6.10

Proportional directional valves

Type 4WRA and 4WRAE

NG 6 and 10
Up to 315 bar
Up to 75 L/min

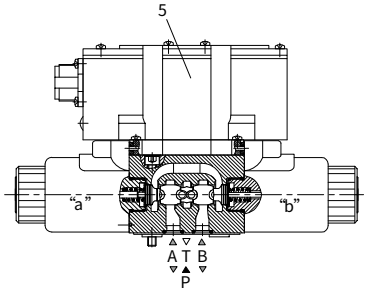
Contents

Features

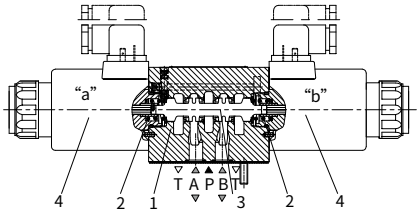
- Direct operated proportional directional valve to control the direction and magnitude of a flow
- For subplate mounting: Porting pattern conforms to ISO4401
- Actuation by means of proportional solenoids with central thread and removable coil
- Spring centred control spool
- Control electronics 4WRAE...L2X: integrated electronics (OBE) with voltage input or current input (A1 resp. F1) 4WRA...L2X: available module amplifier

Function and configurations

The 4/2- and 4/3-way proportioanl 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 4WRA...L2X) or by integrated control electronics (type 4WRAE...L2X).
The valves basically consist of: Body (1) with mounting surface, Control spool (3) with compression springs (2), Solenoids (4) with central thread, Optional integrated electronics (5).
With the solenoids (4), de-energised, the control spool (3) is held in the central position by the compression springs (2).
Direct operation of the control spool (3) by energising one of the proportional solenoids(4) e.g. control of solenoid right, then movement of the control spool (3) to the left in proportion to the electrical input signal, and connection from P to A and B to T via orifice-like crosssections with progressive flow characteristics.

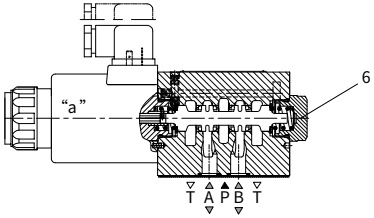


Type 4WRAE 6...-L2X/...

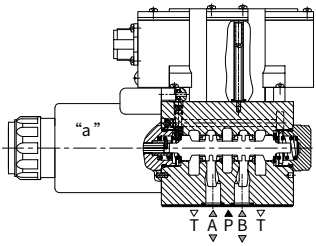


Type 4WRA 10...-L2X/...

4WRA(E)...A-L2X the 2 switched position valves are however only fitted with solenoid "a".
A plug (6) is fitted in place on the "b" proportional solenoid.



Type 4WRA 10...A-L2X/...

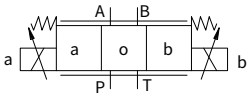


Type 4WRAE 10...A-L2X/...

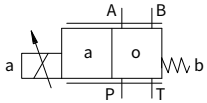
Symbols

Without integrated electronics

Type 4WRA...-L2X/...

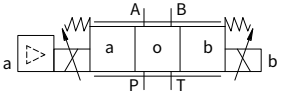


Type 4WRA...A-L2X/...

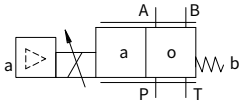


With integrated electronics

Type 4WRAE...-L2X/...



Type 4WRAE...A-L2X/...



Ordering code

4WRA | | | | – L2X / G24 | | | / | | *

Further information in plain text

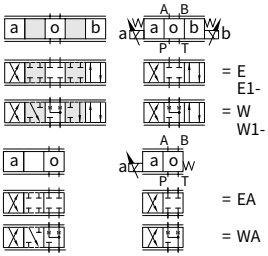
Without integrated =No code
With integrate = E

V = FKM
No code = NBR

Nominal size 6 =6
Nominal size 10 =10

No code = for 4WRA
Interface A1 or F1 for 4WRAE:
A1= Command value input ±10V
F1=Command value input 4 to 20mA

Spool symbols



4WRA: Z4= With plug-in connector
K4= Without plug-in connector
DT= Without plug-in Deutsch connector
4WRAE: K31= Without plug-in connector
Z31= With plug-in connector

N9 = With protected hand override

4WRA: Solenoid type (current)
No code= Solenoid current 2.5A
-15= Solenoid current 1.5A
- 8= Solenoid current 0.8A
4WRAE: Solenoid type (current)
No code= Solenoid current 2.5A

☐ Transitional symbols

With symbols E1 -and W1-:
P → A: q_{vmax} B → T: $q_v/2$
P → B: $q_v/2$ A → T: q_{vmax}

Note: For spools W and WA there is, in the neutral position, aconnection between A to T and B to T with approx.3% of the elevant nominal crossse-ction.

Power supply voltage of electric control device:
G24= Power supply voltage 24VDC

L2X= Series L20~L29
(L20 to L29, unchanged installation and connection dimensions)

Nominal flow at a valve pressure differential ΔP=10bar
NG6: 07= 7L/min
15= 15L/min
30= 26L/min
NG 10: 30= 30L/min
60= 60L/min

Technical data

1. Hydraulic					
Installation			Optional, preferably horizontal		
Nominal size			6		10
Weight	4WRA...L2X	Kg	2.0		6.6
	4WRAE...L2X		2.2		6.8
Nominal flow Q_{vnom} at Δp = 10 bar		L/min	7, 15, 26		30, 60
Hysteresis		%	⩽ 5		
Reversal span		%	⩽ 1		
Response sensitivity		%	⩽ 0.5		
Max.operating pressure	Ports A, B, P	bar	315		
	Port T	bar	210		
Pressure fluid			Mineral oil (HL, HLP) to DIN 51524		
			Other pressure fluids on request!		
Ambient air temperature range	4WRA...L2X	°C	-20°C to 70°C (-4° F to 158° F)		
	4WRAE...L2X	°C	-20°C to 50°C (-4° F to 122° F)		
Viscosity range		mm^2/s	20 to 380 (preferably 30 to 46)		
Fluid Cleanliness Class			NAS1638 class9 or ISO 4406 class 20/18/15		

2. Electrical					
1) Solenoid data					
Voltage type			DC		
Command value signal for 4WRAE			±10V or 4 ～ 20mA		
Max.current per solenoid		A	2.5	1.5	0.8
Solenoid coil resistance	Cold value at 20°C	Ω	2	4.8	19.5
	Max. warm value		3	7.2	28.8
Duty		%	ED100%		
Max.coil temperature		°C	150		
Valve protection to EN 60529			IP 65		
2) Control electronics					
Amplifier	4WRA...L2X		VT-VSPA2-...-L2X		
	4WRAE...L2X		Integrated in the valve (OBE)		
Supply voltage	Nominal voltage	VDC	24		
	Lower limiting value	V	21/22 (4WRA), 19 (4WRAE)		
	Upper limiting value	V	35		
Amplifier power consumption	I_{max}	A	<1.8		
	Impulse current	A	3		

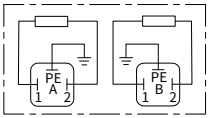
Electrical connections, plug-in connectors

nominal dimensions in mm

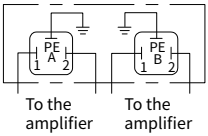
· For type 4WRE...L2X (without integrated electronics)

Connections on the component plug

Plug-in connector to DIN EN 175301-803 or ISO 4400



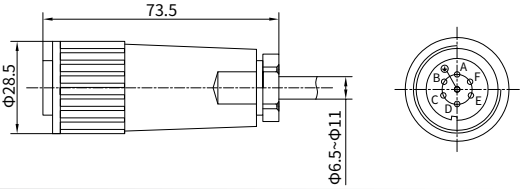
Connections on the plug-in connector



· For type 4WRAE...L2X (with integrated electronics (OBE))

For pin allocation also see block circuit diagram.

Plug-in connector to DIN EN 175201-804



· Integrated control electronics for type 4WRAE

Component plug allocation

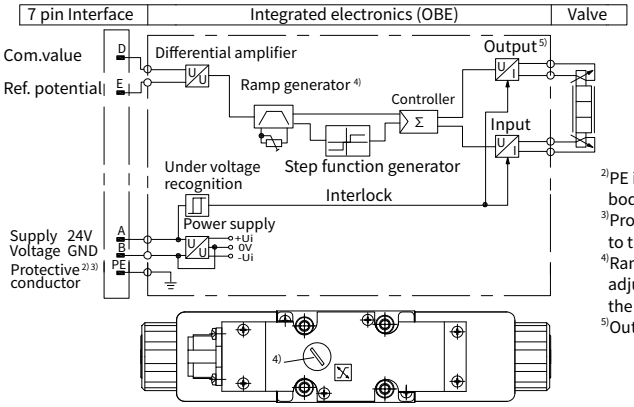
	Contact	Interface A1 signal	Interface F1 signal
Supply voltage	A	24 VDC(U(t)=19V to 35V)	
	B	GND	
	C	n.c. [1]	
Differential amplifier input	D	±10V, Re>50KΩ	4 to 20mA, Re>100Ω
	E	reference potentional command value	
	F	n.c. [1]	

[1] Contacts C and F must not be connected!

Connection cable:
Recommended:
– up to 25 m cable length type LiYCY 7×0.75 mm²;
– up to 50 m cable length type LiYCY 7×1.0 mm².
For outside diameter see plug-in connector sketch.
Only connect screen to PE on the supply line.

Command value:
A positive command value 0 to +10V (or 12 to 20mA) at D and the reference potential at E results in a flow from P to A and B to T. A negative command value 0 to –10V (or 12 to 4mA) at D and the reference potential at E results in a flow from P to B and A to T.
For a valve with 1 solenoid on side a (e.g. spool variants EA and WA) a positive command value at D and the reference potential at E results in a flow from P to B and A to T.

· Integrated electronics (OBE) for type 4WRAE...L2X



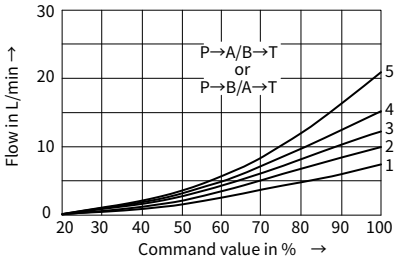
[2] PE is connected to the cooling body and the valve housing!
[3] Protective conductor screwed to the valve housing and cover.
[4] Ramp can be externally adjusted from 0 to 2.5s, the same applies for T_{up} and T_{down}.
[5] Output stages current regulated.

Characteristic curves (measured with HLP46, ϑ_{oil}=40°C ±5°C)

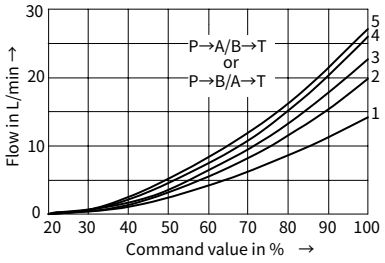
· Type 4WRAE (NG 6 and 10)

NG 6

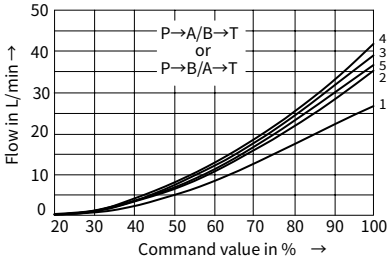
7 L/min nominal flow at a 10 bar valve pressure differential



15 L/min nominal flow at a 10 bar valve pressure differential



30 L/min nominal flow at a 10 bar valve pressure differential

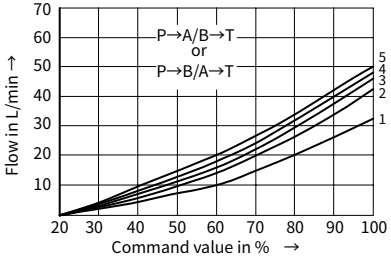


1 Δp=10bar constant
2 Δp=20bar constant
3 Δp=30bar constant
4 Δp=50bar constant
5 Δp=100bar constant

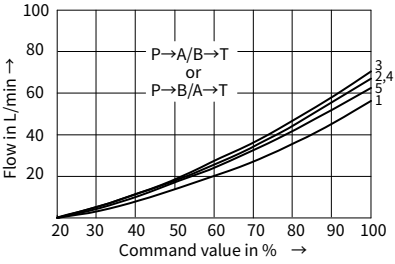
Δp=Valve pressure differential
(inlet pressure p_p minus loadpressure $p_L$minus return pressure p_T)

NG 10

30 L/min nominal flow at a 10 bar valve pressure differential



60 L/min nominal flow at a 10 bar valve pressure differential

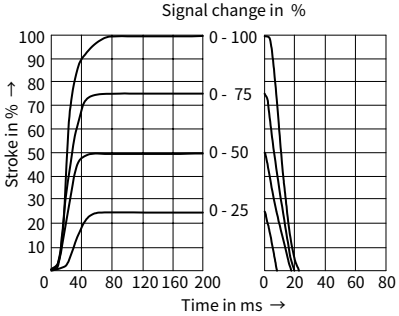


1 Δp=10bar constant
2 Δp=20bar constant
3 Δp=30bar constant
4 Δp=50bar constant
5 Δp=100bar constant

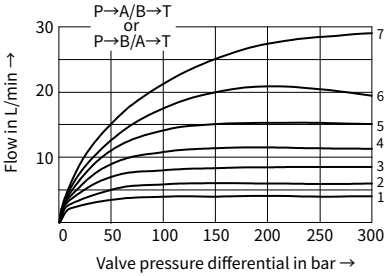
Δp= Valve pressure differential
(inlet pressure p_p minus load pressure p_L minus return pressure p_T)

Characteristic curves (measured with HLP46, ϑ_{oil}=40°C ±5°C)

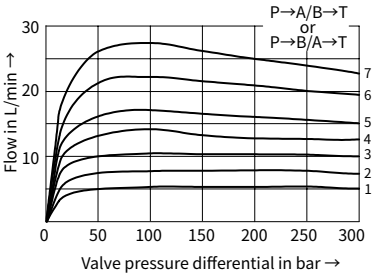
NG 6 Transient function with a stepped form of electrical input sign



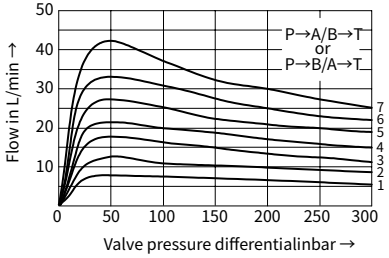
Performance limit, nominal flow 7 L/min



Performance limit, nominal flow 15 L/min



Performance limit, nominal flow 30 L/min

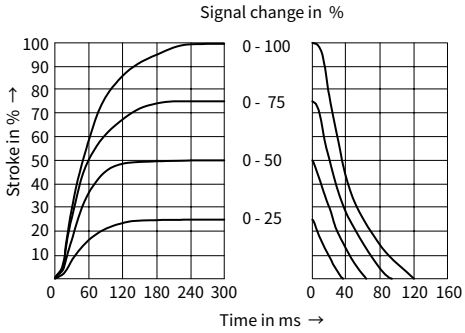


1.Com. value = 40 %
2.Com. value = 50 %
3.Com. value = 60 %
4.Com. value = 70 %
5.Com. value = 80 %
6.Com. value = 90 %
7.Com. value = 100 %

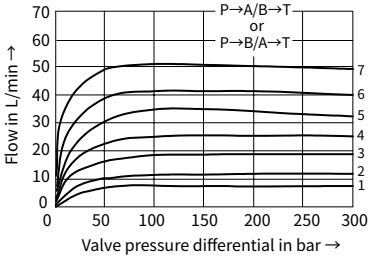
If the performance limits are exceeded then flow forces occur which lead to uncontrolled spool movements.

Characteristic curves (measured with HLP46, ϑ_{oil}=40°C ±5°C)

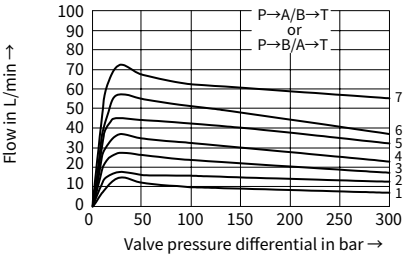
NG 10 Transient function with a stepped form of electrical input sign



Performance limit, nominal flow 30L/min



Performance limit, nominal flow 60 L/min



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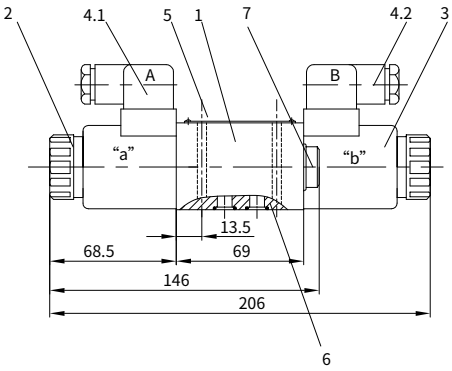
2.Com. value = 50 %
3.Com. value = 60 %
4.Com. value = 70 %
5.Com. value = 80 %
6.Com. value = 90 %
7.Com. value = 100 %

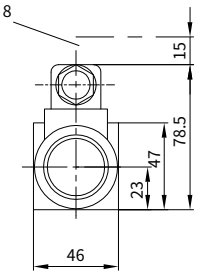
If the performance limits are exceeded then flow forces occur which lead to uncontrolled spool movements.

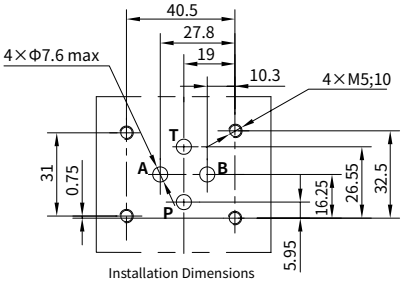
Unit dimensions

(nominal dimensions in mm)

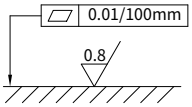
Type 4WRA6...L2X







Installation Dimensions
Mounting surface



Required surface finish of the valve mounting surface

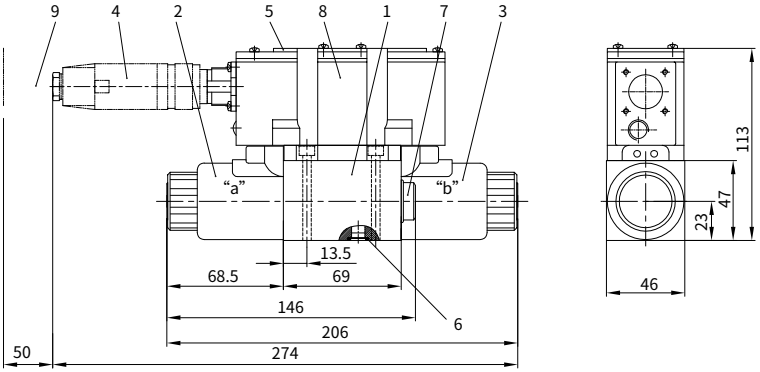
1 Valve housing
2 Proportional solenoid "a"
3 Proportional solenoid "b"
4.1 Plug-in connector "A"
4.2 Plug-in connector "B"
5 Name plate
6 Identical seal rings for ports A, B, P and T
(R-ring 9.81×1.5×1.78 or O-ring 9.25×1.78)
7 Plug for valves with one solenoid
(2 switching positions, versions EA or WA)
8 Space required to remove the plug-in connector

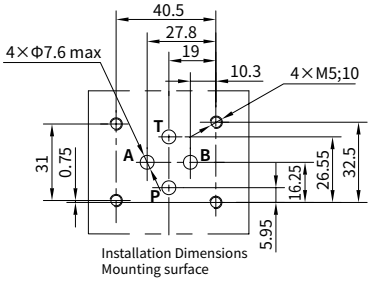
Valve mounting screws
The following valve fixing screws are recommended:
- 4 S.H.C.S.ISO 4762 - M5×50 - 10.9
- 4 GB / T 70.1 - M5×50 - 10.9
- Tightening torque M_A = 8.9 Nm ± 10%

Unit dimensions

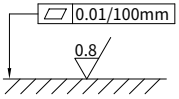
(nominal dimensions in mm)

Type 4WRAE6...L2X





Installation Dimensions
Mounting surface



Required surface finish of the valve mounting surface

1 Valve housing
2 Proportional solenoid "a"
3 Proportional solenoid "b"
4 Plug-in connector
5 Name plate
6 Identical seal rings for ports A, B, P and T
(R-ring 9.81×1.5×1.78 or O-ring 9.25×1.78)
7 Plug for valves with one solenoid
(2 switching positions, versions EA or WA)
8 Integrated electronics (OBE)
9 Space required to remove
the plug-in connector

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- 4 S.H.C.S.ISO 4762 - M5×50 - 10.9
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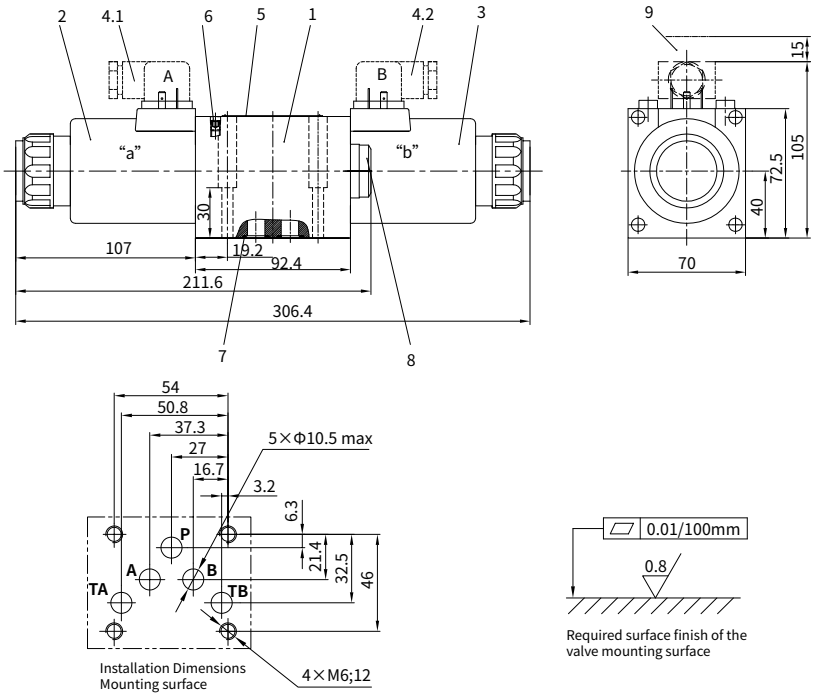
Unit dimensions

(nominal dimensions in mm)

Type 4WRA10...L2X



1 Valve housing
2 Proportional solenoid "a"
3 Proportional solenoid "b"
4.1 Plug-in connector "A"
4.2 Plug-in connector "B"
5 Name plate
6 Valve bleed screw
7 Identical seal rings for ports A, B, P and T
(R-ring 13×1.6×2 or O-ring 12×2)
8 Plug for valves with one solenoid
(2 switching positions, versions EA or WA)
9 Space required to remove the plug-in connector

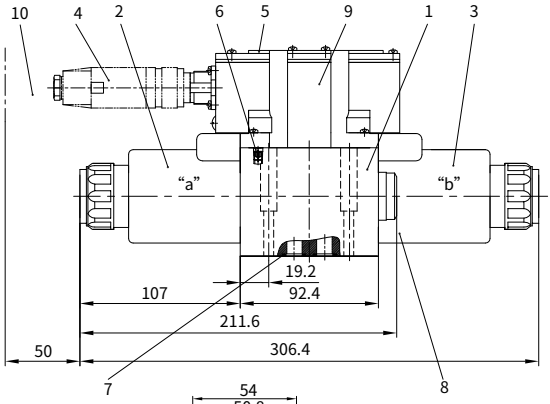
Valve mounting screws

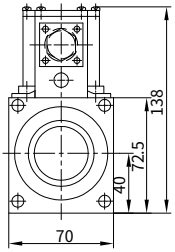
The following valve fixing screws are recommended:
- 4 S.H.C.S.ISO 4762 - M6×40 - 10.9
- 4 GB / T 70.1 - M6×40 - 10.9
- Tightening torque
M_A = 15.5 Nm ± 10%

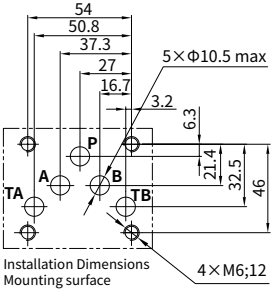
Unit dimensions

(nominal dimensions in mm)

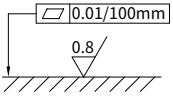
Type 4WRAE10...L2X







Installation Dimensions
Mounting surface



Required surface finish of the valve mounting surface

1 Valve housing
2 Proportional solenoid "a"
3 Proportional solenoid "b"
4 Plug-in connector
5 Name plate
6 Valve bleed screw
7 Identical seal rings for ports A, B, P and T (R-ring 13×1.6×2 or O-ring 12×2)
8 Plug for valves with one solenoid (2 switching positions, versions EA or WA)
9 Integrated electronics (OBE)
10 Space required to remove the plug-in connector

Valve mounting screws

The following valve fixing screws are recommended:

- 4 S.H.C.S.ISO 4762 - M6×40 - 10.9
- 4 GB / T 70.1 - M6×40 - 10.9
- Tightening torque M_A = 15.5 Nm ± 10%