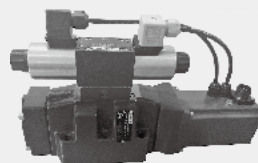


6.11

# Pilot operated proportional directional valves

## Type 4WRKE

NG 10 to 32  
Up to 350 bar  
Up to 1600L/min



### Contents

Function and configuration	02
Symbols	03
Ordering code	03
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### Features

- Pilot operated 2-stage proportional directional valve
- Valve for the control of the size and direction of a flow
- For subplate mounting, porting pattern to DIN 24 340 form A
- Spring centred main spool
- Integrated control electronics

## Function and configuration

### · Proportional directional valve: type 4WRKE...L3X...

The type 4WRKE valves are 2-stage proportional directional control valves. They control the size and direction of a flow.

The main stage is closed loop position controlled so that the spool position is also independent of flow forces at larger flows.

### Structure

The valves basically consists of the pilot control valve (1), housing (8), main spool (7), covers (5 and 6), centering spring (4), inductive position transducer (9) and the pressure reducing valve (3).

### Function

— If no input signal is being applied then the main spool (7) is held in the center position by the centering spring (4). The two control chambers in the covers (5 and 6) are connected via the valve spool (2) to tank.

— The main spool (7) is connected to suitable control electronics via the inductive position transducer (9). The positional change of the main spool (7) as well as the alteration of the command value at the summation point of the amplifier produces a differential voltage.

With the command value/actual value comparison a possible control deviation is recognised via the electronics and an electrical current is applied to the proportional solenoid of the pilot valve (1).

The current induces, within the solenoid, a force which is passed on to the solenoid pin which in turn actuates the control spool. The flow which is provided via the control cross sections causes the main spool to move.

### · Pilot control valve : type 4WRAP 6 W7...-L3X/G24...(1st stage)

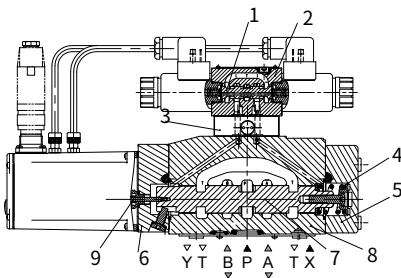
The pilot control valve is a direct operated proportional valve. The control edge geometrics were designed and optimised for the use as a pilot control valve for the proportional directional valves type 4WRKE.

The proportional solenoids are pressure tight, oil-immersed DC solenoids with removable coil. They convert an electrical current proportionally into a mechanical force. An increase in the current strength causes an appropriately higher solenoid force.

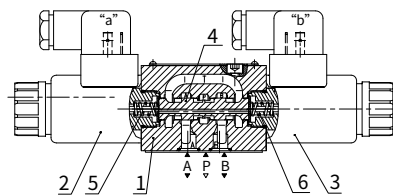
### Structure

The pilot control valve basically consists of the housing (1), proportional solenoids (2 and 3), valve spool (4) and springs (5 and 6).

In the de-energised condition both actuator ports are connected to tank. If one of the two solenoids (2 or 3) is energised, then the solenoid force moves the valve spool (4) against the spring (6 or 5). Once the overlap area is overcome, the connection to tank of one of the two actuator ports is blocked and the connection to the pressure chamber is established. There is flow from P to the control chamber of the main stage.



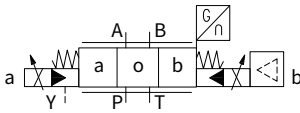
Type 4WRKE 16 ...-L3X...



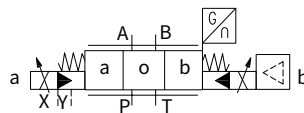
Type 4WRAP 6 W7...L3X/G24...

# Symbols (simplified)

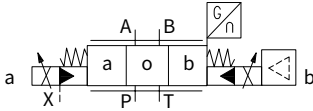
Type 4WRKE...-L3X...E.



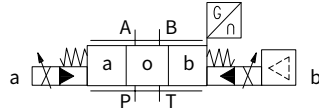
Type 4WRKE...-L3X...



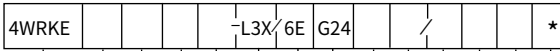
Type 4WRKE ...-L3X ... T .



Type 4WRKE...-L3X...ET



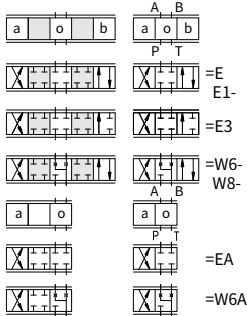
## Ordering code



Electrically operated 2-stage proportional directional valve of 4-way design with integrated electronics

- Nominal size 10 =10
- Nominal size 16 =16
- Nominal size 25 =25
- Nominal size 27 =27
- Nominal size 32 =32

### Spool symbols



□ Transitional symbols

- Nominal flow in L/min at 10 bar valve pressure differential
- 25= 50= 100= Nominal size 10
  - 125= 200= Nominal size 16
  - 220= 350= Nominal size 25
  - 500= Nominal size 27
  - 400= 600= Nominal size 32

Further information in plain text

- V = FKM Seals
- No code = NBR Seals

D3=With pressure reducing valve ZDR6DP0-L4X/40YM(fixed setting)

### Interface:

- C1= Command value input  $\pm 10$ mA
- A1= Command value input  $\pm 10$ V
- F1= Command value input 4 to 20mA

### Electrical connections

- K31 = With component plug, Without plug-in connector
- Z31 = With component plug and plug-in connector

### 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

### Supply voltage

+ 24 V DC

G24= Proportional solenoid with removable coil

L3X= L30 to L39: unchanged installation and connection dimensions

### Characteristic curve form

- L= Linear
- P= Linear with fine control range

**Note:** With symbol E1-, W8-:

$$P \rightarrow A: q_{v,max} \quad B \rightarrow T: q_v/2 \quad P \rightarrow B: q_v/2 \quad A \rightarrow T: q_{v,max}$$

With the spools W6, W8 there is a connection from A to T and B to T in the zero position with approx. 2 % of the applicable nominal crosssection.

## Technical data

General						
Nominal size	10	16	25	27	32	
Installation and commissioning guidelines	Optional, preferably horizontal					
Storage temperature range	°C	- 20 to + 80				
Ambient temperature range	°C	- 20 to + 50				
Weight	kg	8.7	11.2	16.8	17	31.5

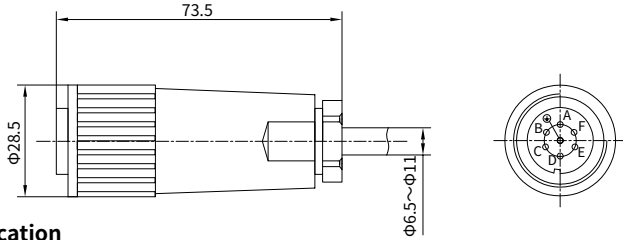
Hydraulic (measured at p=100bar, with HLP46 at $\theta_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ )								
Operating pressure	-Pilot control valve	Pilot oil supply	bar	25 to 315				
	-Main valve	Ports P, A, B	bar	Up to 315	Up to 350	Up to 350	Up to 210	Up to 350
Return pressure	Port T (Pilot oil drain)	Internal	bar	Static < 10				
		External	bar	Up to 315	Up to 250	Up to 250	Up to 210	Up to 250
	Port Y	bar	Static < 10					
Nominal flow $q_{vnom} \pm 10\%$ at $\Delta p = 10\text{bar}$ ( $\Delta p =$ valve pressure differential)	L/min	25	-	-	-	-		
		50	125	220	-	440		
		100	180	350	500	600		
Flow of main valve (max. permissible)	L/min	170	460	870	1000	1600		
Pilot oil flow at port X or Y with a step form of input signal from 0 to 100 % (315 bar)	L/min	4.1	8.5	11.7	11.7	13		
Pressure fluid	Mineral oil (HL, HLP) to DIN 51 524 Phosphate ester (HFD-R)							
Pressure fluid temperature range	°C	10 to 80, preferably 40 to 50						
Viscosity range	mm <sup>2</sup> /s	20 to 380, preferably 30 to 45						
Degree of contamination	Maximum permissible degree of contamination of the pressure fluid is to NAS 1638.		A filter with a minimum retention rate of $\beta_x = 75$ is recommended					
	Pilot control valve	Class 7	x = 5					
	Main valve	Class 9	x = 7					
Hysteresis	%	≤ 1						
Response sensitivity	%	≤ 0.5						

Electrical	
Voltage type	DC
Electrical connection	Plug-in connector to DIN EN175 201-804
Power, max.	W 72 (average = 24W)
Control electronics	Integrated into the valve

## Electrical connections, plug-in connector

For pin allocation also see block circuit diagram.

Plug-in connector to DIN EN 175201-804



### Component plug allocation

	Contact	Signal
Supply voltage	A	24 VDC (18 to 35 VDC); $I_{max} = 1, 5 \text{ A}$ ; impulse load $\leq 3 \text{ A}$
	B	0V
Ref. (actual value)	C	Ref. potential for actual value (contact F)
Differential amplifier input (command value)	D	$\pm 10\text{V}$ or 4 – 20mA
	E	0V ref. potential
Measurement output (act. value)	F	$\pm 10\text{V}$ or 4 – 20 mA
	PE	Connected with cooling body and valve housing

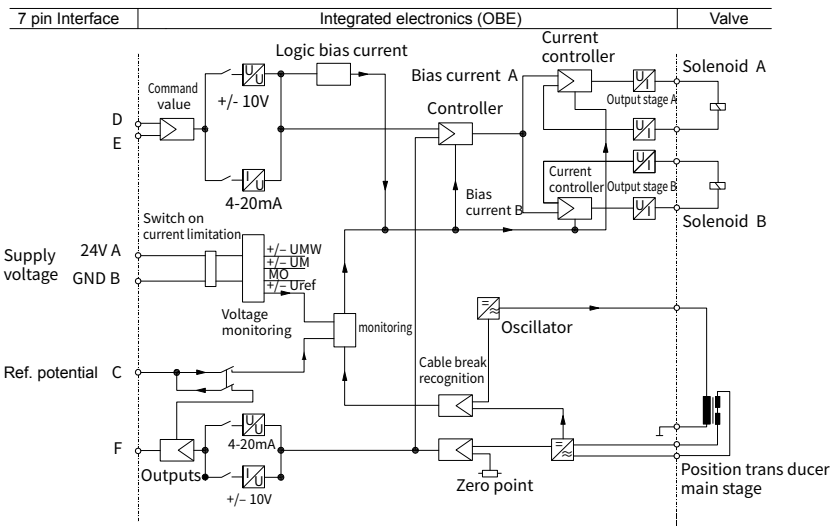
### Command value:

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:

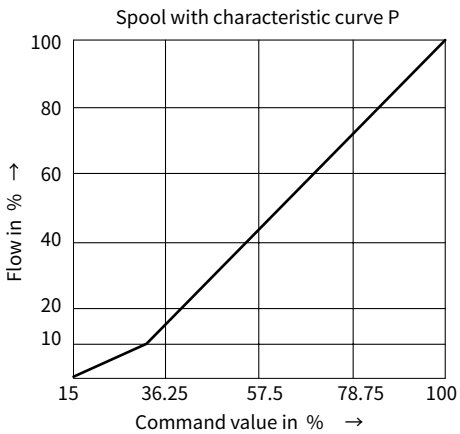
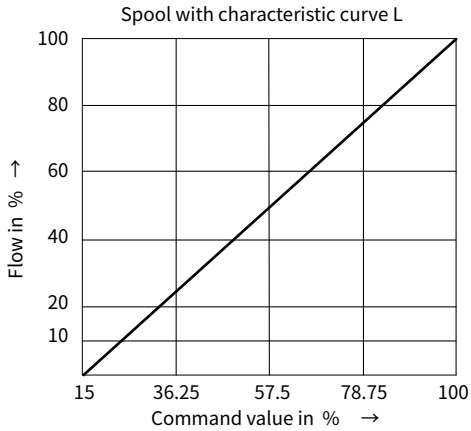
- Recommendation: – Up to 25m cable length type LiYCY 7×0.75 mm<sup>2</sup>
- Up to 50m cable length type LiYCY 7×1.0 mm<sup>2</sup>
- External diameter: – 6.5 to 11mm (plastic plug-in connection)
- 8 to 12mm (metal plug-in connector)
- Connect screen to ⊥ only on supply side.

### Block circuit diagram / connection allocation of the integrated control electronics for type 4WRKE



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

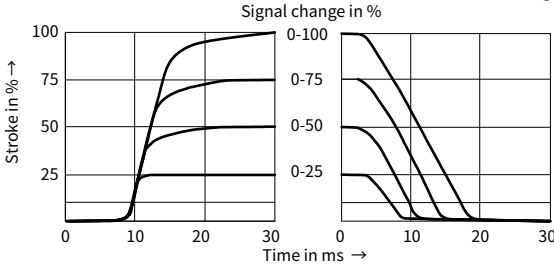
## Flow - command value curve



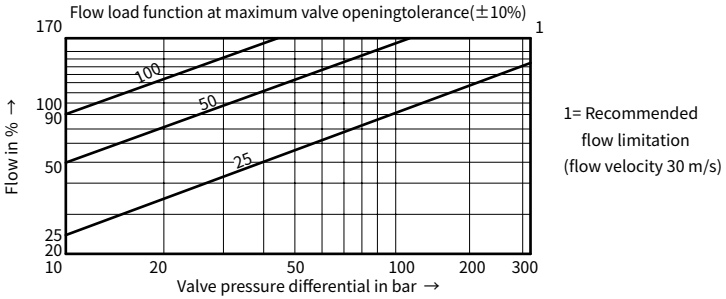
**Characteristic curves** (measured at p = 100 bar, with HLP46,  $\vartheta_{oil} = 40^\circ\text{C} \pm 5^\circ\text{C}$ )

**NG 10**

**Transient function with a step form of electrical input signal**

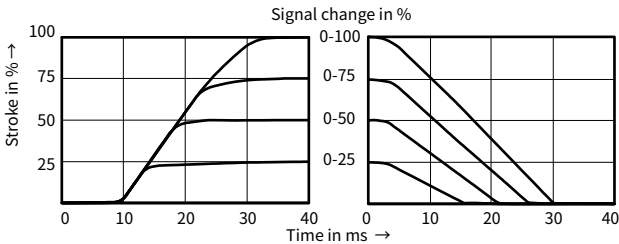


**Flow-pressure differential curve**

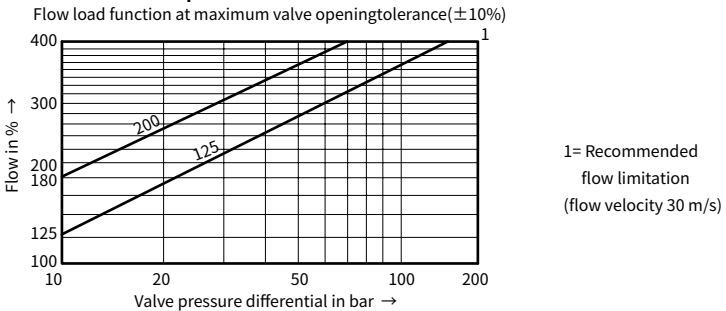


**NG 16**

**Transient function with a step form of electrical input signal**



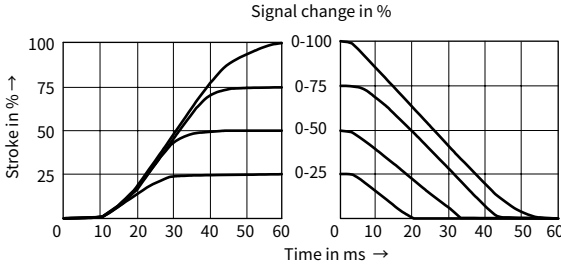
**Flow-pressure differential curve**



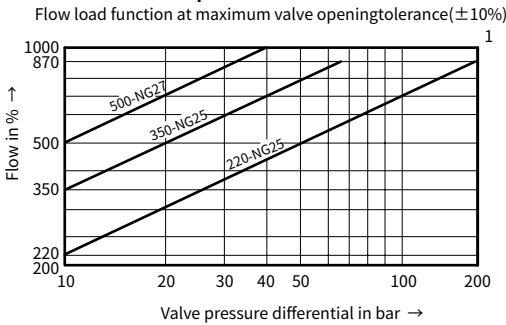
06

**Characteristic curves** (measured at  $p=100\text{bar}$ , with HLP46,  $\vartheta_{\text{oil}}=40^\circ\text{C} \pm 5^\circ\text{C}$ )

**NG 25, 27** Transient function with a step form of electrical input signal



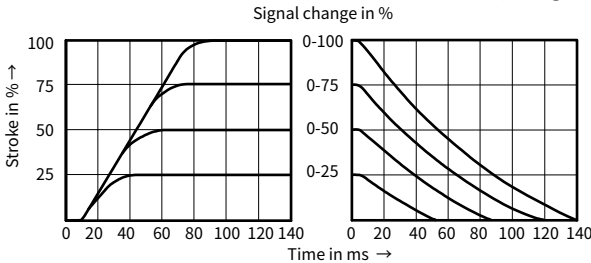
**Flow-pressure differential curve**



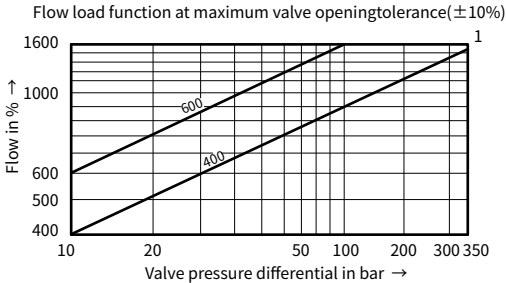
1= Recommended flow limitation (flow velocity 30 m/s)

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**NG 32** Transient function with a step form of electrical input signal



**Flow-pressure differential curve**



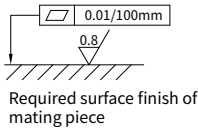
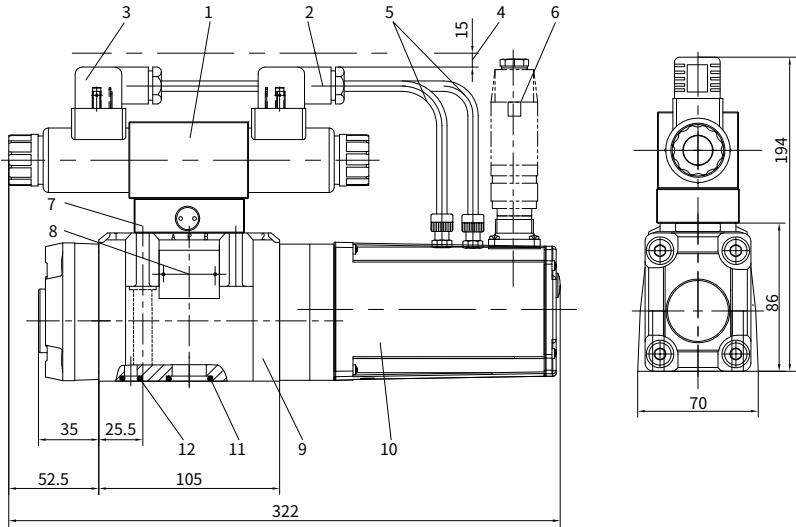
1= Recommended flow limitation (flow velocity 30 m/s)



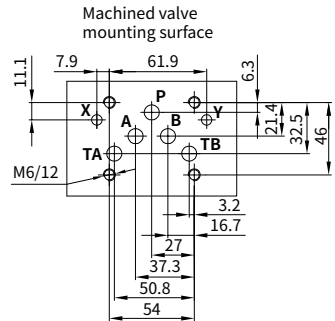
# Unit dimensions

(Dimensions in mm)

## NG 10



- 1 Pilot control valve
- 2 Plug-in connector "A"
- 3 Plug-in connector "B"
- 4 Space required to remove the plug-in connector
- 5 Cable
- 6 Plug-in connector
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics
- 11 R-ring 13×1.6×2, ports A, B, P, T
- 12 R-ring 11.18×1.6×1.78, ports X and Y



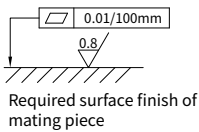
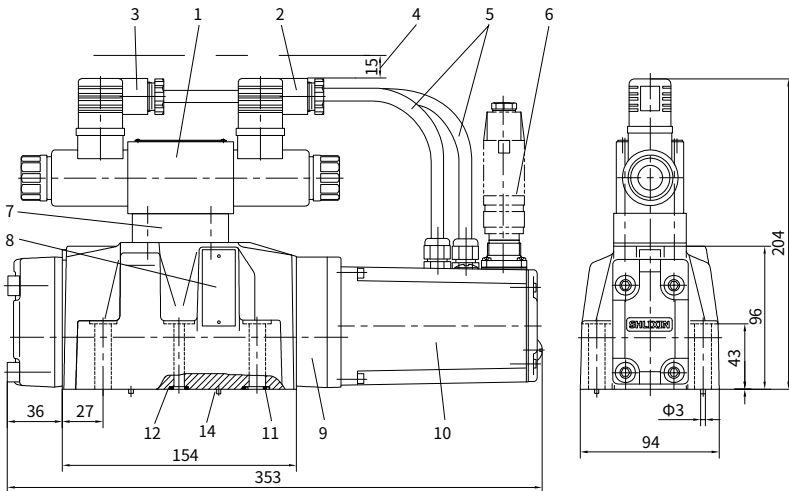
**Valve mounting screws:**  
 4- M6×45 GB/T 70.1-10.9;  
 $M_A=13.5\text{ Nm}$

06

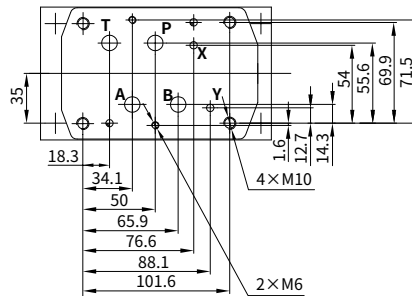
## Unit dimensions

(Dimensions in mm)

### NG 16



Machined valve mounting surface



- 1 Pilot control valve
- 2 Plug-in connector "A"
- 3 Plug-in connector "B"
- 4 Space required to remove the plug-in connector
- 5 Cable
- 6 Plug-in connector
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics
- 11 R-ring 22.53×2.3×2.62, ports A, B, P, T
- 12 R-ring 10×2×2, ports X and Y
- 14 Locating pin

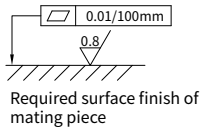
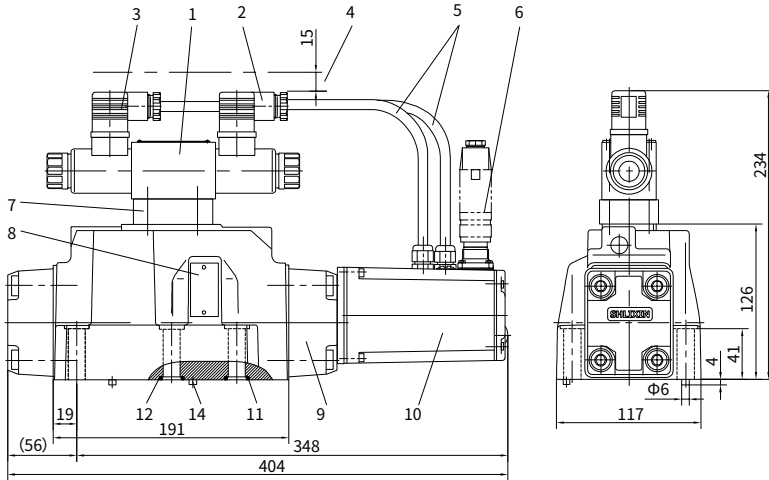
#### Valve mounting screws:

- 2- M6×55 GB/T 70.1-10.9;  $M_A=14$  Nm
- 4- M10×60 GB/T 70.1-10.9;  $M_A=58$  Nm

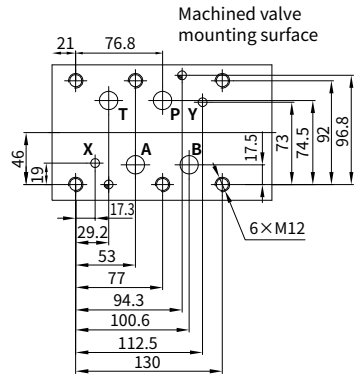
# Unit dimensions

(Dimensions in mm)

## NG 25



- 1 Pilot control valve
- 2 Plug-in connector "A"
- 3 Plug-in connector "B"
- 4 Space required to remove the plug-in connector
- 5 Cable
- 6 Plug-in connector
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics
- 11 R-ring 27.8×2.6×3, ports A, B, P, T
- 12 R-ring 19×3×3, ports X and Y
- 13 Locating pin

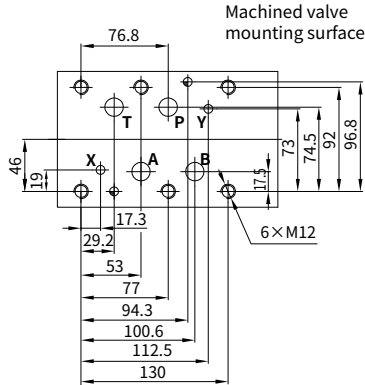
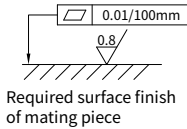
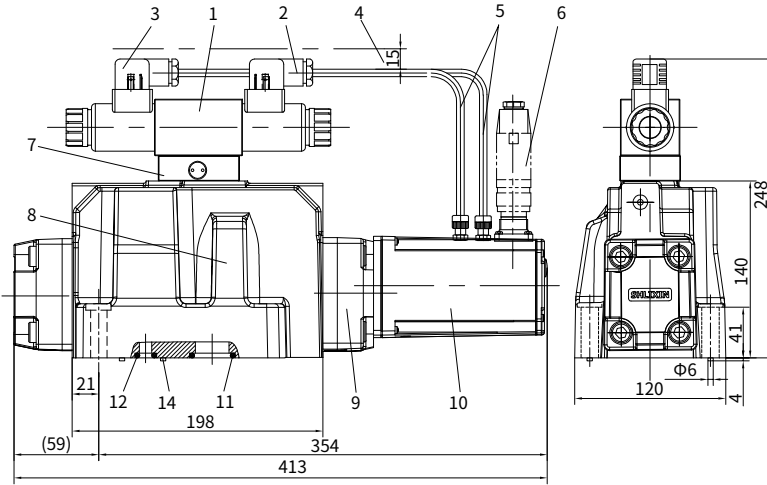


**Valve mounting screws:**  
 6- M12×60 GB/T 70.1-10.9;  
 M<sub>A</sub> = 100 Nm

# Unit dimensions

(Dimensions in mm)

## NG 27



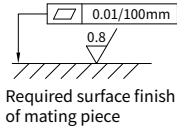
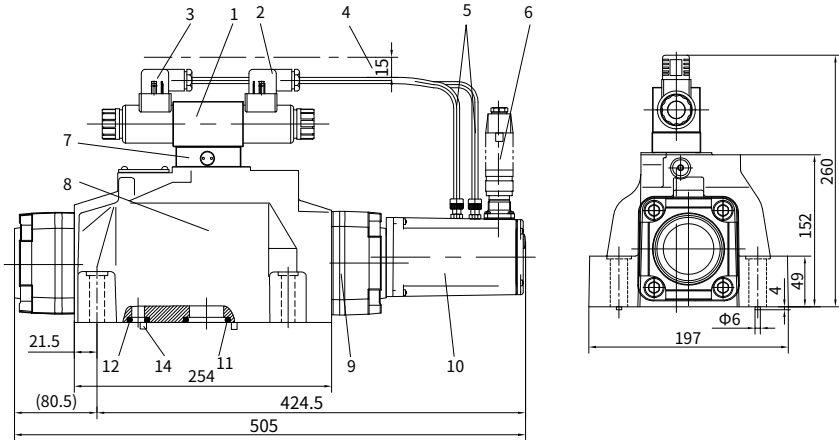
- 1 Pilot control valve
- 2 Plug-in connector "A"
- 3 Plug-in connector "B"
- 4 Space required to remove the plug-in connector
- 5 Cable
- 6 Plug-in connector
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics
- 11 R-ring 34.52×3.53×3.53, ports A, B, P, T
- 12 R-ring 19×3×3, ports X and Y
- 14 Locating pin

**Valve mounting screws:**  
6- M12×60 GB/T 70.1-10.9; M<sub>A</sub>=100 Nm

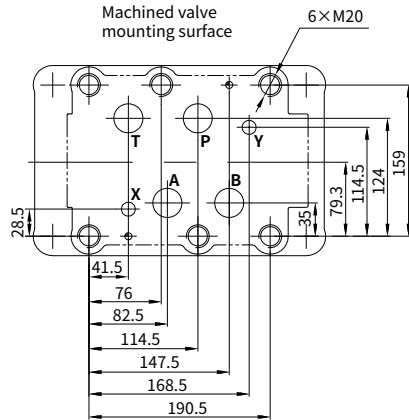
# Unit dimensions

(Dimensions in mm)

## NG 32



- 1 Pilot control valve
- 2 Plug-in connector "A"
- 3 Plug-in connector "B"
- 4 Space required to remove the plug-in connector
- 5 Cable
- 6 Plug-in connector
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics
- 11 R-ring 42.5×3×3, ports A, B, P, T
- 12 R-ring 19×3×3, ports X and Y
- 13 Locating pin



Valve mounting screws:  
 6- M20×80 GB/T 70.1-10.9;  
 $M_A=340\text{ Nm}$

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