

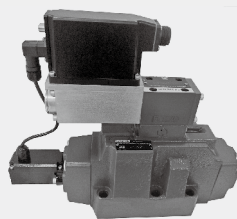


Pilot operated proportional directional valves

6.15

Type 4WRLE

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



Contents

Function and configuration	02
Symbols	02
Ordering code	03
Technical data	04-05
Electrical connection	06
Technical data for the cable	06
On-board electronics	07
Integrated electronics	08
Characteristic curves	09-11
Unit dimensions	12-15

Features

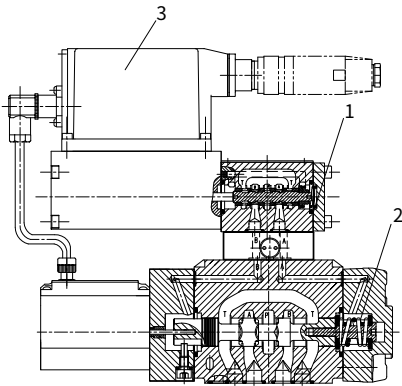
- Pilot valve NG6, with control spool and sleeve in servo quality, actuated on one side, 4/4 fail-safe position when switched off
- Control solenoid with electrical position feedback and electronics for position transducer (LvdT DC/DC)
- Main stage in servo quality with position feedback
- Pilot operated 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 inductiveposition 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...10 V between 20...100 %.

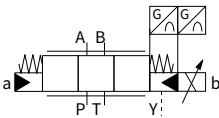
If the input setpoint is $< \pm 0.5$ V, the control spool is held in the springcentered, overlapped mid position.

Power failure

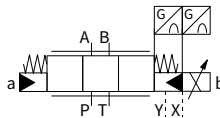
In the event of a power failure or an open circuit, the onboard electronics cut off the electricity to the control solenoid and the pilot spool moves to the fail-safe position, relieving the control oil chambers of the main stage. The main stage control spool is held by springs in mid position.

Symbols

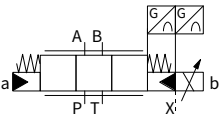
Type 4WRLE...-L4X...E.



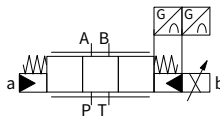
Type 4WRLE...-L4X...



Type 4WRLE . -L4X . . T .



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



Ordering code

4WRLE	E				L4X / G24	K0 /			*
-------	---	--	--	--	-----------	------	--	--	---

With on-board electronics = E

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

Control spool symbols

	A, B = E, E1
	A, B = W6, W8
	A, B = W, W1
	A, B = V, V1
	A, B = E4
	A, B = W4
	A, B = 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

D3 = ZDR6DP0-L4X/40YM
With pressure reducing valve

V = FKM seals
No code = NBR seals

Interface

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

Electrical connection:

K0 = without plug-in connector,
with plug to DIN 43563-AM6,
order plug-in connector separately

Control oil inlet "x"
control oil return "y"

No design. = "x" = external, "y" = external
E = "x" = internal, "y" = external
ET = "x" = internal, "y" = internal
T = "x" = external, "y" = 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
L = Linear

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

	NG10:	NG25:
55 =	55 l/min	370 = 370 l/min
100 =	100 l/min	
	NG16:	NG27:
120 =	120 l/min	430 = 430 l/min
200 =	200 l/min	

¹⁾ NG27 is a high-flow version of NG25, ports P, A, B and T have $\Phi 32$ mm in the main stage.
Contrary to standard ISO 4401-08-08-0-05, ports P, A, B and T may be drilled to max. $\Phi 30$ mm in the control block.
These valves therefore offer higher flow rates Q_A ; Q_B

Technical data

General				
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	NG10 8.35	NG16 10
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 $\Delta p = 5$ bar per notch ²⁾		L/min	NG10	NG16
			NG25	NG27
		see Ordering code		
Max. working pressure	Ports P, A, B External control oil inlet	bar	350	350
	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
Q_N pilot valve $\Delta p = 35$ bar		L/min	4	12
Leakage of pilot valve at 100 bar		L/min	< 180	< 350
Leakage of main stage (symbols "E") at 100 bar		L/min	< 0.25	< 0.4
			< 0.6	< 0.6

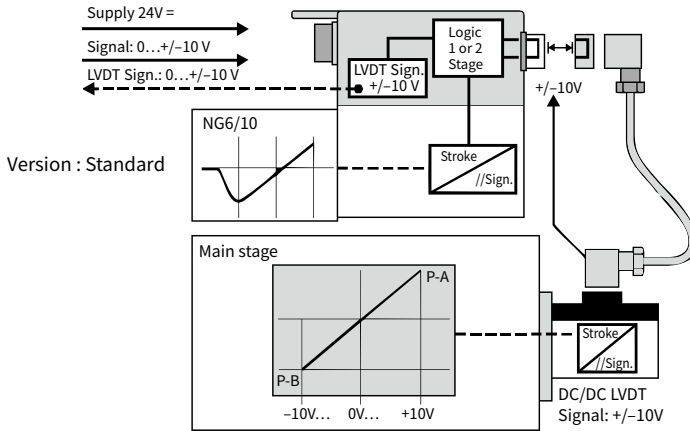
Static/Dynamic				
Hysteresis		%	< 0.1, scarcely measurable	
Manufacturing tolerance for Q_{max}		%	≤ 10	
Response time for signal change (at X = 100 bar)	0...100 %		25	26
	0...10 %		14	15
Response time for signal change (at X = 10 bar)	0...100 %		85	80
	0...10 %		50	30
Switch-off behavior		After electrical switch-off: pilot valve in fail-safe. Main stage moves to spring-centered "mid position"		
Thermal drift		Zero point displacement < 1 % at $\Delta T = 40^{\circ}\text{C}$		
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: 0 V		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 0 V	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 +8 V, calibrated at the factory, see valve characteristic curve

Electrical connection

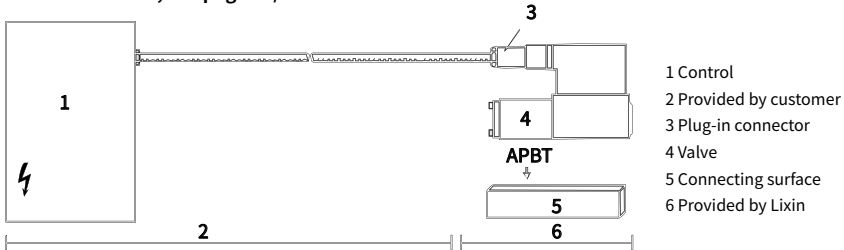


Important:

Pilot operated 4/3-way servo solenoid directional control valves with positive overlap perform their function in open or closed-loop-controlled axes and have approx. 20 % overlap when switched off. This condition does not constitute an active fail-safe position.

For this reason, many applications require the use of "external check valves" or certain sandwich-mounted valves, which must be taken into account during the On/Off switching sequence.

For electrical data, see page 05/16



Technical data for the cable

Version:

- Multi-core wire
- Litz wire structure, extra fine wire according to VDE 0295, class 6
- Protective earthing conductor, green-yellow
- Cu shielding braid

Number of wires:

- Determined by the valve type, connector type and signal configuration

Line Ø:

- 0.75 mm² to 20 m of length
- 1.0 mm² to 40 m of length

Outer Ø:

- 9.4...11.8 mm
- 12.7...13.5 mm

Supply voltage 24 VDC_{nom}

If the value falls below 18 VDC, a fast shut-down takes place internally, comparable with "Enable OFF".

Also with version "F1":

$I_{D,E} \geq 3 \text{ mA}$ - valve is active.

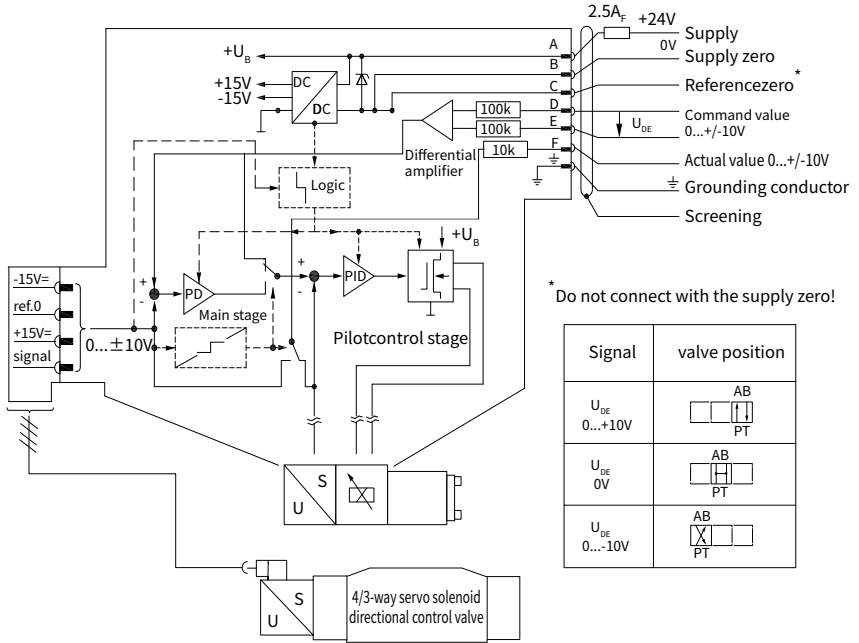
$I_{D,E} \leq 2 \text{ mA}$ - Valve is deactivated.

Electric signals taken out via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions! (see also the European standard "Safety requirements for fluid power systems and their components - Hydraulics", EN ISO 982)

On-board electronics

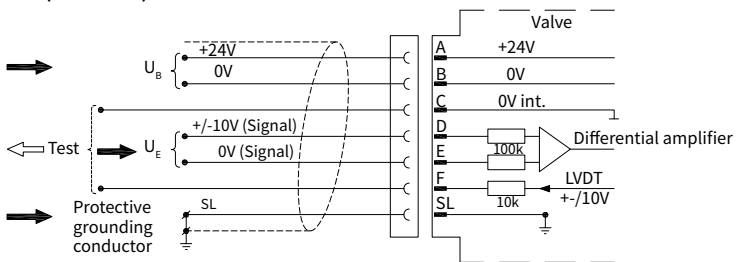
Block diagram/pin assignment

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



Pin assignment 6P+PE

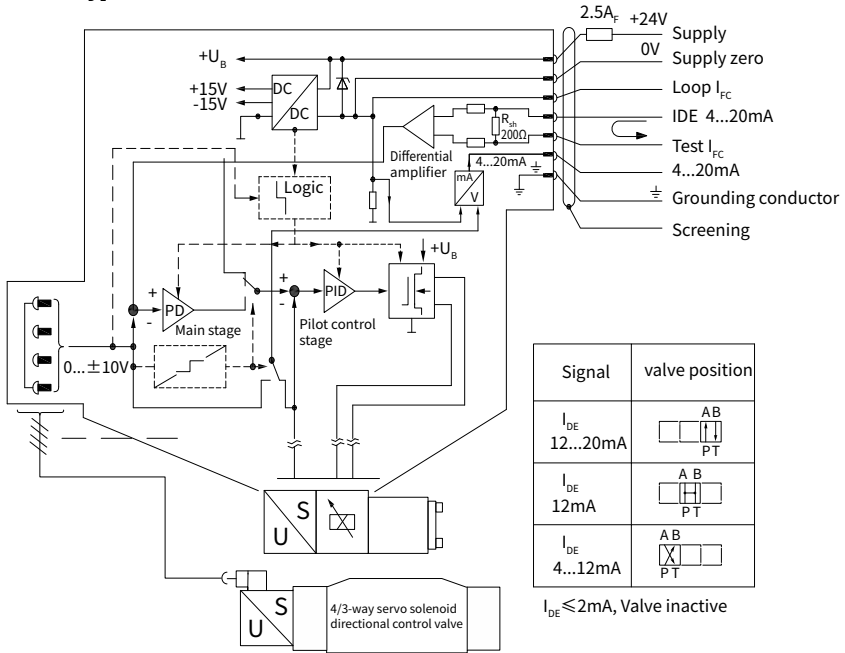
A1: $U_{D-E} \pm 10V$ ($R_i=100K\Omega$)



Integrated electronics

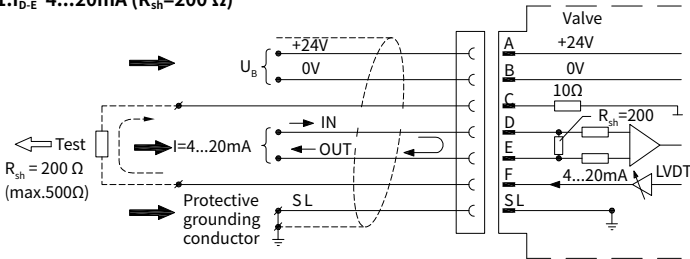
Block diagram/Pinout

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



Pin assignment 6P+PE

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

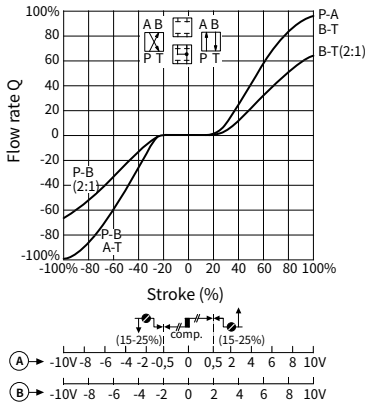


Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

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

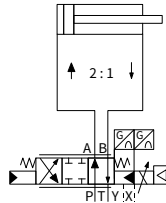
Symbol E, W ($Q_A: Q_B = 1 : 1$)

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



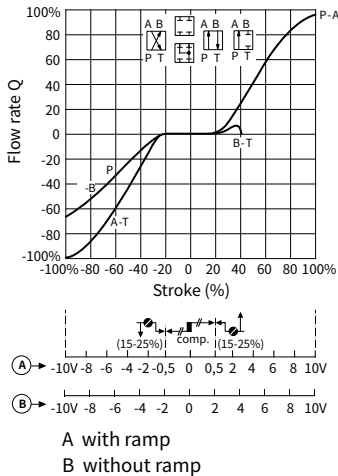
Control spool with asymmetric metering notches

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.

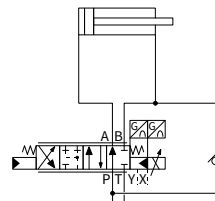
Symbol E4, W4 ($Q_A: Q_B = 1 : 2$)



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.

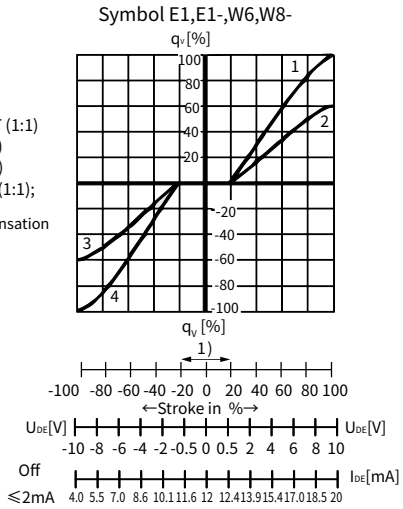
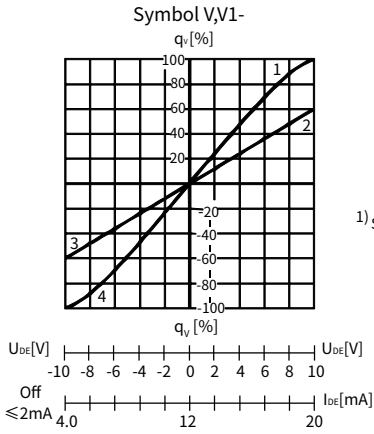


06

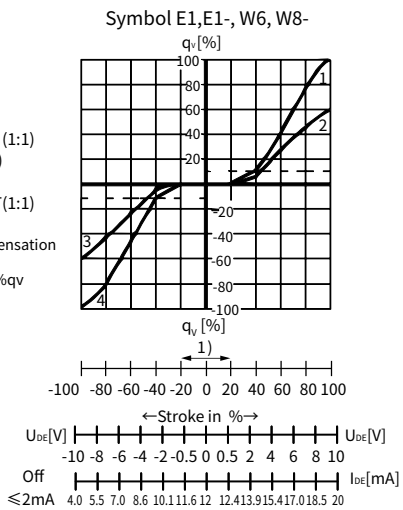
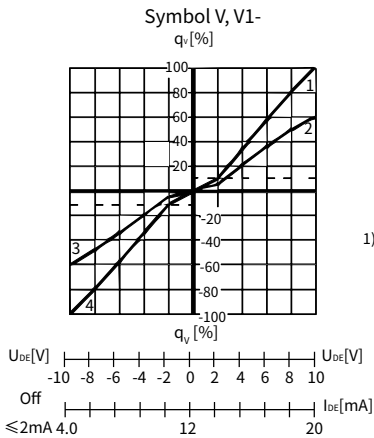
Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, $\Delta p=5\text{ bar/control edge}$)

Flow signal function

Flow characteristic "L"



Flow characteristic "P"

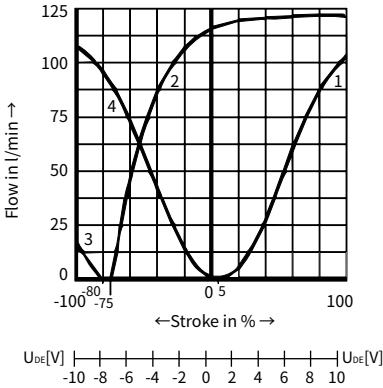


Characteristic curves(measured with HLP46, $\vartheta_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$, $\Delta p = 5 \text{ bar/control edge}$)

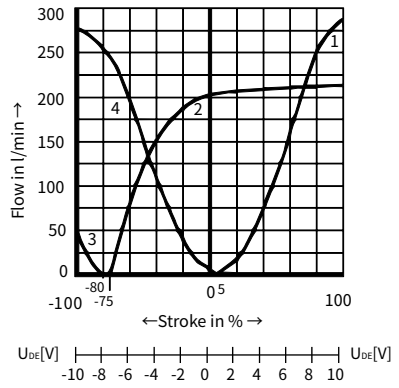
Flow signal function

Flow characteristic "M"

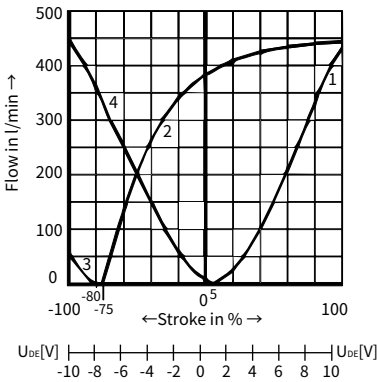
Symbol Q3,version "100"



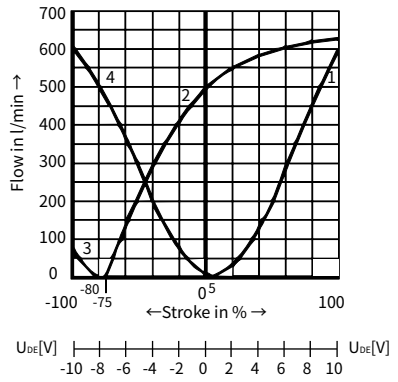
Symbol Q3,version "250"



Symbol Q3,version "400"



Symbol Q3,version "600"



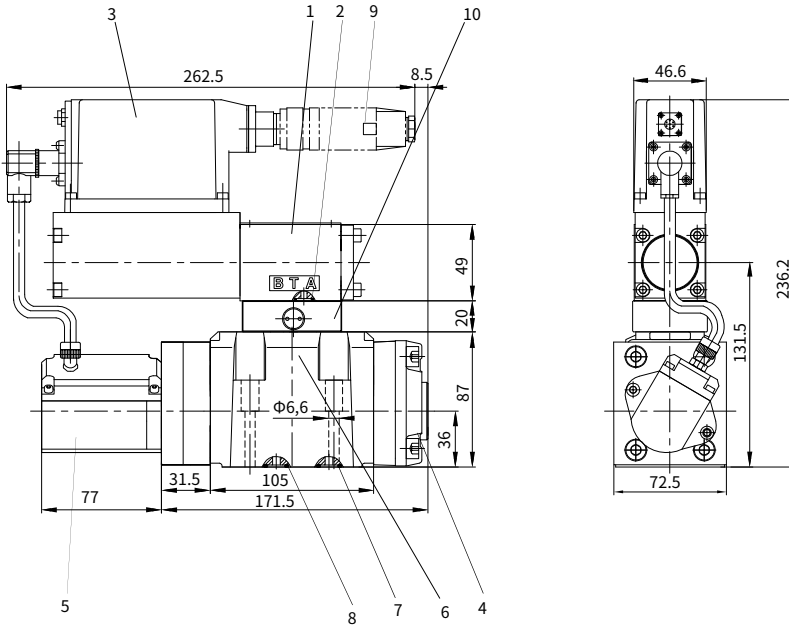
- 1 P-A 3 P-B
- 2 B-T 4 A-T

06

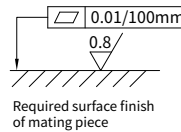
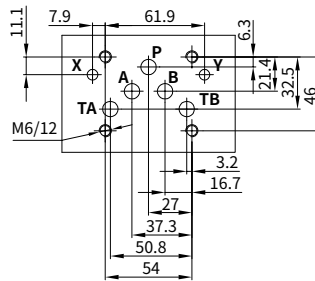
Unit dimensions

(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)
- 10 Pressure reducing valve

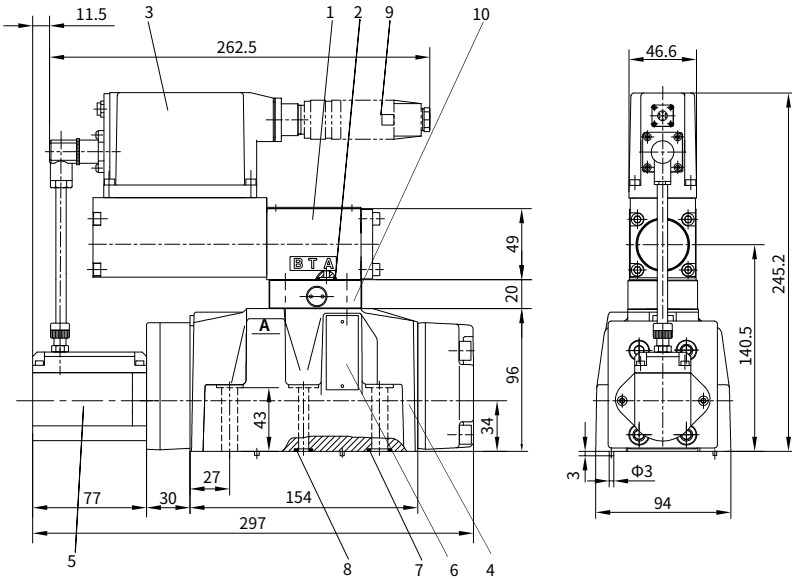
Valve fixing screws:

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

Unit dimensions

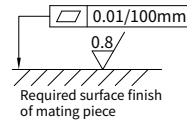
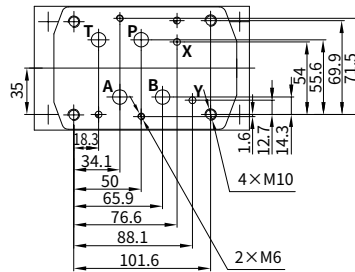
(Dimensions in mm)

NG 16



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

Machined valve mounting surface



Valve fixing screws:

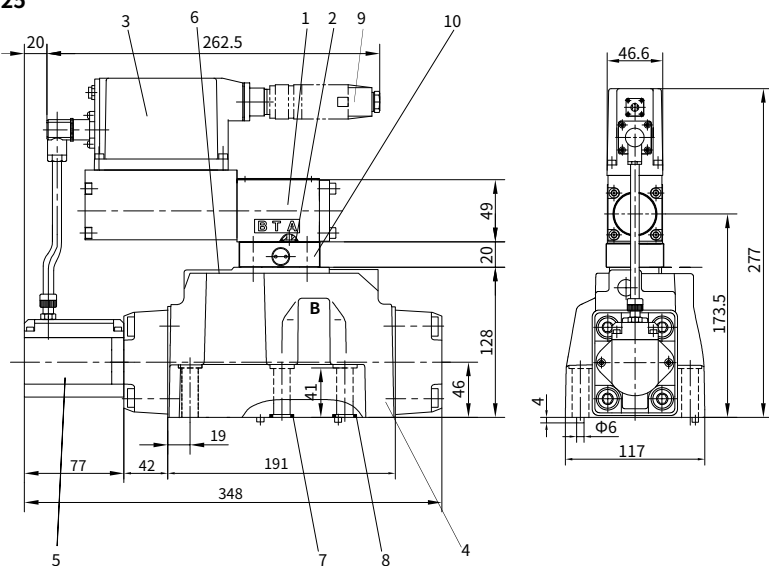
- 2- M6×60 ISO 4762-10.9; M_A =14 Nm
- 4- M10×60 ISO 4762-10.9; M_A =60 Nm

06

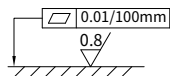
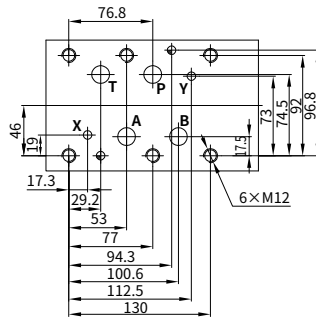
Unit dimensions

(Dimensions in mm)

NG 25



Machined valve mounting surface



Required surface finish
of mating piece

- 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 $27.8 \times 2.6 \times 3$, 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)
- 10 Pressure reducing valve

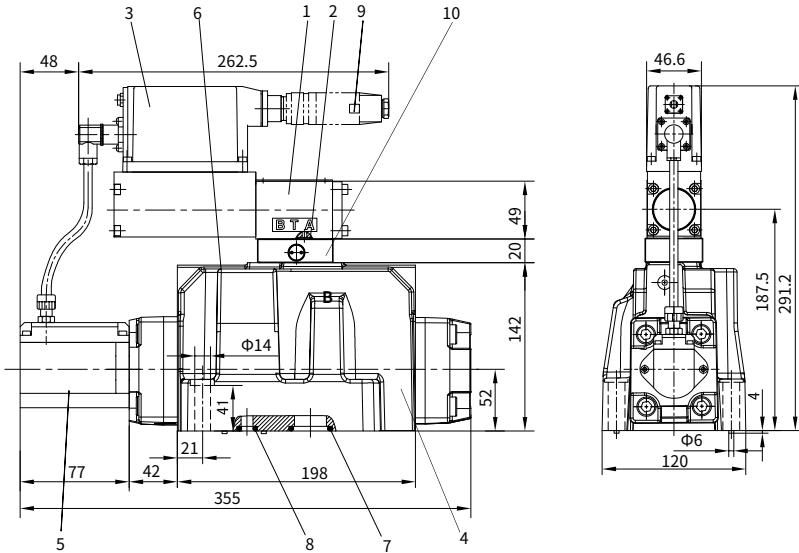
Valve fixing screws:

6- M12 \times 60 ISO 4762-10.9; $M_A = 100$ 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)
- 10 Pressure reducing valve

Valve fixing screws:

6- M12×60 ISO 4762-10.9; $M_A = 100$ Nm

