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Electro-hydraulic Proportional Directional Valve

Model: 4WRZ(E)...7X

- Size 10 to 32
- Maximum working pressure 350 bar
- Maximum working flow 1600 L/min

Contents

Features

- Pilot operated proportional directional valve
- Control the direction and size of the flow
- For subplate mounting
- Spring centred control spool
- Operation by proportional solenoids with central thread and detachable coil
- Both valves and proportional amplifiers from the same supplier

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Pilot control valve model 3DREP6...
This pilot valve is a three-way pressure reducing valve controlled by a proportional solenoid. It converts an input signal into a proportional pressure output signal and is used for all valves model 4WRZ...
The proportional solenoids are adjustable, DC wet pin solenoids with central threads and detachable coils. The solenoids are controlled by external amplifier (model WRZ...) or internal amplifier (mode 4WRZE...)

Structure:
The valves consist of:

- Valve body with mounting surface (1)
- Control spool (2) with pressure measuring spools (3 and 4)
- Solenoids (5 and 6) with central threads
- Optional amplifier (7)

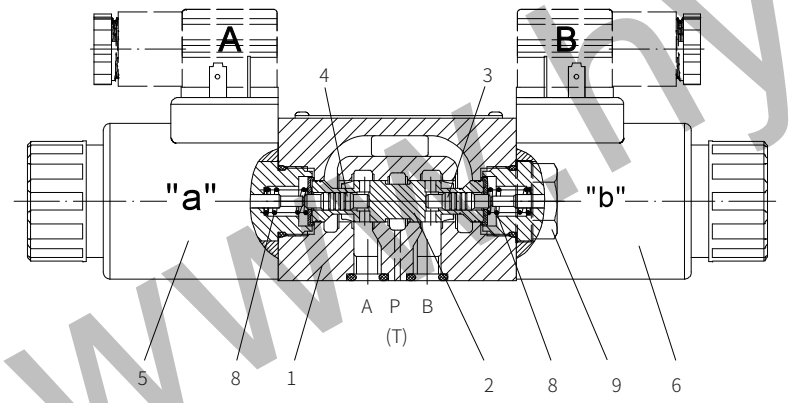
Operating Principle:

- When the solenoids (5and6) are de-energized, the compression spring (8) holds the control spool (2) in the central position.
- After the proportional solenoid is energized, it will directly push the control spool (2), e.g. energization of the solenoid "b" (6):

→The control spool (2) and pressure measuring spool (3) are pushed to the left in proportion to the electrical input signal.
→At this time, P to A and B to T are connected through the throttle formed by the spool and the valve body with progressive flow characteristics.

- De-energization of solenoid (6)

→The control spool (2) is pushed back to the central position by the compression spring (8). In the central position of the pilot valve, A and B are connected to T, that means the hydraulic fluid can flow to the tank directly.



Model 3DREP6...-2XJ/

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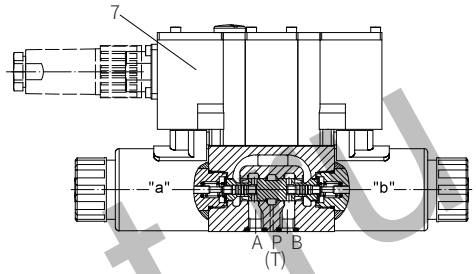
Note for model 3DREP6...
It must be avoided to drain all the oil in the return line. If necessary, a back pressure valve is to be installed in the circuit (back pressure about 2 bar).

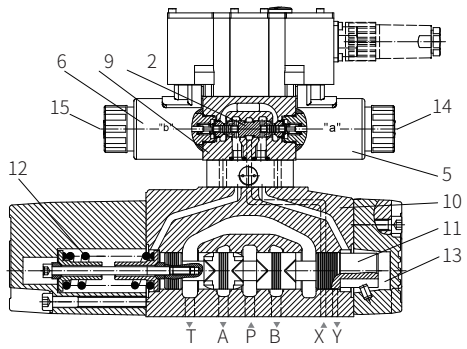


Model 3DREPE6...-2XJ/

Two position valve (model 3DREP... B...)
In principle, the function of this valve is similar to the valve with three-position. The two position valve is installed with solenoid "a" (5) only, and a screw plug (9) is installed at the position of the second solenoid.
Pilot operated proportional directional valve model 4WRZ...
The 4WRZ valve is pilot operated 4-way directional valve which is controlled by proportional solenoids, it controls the direction and size of the flow.
Structure:
The valves consist of:

- Pilot control valve (9) with proportional solenoids (5 and 6)
- Main valve (10) with main valve spool (11) and compression spring (12)

Operating principle:
When the solenoids (5 and 6) are de-energised, the compression spring (12) holds the main valve spool (11) in the central position.
→The action of the main valve spool (11) is controlled by the pilot valve (9), the main valve spool is proportional moved, e.g. by means of solenoid "b" (6).



Model 4WRZE16..-7XJ/..

→Firstly, the control spool (2) is pushed to the right, the pilot oil is fed through the pilot valve (9) into the pressure chamber (13) and moves the main spool (11) in proportion to the electrical input signal.

- At this time, P to B and A to T are connected through the throttle formed by the spool and the valve body with progressive flow characteristics.
- The pilot oil required for the pilot valve can be supplied internally through port P or externally through port X.

→When the solenoid (6) is de-energized, the control spool (2) and main valve spool (11) will return to the central position.

- Depending on the different position of the main valve spool, P to A and B to T or P to B and A to T are connected. The optional manual emergency operations (14 and 15) with protective cap allow the pilot valve (2) to move when the solenoid is not energized.

Attention! Inadvertent activation of manual emergency operation may cause the equipment movement out of control.

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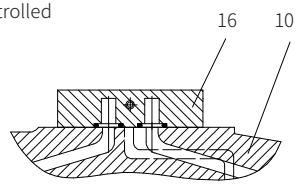
Function description, sectional drawing

Externally controlled pilot operated proportional directional valve, model 4WRH...

The model WRH... is a pilot proportional directional valve controlled by an external pressure regulating valve.



Model 4WRH...-7XJ/

Structure:

The valves consist of:

- Main valve (10) with main valve spool (11) and compression spring (12)
- Adapter board (16)

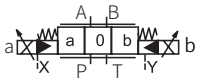
Working principle:

- The adapter board (16) connects the control port A to control port T (Y) and the control port B to port P (X). The pilot pressure of the main valve must not exceed 25 bar.

Functional symbols

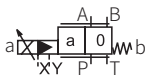
With electro-hydraulic operation and for external amplifier

Model 4WRZ...-7XJ/...

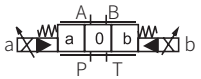


X=external
Y=external

Model 4WRZ...A-7XJ/...

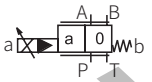


Model 4WRZ...-7XJ/...ET...



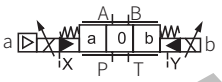
X=internal
Y=internal

Model 4WRZ...A...-7XJ/...ET...



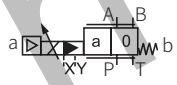
With electro-hydraulic operation and for integrated amplifier

Model 4WRZE...-7XJ/...

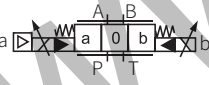


X=external
Y=external

Model 4WRZE...A-7XJ/...

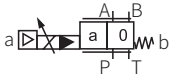


Model 4WRZE...-7XJ/...ET...



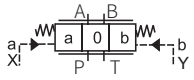
X=internal
Y=internal

Model 4WRZE.A...-7XJ/...ET...



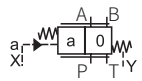
With hydraulic operation

Model 4WRH..7XJ/...



X=external
Y=external

Model 4WRH...A..7XJ/...



Models and specifications

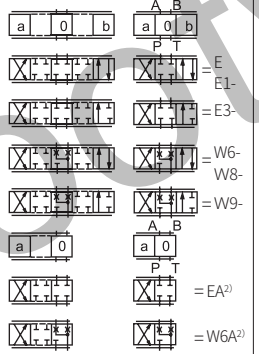
4WR_ | | | | – 7X | / | | | | / | | | *

hydraulic operation =H
electro-hydraulic operation =Z

for external electronics =No code
with integrated electronics =E

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

symbols



with symbols E1- and W8-:
P→A: q_{vmax}
B→T: $q_{v/2}$
P→B: $q_{v/2}$
A→T: q_{vmax}

with symbols E3- and W9-:
P→A: q_{vmax} B→T: closed
P→B: $q_{v/2}$ A→T: q_{vmax}
(When forming a differential circuit, the bottom interface of the hydraulic cylinder should be connected to port A)

note: For spools W6-, W8-, W9 and W6A, when in neutral position, a connection from A to T and B to T with less than 2% of the relevant nominal cross-section.

more information in text

sealing material
No code= NBR seals
V= FKM seals
(consult for other seals)

No code= without pressure reducing valve
D31) = with pressure reducing valve ZDR6DP0-4X/40YM-W80 (fixed setting)

electrical connection
For 4WRZE:
A1= command value input ± 10 V
F1= command value input 4 to 20mA
No code= for WRZ and WRH

electrical connections
K4= for model 4WRZ... without plug in connector
K31= for model 4WRZE... plug-in connector

supply and drain of pilot oil
No code= pilot oil supply external drain external
E= pilot oil supply internal drain external
ET= pilot oil supply internal drain internal
T= pilot oil supply external drain internal

No code= without special protection

No code= no manual emergency operation
N9= with hidden manual emergency operation

electronic control supply voltage
G24= 24V DC (standard)

6E= pilot valve, proportional solenoid with detachable coil

7X= 70 to 79 series (installation and connection size unchanged)

nominal flow rate at valve pressure difference △ P=10bar

25=	50=	85=	size 10
100=	150=		size 16
220=	325=		size 25
360=	520=		size 32

1) Not used for 4WRH and 4WRZ without pilot valve
2) Not applicable for model 4WRH

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Overview					
Valve model			.WRZ	.WRZE	
Installation position			Optional, firstly horizontal		
Storage temperature range		°C	-20 to +80		
Environment temperature range		°C	- 20 to + 70	- 20 to + 50	
Weight -Subplate mounting	size 10	kg	7.8	8.0	
	size 16	kg	13.4	13.6	
	size 25	kg	18.2	18.4	
	size 32	kg	42.2	42.2	

Hydraulic (Measured at pressure P=100 bar and using HLP46, ϑ_{oil}=40°C ± 5°C)						
size		size	10	16	25	32
Working pressure - Pilot valve	External pilot oil supply	bar	30 to 100			
	Internal pilot oil supply	bar	100 to 315 with "D3"	100 to 350 with "D3"		
Main valve port P, A, B		bar	Up to 315	Up to 350	Up to 350	Up to 350
Return flow pressure	Port T (port R) (External pilot oil drain)	bar	Up to 315	Up to 250	Up to 50	Up to 150
	Port T (Internal pilot oil drain)	bar	Up to 30	Up to 30	Up to 30	Up to 30
	Port Y	bar	Up to 30	Up to 30	Up to 30	Up to 30
Flow of the main valve		L/min	Up to 170	Up to 460	Up to 870	Up to 1600
Control oil flow in port X and Y with stepped input signal (0 →100 %)		L/min	3.5	5.5	7	15.9
Pilot oil volume for reversing of the main valve 0 →100 %		cm^3	1.7	4.6	10	26.5
Fluid		°C	Mineral oil (HL, HLP)[1] In accordance with DIN 51524; Fast living organisms degraded oil according to VDMA 24568; HETG (Rapeseed oil)[1]; HEPG (Polyethyleneglycol)[2] ; HEES (Synthetic Fats) [2]			
Oil temperature range			-20 to +80 (preferably +40 to +50)			
Viscosity range		mm^2	20 to 380 (preferably 30 to 46)			
The maximum allowable pollution degree of the oil - Pilot valve			Class 18/16/13			
- Main valve			Class 20/18/15			
Hysteresis		%	⩽ 6			

The oil must meet the cleanliness degree requested by the components in the hydraulic system.
Effective oil filtration can prevent failure and increase the service life of the components.

Electrical					
Valve model				.WRZ	.WRZE
Valve protection to EN60529				IP65, plug installed and locked	
Voltage type				DC	
Command value overlap			%	15	
Maximum current			A	1.5	2.5
Solenoid coil resistance	Cold value at 20°C		Ω	4.8	2
	Maximum warm value		Ω	7.2	3
Power rate			%	100	
Maximum coil temperature			°C	150	
Electrical connection	WRZ			With component plug and plug-in connector to DINEN 175301-803	
	WRZE			With component plug and plug-in connector to DINEN 175201-804	
Control electronics					
Internal amplifier for model 4WRZE...				Integrated in the valve	
Current consumption	I_{max}		A	-	1.8
	Impulse current		A	-	3
Command value signal		Voltage input "A1"	V	-	±10
		Current input "F1"	mA	-	4 to 20
External amplifier for model 4WRZ...					
Modular amplifier				RT-PVDA-OX-D2-30-CN-A1/F1	

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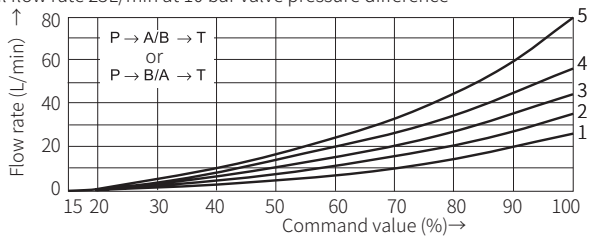
Characteristic curve

(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

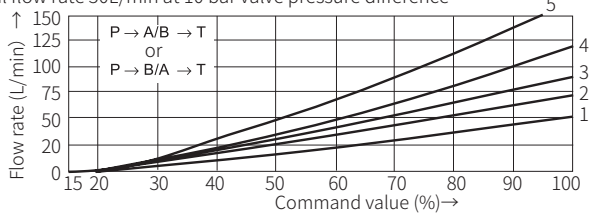
Size 10

The nominal flow rate 25L/min at 10 bar valve pressure difference



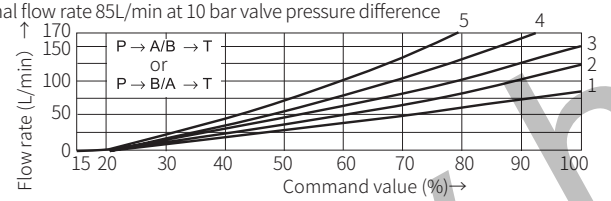
1 △P=10 bar constant
2 △P=20 bar constant
3 △P=30 bar constant
4 △P=50 bar constant
5 △P=100 bar constant

The nominal flow rate 50L/min at 10 bar valve pressure difference



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

The nominal flow rate 85L/min at 10 bar valve pressure difference

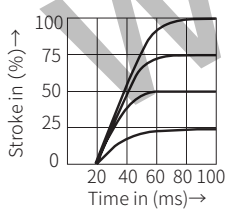


1 △P=10 bar constant
2 △P=20 bar constant
3 △P=30 bar constant
4 △P=50 bar constant
5 △P=100 bar constant

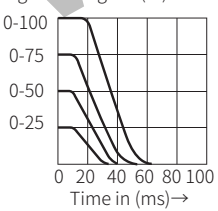
△P=valve pressure difference (inlet pressure P_P minus load pressure P_L and minus return oil pressure P_T)

Transition performance of the valve when the input signal is a step signal, measured at P_{st}=50 bar

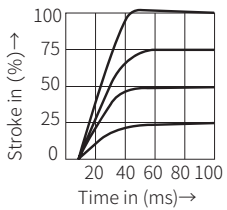
Model 4WRZ...



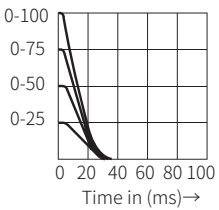
Signal change in (%)



Model 4WRZE...



Signal change in (%)

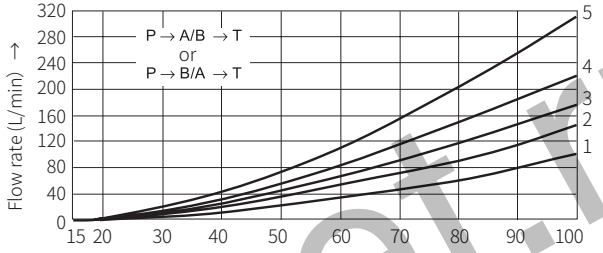


Characteristic curve

(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

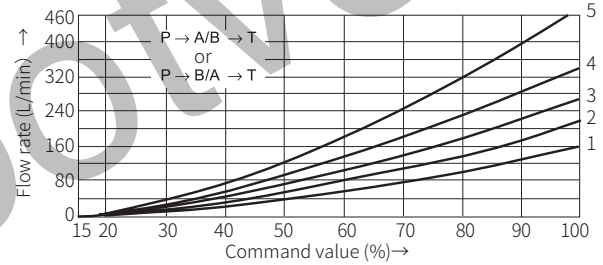
Size 16

The nominal flow rate 100L/min at 10 bar valve pressure difference



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

The nominal flow rate 150L/min at 10 bar valve pressure difference

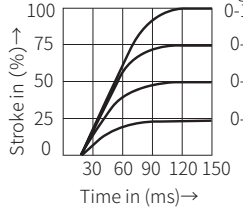


1 △P=10 bar constant
2 △P=20 bar constant
3 △P=30 bar constant
4 △P=50 bar constant
5 △P=100 bar constant

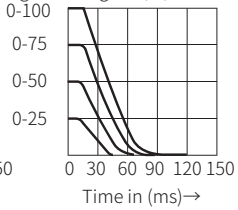
△P=valve pressure difference (inlet pressure P_P minus load pressure P_L and minus return oil pressure P_T)

Transition performance of the valve when the input signal is a step signal, measured at P_{st}=50 bar

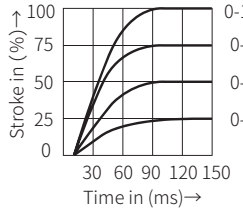
Model 4WRZ...



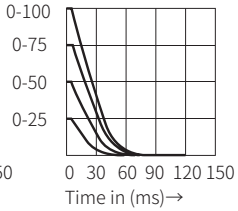
Signal change in (%)



Model 4WRZE...



Signal change in (%)



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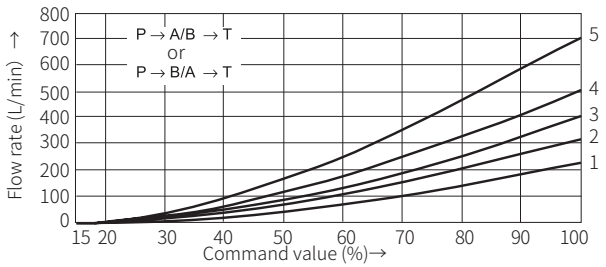
Characteristic curve

(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

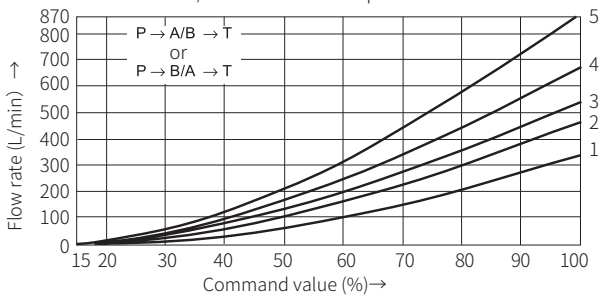
Size 25

The nominal flow rate 220L/min at 10 bar valve pressure difference



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

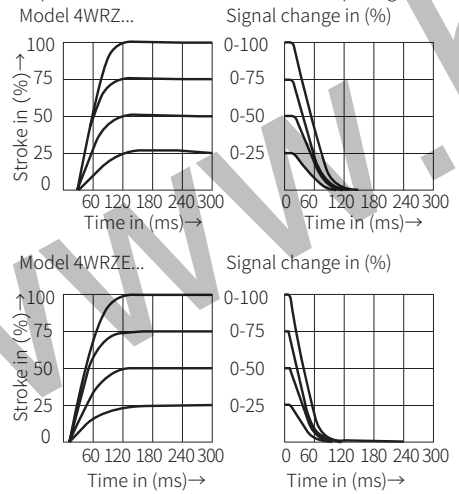
The nominal flow rate 325L/min at 10 bar valve pressure difference



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

△P=valve pressure difference (inlet pressure P_P minus load pressure P_L and minus return oil pressure P_T)

Transition performance of the valve when the input signal is a step signal, measured at P_{st}=50 bar

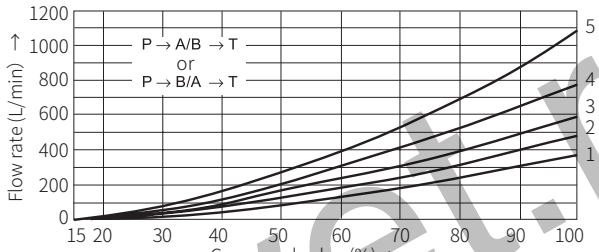


Characteristic curve

(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

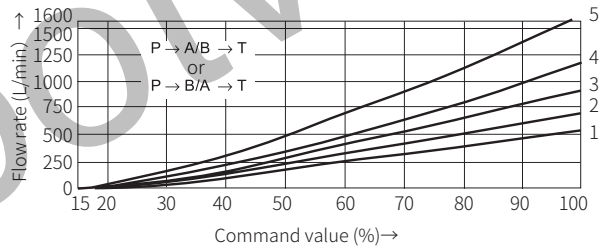
Size 32

The nominal flow rate 360L/min at 10 bar valve pressure difference



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

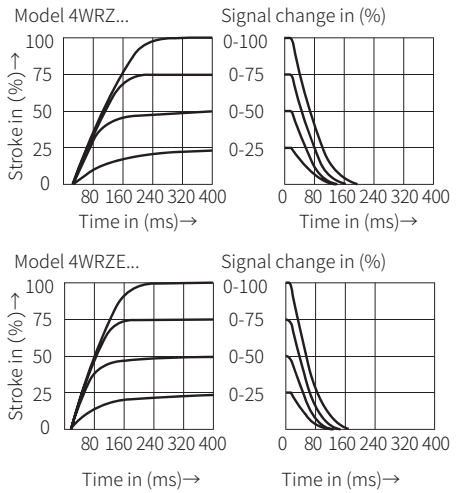
The nominal flow rate 520L/min at 10 bar valve pressure difference



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

△P=valve pressure difference (inlet pressure P_P minus load pressure P_L and minus return oil pressure P_T)

Transition performance of the valve when the input signal, measured at P_{st}=50 bar



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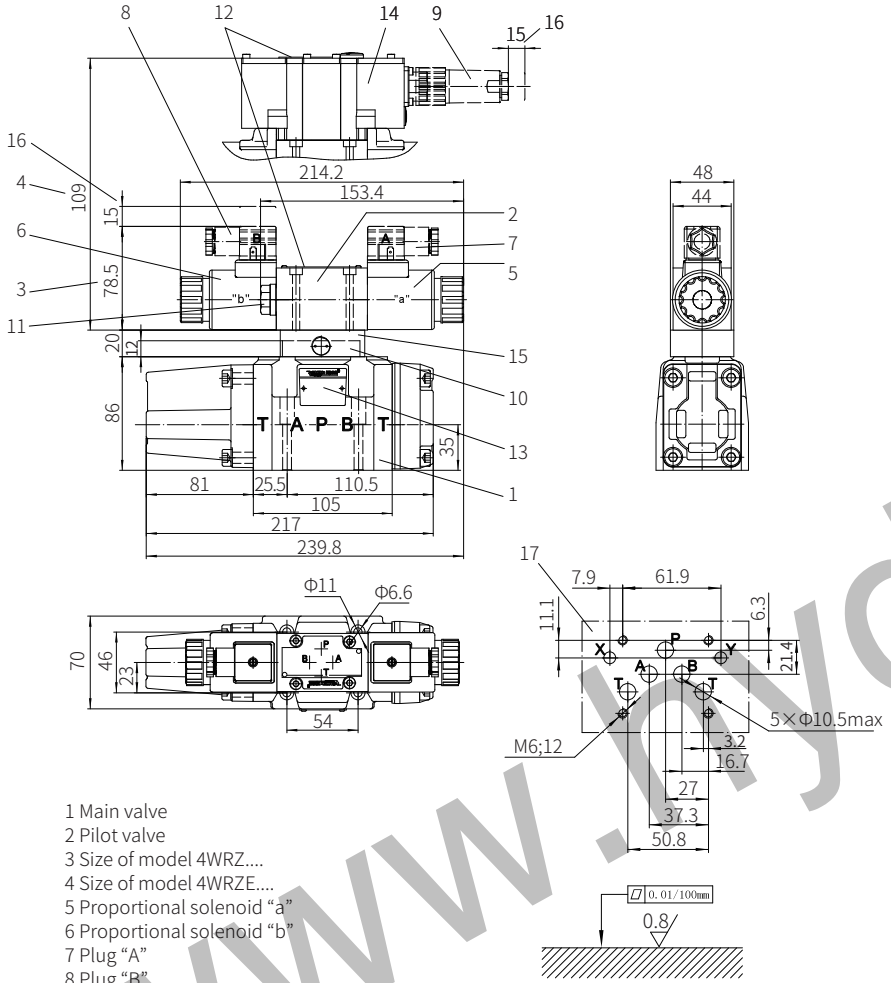
Model 4WRZ(E)10...-7XJ/...

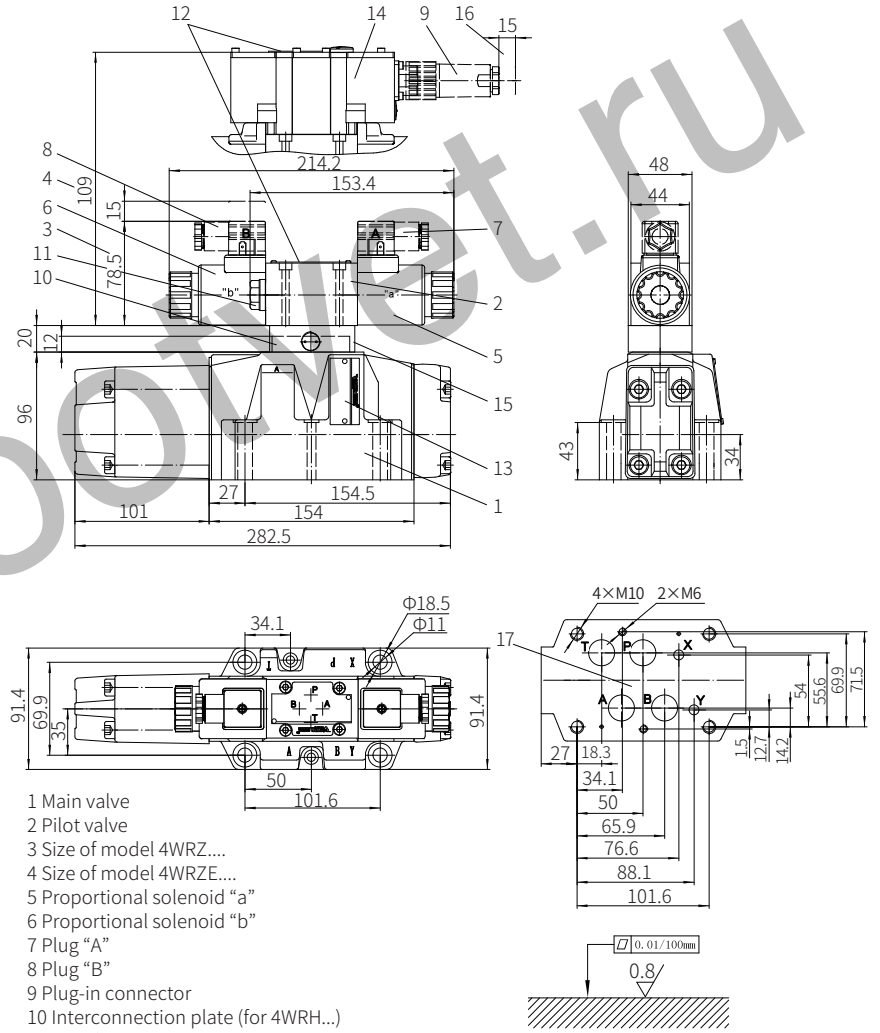


1 Main valve
2 Pilot valve
3 Size of model 4WRZ....
4 Size of model 4WRZE....
5 Proportional solenoid “a”
6 Proportional solenoid “b”
7 Plug “A”
8 Plug “B”
9 Plug-in connector
10 Interconnection plate (for 4WRH...)
11 Plug for valve with one solenoid
12 Name plate for pilot valve
13 Name plate for main valve
14 Built-in amplifier (OBE)
15 Pressure reducing valve “D3”
16 Space required to remove the plug
17 Valve connection surface

Required surface finishing of mating components

Valve fixing screw
M6x40-10.9 grade GB/T70.1-2000
Tightening torque M_A=13.7Nm

Model 4WRZ(E)16...-7XJ/...



1 Main valve
2 Pilot valve
3 Size of model 4WRZ....
4 Size of model 4WRZE....
5 Proportional solenoid “a”
6 Proportional solenoid “b”
7 Plug “A”
8 Plug “B”
9 Plug-in connector
10 Interconnection plate (for 4WRH...)
11 Plug for valve with one solenoid
12 Name plate for pilot valve
13 Name plate for main valve
14 Built-in amplifier (OBE)
15 Pressure reducing valve “D3”
16 Space required to remove the plug
17 Valve connection surface

Required surface finishing of mating components

Valve fixing screw
4xM10x60-10.9 grade GB/T70.1-2000
Tightening torque M_A=60Nm
2xM6x55-10.9 grade GB/T70.1-2000
Tightening torque M_A=13.7Nm

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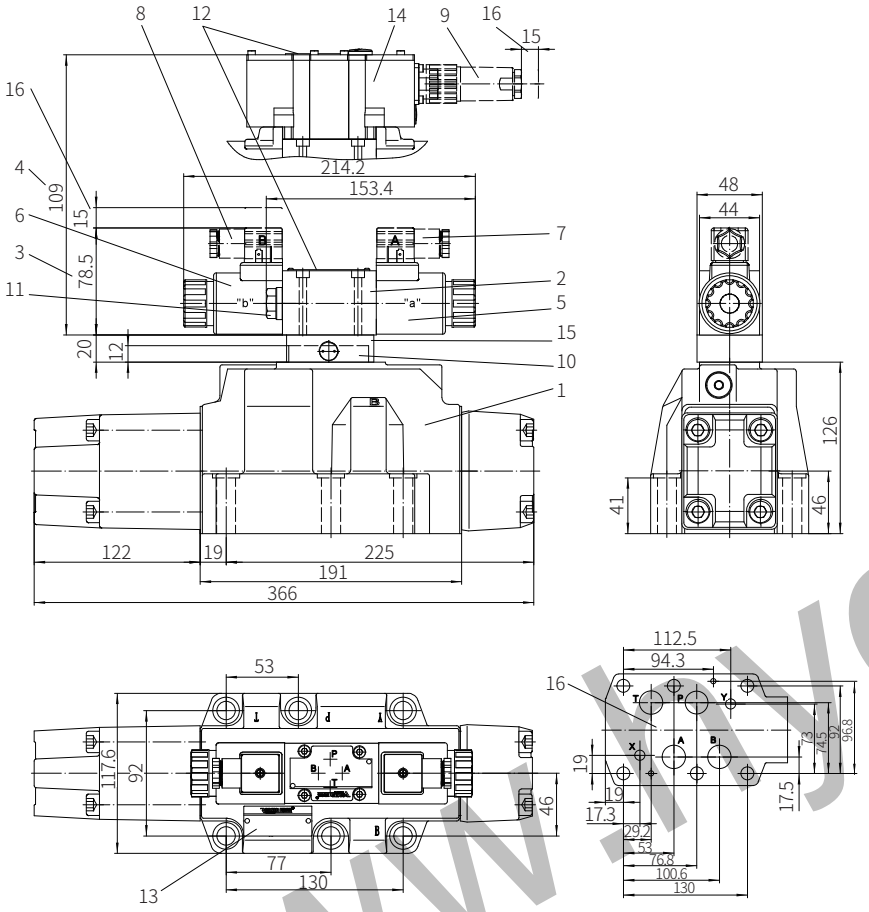
Model 4WRZ(E)25...-7XJ/...

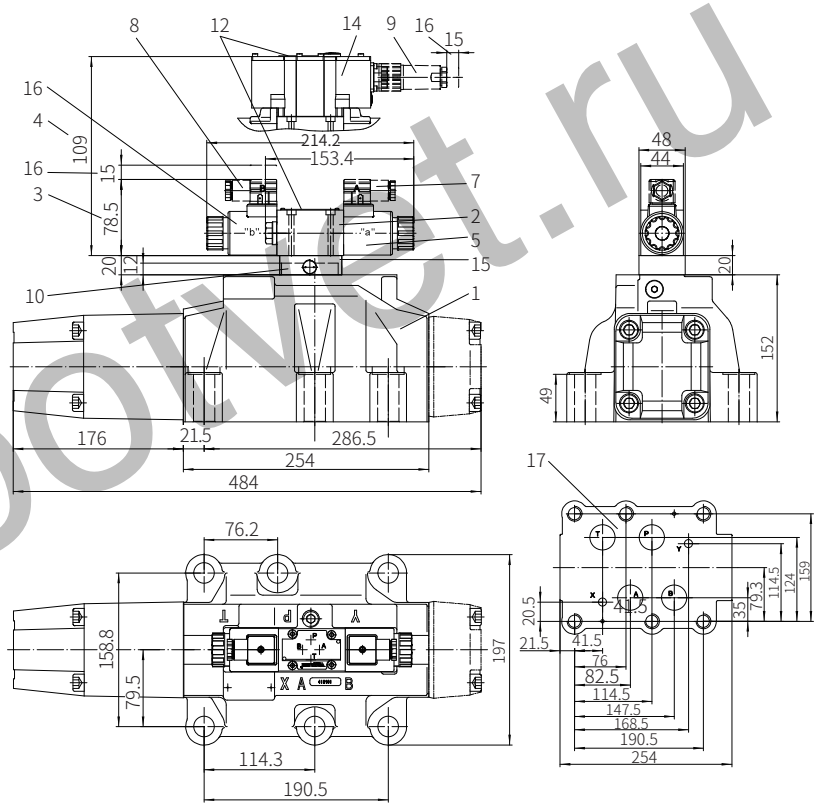


1 Main valve
2 Pilot valve
3 Size of model 4WRZ....
4 Size of model 4WRZE....
5 Proportional solenoid “a”
6 Proportional solenoid “b”
7 Plug “A”
8 Plug “B”
9 Plug-in connector
10 Interconnection plate (for 4WRH...)
11 Plug for valve with one solenoid
12 Name plate for pilot valve
13 Name plate for main valve
14 Built-in amplifier (OBE)
15 Pressure reducing valve “D3”
16 Space required to remove the plug
17 Valve connection surface

Required surface finishing of mating components

Valve fixing screw
6xM12x60-10.9 grade GB/T70.1-2000
Tightening torque M_A=95Nm

Model 4WRZ(E)32...-7XJ/...



1 Main valve
2 Pilot valve
3 Size of model 4WRZ....
4 Size of model 4WRZE....
5 Proportional solenoid “a”
6 Proportional solenoid “b”
7 Plug “A”
8 Plug “B”
9 Plug-in connector
10 Interconnection plate (for 4WRH...)
11 Plug for valve with one solenoid
12 Name plate for pilot valve
13 Name plate for main valve
14 Built-in amplifier (OBE)
15 Pressure reducing valve “D3”
16 Space required to remove the plug
17 Valve connection surface

Required surface finishing of mating components

Valve fixing screw
6xM20x80-10.9 grade GB/T70.1-2000
Tightening torque M_A=373Nm

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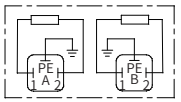
Electrical connections

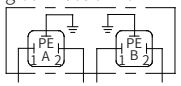
Model 4WRZ...2XJ/...(Without built-in amplifier)

Component plug connection form

The plug-in connector to DINEN 175301-803 or ISO4400

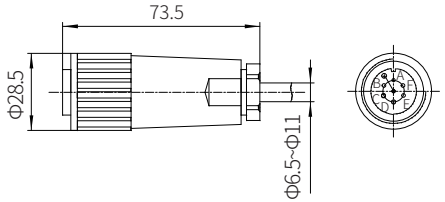


Component plug connection form



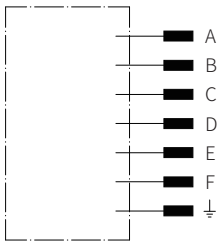
Model 4WRZE...2XJ/...(With built-in amplifier)

The plug-in connector to DINEN 175201-804



Model 4WRZE...(With built-in amplifier)

Terminal identification of plugs



Terminal identification	Contact	A1 signal	F1 signal
Supply voltage	A	24VDC(19~35V)	
	B	GND	
	C	no connection[1)]	
Differential amplifier input	D	±10V, Re>50K Ω	4~20mA, Re>100 Ω
	E	Reference potential	
	F	no connection[1)]	

Command value:

A positive command value 0 to 10V (or 12 to 20mA) at D and E causes a flow from P to A and B to T.

A negative command value 0 to -10V (or 12 to 4mA) at D and E causes a flow from P to B and A to T.

For valves only with one solenoid in side "A" (symbols EA and WA), a positive command value at D and E causes a flow from P to B and A to T.

Connecting cable:

Recommendation:

Cable length up to 25m, model LiYCY 5x0.75mm²

Cable length up to 50m, model LiYCY 5x1.0mm²

The external diameter of the cable is 6.5 to 11mm

The connection of screen to PE on the supply side only.

[1)]Contacts C and F are not allowed to be connected together.

Control oil supply

Model 4WRZ... -.../ pilot oil supply external
Model 4WRH... -.../ pilot oil drain external

In this construction, the pilot oil is supplied from a separate control circuit (supply external).
The pilot oil return via port Y separately (drain external) but not through the port "T" of main valve.

Model 4WRZ... -.../...E...pilot oil supply internal
pilot oil drain external

In this construction, the pilot oil is supplied from port P of the main valve
(supply internal).
The pilot oil return via port Y separately (drain external) but not through port T of main valve.
Ports "Y" in the subplate is closed.

Model 4WRZ... -.../...ET...pilot oil supply internal
pilot oil drain internal

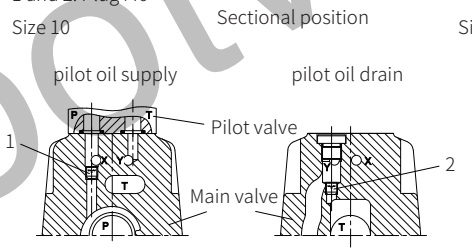
In this construction, the pilot oil is supplied from port P of the main valve (supply internal).
The pilot oil return to port T of main valve directly (drain internal).
Ports "X" and "Y" in the subplate are both closed.

Model 4WRZ... -.../...T...pilot oil supply external
pilot oil drain internal

In this construction, the pilot oil is supplied from a separate control circuit (supply external).
The pilot oil return to port T of the main valve (drain internal).
Port "Y" in the subplate is closed.

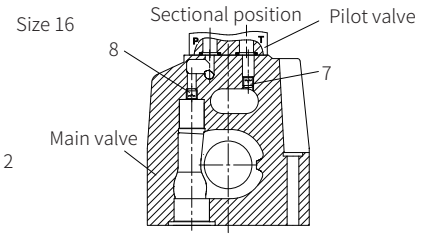
1 and 2: Plug M6

Size 10



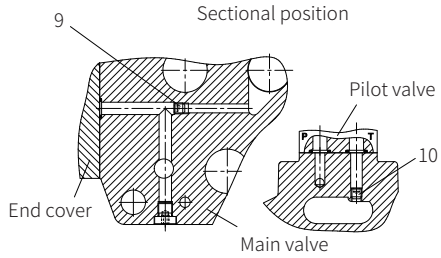
Pilot oil supply external: 1 closed
internal: 1 open
Pilot oil return external: 2 closed
internal: 2 open

Size 16



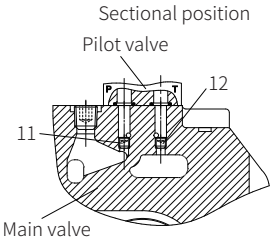
Pilot oil supply external: 8 closed
internal: 8 open
Pilot oil return external: 7 closed
internal: 7 open

Size 25



Pilot oil supply external: 9 closed
internal: 9 open
Pilot oil return external: 10 closed
internal: 10 open

Size 32



Pilot oil supply external: 11 closed
internal: 11 open
Pilot oil return external: 10 closed
internal: 10 open

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