

**BEIJING HUADE  
HYDRAULIC INDUSTRIAL  
GROUP Co.,LTD**

**Proportional directional valve, pilot operated with  
electrical position feedback Type HD-4WRKE**

Size 10,16,25,32,35

up to 35M Pa

up to 3000L/min

- Pilot operated 2-stage proportional directional valve
- For subplate mounting
- Valve for the control of the size and direction of a flow
- Actuation via proportional solenoids
- Spring centred main spool
- Electrical position feedback
- Single stage proportional directional valve pilot control
- Main stage with closed loop position control
- Integrated control electronics



Type H D-4WRKE 10 ...-3X/6EG24...K31/ ... D3...  
with integrated control electronics

**Function, section**

Pilot control valve type HD-4WRAP 6 W7.3X/G24... (1st stage)

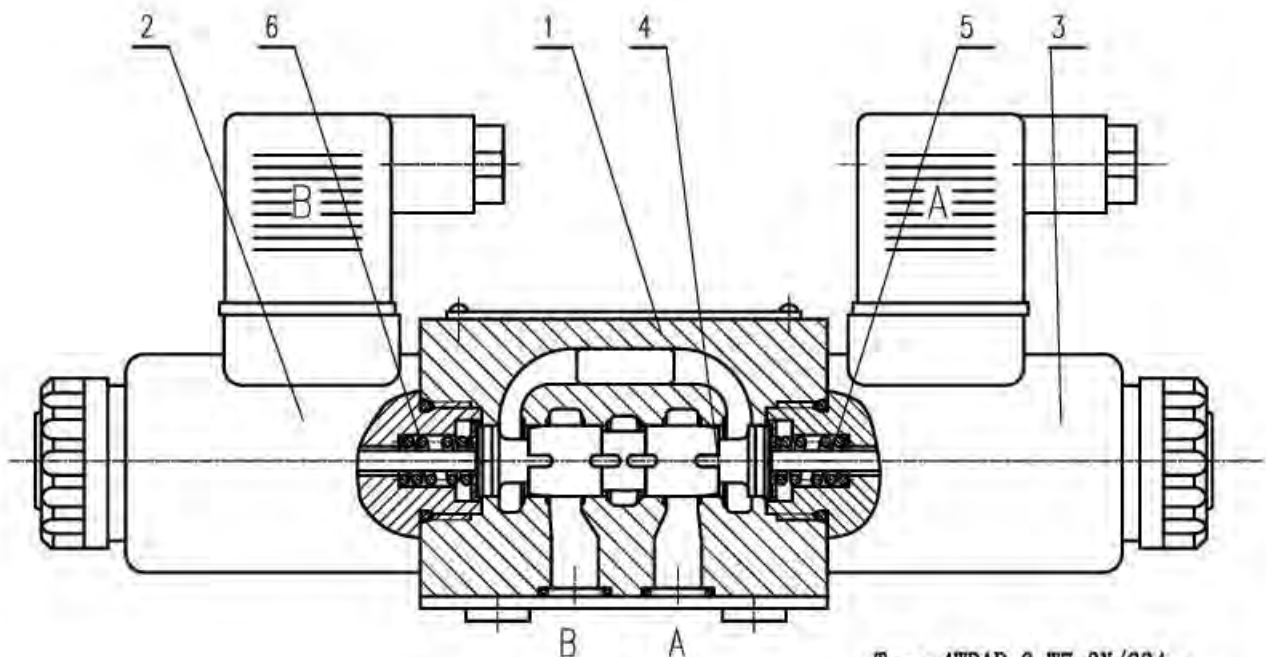
The pilot control valve is a direct operated proportional valve. The control edge geometrics were designed and optimised for the use as a pilot control valve for the proportional directional valves type HD-4WRKE.

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. The set solenoid force remains constant over the entire control stroke.

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 4WRAP 6 W7.3X/G24...

## Function, section

The type HD-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.

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).

If no input signal is being applied then the main spool (7) is held in the centre 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.

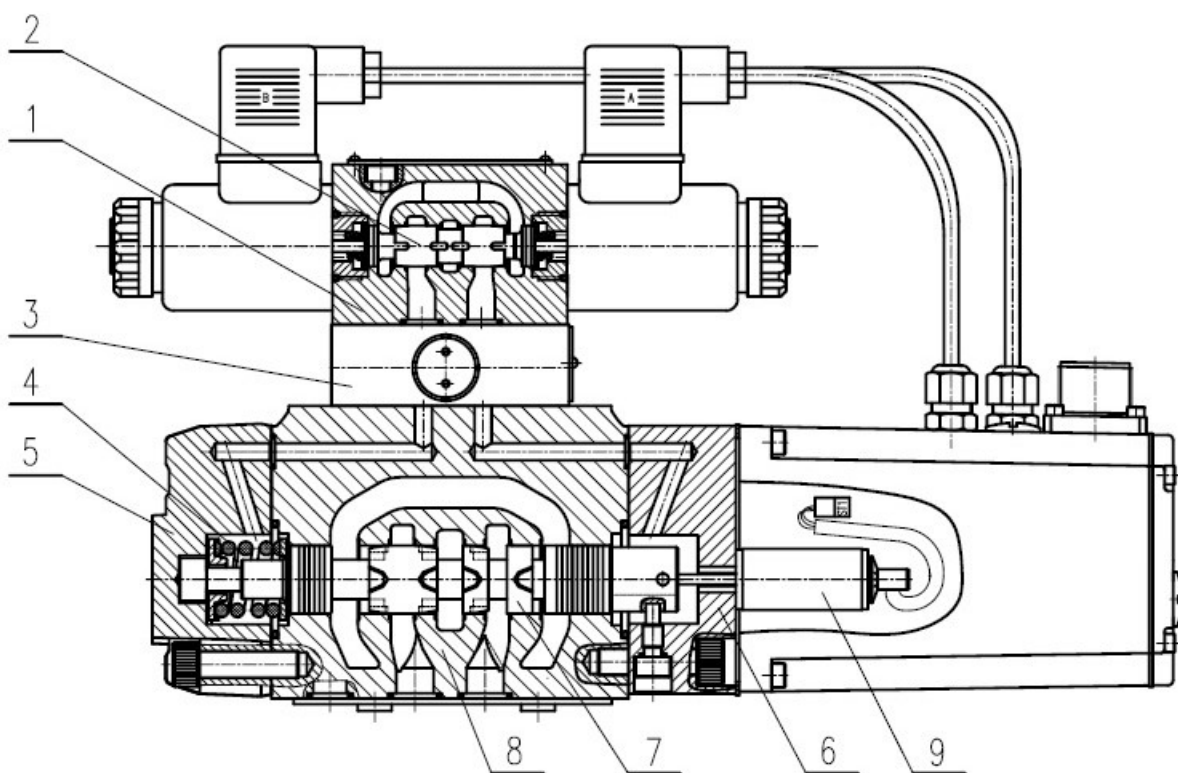
With the command value/actual value comparison a possible control deviation is recognised via the electronics and an electrical current is applied to the proportional solenoid of the pilot valve (1).

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.

The main spool (7) with the attached core of the inductive position transducer (9) is moved until the actual value is equal to the command value. In the controlled condition the main spool (7) is force balanced and is held in this controlled position.

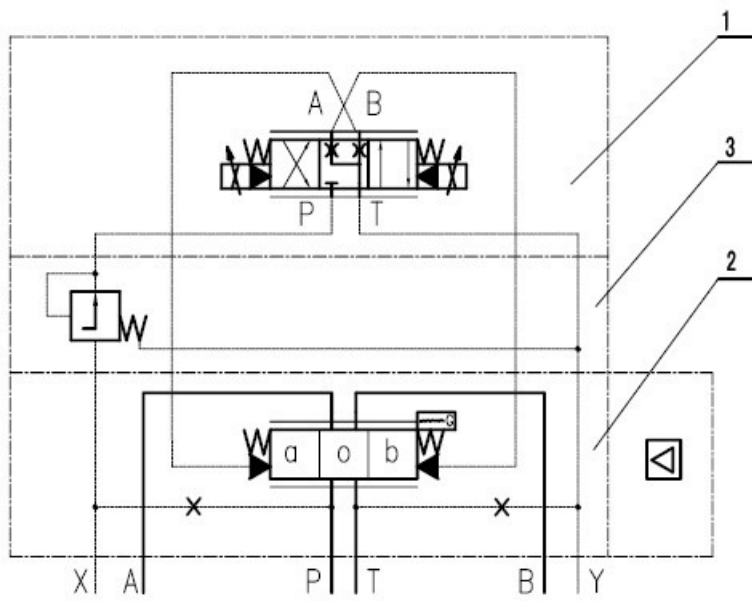
Spool stroke and control opening change in proportion to the command value.

The control electronics are integrated into the valve. By matching the valve and the electronics the model variation of the units is kept low.



Type HD-4WRKE 10 ... - 3X...

## S symbol (detailed)



Example:

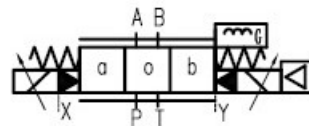
1 Pilot control valve type HD-4WRAP6...

2 Main valve

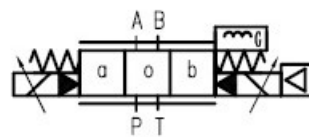
3 Pressure reducing valve type  
ZDR 6 DP0-4X/40YM

## Symbols(simplified)

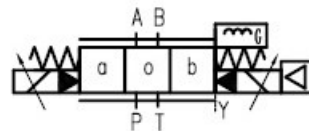
Type HD-4WRKE... - 3X...



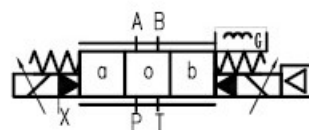
Type HD-4WRKE... - 3X/... ET.



Type HD-4WRKE... - 3X/... E.



Type HD-4WRKE... - 3X/... T.



# Ordering details

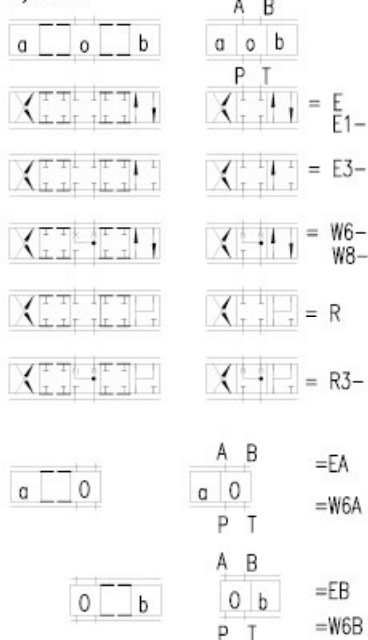
HD 4WRKE 3X \*

Technology of Beijing  
Huade Hydraulic =HD

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

size 10 = 10  
size 16 = 16  
size 25 = 25  
size 32 = 32  
size 35 = 35

### Symbols



With symbol E1-, W8-:

$$P \rightarrow A = q_{vmax} \quad B \rightarrow T = q_v/2$$

$$P \rightarrow B = q_v/2 \quad A \rightarrow T = q_{vmax}$$

With symbol R, R3:

$$P \rightarrow A = q_{vmax} \quad B \rightarrow T = q_v/2$$

$$P \rightarrow B = q_{vmax}/2 \quad A \rightarrow T = q_{vmax}$$

Note:

With the spools W6,W8 and R3 there is a connection from A to T and B to T in the zero position with approx. 2 % of the applicable nominal crosssection.

Further details  
in clear text

No code = NRB seals  
V = FKM seals

D3=With pressure reducing valve  
ZDR 6 DPO-4X/40YM  
(fixed setting)

A1=Command/actual value  $\pm 10$  V

F1=Command/actual value 4 to  
20 mA

Electrical connections

With component plug

K31= Without plug-in connector

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

G24 = 24 V DC

6E = Proportional solenoid with removable coil

3X = Series 30 to 39  
(30 to 39: unchanged installation and connection dimensions)

3XH = high flow (only size 25)  
Nominal flow 500L/min

Characteristic curve form

L= Linear

P= Linear with fine control range

Nominal flow in L/min at 1MPa valve pressure differential

25 =	50 =	100 =	size10
125 =	200 =		size16
220 =	350 =	500 =	size25
400 =	600 =		size32
1000 =			size35

## Technical data

### Hydraulic

Size	10	16	25	32	35	
Operating pressure	Pilot control valve (MPa) Pilot oil supply		2.5~31.5			
	Main valve, ports P, A, B (MPa)		31.5	35	35	35
Return pressure (MPa)	Pilot oil drain, external		31.5	25	25	25
	Pilot oil drain, internal		<1			
	Port Y		<1			
Nominal flow $q_v \pm 10\%$ at $\Delta p = 1\text{MP}$ (L/min)		25 50 90	125 180	220 350	400 600	1000
Flow of main valve (max. permissible) (L/min)		170	460	870	1600	3000
Pilot oil flow at port X or Y with a step form of input signal from 0 to 100 % (L/min)		4.1	8.5	11.7	13.0	13.0
Hysteresis (%)		$\leq 1$				
Response sensitivity (%)		$\leq 0.5$				
Filtering precision ( $\mu\text{m}$ )		$\leq 20$				
Pressure fluid		Mineral oil Phosphate ester				
Medium viscosity ( $\text{mm}^2/\text{s}$ )		20~380				
Pressure fluid temperature range ( $^{\circ}\text{C}$ )		-20~+70				
Weight (Kg)		8.7	11.2	16.8	31.5	34

### Electrical data

Valve protection to DIN 40 050	IP65
Voltage type	DC
Signal type	Analogue
Power, max. W	72 (average = 24 W)
Electrical connection	With component plug to E DIN 43 563-AM6
	Plug-in connector to E DIN 43 563-BF6-3
Control electronics	Integrated into the valve

## Pilot oil supply

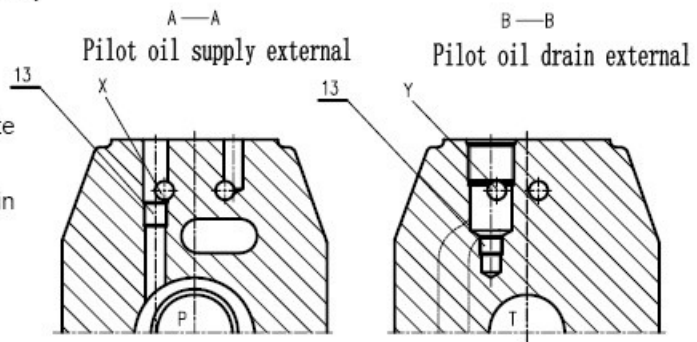
### Pilot oil supply, throttle insert (example: NS10)

#### 1. Pilot oil supply external

Pilot oil drain external

In this type the pilot oil supply is from a separate pilot pressure circuit (external).

The pilot oil drain is not into the T port of the main valve but separately into tank via port Y (external)



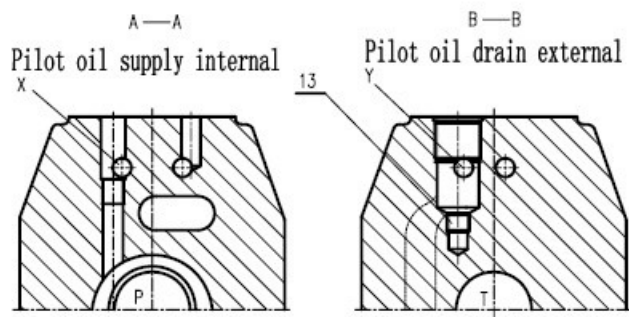
#### 2. Pilot oil supply internal

Pilot oil drain external

In this type the pilot oil supply is from the P port of the main valve (internal).

The pilot oil drain is not into the T port of the main valve but separately into tank via port Y (external).

Port X must be plugged in the subplate.



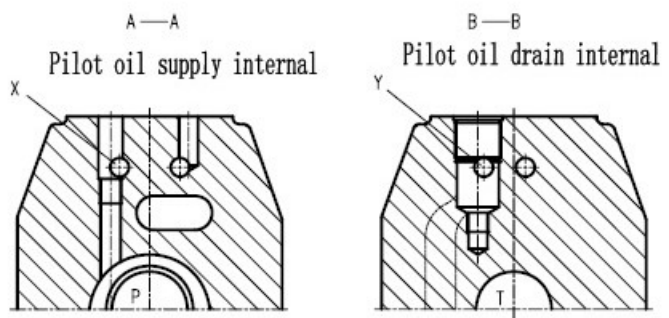
#### 3. Pilot oil supply internal

Pilot oil drain internal

In this type the pilot oil supply is from the P port of the main valve (internal).

The pilot oil drain is directly into the T port of the main valve (internal).

Port X and Y must be plugged in the subplate.



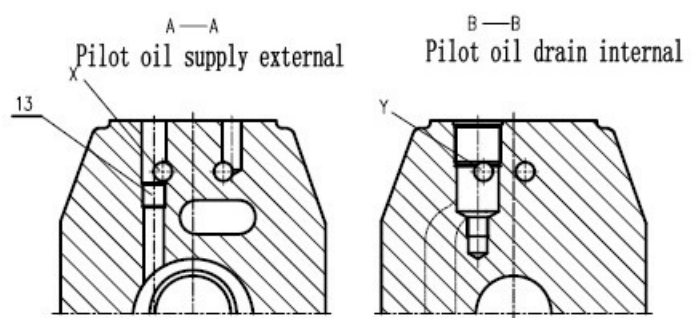
#### 4. Pilot oil supply external

Pilot oil drain internal

In this type the pilot oil supply is from a separate pilot pressure circuit (external).

The pilot oil drain is directly into the T port of the main valve (internal).

Port Y must be plugged in the subplate.

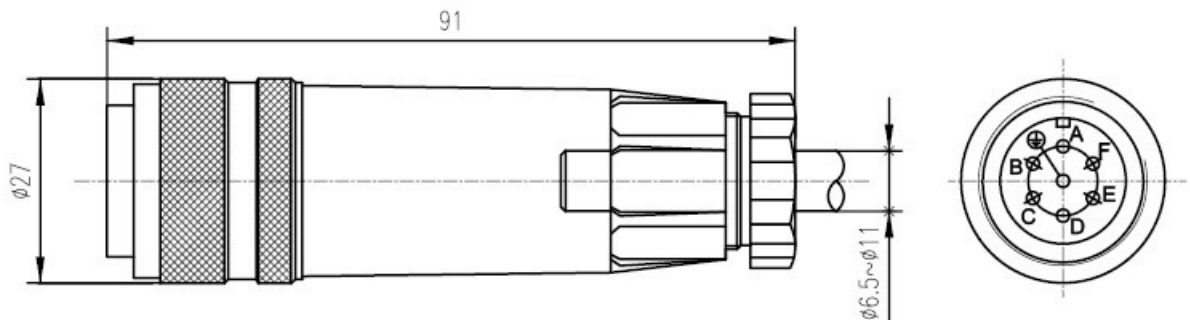


## Electrical connections, plug-in connector

### Plug-in connector

Plug-in connector to E DIN 43 563-BF6-3

Separate order, plastic version



### Component plug allocation

	Contact	Signal
Supply voltage	A	24 VDC (18 to 35VDC); $I_{max}=1.5A$ ; impulse load $\leq 3A$
	B	0 V
Ref. (actual value)	C	Ref. potential for actual value (contact F)
Differential amplifier input (command value)	D	$\pm 10 V$ or 4-20 mA
	E	0 V ref. potential
Measurement output (act. value)	F	$\pm 10 V$ 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 25 m cable length type LiYCY 7 x 0.75 mm<sup>2</sup>

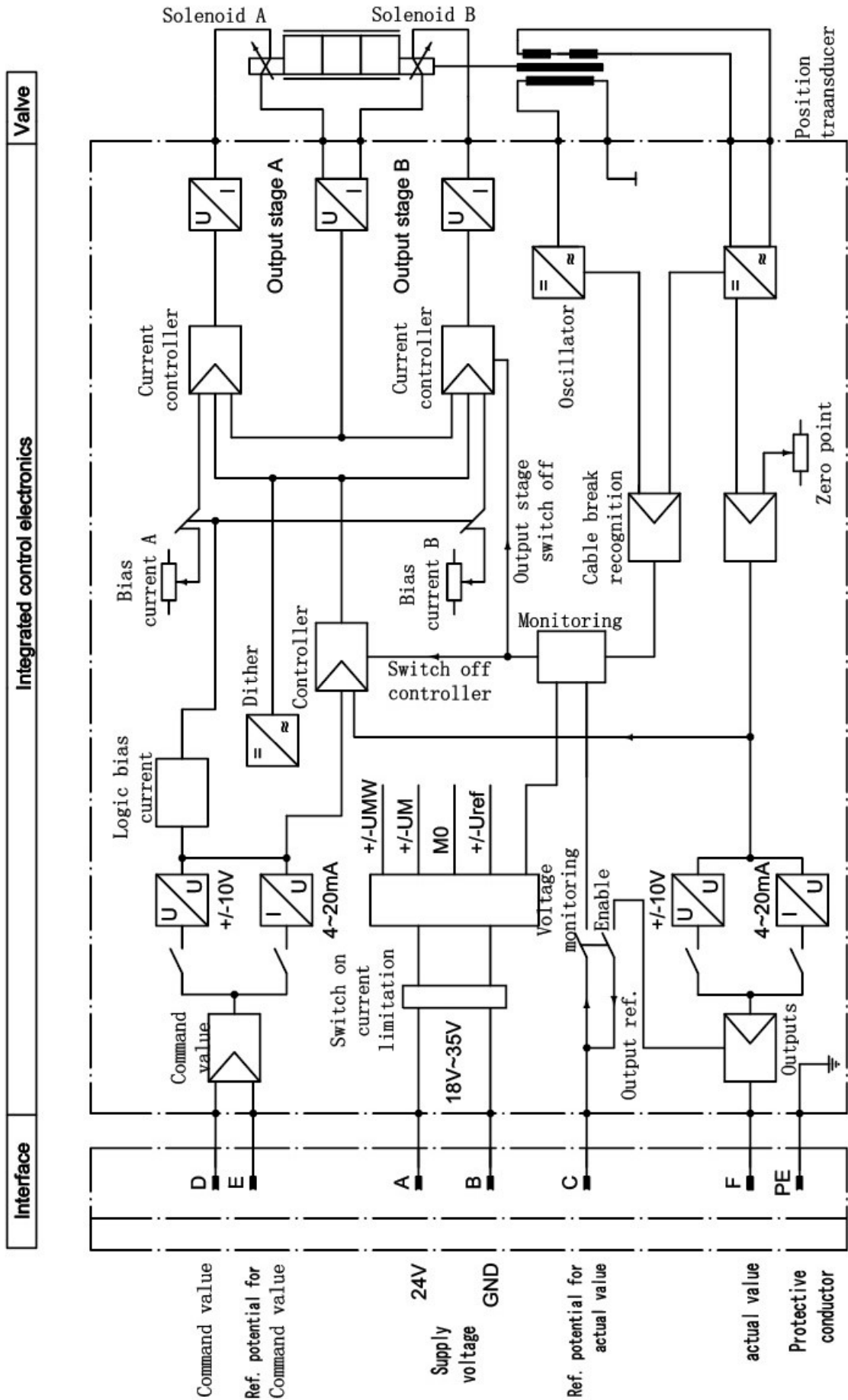
– Up to 50 m cable length type LiYCY 7 x 1.0 mm<sup>2</sup>

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

Connect screen to  $\perp$  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!

Blockcircuit diagram / connection allocation of the integrated control electronics for type HD-4WRKE

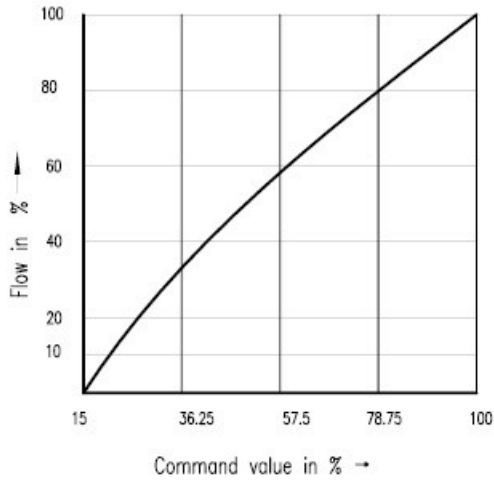




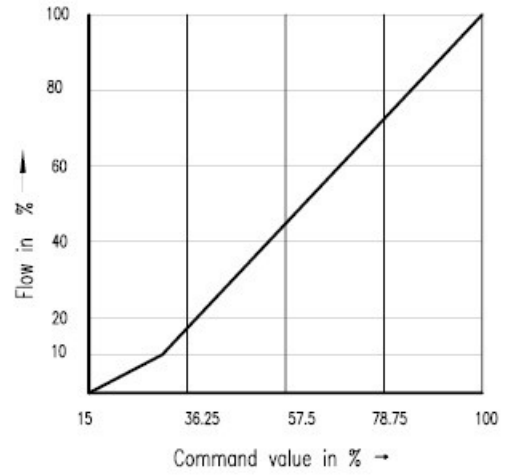
# Characteristic curves (measured at 1MPa valve pressure differential or 0.5MPa per control land)

Spool symbols E, W or R

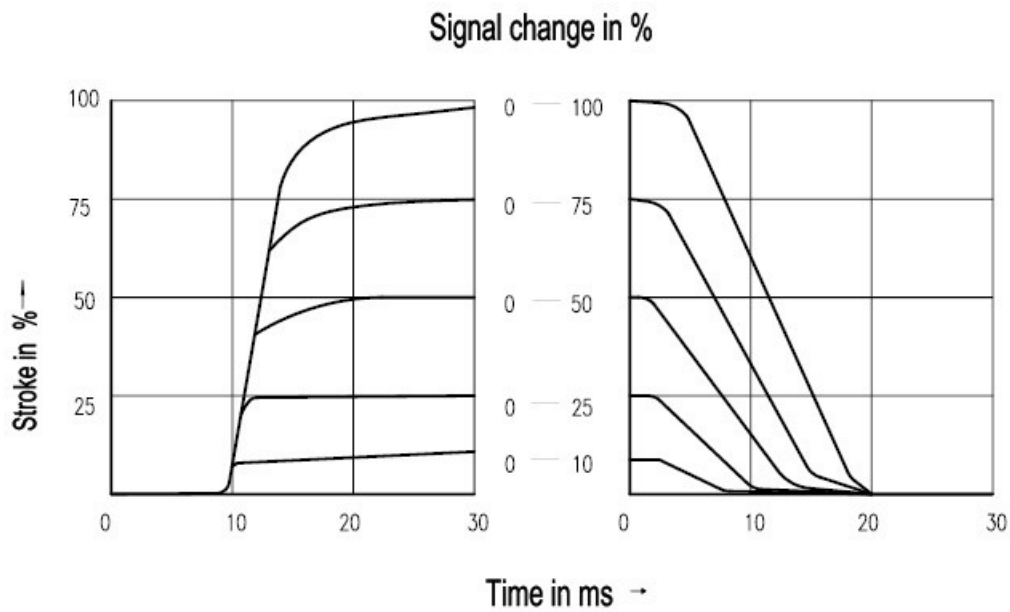
Spool with characteristic curve L



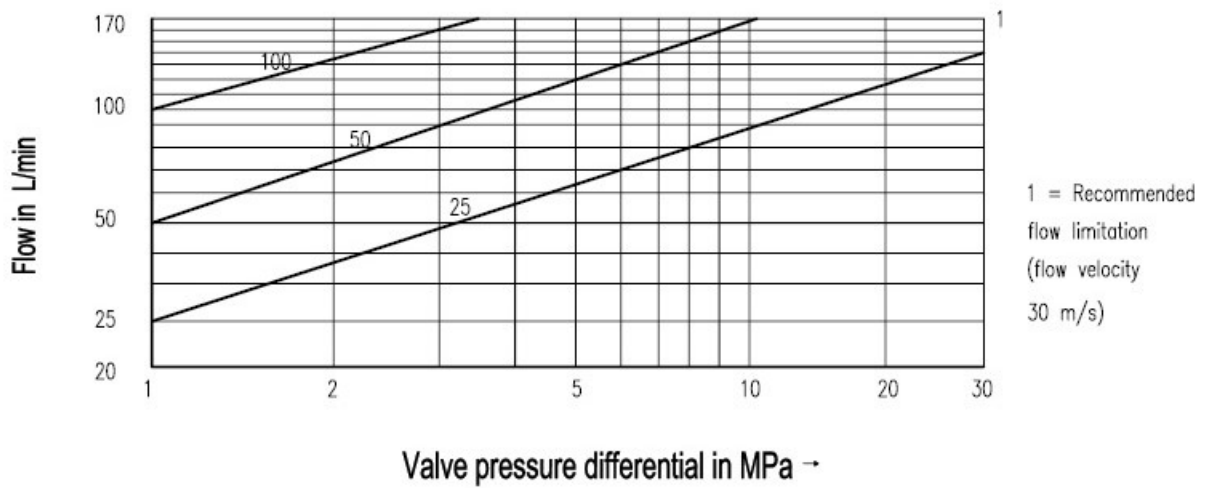
Spool with characteristic curve P



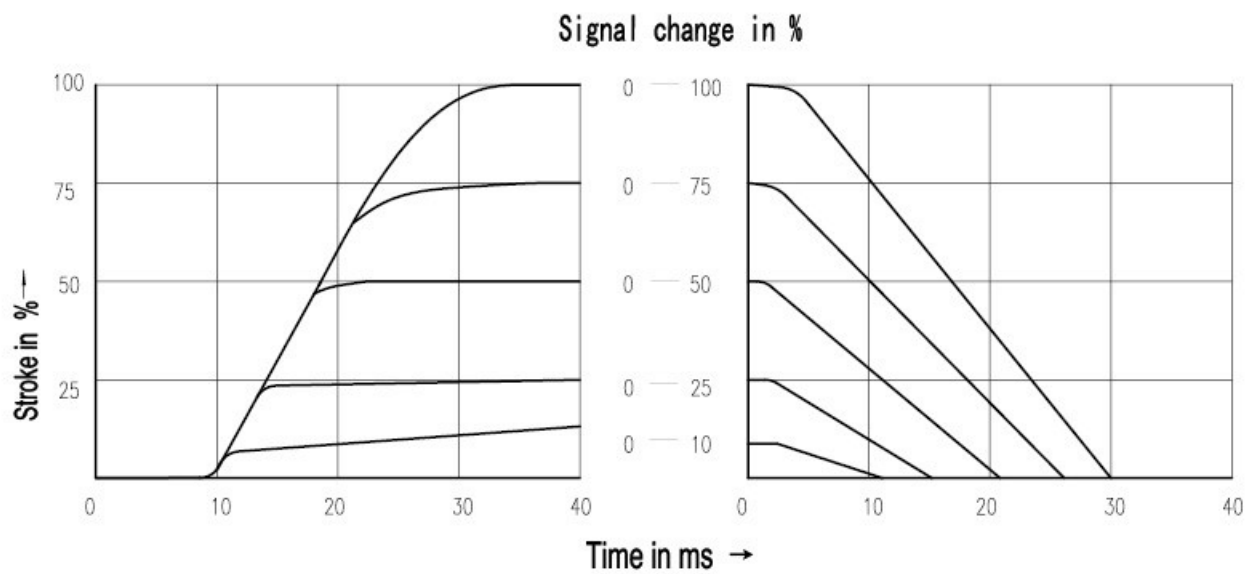
Transient function with a step form of electrical input signal



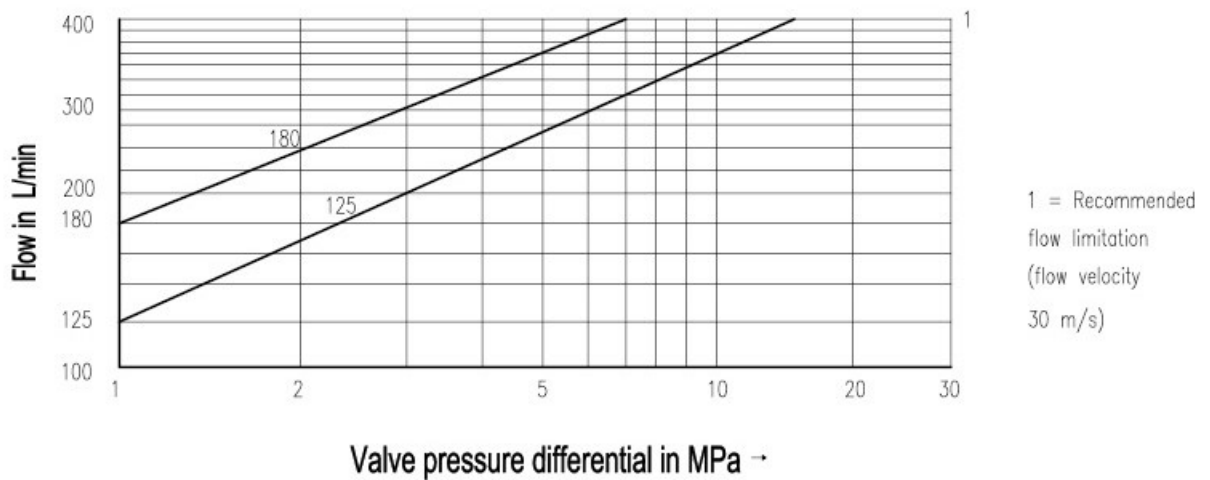
Flow load function at maximum valve opening  
(tolerance ± 10 %)



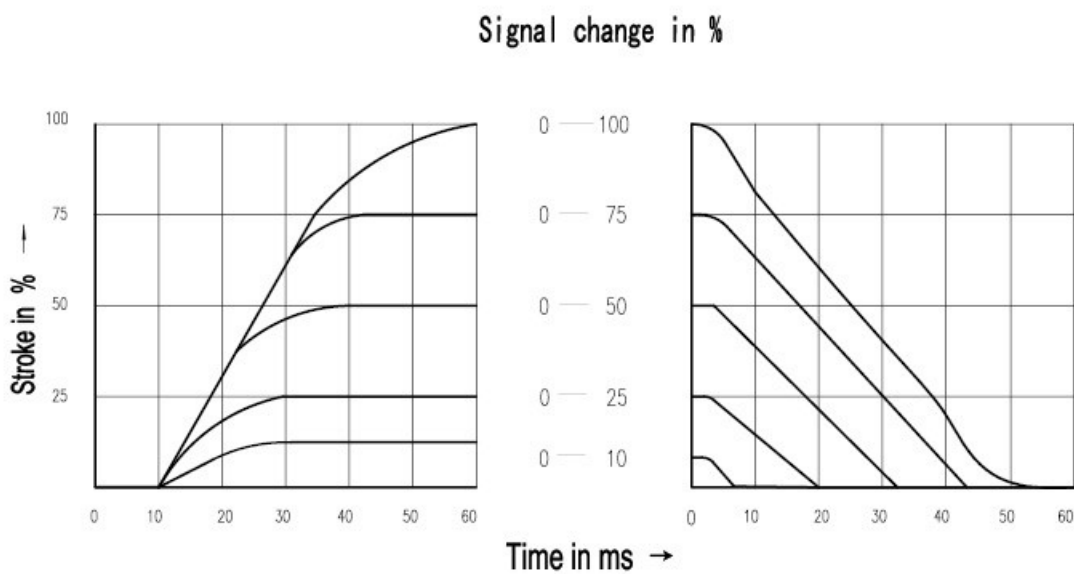
Transient function with a step form of electrical input signal



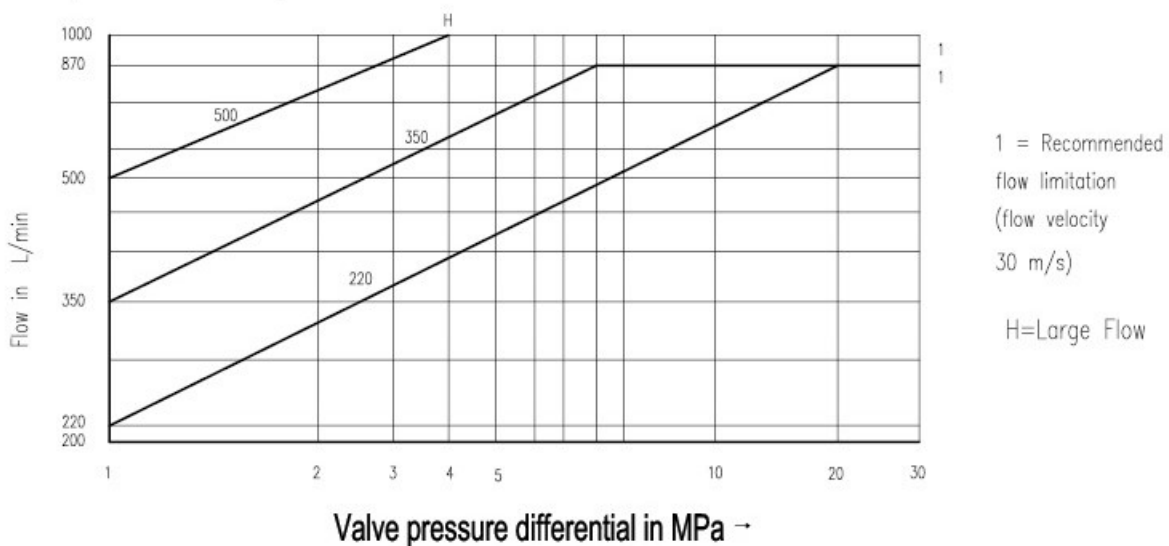
Flow load function at maximum valve opening  
(tolerance  $\pm 10\%$ )



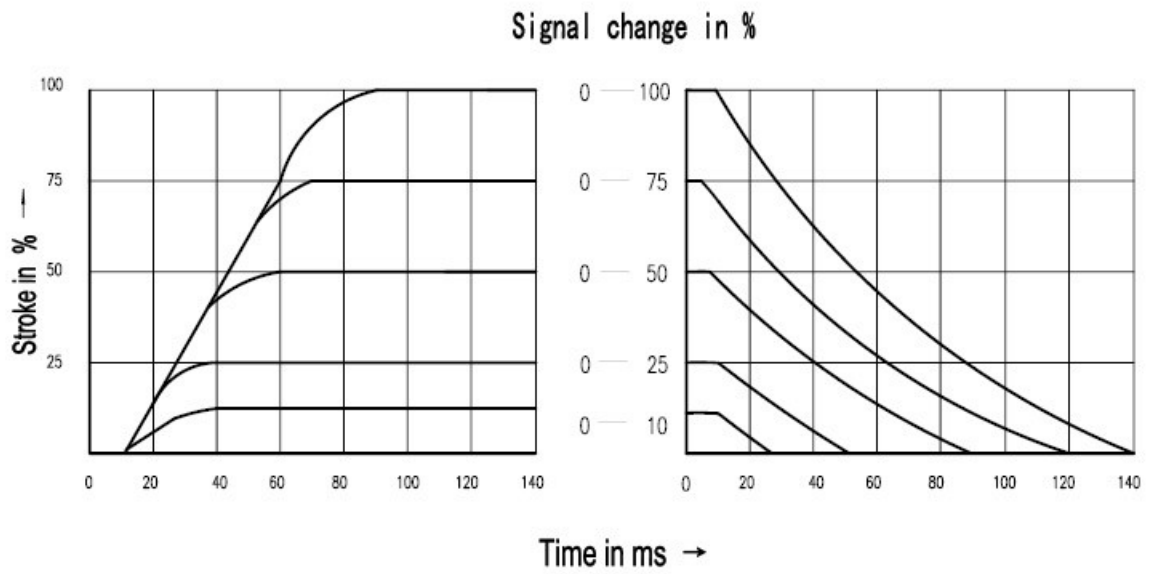
Transient function with a step form of electrical input signal



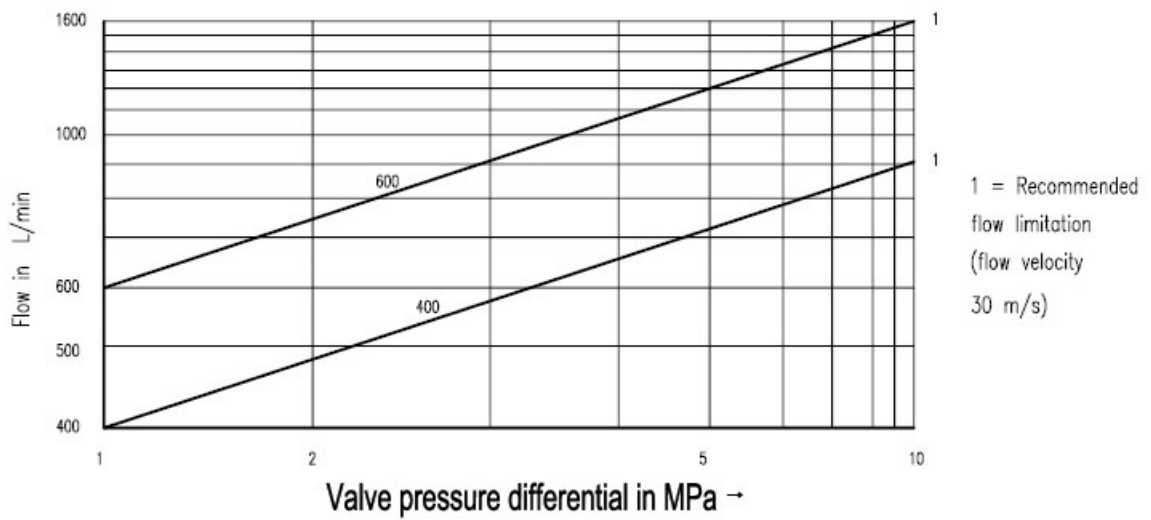
Flow load function at maximum valve opening  
(tolerance ± 10 %)



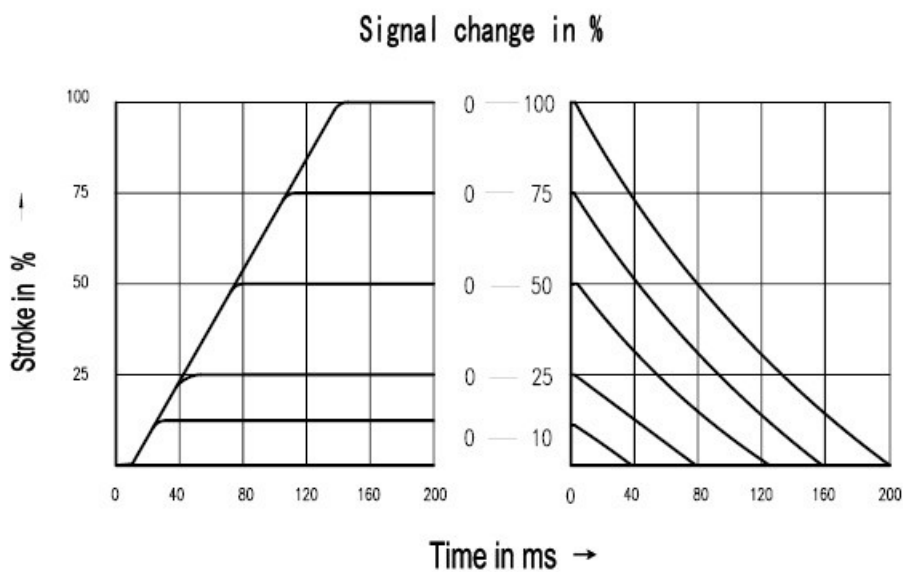
Transient function with a step form of electrical input signal



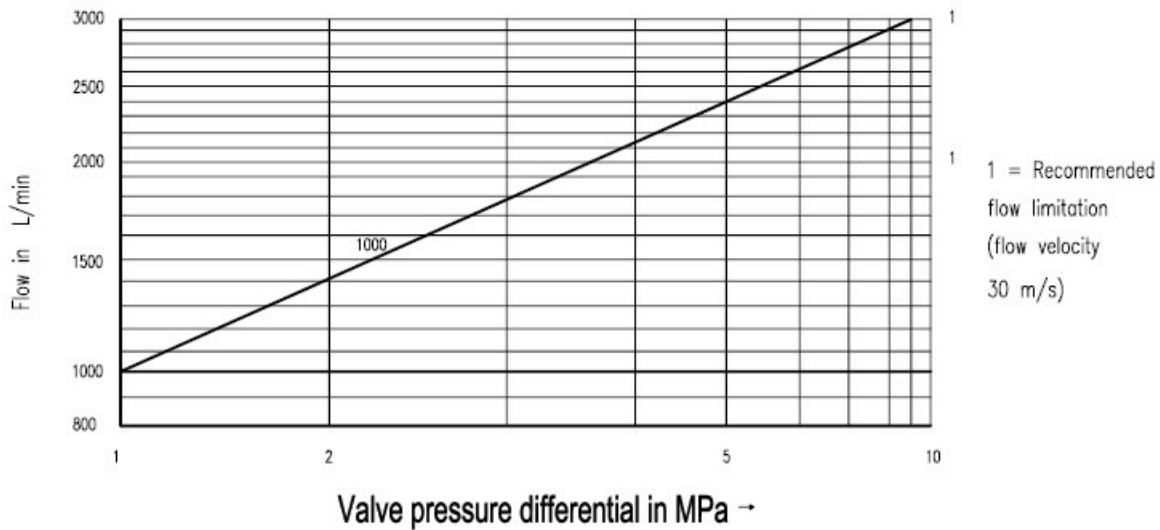
Flow load function at maximum valve opening  
(tolerance  $\pm 10\%$ )

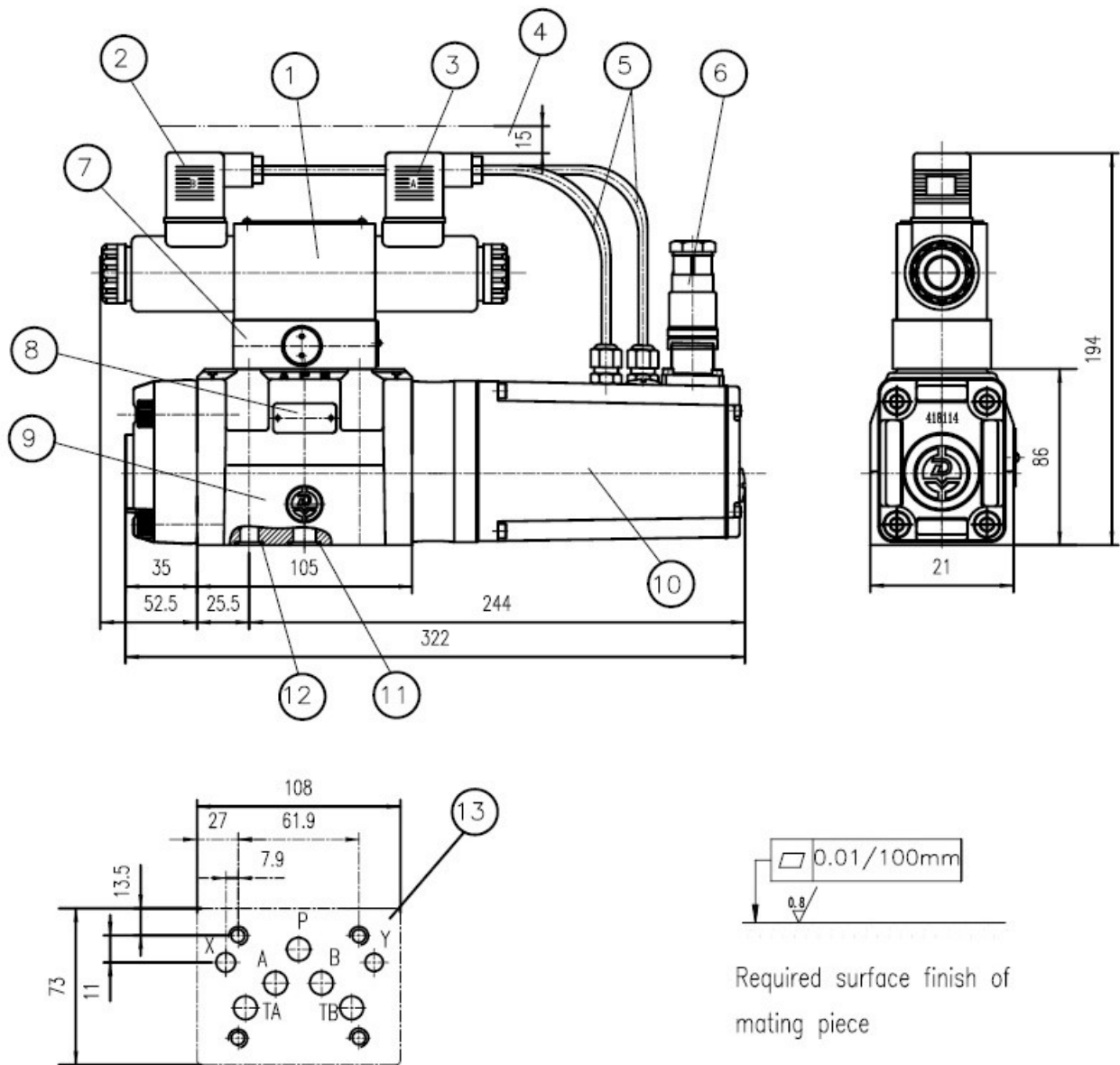


Transient function with a step form of electrical input signal



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



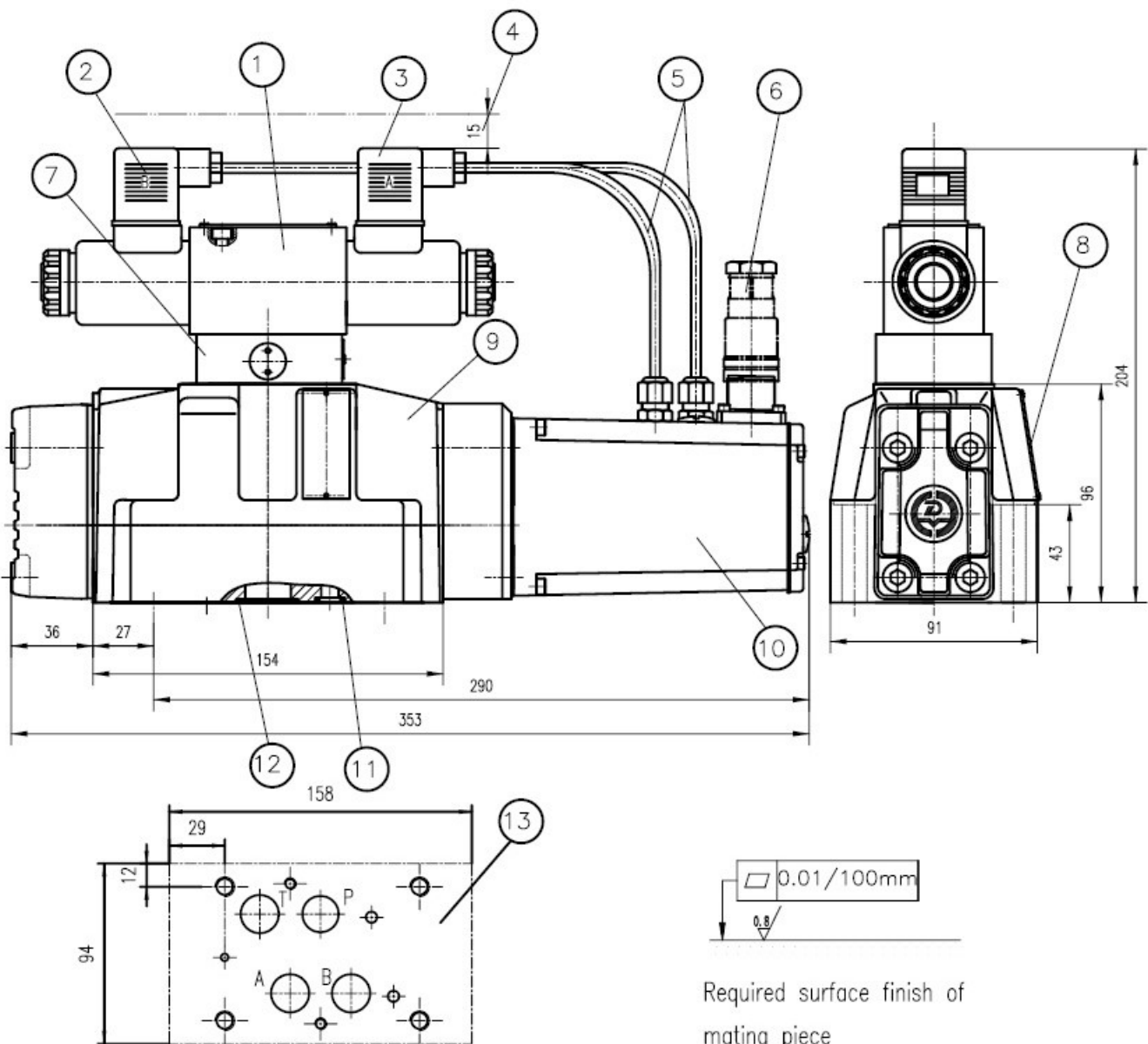


- |   |   |    |  |
|---|---|----|--|
| 1 | Pilot control valve                                 | 7  | Pressure reducing valve                                |
| 2 | Plug-in connector "B", colour black                 | 8  | Nameplate  |
| 3 | Plug-in connector "A", colour grey                  | 9  | Main valve   |
| 4 | Space required to remove the plug-in connector      | 10 | Integrated control electronics                         |
| 5 | Cable   | 11 | O-ring 12 x 2(for ports A,B,P,T)                       |
| 6 | Plug-in connector (plastic version, separate order) | 12 | O-ring 10.82 x 1.78(for ports X and Y)                 |
|   |   | 13 | Machined valve mounting surface, position of the ports |

Valve fixing screws: 4-M6 x 45 (GB/T70.1);  $M_A = 14 \text{ Nm}$

Unit dimensions: NS 16

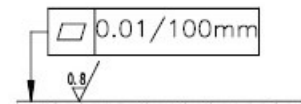
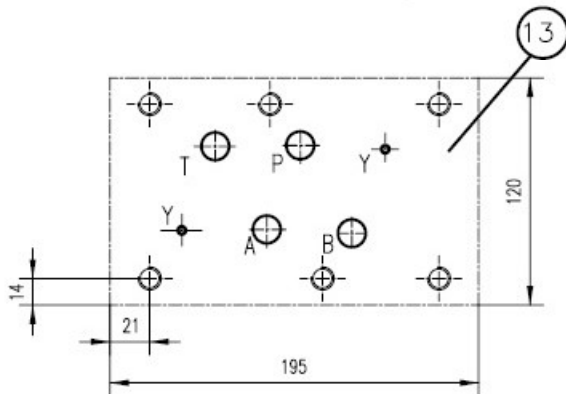
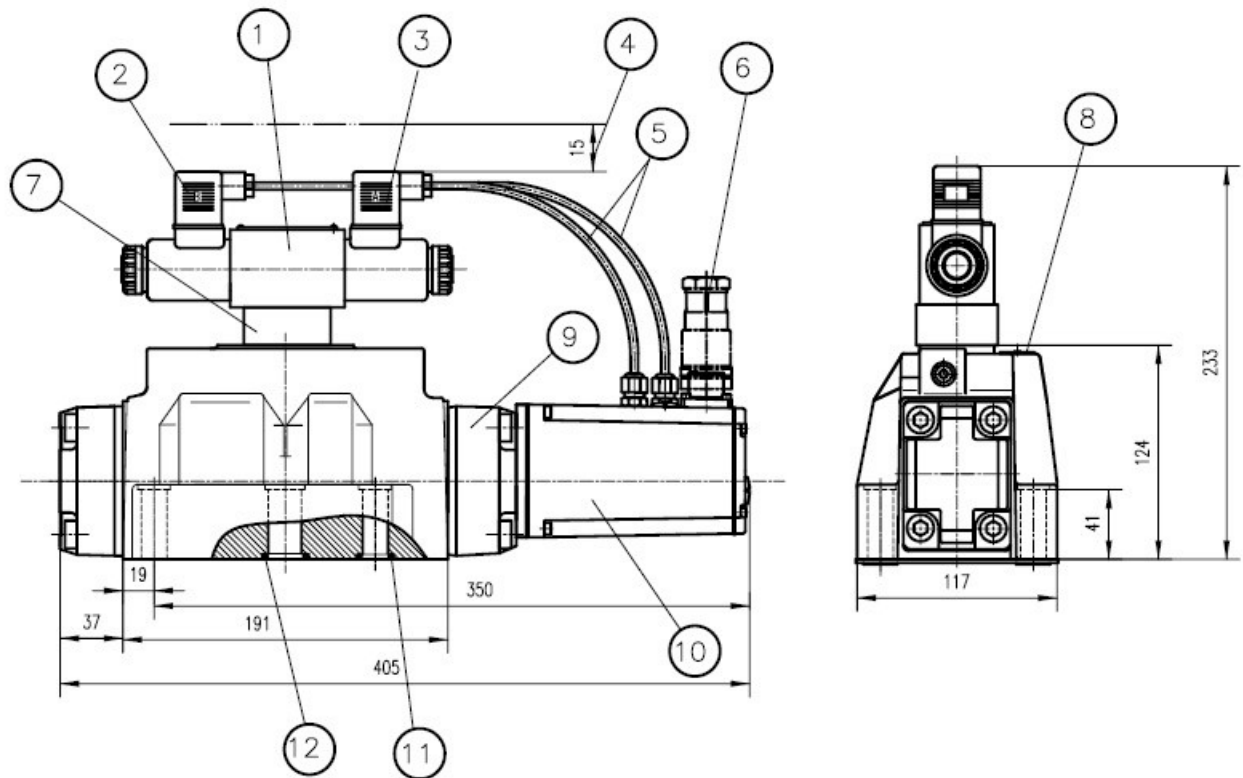
(Dimensions in mm)



- |   |   |    |   |
|---|---|----|---|
| 1 | Pilot control valve                                 | 7  | Pressure reducing valve                                   |
| 2 | Plug-in connector "B", colour black                 | 8  | Nameplate   |
| 3 | Plug-in connector "A", colour grey                  | 9  | Main valve  |
| 4 | Space required to remove the plug-in connector      | 10 | Integrated control electronics                            |
| 5 | Cable   | 11 | O-ring 12x2(for ports A,B,P,T)                            |
| 6 | Plug-in connector (plastic version, separate order) | 12 | O-ring 22x2.5(for ports X and Y)                          |
|   |   | 13 | Machined valve mounting surface,<br>position of the ports |

Valve fixing screws: 2 -M6X60(GB/T70.1)  $M_A=14Nm$   
 4 -M10X60(GB/T70.1)  $M_A=68Nm$





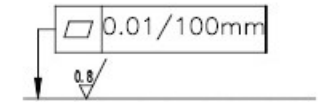
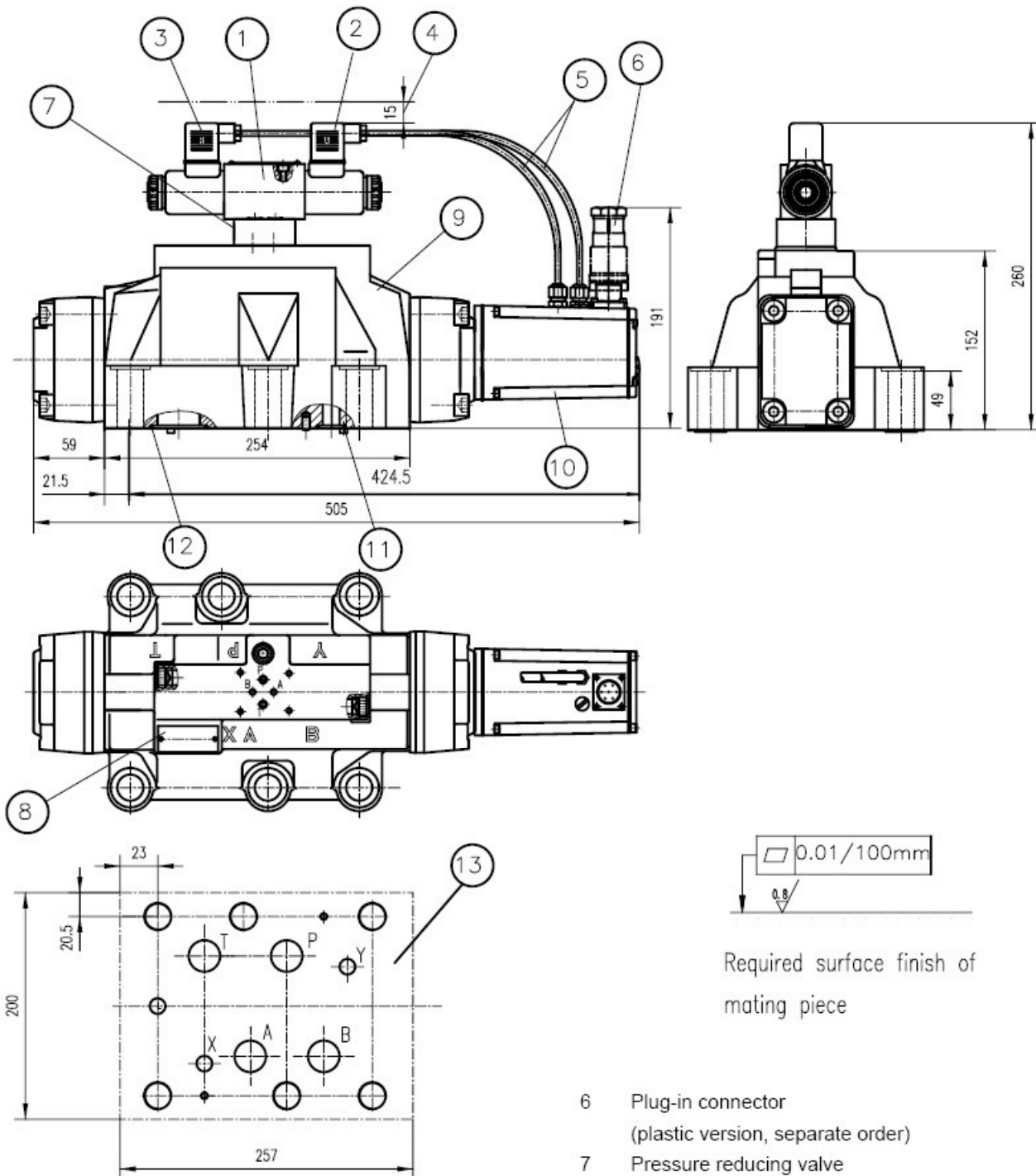
Required surface finish of mating piece

- |   |   |
|---|---|
| 1 Pilot control valve                                 | 7 Pressure reducing valve                                 |
| 2 Plug-in connector "B", colour black                 | 8 Nameplate   |
| 3 Plug-in connector "A", colour grey                  | 9 Main valve  |
| 4 Space required to remove the plug-in connector      | 10 Integrated control electronics                         |
| 5 Cable   | 11 O-ring 19x3(for ports A,B,P,T)                         |
| 6 Plug-in connector (plastic version, separate order) | 12 O-ring 27x3(for ports X and Y)                         |
|   | 13 Machined valve mounting surface, position of the ports |

Valve fixing screws: 6 -M12X60(GB/T70.1) $M_A=130\text{Nm}$

Unit dimensions: NS 32

(Dimensions in mm)



Required surface finish of mating piece

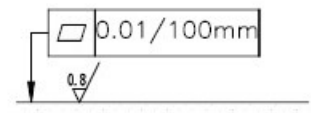
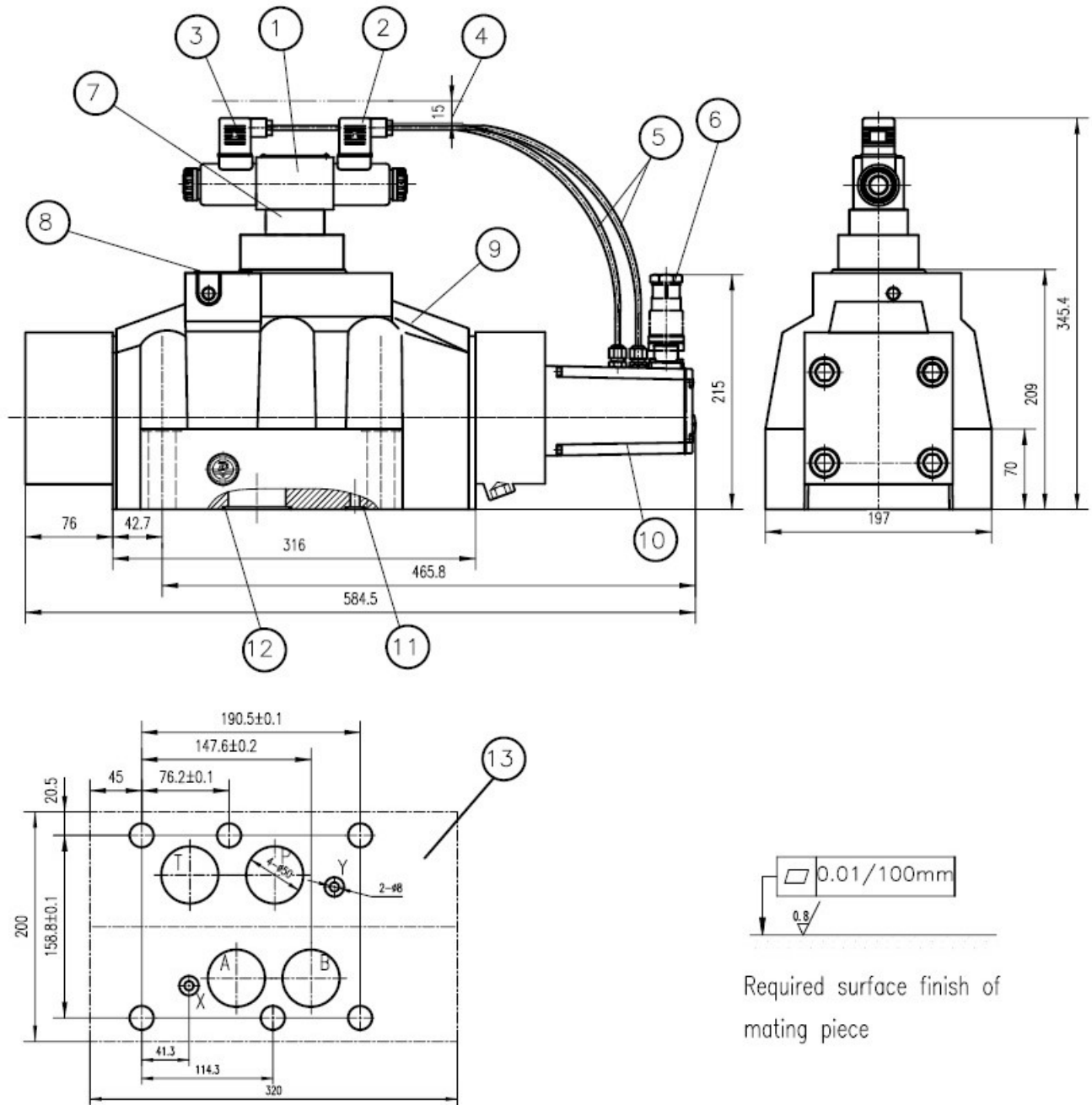
- 1 Pilot control valve
- 2 Plug-in connector "B", colour black
- 3 Plug-in connector "A", colour grey
- 4 Space required to remove the plug-in connector
- 5 Cable

- 6 Plug-in connector (plastic version, separate order)
- 7 Pressure reducing valve
- 8 Nameplate
- 9 Main valve
- 10 Integrated control electronics
- 11 O-ring 19x3(for ports A,B,P,T)
- 12 O-ring 42x3(for ports X and Y)
- 13 Machined valve mounting surface, position of the ports

Valve fixing screws: 6 - M20X80(GB/T70.1)  $M_A=430Nm$

Unit dimensions: NS 35

(Dimensions in mm)



Required surface finish of mating piece

- |   |   |    |  |
|---|---|----|--|
| 1 | Pilot control valve                                 | 7  | Pressure reducing valve                                |
| 2 | Plug-in connector "B", colour black                 | 8  | Name plate   |
| 3 | Plug-in connector "A", colour grey                  | 9  | Main valve   |
| 4 | Space required to remove the plug-in connector      | 10 | Integrated control electronics                         |
| 5 | Cable   | 11 | O-ring 19×3(for ports A,B,P,T)                         |
| 6 | Plug-in connector (plastic version, separate order) | 12 | O-ring 42×3(for ports X and Y)                         |
|   |   | 13 | Machined valve mounting surface, position of the ports |

Valve fixing screws: 6 - M20X100(GB/T70.1)  $M_A=430N.m$

## Notice

### Notice

1. The fluid must be filtered. Minimum filter fineness is 20  $\mu\text{m}$ .
2. The tank must be sealing up and an air filter must be installed on air entrance.
3. Products without subplate when leaving factory, if need them, please ordering specially.
4. Valve fixing screws must be high intensity level (class 10.9). Please select and use them according to the parameter listed in the sample book.
5. Roughness of surface linked with the valve is required to  $\frac{0.8}{\sqrt{\text{mm}}}$ .
6. Surface finish of mating piece is required to 0.01/100mm.