

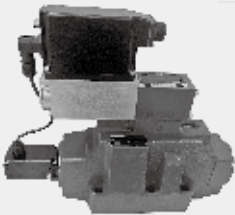


Pilot operated proportional directional valves

6.21

Type 4WRLE

Sizes 10 to 27
Up to 350 bar
Up to 600 L/min



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Features

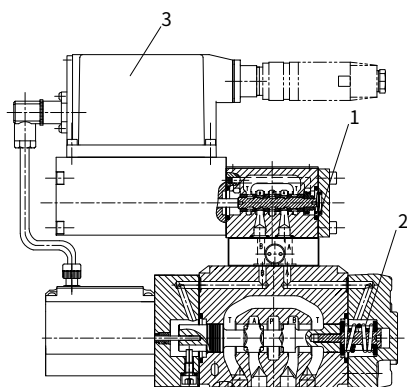
- Pilot valve NG6, with control spool and sleeve in servo quality, actuated on one side, 4/4 fail-safe position when switched off
- Control solenoid with electrical position feedback and electronics for position transducer (LvdT DC/DC)
- Main stage in servo quality with position feedback
- Pilot operated 4/3-way servo solenoid directional control valves NG10 to NG27

Function and configuration

Construction

The valve consists of three main assemblies:

- Pilot valve (1) with control spool and sleeve, return springs, control solenoid and inductive position transducer
- Main stage (2) with centering springs and position feedback
- On-board trigger electronics (3)



Type 4WRLE 10 ...-L4X...

Functional description

When the control solenoid is not actuated, the control spool is held by springs in the fail-safe position, and the main stage spool remains in its spring-centered mid position.

In the on-board electronics, the pre-defined setpoint is compared with the actual value for the position of the main stage control spool. In the event of an error signal, the control solenoid is actuated, and the pilot spool is moved as the magnetic force changes.

The flow released through the control cross-sections causes the main control spool to move. The spool stroke is controlled proportionately to the setpoint of 0.5...10V between 20...100 %.

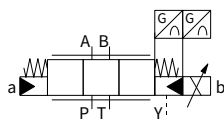
If the input setpoint is $< \pm 0.5V$, the control spool is held in the springcentered, overlapped mid position.

Power failure

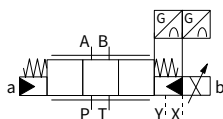
In the event of a power failure or an open circuit, the onboard electronics cut off the electricity to the control solenoid and the pilot spool moves to the fail-safe position, relieving the control oil chambers of the main stage. The main stage control spool is held by springs in mid position.

Symbols

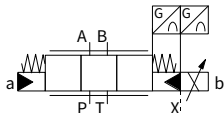
Type 4WRLE...-L4X...E.



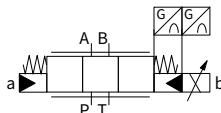
Type 4WRLE...-L4X...



Type 4WRLE . -L4X . . T .



Type 4WRLE...-L4X...ET.



Ordering code

4WRL	E				- L4X / G24		/		★
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With on-board electronics

NG10	= 10
NG16	= 16
NG25	= 25
NG27 ¹⁾	= 27

Control spool symbols

A, B = E, E1-

= W6-, W8-

= W, W1-

= V, V1-

= E4-

= W4-

= Q3-

Transitional symbols

With symbols:

E1-, E4-, W1-, W4-, W8-, V1-:
P → A: qv B → T: qv/2
P → B: qv/2 A → T: qv

Further information in plain text

V = FKM seals
No code = NBR seals

Interface

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

K31= Without plug-in connector
Z31= With plug-in connector

No code = Pilot oil supply and drain
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

Power supply of trigger electronics
+24V DC

G24 =

L4X = Unit series 40 to 49
(installation and connection dimensions unchanged)

M = Progressive with linear fine metering
(Only for symbol Q3), other sizes available upon request

L = Linear

Nominal flow rate at 10 bar valve pressure difference
(5 bar per metering notch)

NG10	100 L/min
NG16	200 L/min (Only for symbol W6- and W8-)
	250 L/min (Only for symbol E, E1-, V, V1- and Q3-)
NG25	350 L/min (Only for symbol W6- and W8-)
	400 L/min (Only for symbol E, E1-, V, V1- and Q3-)
NG27	430 L/min (Only for symbol W6- and W8-)
	600 L/min (Only for symbol E, E1-, V, V1- and Q3-)

Technical data

General		NG10	NG16	NG25	NG27
Design		Spool type valve, pilot operated			
Construction		Servo solenoid directional control valve NG6, with position controller for pilot valve and main stage			
Type of mounting		Subplate, mounting hole configuration NG10...27 to ISO 4401-...			
Installation position		Optional			
Ambient temperature range	°C	-20...+50			
Weight	kg	8.35	10	18	18
Vibration resistance, test condition		Max.25g, shaken in 3 dimensions (24 h)			

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Pressure fluid			Hydraulic oil to DIN 51524...535, other fluids after prior consultation			
Viscosity range	Recommended	mm ² /s	20...100			
	Max. permitted	mm ² /s	10...800			
Maximum permissible degree of contamination of pressure fluid. Purity class to ISO 4406 (c)			Class 18/16/13 ¹⁾			
Flow direction			See symbol			
Nominal flow at Δ p = 5 bar per notch ²⁾		L/min	see ordering code			
Max. working pressure	Ports P, A, B External control oil inlet	bar	350	350	350	280
	Ports P, A, B Internal control oil inlet	bar	280			
	Ports T, X, Y	bar	250			
Min. control oil pressure in "pilot stage"		bar	10			
Q _{max}		L/min	170	450	900	1000
Q _N pilot valve Δp = 35 bar		L/min	4	12	24	24
Leakage of pilot valve at 100 bar		L/min	< 0.18	< 0.35	< 0.5	< 0.5
Leakage of main stage (symbols "E") at 100 bar		L/min	<0.25	< 0.4	< 0.6	< 0.6

Static/Dynamic

Hysteresis		%	< 0.1, scarcely measurable			
Manufacturing tolerance for Q _{max}		%	≤ 10			
Response time for signal change	at X = 100 bar	0...100 %	25	26	32	32
		0...10 %	14	15	18	18
	at X = 10 bar	0...100 %	85	80	120	120
		0...10 %	50	30	50	50
Switch-off behavior			After electrical switch-off: pilot valve in fail-safe. Main stage moves to spring-centered "mid position"			
Thermal drift			Zero point displacement < 1% at ΔT = 40°C			
Zero adjustment			Adjustable ±5% via valve amplifier			

¹⁾ The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.

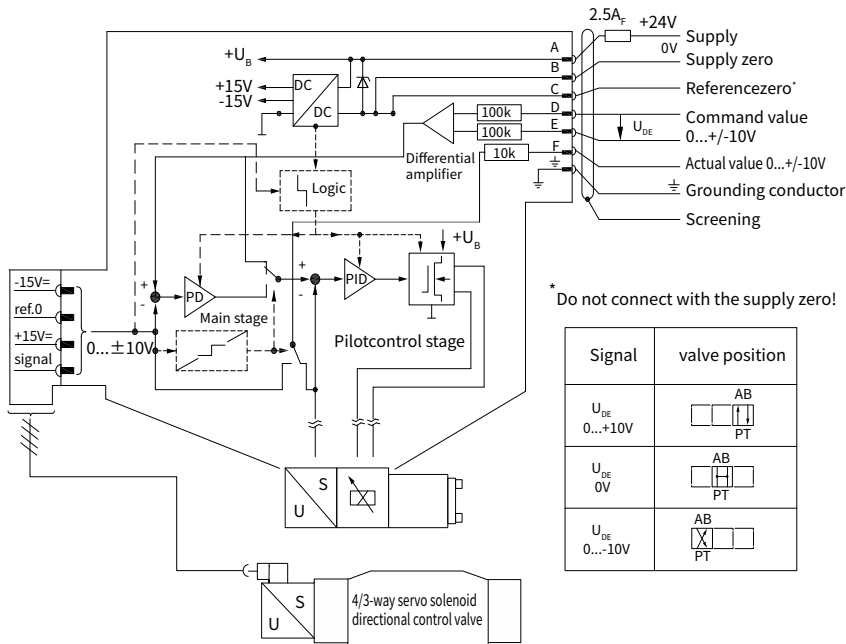
Technical data

Electric pilot valve NG6, trigger electronics integrated in the valve		
Cyclic duration factor	%	100 ED
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Connection		Plug-in connector 6P+PE, DIN 43563
Power supply		24 V DC
Terminal A:		min. 21 V DC/max. 40 V DC
Terminal B: 0V		Ripple max. 2 V DC
Power consumption		40 VA max.
External fuse	A _F	2.5
Input, "Standard" version		Differential amplifier, R _i = 100 kΩ
Terminal D: U ^E		0... ± 10 V
Terminal E:		0 V
Max. differential input voltage at 0V	D → B E → B	max. 18V DC
Test signal, "Standard" version		LVDT
Terminal F: U _{test}		0... ± 10 V
Terminal C:		Reference 0 V
Protective conductor and screen		See pin assignment
Recommended cable		See pin assignment Up to 20m 7×0.75mm ² Up to 40m 7×1mm ²
Calibration		Overlap and P-A at +8V, calibrated at the factory, see valve characteristic curve

On-board electronics

Block diagram/pin assignment

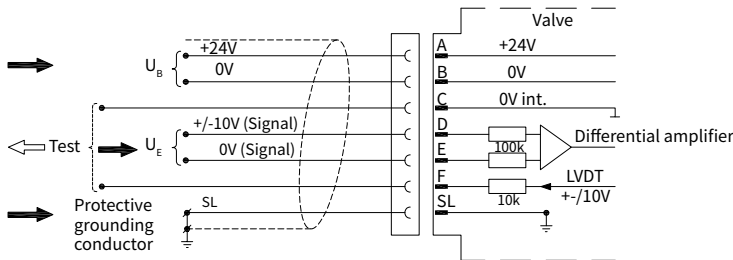
Version A1: $U_{D-E} \pm 10V$



* Do not connect with the supply zero!

Pin assignment 6P+PE

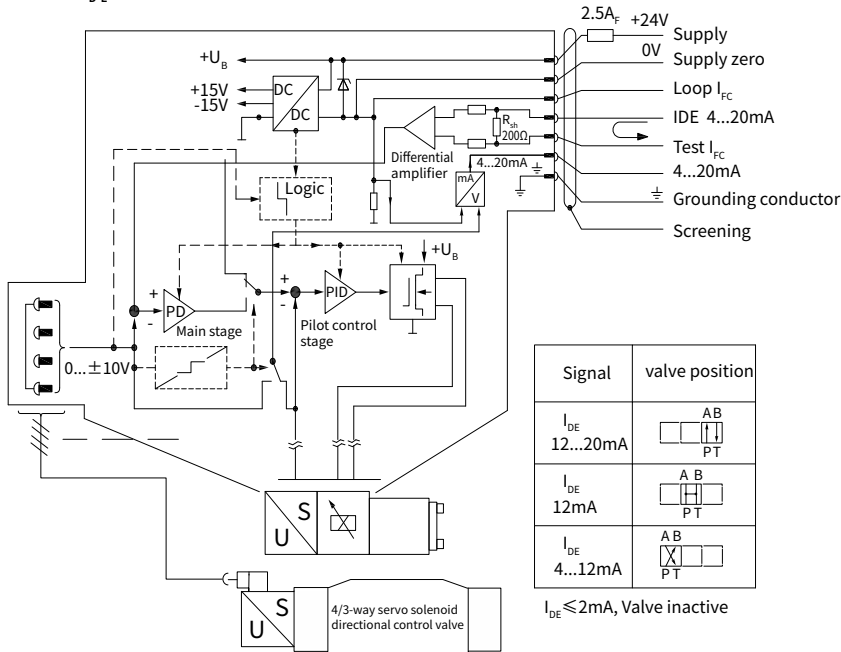
A1: $U_{D-E} \pm 10V$ ($R_i=100K\Omega$)



Integrated electronics

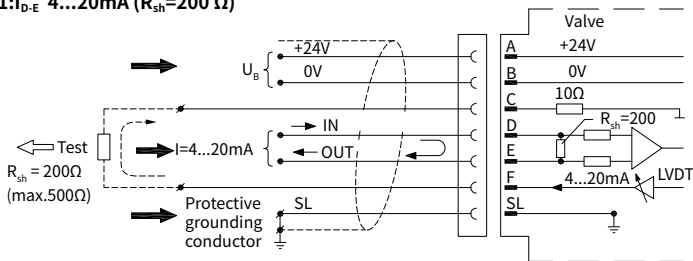
Block diagram/Pinout

Version F1: I_{D-E} 4...20mA



Pin assignment 6P+PE

F1: I_{D-E} 4...20mA ($R_{sh}=200\ \Omega$)

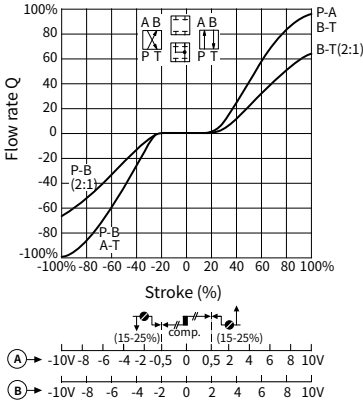


Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Flow rate – signal function $Q = f(U_e)$

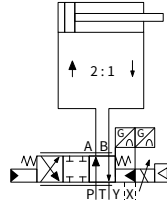
Symbol E, W ($Q_A: Q_B = 1:1$)

E1, W1 ($Q_A: Q_B = 2:1$)



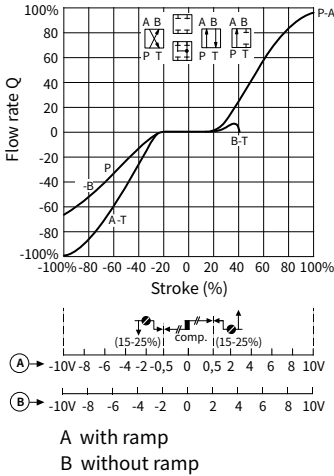
Control spool with asymmetric metering notches

Control spools with asymmetric metering notches are available in a ratio of 2:1 for the purpose of adaptation to differential cylinders.



Flow in mid position, "leakage oil pressure relief" With symbol "E", leakage oil in the two work chambers A and B of the control piston gives rise to a build-up of pressure in A or B, which then causes a connecting cylinder to drift out of position. In many cases, the "W" symbol is a better solution. With a setpoint of "0", the control piston moves into the over-lapped mid position. In this mid position, pressure is then relieved from ports A and B with 1% +0.5% QN to T. This also supports the function of external check valves.

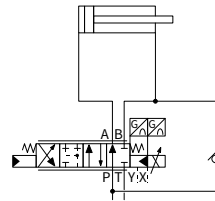
Symbol E4, W4 ($Q_A: Q_B = 1:2$)



Control spools in a differential circuit

In order to produce differential circuits, valve spools with a 4th position are available. It is sufficient to install a non-return valve in the consumer lines.

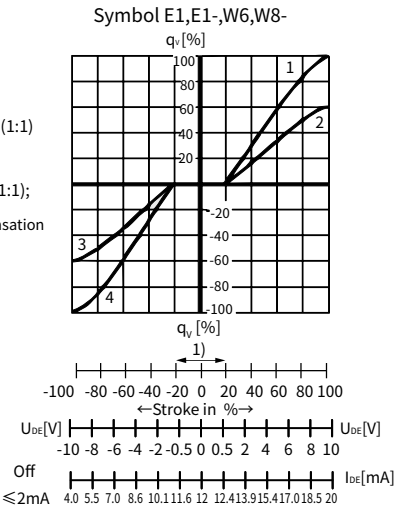
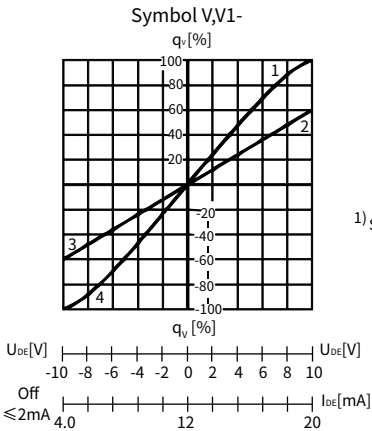
In addition, a control spool (symbol) with internal B-P connection is employed for certain branch-oriented solutions. However, we recommend that you consult Hengli hydraulic with regard to these special symbols, as a simulation or knowledge of this type of system is usually required.



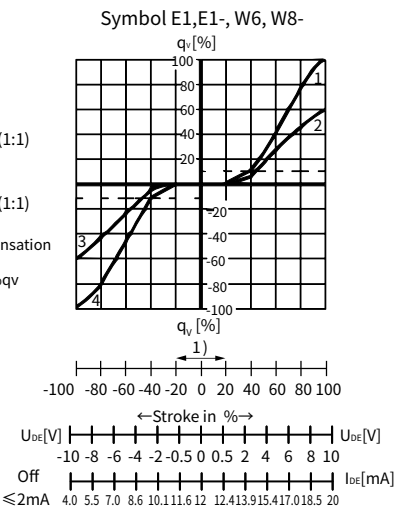
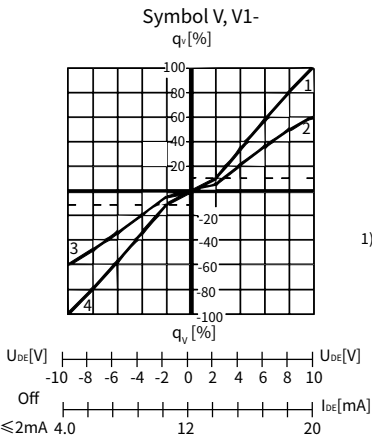
Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, $\Delta p=5\text{ bar/control edge}$)

Flow signal function

Flow characteristic "L"



Flow characteristic "P"

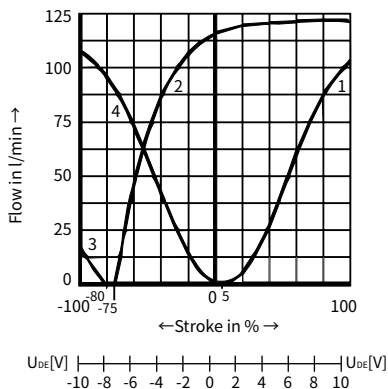


Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, $\Delta p=5\text{ bar/control edge}$)

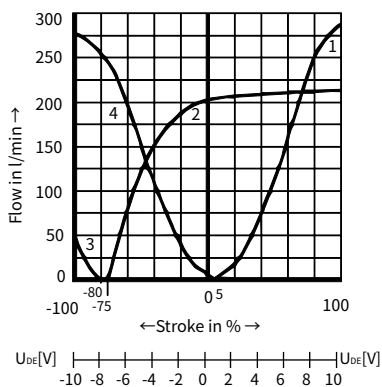
Flow signal function

Flow characteristic "M"

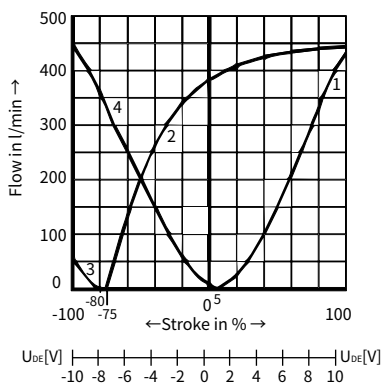
Symbol Q3,version"100"



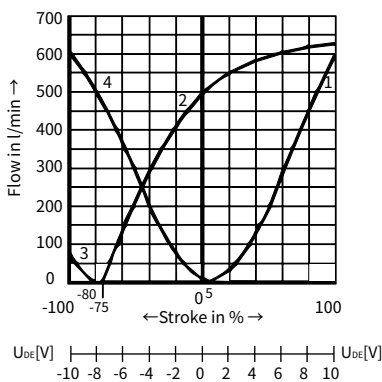
Symbol Q3,version"250"



Symbol Q3,version "400"



Symbol Q3,version "600"

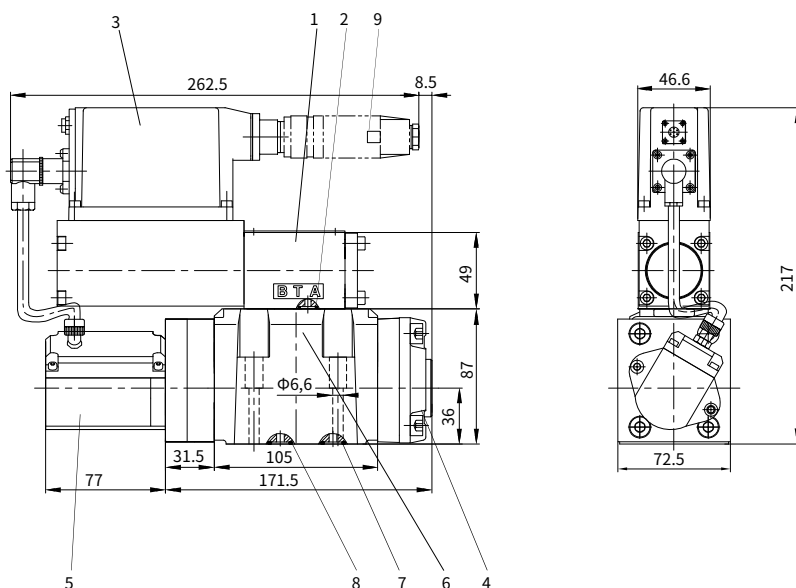


- | | |
|-------|-------|
| 1 P-A | 3 P-B |
| 2 B-T | 4 A-T |

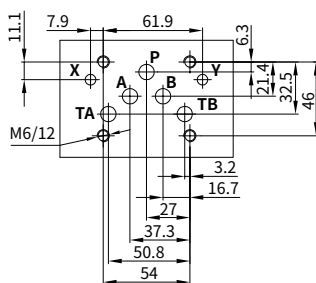
Unit dimensions

(Dimensions in mm)

NG 10



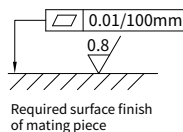
Machined valve mounting surface



- 1 Pilot control valve
- 2 R-ring $9.81 \times 1.5 \times 1.78$ (ports P, A, B, T)
- 3 On-board electronics
- 4 Main valve
- 5 Inductive position transducer (main valve)
- 6 Nameplate
- 7 R-ring $13 \times 1.6 \times 2$, ports A, B, P, T
- 8 R-ring $11.18 \times 1.6 \times 1.78$, ports X and Y
- 9 Plug-in connector not included in delivery (order separately)

Valve fixing screws:

4- M6 $\times$ 45 ISO 4762-10.9; $M_A = 13.5 \text{ Nm}$

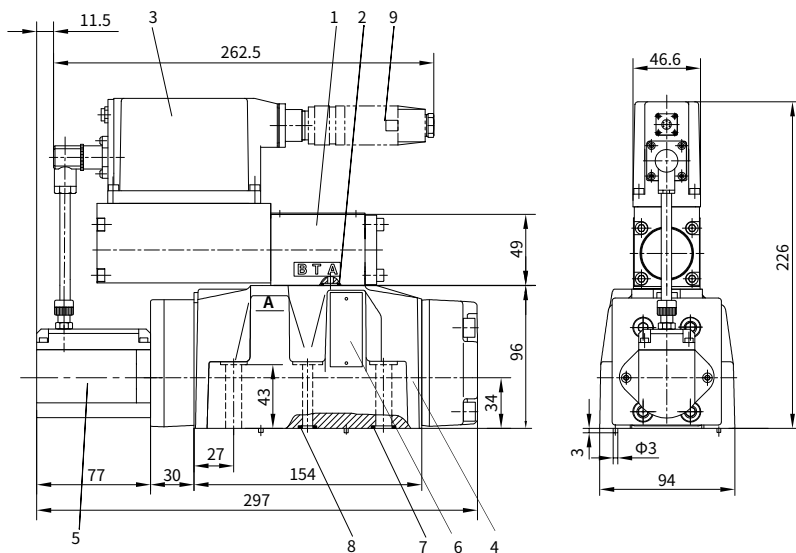


Required surface finish of mating piece

Unit dimensions

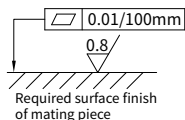
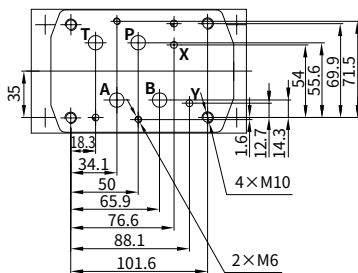
(Dimensions in mm)

NG 16



Machined valve mounting surface

- 1 Pilot control valve
- 2 R-ring $9.81 \times 1.5 \times 1.78$ (ports P, A, B, T)
- 3 On-board electronics
- 4 Main valve
- 5 Inductive position transducer (main valve)
- 6 Nameplate
- 7 R-ring $22.53 \times 2.3 \times 2.62$, ports A, B, P, T
- 8 R-ring $10 \times 2 \times 2$, ports X and Y
- 9 Plug-in connector not included in delivery (order separately)



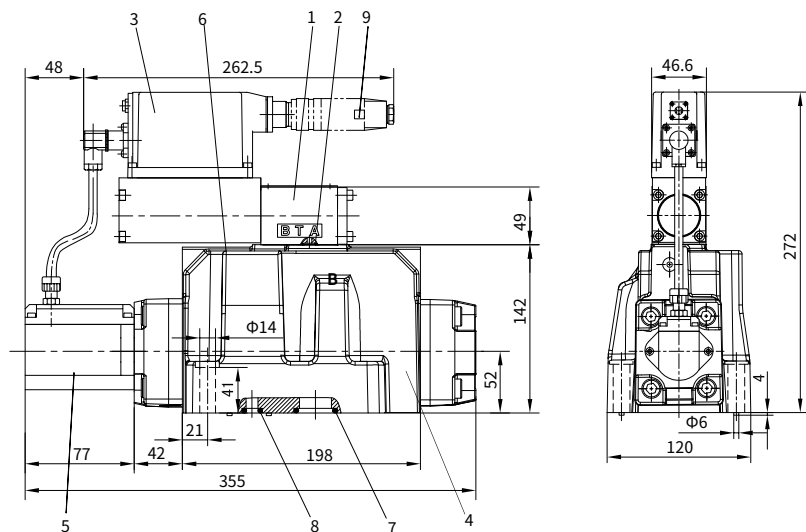
Valve fixing screws:

2- M6×60 ISO 4762-10.9; $M_A=14$ Nm4- M10×60 ISO 4762-10.9; $M_A=60$ Nm

Unit dimensions

(Dimensions in mm)

NG 27

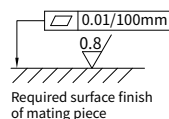
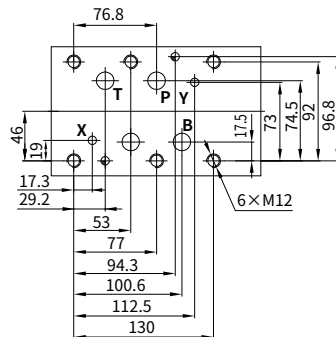


- 1 Pilot control valve
- 2 R-ring $9.81 \times 1.5 \times 1.78$ (ports P, A, B, T)
- 3 On-board electronics
- 4 Main valve
- 5 Inductive position transducer (main valve)
- 6 Nameplate
- 7 R-ring $34.52 \times 3.53 \times 3.53$ (ports A, B, P, T)
- 8 R-ring $19 \times 3 \times 3$, ports X and Y
- 9 Plug-in connector not included in delivery (order separately)

Valve fixing screws:

6- M12×60 ISO 4762-10.9; $M_A=100$ Nm

Machined valve mounting surface



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