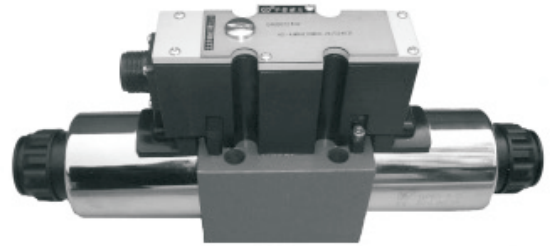


- For subplate mounting
- Direct actuated proportional valve for controlling the direction and volume of a flow
- Spring centred control spool
- Integrated control electronics, interface A1 or F1 for type 4WRAE
- Actuation by means of proportional solenoids with central thread and removable coil
- Control electronics for type 4WRA



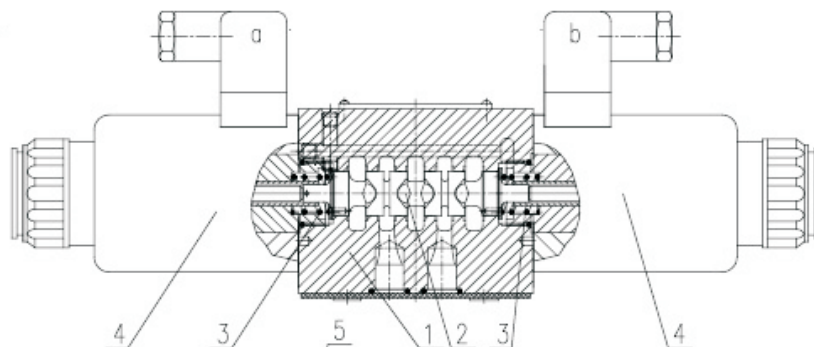
## Function, section

The 4/2- and 4/3-way proportional directional valves are designed as direct operated components for subplate mounting. They are actuated by means of proportional solenoids with central thread and removable coil. The solenoids are controlled either by external control electronics (type WRA) or by integrated control electronics (type WRAE). The valves basically consist of: Housing (1) with mounting surface, Control spool (2) with compression springs (3), Solenoids (4) with central thread, Optional integrated valve electronics (5).

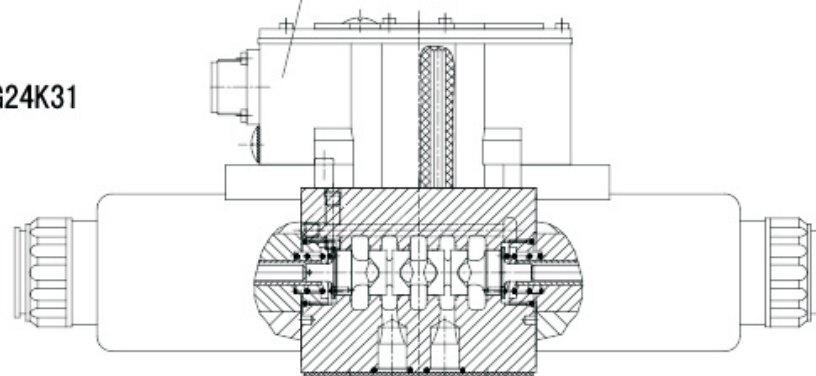
HD-4WRA(E) ...2X/...

With the solenoids (4) de-energised, the control spool (2) is held in the central position by compression springs (3). Direct actuation of the control spool (2) by energising a proportional solenoid. E.g. controlling of solenoid "b" (4). The control spool (2) is moved to the left in proportion to the electrical input signal. Connection from P to A and B to T via orifice-like cross sections with progressive flow characteristics. De-energisation of the solenoid (4). The control spool (2) is returned to the central position by compression spring (3).

**HD-4WRA...-2X/G24K4**



**HD-4WRAE...-2X/G24K31**



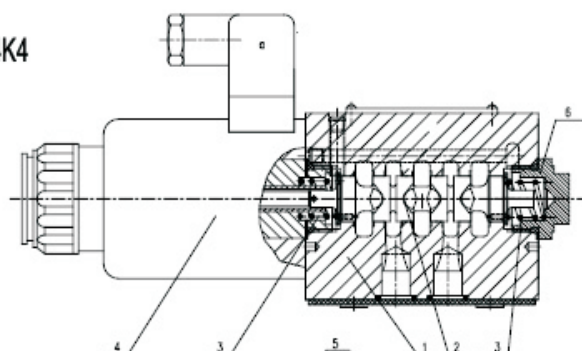
HD-4WRA(E)...A-2X/

In principle, the function of this valve version corresponds to that of the valve with 3 spool positions. However, the valves with 2 spool positions are only fitted with solenoid "a". Instead of the 2nd proportional solenoid a plug (5) is fitted for NS 6 or for NS 10 a cover (5).

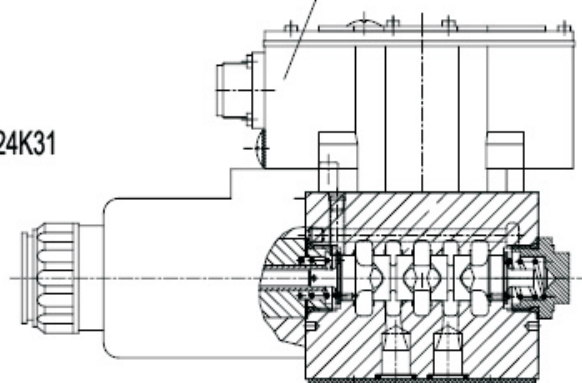
Note for type 4WRA 6...-2X/...:

Draining of the tank line is to be avoided. With the appropriate installation conditions, a back pressure valve is to be installed (back pressure approx. 0.2MPa).

HD-4WRA...A-2X/G24K4



HD-4WRAE...A-2X/G24K31

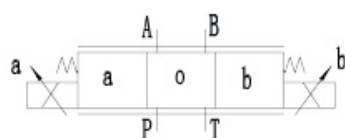


## Symbols

Proportional directional valve without integrated control electronics

Proportional directional valve with integrated control electronics

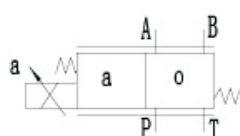
HD-4WRA...-2X/...



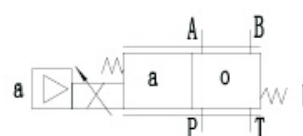
HD-4WRAE...-2X/...



HD-4WRA...A-2X/...



HD-4WRAE...A-2X/...



## Ordering details

HD 4WRA - 2X/G24 \*

BEIJING HUADE HYDRAULIC=HD

Without integrated control electronics =No Code  
With integrated control electronics =E

Nominal size 6 =6  
Nominal size 10 =10

Further details in clear text

No code = NBR seals  
V = FKM seals

NO Code = FOR WRA  
FOR WRAE:  
A1 = Command value input  $\pm 10$  V  
F1 = Command value input 4 to 20 mA

K4 = With component plug(for WRA)  
K31 = With component plug(for WRAE)

G24 = Supply voltage 24 VDC

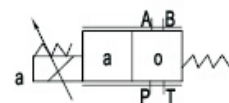
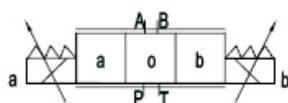
2X = Series 20 to 29  
(20 to 29: unchanged installation and connection dimensions)

Nominal flow at a valve pressure differential  $\Delta p = 1$  Mpa

NS6  
07= 7L/min  
15= 15L/min  
30= 26L/min

NS10  
30= 30L/min  
60= 60L/min

### Symbols



With symbols E1- and W1-:

P- A:  $q_{V \max}$  B- T:  $q_{V/2}$

P- B:  $q_{V/2}$  A- T:  $q_{V \max}$

Note:

With spools W and WA in the neutral position there is a connection from A to T and B to T with approx.3% of the relevant nominal cross-section.

## Technical data

### Hydraulic

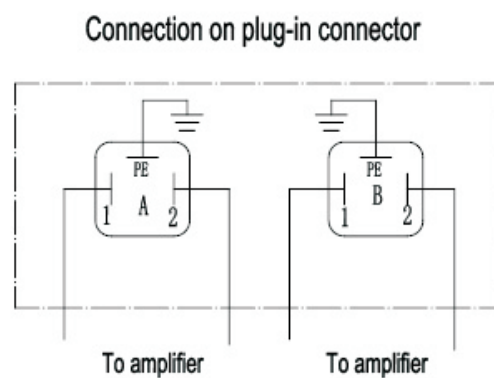
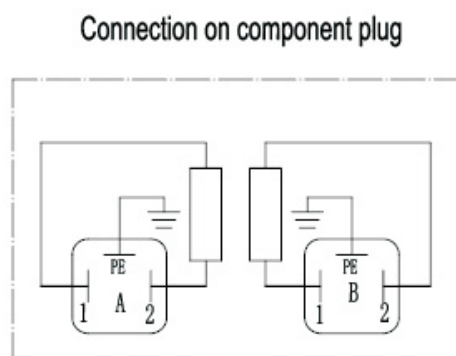
Valve type		HD-WRA	HD-WRAE
Operating pressure :MPa	Port A、P、B	31.5	31.5
	Ports T	21	21
Nominal flow $q_{V\text{ nom}}$ at $\Delta P=1\text{MPa}$	NS6 (L/min)	7、15 and 26	
	NS10 (L/min)	30 and 60	
Degree of contamination ( $\mu\text{m}$ )		$\leq 20$	
Hysteresis (%)		$\leq 5$	
Reversal error (%)		$\leq 1$	
Response sensitivity (%)		$\leq 0.5$	
Pressure fluid		Mineral oil or Phosphate ester	
Viscosity range ( $\text{mm}^2/\text{s}$ )		20~380	
Ambient temperature range ( $^{\circ}\text{C}$ )		-20 to +80	-20 to +50
Weight (Kg)	NS6	2.0	2.2
	NS10	6.6	6.8

### Electrical

Electrical,solenoid			
Valve type		HD-WRA	HD-WRAE
Voltage type		DC	
Voltage controlled (V)		±10	
Max. current per solenoid (A)		2.5	
Solenoid coil resistance (Ω)	Cold value at 20 °C	2	
	Max. warm value	3	
Duty		100%	
Coil temperature (°C)		up to150	
Valve protection to DIN40050		IP65	
Electrical, control electronics			
control electronics		HD-VT-VSPA2-1-1X/	integrated in the valve
Supply voltage	Nominal voltage VDC	24	
	Lower limiting value V	21/22	19
	Upper limiting value V	35	
Power consumption of the amplifier	I <sub>max</sub> A	1.8	
	Max. power impulse current A	3	

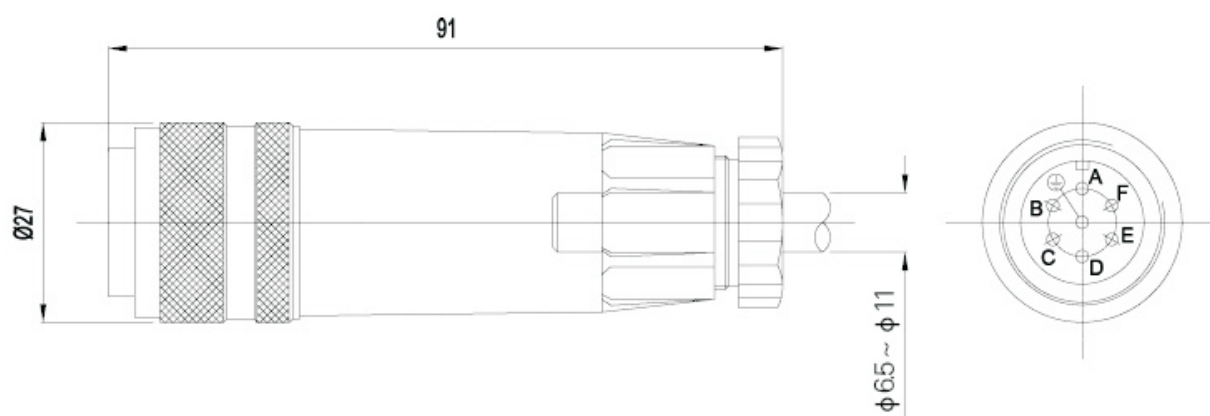
## Electrical connection, plug-in connectors

For type 4WRA  
(without integrated electronics)



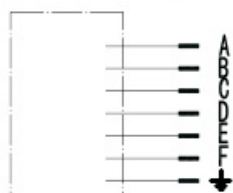
For type 4WRAE  
(with integrated electronics)

Plug-in connector to E DIN 43 563-BF6-3/  
Separate order, plastic version



## Integrated control electronics for type 4WRAE

Pin allocation of the component plug



Integrated electronics  
(see below)

	Slot	Signal
Supply voltage	A	24VDC (19–35VDC)
	B	
	C	n. c. <sup>1)</sup>
Differential amplifier input	D	com. value ( $\pm 10V/4-20mA$ )
	E	ref. potential
	F	n. c. <sup>1)</sup>

Com. value: Positive command value (0 to 10 V or 12 to 20 mA) at D and reference potential to E causes flow from P to A and B to T. Negative command value (0 to – 10 V or 12 to 4 mA) at D and reference potential to E causes flow from P to B and A to T.

For valves with a solenoid on side "a" (spool variant EA and WA) reference potential to E and positive command value at D (NS 6: 4 to 20 mA and NS 10: 12 to 20 mA) causes flow from P to B and A to T.

Connection cable: Recommendation: – up to 25 m cable length type LiYCY 5 x 0.75 mm<sup>2</sup>

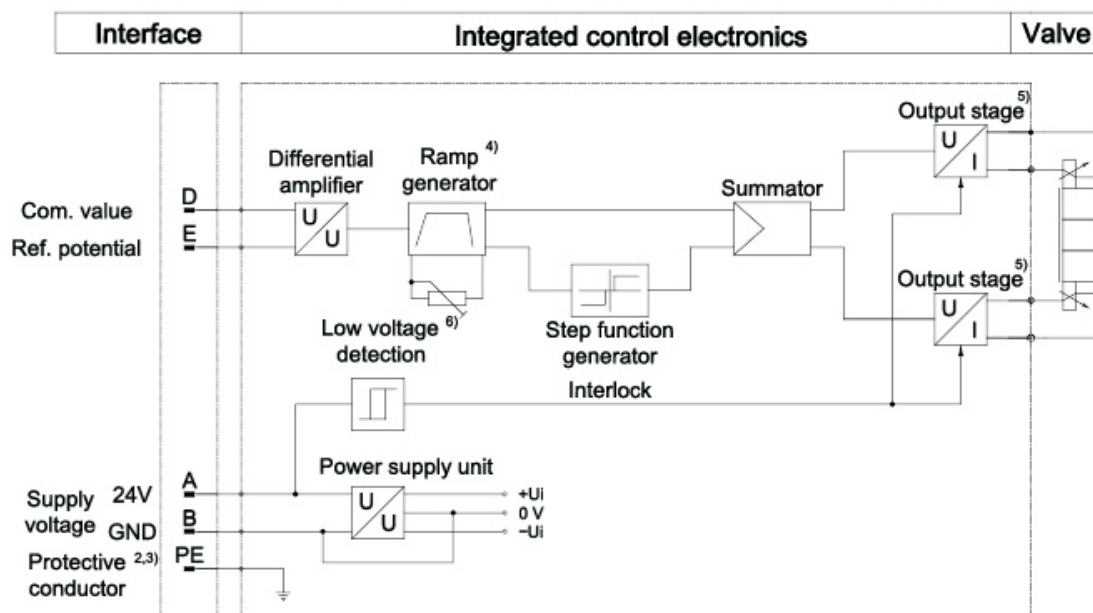
– up to 50 m cable length type LiYCY 5 x 1.0 mm<sup>2</sup>

External diameter 6.5 to 11 mm

Connect screen to PE only on the supply side.

1) Slots C and F must not be connected!

Block circuit diagram/terminal allocation of the integrated control electronics



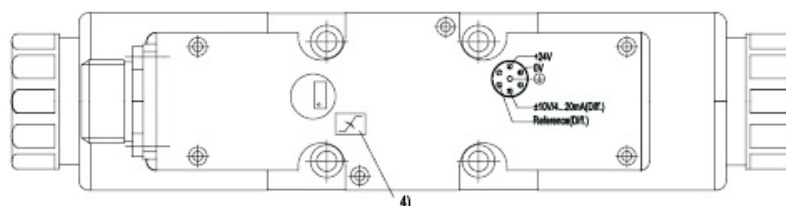
<sup>2)</sup> PE is connected to the cooling body and the valve housing

<sup>3)</sup> Protective conductor screwed to the valve housing and cover

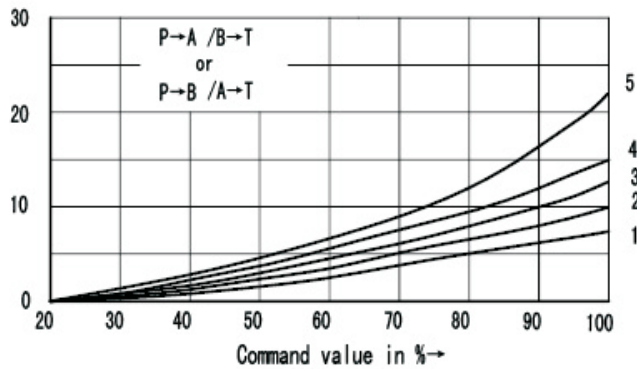
<sup>4)</sup> Ramp can be externally adjusted from 0 to 2,5 s; the same applies for  $T_{up}$  and  $T_{down}$

<sup>5)</sup> Output stages current regulated

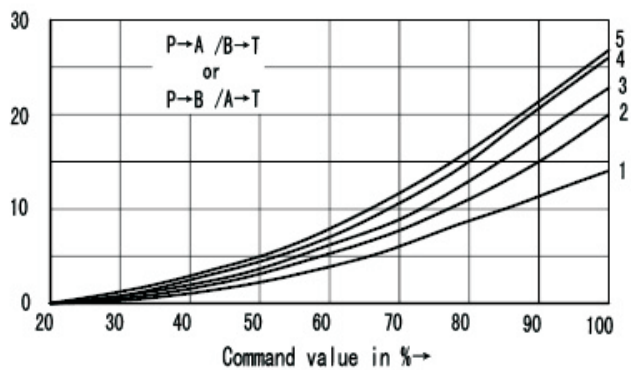
<sup>6)</sup> Low voltage detection is not carried out for component type 4WRAE 10-2X.



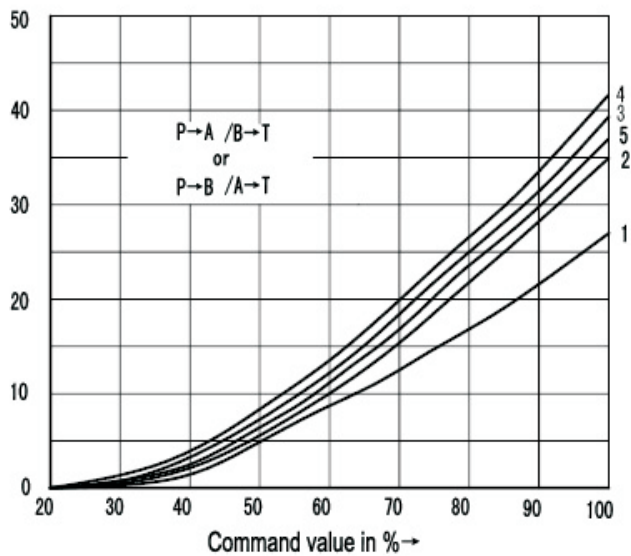
7 L/min nominal flow at 1 Mpa valve pressure differential



15 L/min nominal flow at 1Mpa valve pressure differential



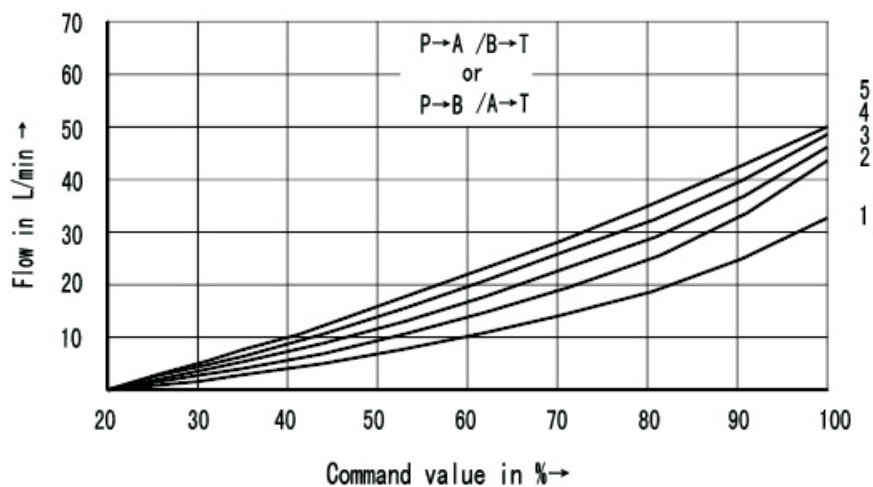
30 L/min nominal flow at 1 Mpa valve pressure differential



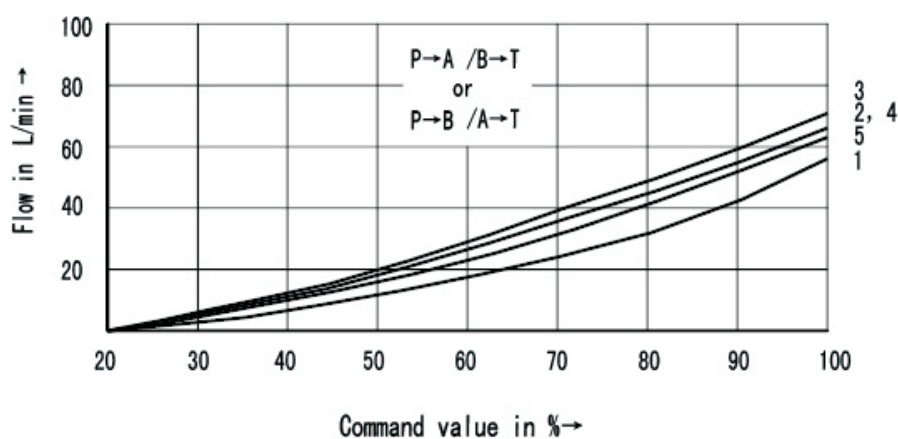
- 1、  $\Delta P = 1\text{ MPa}$  constant
- 2、  $\Delta P = 2\text{ MPa}$  constant
- 3、  $\Delta P = 3\text{ MPa}$  constant
- 4、  $\Delta P = 5\text{ MPa}$  constant
- 5、  $\Delta P = 10\text{ MPa}$  constant

$\Delta P$  = Value pressure differential  
(inlet pressure  $p_i$  minus load pressure  $p_L$   
and minus return pressure  $p_r$ .)

30 L/min nominal flow at 1 Mpa valve pressure differential



60 L/min nominal flow at 1 Mpa valve pressure differential



1、 $\Delta P = 1\text{ MPa}$  constant

2、 $\Delta P = 2\text{ MPa}$  constant

3、 $\Delta P = 3\text{ MPa}$  constant

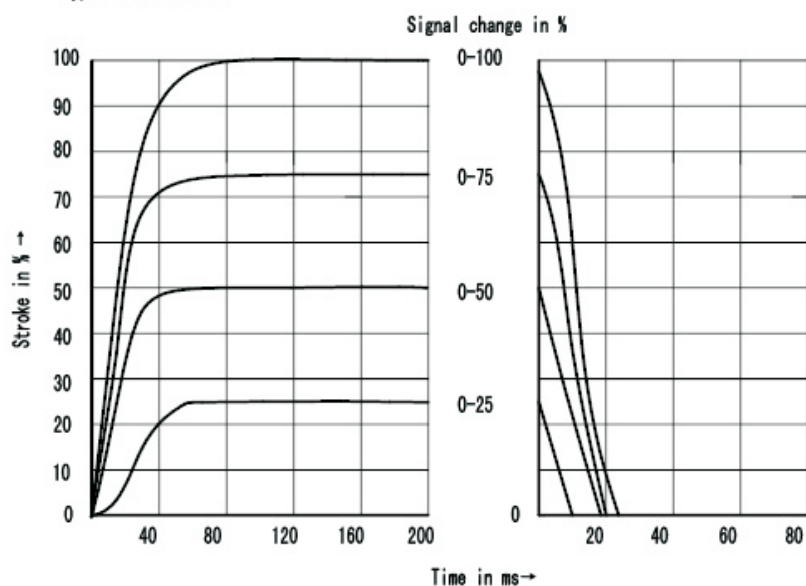
4、 $\Delta P = 5\text{ MPa}$  constant

5、 $\Delta P = 10\text{ MPa}$  constant

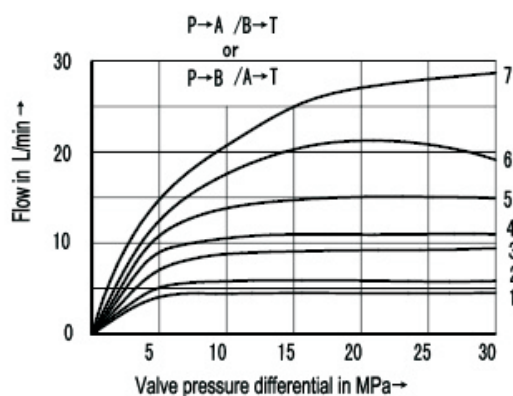
$\Delta P$  = Valve pressure differential (inlet pressure  $p_i$  minus load pressure  $p_L$  and minus return pressure  $p_r$ )

Transient functions with stepped form of electrical input signals

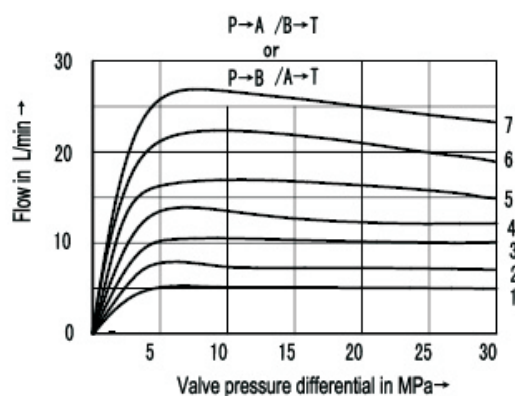
Types WRA and WRAE



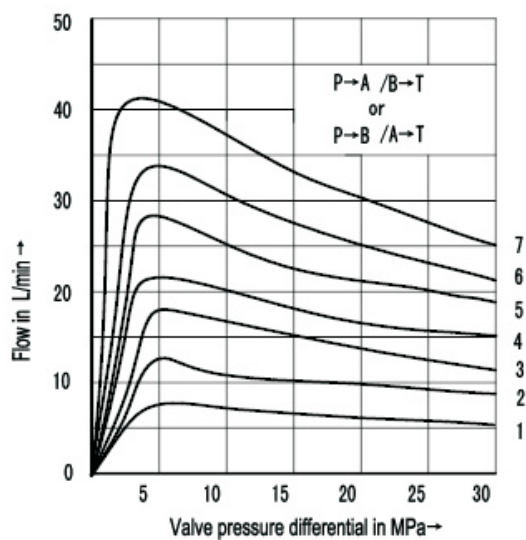
Performance limit, nominal flow 7 L/min



Performance limit, nominal flow 15 L/min



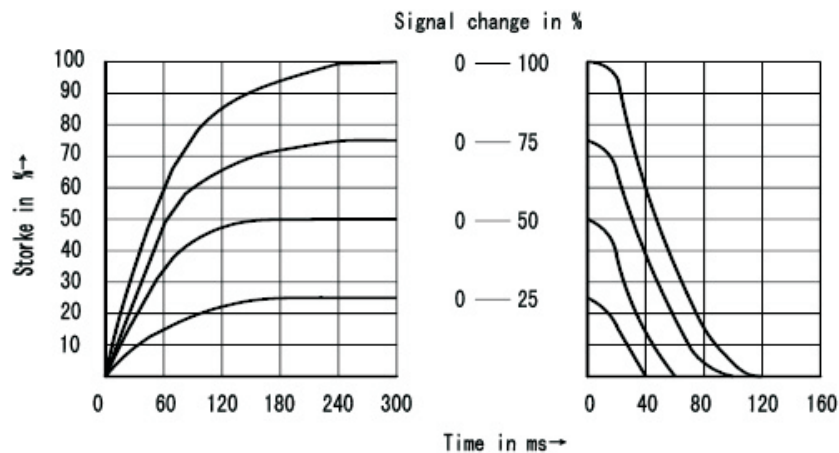
Performance limit, nominal flow 30 L/min



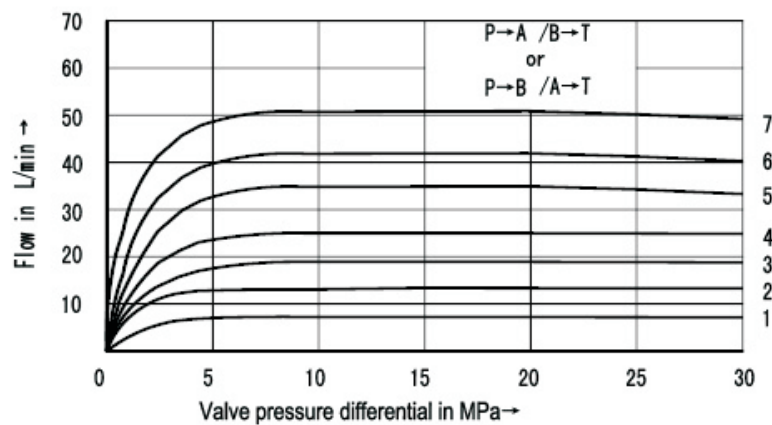
- 1, Command valve = 40%
- 2, Command valve = 50%
- 3, Command valve = 60%
- 4, Command valve = 70%
- 5, Command valve = 80%
- 6, Command valve = 90%
- 7, Command valve = 100%

If the performance limits are exceeded then flow forces occur which lead to uncontrolled spool movements.

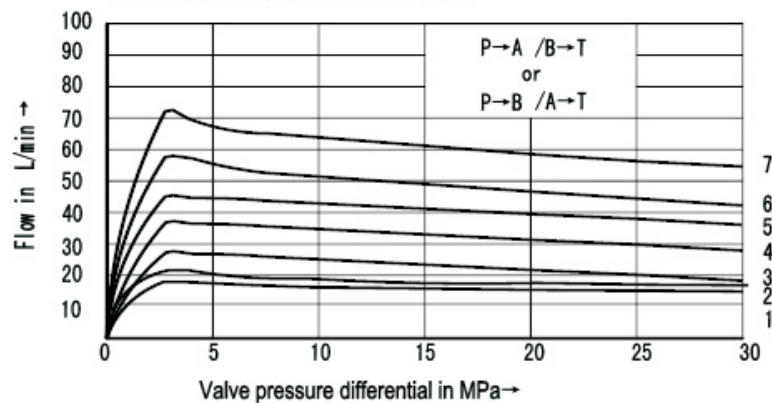
Transient functions with stepped form of electrical input signals



Performance limit, nominal flow 30 L/min

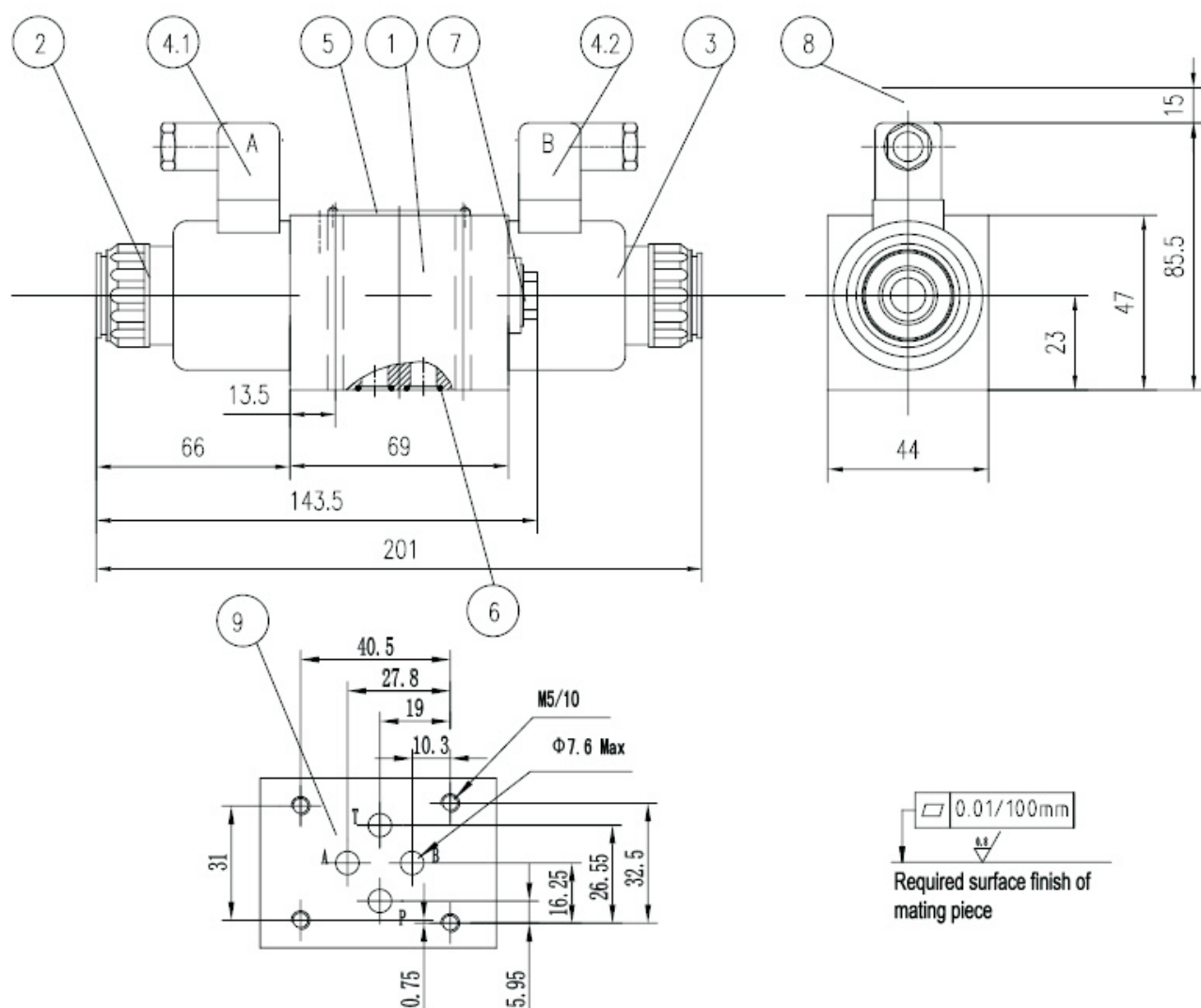


Performance limit, nominal flow 60 L/min



- 1, Command value = 40 %
- 2, Command value = 50 %
- 3, Command value = 60 %
- 4, Command value = 70 %
- 5, Command value = 80 %
- 6, Command value = 90 %
- 7, Command value = 100 %

If the performance limits are exceeded then flow forces occur which lead to uncontrolled spool movements.



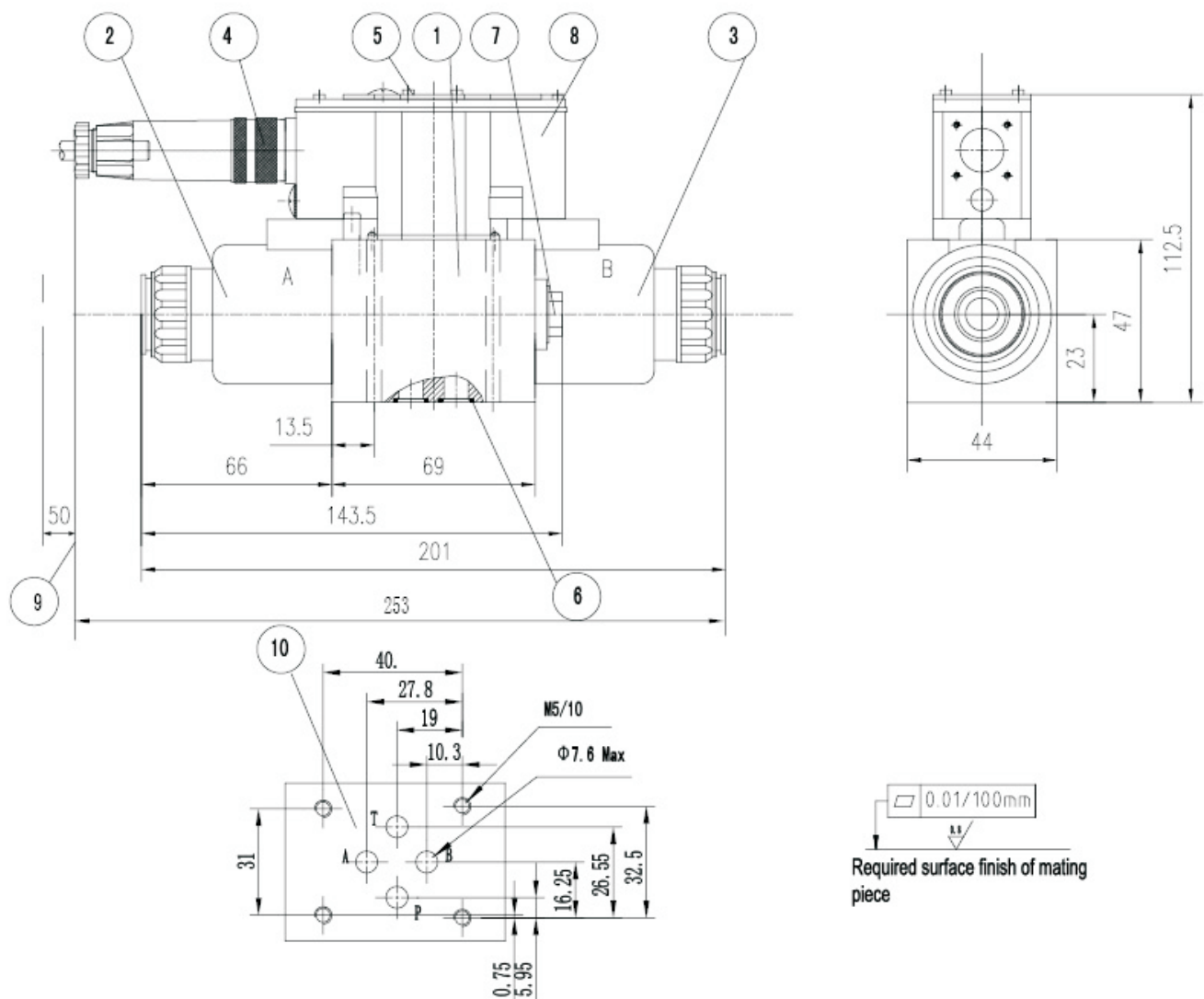
- 1 Valve housing
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4.1 Plug-in connector "A"
- 4.2 Plug-in connector "B"
- 5 Nameplate
- 6 O-ring 9.25X1.78 (ports P,A,B,T)
- 7 Plug for valves with one solenoid  
(2 switched positions, versions EA or WA)
- 8 Space required to remove the plug-in connector
- 9 Machined valve mounting surface

Subplates: G341/01(G1/4")

G342/01(G3/8")

G502/01(G1/2")

Valve fixing screws: 4- M5 x 50(GB/T70.1);  $M_A = 8.9 \text{ Nm}$



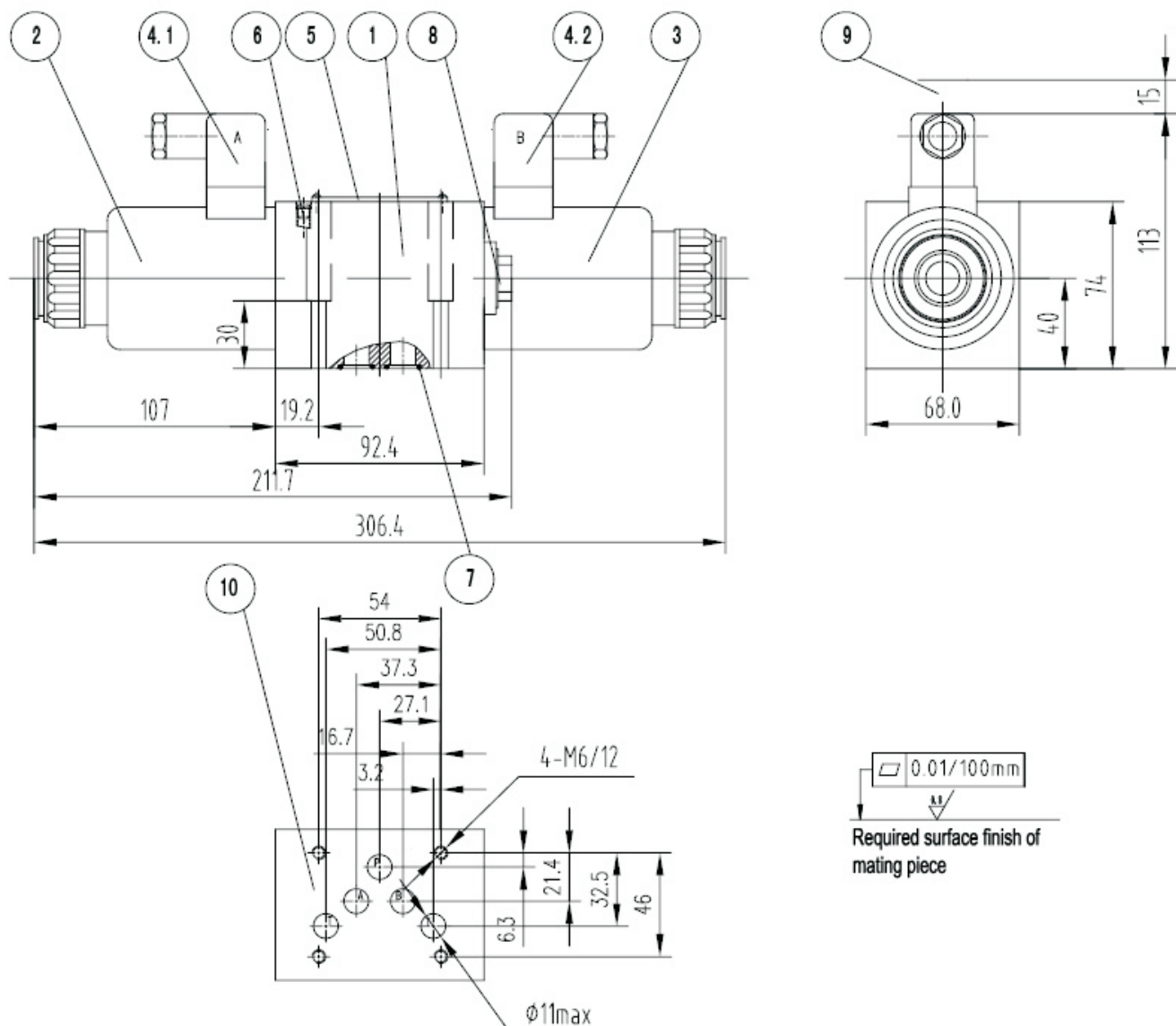
- 1 Valve housing
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4 Plug-in connector, separate order
- 5 Nameplate
- 6 O-ring 9.25X1.78 (ports P, A, B, T)
- 7 Plug for valves with one solenoid  
(2 switched positions, versions EA or WA)
- 8 Integrated control electronics
- 9 Space required for the connection cable and to  
remove the plug-in connector
- 10 Machined valve mouting surface

Subplates: G341/01(G1/4")

G342/01(G3/8")

G502/01(G1/2")

Valve fixing screws: 4 - M5 x 50(GB/T70.1);  $M_A = 8.9 \text{ Nm}$



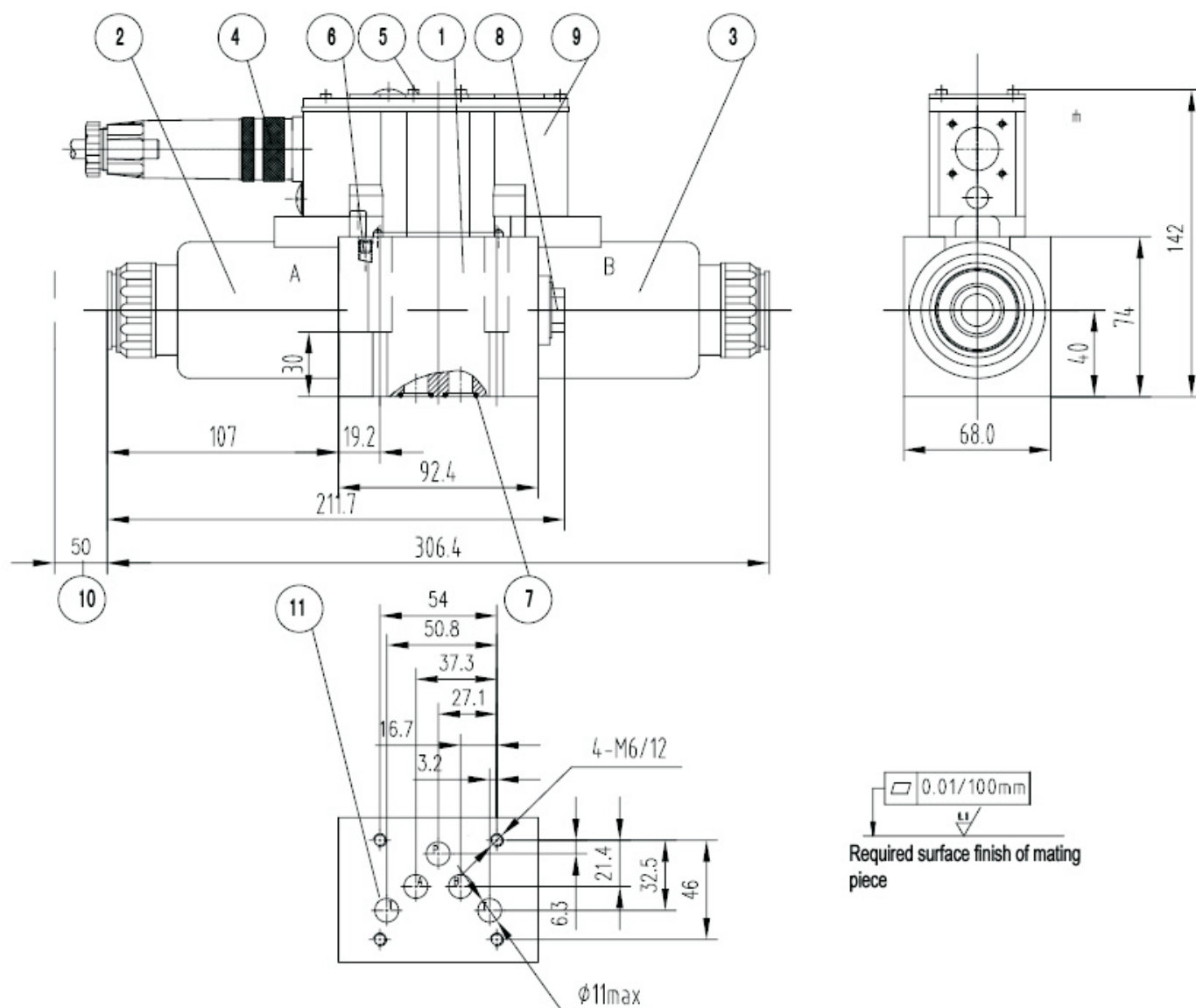
- 1 Valve housing
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4.1 Plug-in connector "A"
- 4.2 Plug-in connector "B"
- 5 Nameplate
- 6 Valve bleed screw
- Note: The valves are bled before delivery.
- 7 O-ring 12X2(ports P, A, B, T)
- 8 Plug for valves with one solenoid (2 switched positions, versions EA or WA)
- 9 Space required to remove the plug-in connector
- 10 Machined valve mounting surface

Subplates: G66/01(G3/8")

G67/01(G1/2")

G534/01(G3/4")

Valve fixing screws: 4 -M6 x 40(GB/T70.1);  $M_A = 15.5 \text{ Nm}$



- 1 Valve housing
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4 Plug-in connector ,separate order
- 5 Nameplate
- 6 Valve bleed screw
- Note: The valves are bled before delivery.
- 7 O-ring 12X2  
(ports P, A, B, T)
- 8 Cover for valves with one solenoid  
(2 switched positions, versions EA or WA)
- 9 Integrated valve electronics
- 10 Space required for the connection cable and to  
remove the plug-in connector
- 11 Machined valve mounting surface

Subplates: G66/01(G3/8")

G67/01(G1/2")

G534/01(G3/4")

Valve fixing screws: 4 - M6 x 40 (GB/T70.1);  $M_A = 15.5 \text{ Nm}$

## 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  $\frac{0.8}{\sqrt{\text{ }}$ .
6. Surface finish of mating piece is required to 0.01/100mm.

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