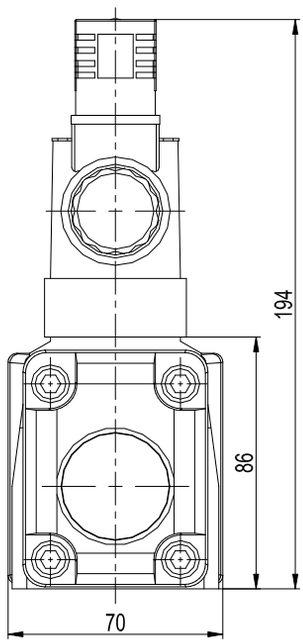
Characteristic curve (NG 32)

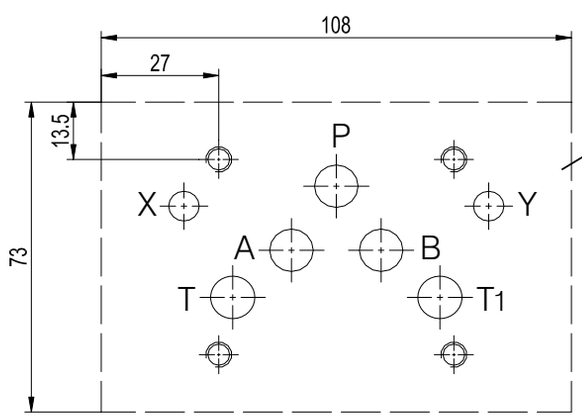
Measured with 46# anti-wear hydraulic oil, ϑ oil = 40 ±5 °C
Step Response Curve
Port Ps= 100 bar



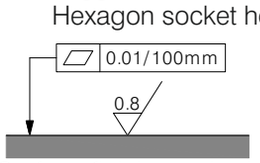
Unit Dimensions NG10 (Dimensions in mm)







10
Valve fixing screw:
suggestion:
Hexagon socket head cap screws: 4 - M6 x 45 - Class 10.9

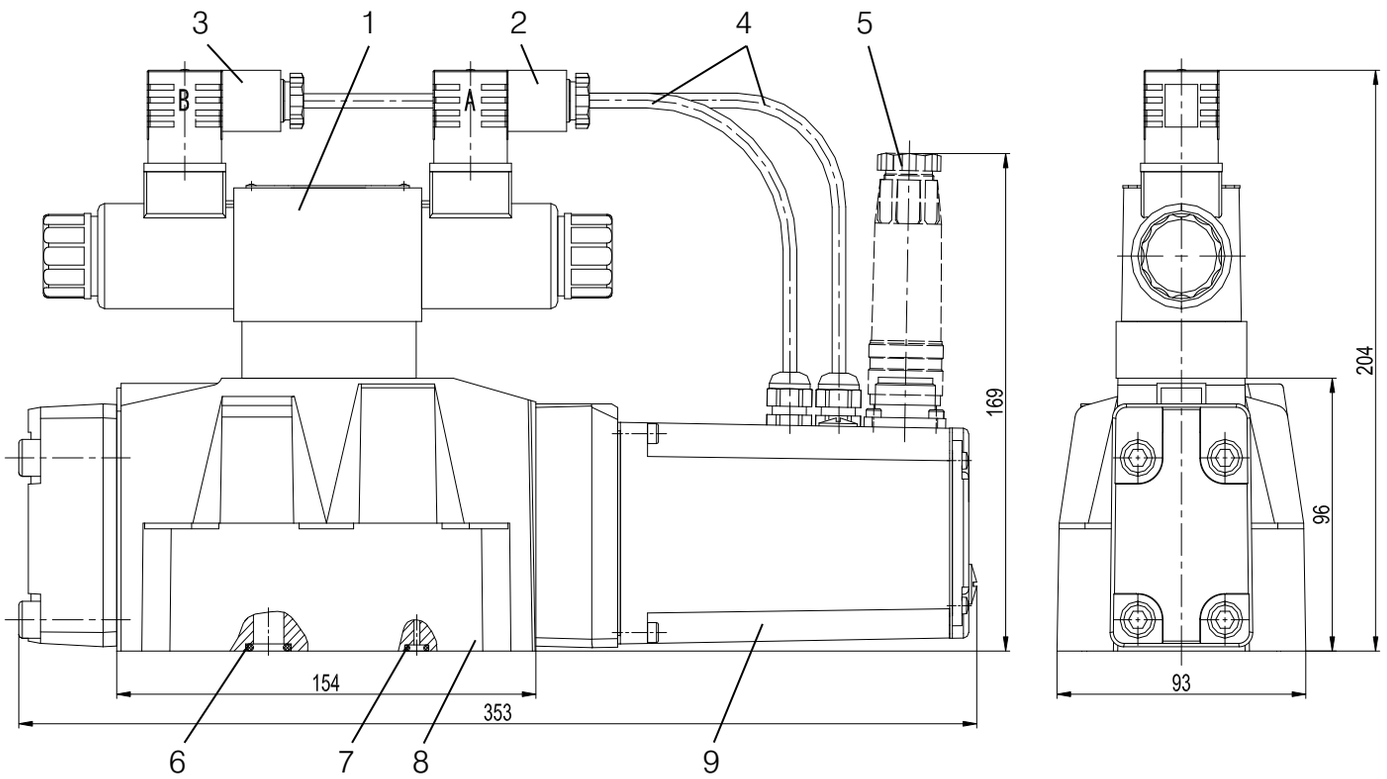


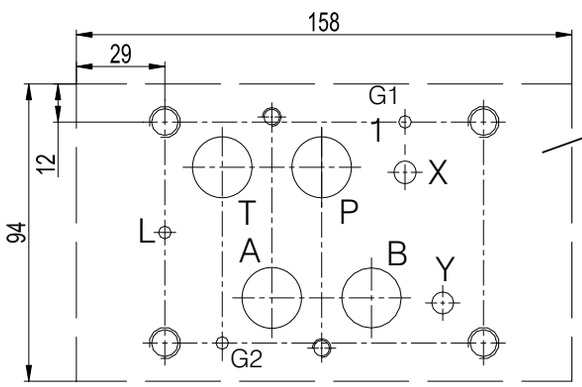
Surface finish required for valve body mounting surfaces

Unit mm	P	A	T	T1	B	F1	F2	F3	F4	X	Y
Aperture/ Thread	max Ø11.2	max Ø11.2	max Ø11.2	max Ø11.2	max Ø11.2	M6	M6	M6	M6	max Ø6.3	max Ø6.3
x	27	16.7	3.2	50.8	37.3	0	54	54	0	-8	62
y	6.3	21.4	32.5	32.5	21.4	0	0	46	46	11	11

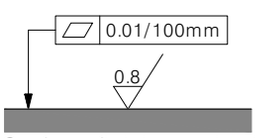
1. Pilot valve
2. male connector "A" grey
3. male connector "B" black
4. Wiring
5. Seven-pin plug (to be ordered separately)
6. Ports X, Y use the same seal
7. Use the same seal ring for ports P, T, A, B
8. Main stage valve
9. Integrated Electronic Components (OBE)
10. Machined valve contact surface, port mounting surface conforms to ISO 4401-07-07-0-05 and the marked deviation: port P, T, A, B Ø11mm

Unit Dimensions NG16 (Dimensions in mm)





Valve fixing screw:
suggestion:
10 Hexagon socket head cap screws: 2 - M6 x 60 - Class 10.9
Hexagon socket head cap screws: 4 - M10 x 60 - Class 10.9

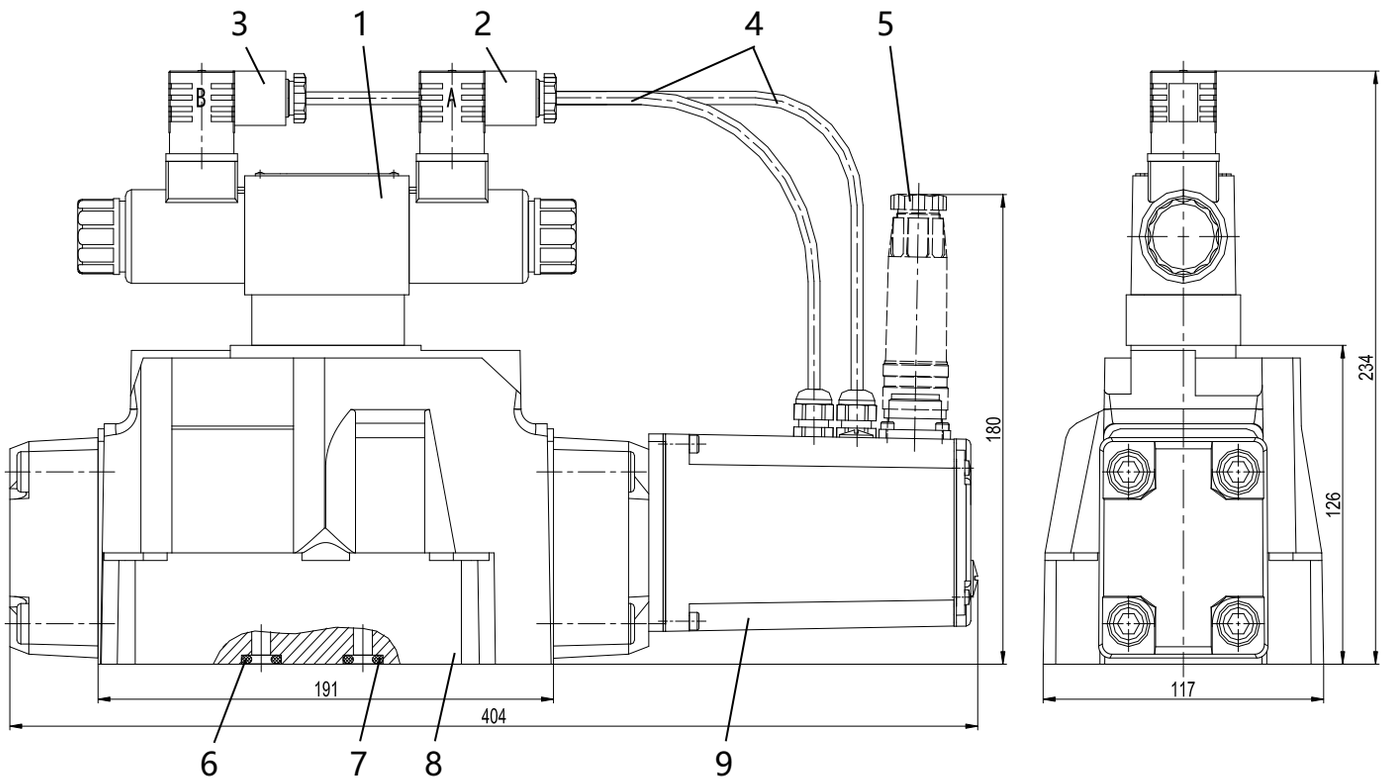


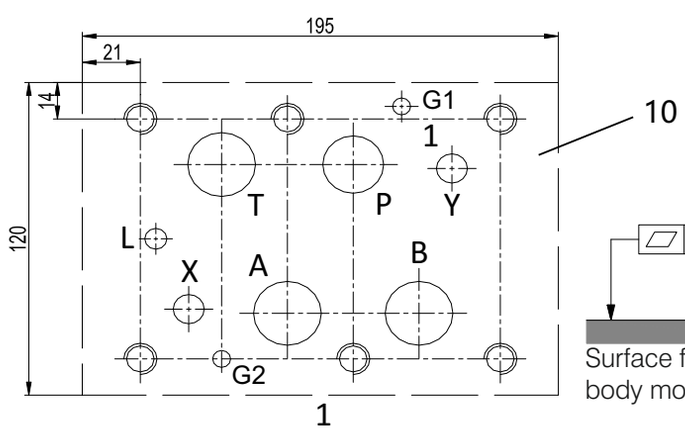
Surface finish required for valve body mounting surfaces

Unit mm	P	A	T	B	X	Y	G1	G2	F1	F2	F3	F4	F5	F6
Aperture /Thread	Ø17.5 max	Ø17.5 max	Ø17.5 max	Ø17.5 max	Ø6.3 max	Ø6.3 max	Ø4	Ø4	M10	M10	M10	M10	M6	M6
x	50	34.1	18.3	65.9	76.6	88.1	76.6	18.3	0	101.6	101.6	0	34.1	50
y	14.3	55.6	14.3	55.6	15.9	57.2	0	69.9	0	0	0	69.9	-1.6	71.5

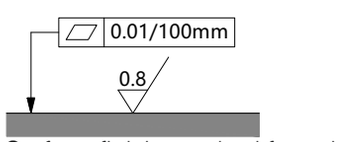
1. Pilot valve
2. male connector "A" grey
3. male connector "B" black
4. Wiring
5. Seven-pin plug (to be ordered separately)
6. Ports P, T, A, B use the same seal
7. Ports X, Y use the same seal
8. Main stage valve
9. Integrated Electronic Components (OBE)
10. Machined valve contact surface, port mounting surface conforms to ISO 4401-07-07-0-05 and the marked deviation: port P, T, A, B Ø20m

Unit Dimensions NG25 (Dimensions in mm)





Valve fixing screw:
suggestion:
Hexagon socket head cap screws: 6 - M12 x 60 - Class 10.9

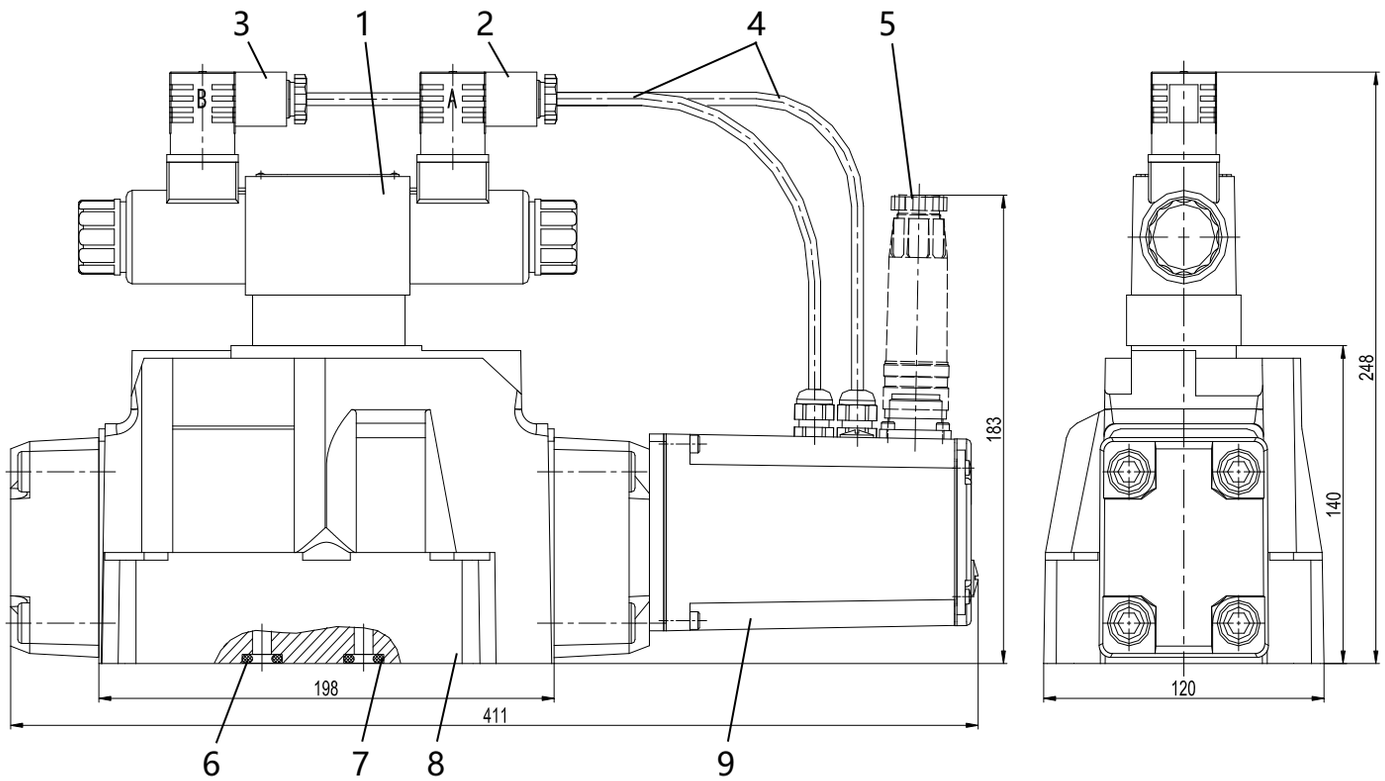


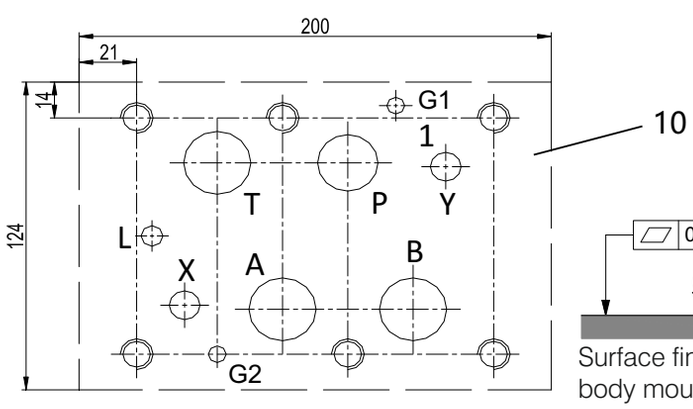
Surface finish required for valve body mounting surfaces

Unit mm	P	A	T	B	X	Y	G1	G2	F1	F2	F3	F4	F5	F6
Aperture /Thread	Ø25 max	Ø25 max	Ø25 max	Ø25 max	Ø11.2 max	Ø11.2 max	Ø7.5	Ø7.5	M12	M12	M12	M12	M12	M12
x	77	53.2	29.4	100.8	17.5	112.7	94.5	29.4	0	130.2	130.2	0	53.2	77
y	17.5	74.6	17.5	74.6	73	19	-4.8	92.1	0	0	92.1	92.1	0	92.1

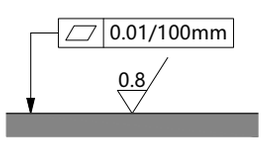
1. Pilot valve
2. male connector "A" grey
3. male connector "B" black
4. Wiring
5. Seven-pin plug (to be ordered separately)
6. Ports X, Y use the same seal
7. Use the same seal ring for ports P, T, A, B
8. Main stage valve
9. Integrated Electronic Components (OBE)
10. Machined valve contact surface, port mounting surface conforms to ISO 4401-08-08-0-05 Deviation from standard: Port P Ø24mm; Port T, A, B Ø25mm

Unit Dimensions NG27 (Dimensions in mm)





Valve fixing screw:
suggestion:
Hexagon socket head cap screws: 6 - M12 x 60 - 10

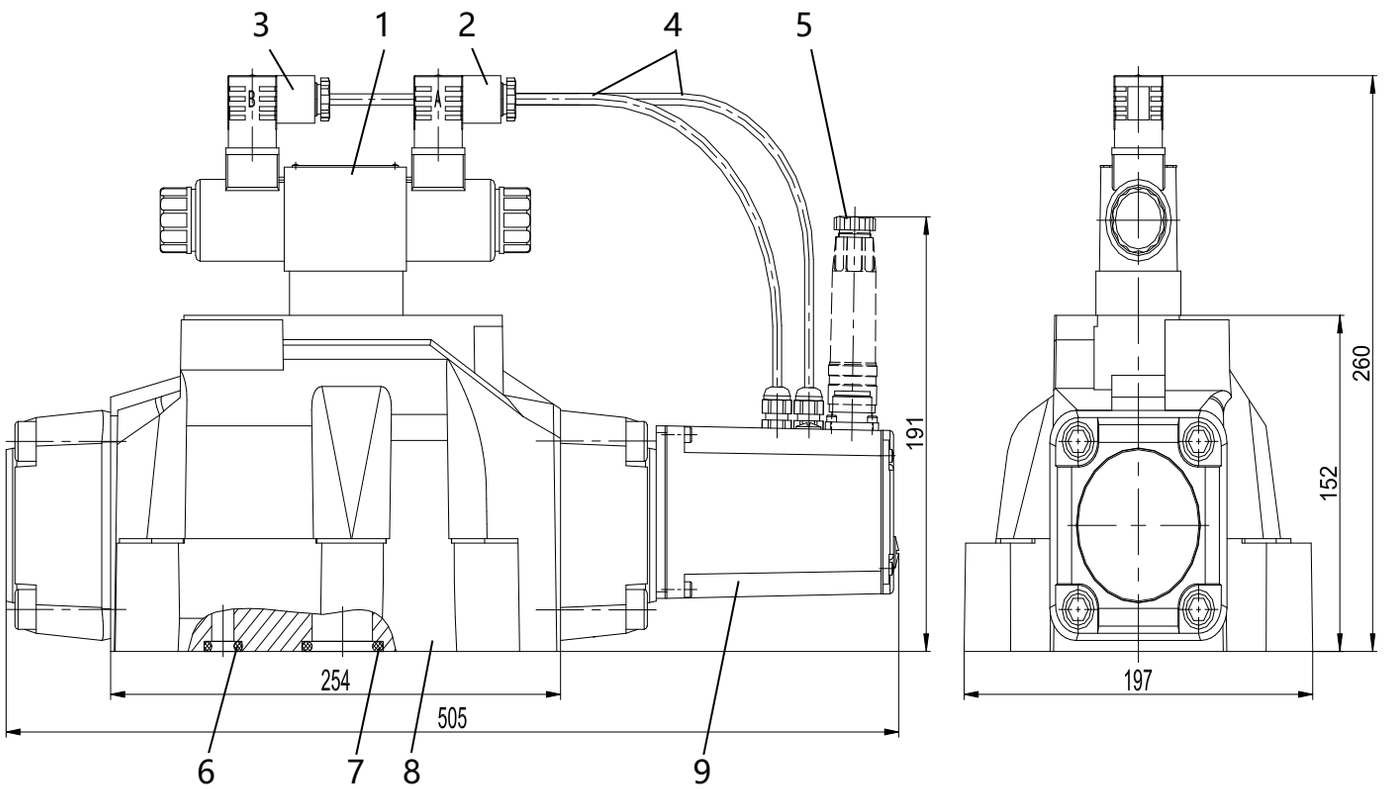


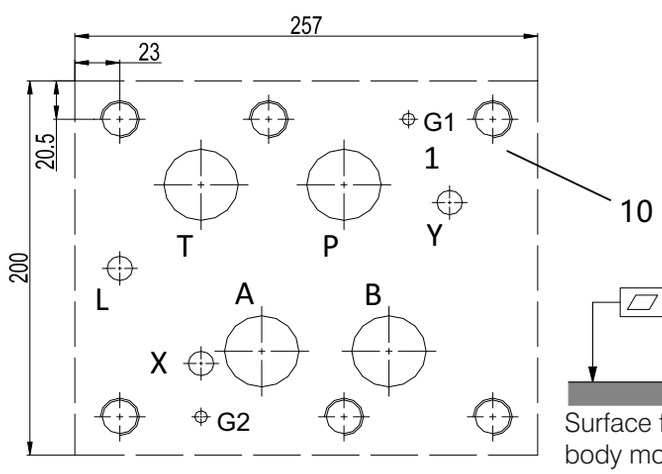
Surface finish required for valve body mounting surfaces

Unit mm	P	A	T	B	X	Y	G1	G2	F1	F2	F3	F4	F5	F6
Aperture /Thread	Ø35 max	Ø35 max	Ø35 max	Ø35 max	Ø11.2 max	Ø11.2 max	Ø7.5	Ø7.5	M12	M12	M12	M12	M12	M12
x	77	53.2	29.4	100.8	17.5	112.7	94.5	29.4	0	130.2	130.2	0	53.2	77
y	17.5	74.6	17.5	74.6	73	19	-4.8	92.1	0	0	92.1	92.1	0	92.1

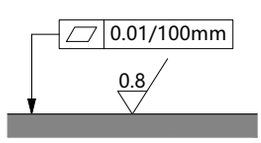
1. Pilot valve
2. male connector "A" grey
3. male connector "B" black
4. Wiring
5. Seven-pin plug (to be ordered separately)
6. Ports X, Y use the same seal
7. Use the same seal ring for ports P,T,A,B
8. Main stage valve
9. Integrated Electronic Components (OBE)
10. Machined valve contact surface, port mounting surface conforms to ISO 4401-08-08-0-05 Deviation from standard: port P, T, A, B Ø32mm

Unit Dimensions NG32 (Dimensions in mm)





Valve fixing screw:
suggestion:
Hexagon socket head cap screws: 6 - M20 x 80 - Class 10.9



Surface finish required for valve body mounting surfaces

Unit mm	P	A	T	B	X	Y	G1	G2	F1	F2	F3	F4	F5	F6
Aperture /Thread	Ø34 max	Ø38 max	Ø38 max	Ø38 max	Ø13 max	Ø13 max	Ø6.5	Ø6.5	M20	M20	M20	M20	M20	M20
x	114.5	82.5	41.5	147.5	41.5	168.5	147.5	41.5	0	190.5	190.5	0	76	114.5
y	35	124	35	124	130.5	44.5	0	159	0	0	159	159	0	159

1. Pilot valve
2. male connector "A" grey
3. male connector "B" black
4. Wiring
5. Seven-pin plug (to be ordered separately)
6. Ports X, Y use the same seal
7. Use the same seal ring for ports P,T,A,B
8. Main stage valve
9. Integrated Electronic Components (OBE)
10. Machined valve contact surface, port mounting surface conforms to ISO 4401-08-08-0-05 Deviation from standard: Port P, T, A, BØ38mm

The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract.

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