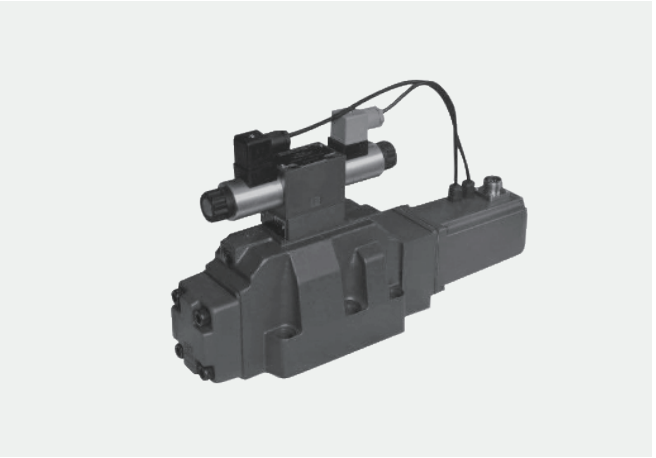
Electro-hydraulic Proportional Directional Valve

Model: 4WRKE...3XJ



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

Contents

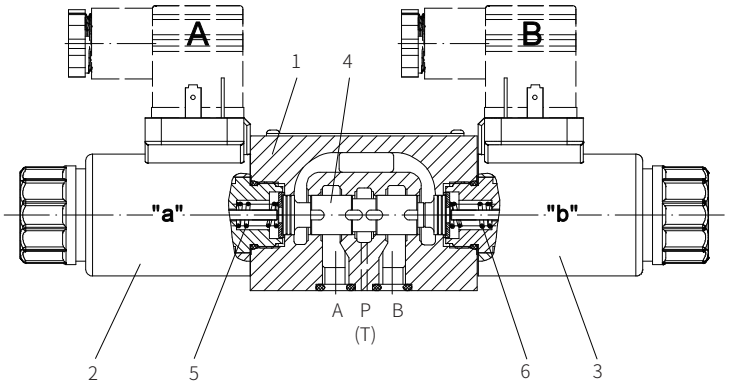
Features

- ● Pilot operated two-stage proportional directional valve
- ● For subplate mounting
- ● Control the direction and size of the flow
- ● Operation by proportional solenoids
- ● Spring centred main control spool
- ● Electrical position feedback
- ● Main stage with position closed-loop control
- ● Internal amplifier

Function description, sectional drawing

Pilot control valve model 4WRAP6W7...3XJ/G24... (1st stage)
This valve is a direct operated proportional valve. The dimensions of control edge is designed and optimized for the use as a pilot control valve for proportional directional valves model 4WRKE.
The proportional solenoids are oil-immersed DC solenoids with detachable coils. They convert the electric current proportionally into mechanical force. The increase of electric current cause the correspondingly higher of solenoid force. During the whole adjustment stroke, the set solenoid force remains unchanged.

The pilot control valve mainly consists of the valve body (1), proportional solenoids (2 and 3), valve spool (4), and springs (5and 6).
When the solenoid is de-energised, the working oil ports are connected to the oil tank. If one of the two solenoids (2 or 3) is energised, the solenoid force moves the valve spool (4) against the spring (5 or 6). Once the overlap area is overcome, one of the two working oil ports connected to the oil tank is blocked and will connect to the pressure chamber. Then the fluid flows from P to the control chamber of the main stage.

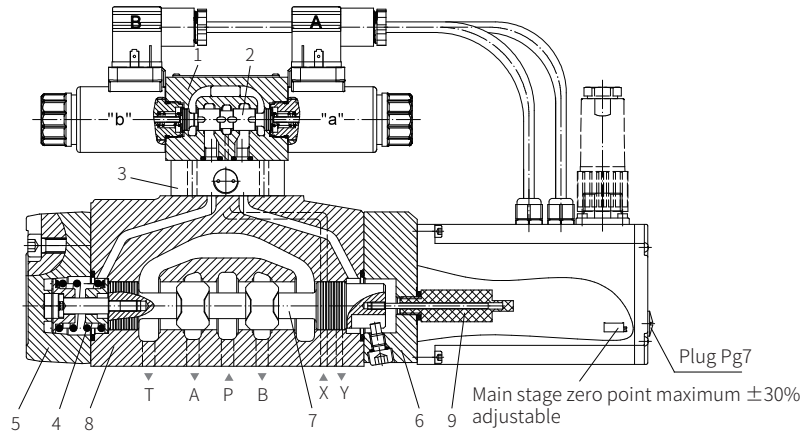


Model 4WRAP6W7-3XJ/G24...

Function description, sectional drawing

The 4WRKE valve is a two-stage proportional directional control valve. They control the size and direction of the flow. The main stage is position closed loop controlled so that the valve spool position is independent of the hydraulic force in larger flows.
The valve consists of the pilot control valve (1), valve body (8), main valve spool (7), covers (5and 6), centering spring (4), inductive position sensor (9), and pressure reducing valve (3).
If there is no input signal, the main valve spool (7) is held in the the central position by the centering spring (4). The two control chambers in the covers (5 and 6) are connected to the oil tank through the valve spool (2).
The main valve spool (7) is connected to the corresponding electronic amplifier through the induction position sensor (9), the change of position of the main valve spool (7) as well as the change of the command value at the summing point of the amplifier result in a differential voltage.

The control deviation is obtained by comparing the command value/ actual value through the electronic and a current is supplied to the proportional solenoid of the pilot valve (1).
The current induces solenoid force within the solenoid and transmit it to the solenoid push rod to push the control valve spool. The flow through the control port causes the main spool to move.
The main valve spool (7) with the solenoid core induction position sensor (9) continues to move until the actual value and command value are equal.
Under the condition of closed loop control, the main valve spool (7) is in force balanced and remained in the control position.
The changes of valve spool stroke and the control valve opening are proportional to the command value. The electronic control amplifier is built into the valve.
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 4WRKE16...-3XJ/

Valve characteristics

- The second stage is basically composed of our proportional valve components.
- The zero point adjustment of the "main stage zero point" is preset by the manufacturer, and can be adjusted within range of ± 30% of the nominal stroke through the potentiometer inside the electronic control. The integrated electronic control can be operated by removing the plug at the end of the valve cover.
- When replacing the pilot control valve or electronic controller, it must be readjusted.

Any adjustment must be carried out by trained experts.

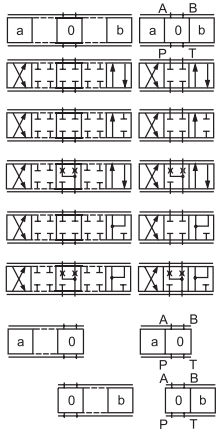
Models and specifications

4WRKE | | | | -3X | J | / 6E | G24 | | K31 | / | | D3 | | *

Electrically operated, 2-stage proportional directional valve in 4-way with integrated amplifier

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 R and R3:
P→A : q_{Vmax} B→P: $q_{v/2}$
P→B: q_{Vmax} A→T: q_{Vmax}

note:
For spools W6, W8 and R3, when in neutral position, a connection from A to T and B to T with 2% around of the relevant nominal cross-section.

more information in text

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

D3= With pressure reducing valve ZDR6DP0-4X/40YM-W80 (fixed setting)

Electrical connection
A1=Command value/actual value ±10V
F1= Command value /actual value 4 to 20 mA

Electrical connection
K31= With component plug and plug-in connector to DIN EN 175201-804

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

Supply voltage
G24= 24V DC

6E= proportional solenoid with detachable coil

J= Rekith

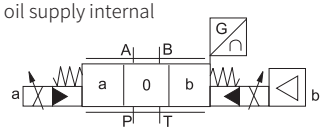
3X= 30 to 39 series
(30 to 39 series installation and connection size unchanged)

Characteristic curve form
L= Linear

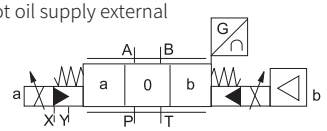
Nominal flow rate-reference characteristic curve
25= or 50= or 100= Size 10
125= or 200= Size 16
220= or 350= Size 25
400= or 600= Size 32

Functional symbols

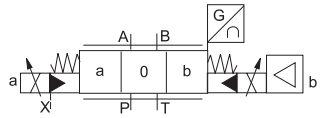
Model 4WRKE...-3XJ...ET...
pilot oil supply internal



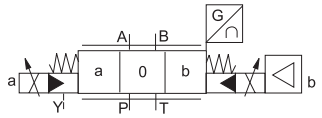
Model 4WRKE...-3XJ...
pilot oil supply external



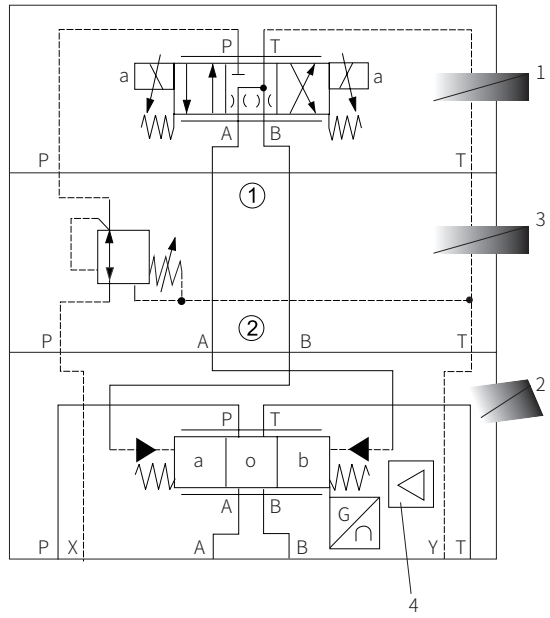
Model 4WRKE-3XJ...T...
pilot oil supply external and drain internal



Model 4WRKE...-3XJ...E...
pilot oil supply internal and drain external



Functional symbols detailed:
1、Pilot control valve, model 4WRAP6...
2、Main valve
3、Pressure reducing valve, model ZDR6DP0-4XJ/40YM-W80
4、Integrated electronic controller



Technical parameters

Overview						
Size			10	16	25	32
Installation and commissioning			Optional, firstly horizontal			
Storage temperature range		°C	-20 to +80			
Environment temperature range		°C	-20 to +50			
Weight		kg	8.7	11.2	16.8	31.5
Hydraulic	(Measured at pressure P=100 bar and using HLP46, ϑ_{oil}=40°C ± 5°C)					
Working pressure	Pilot control valve Pilot oil supply	bar	25 to 315			
	Main valve oil ports A, B, P	bar	Up to 315	Up to 350	Up to 350	Up to 350
Return flow pressure	Port T Pilot oil drain, internal	bar	Static <10 (pilot valve)			
	Pilot oil drain, external	bar	Up to 315	Up to 250	Up to 250	Up to 250
	Port Y	bar	Static <10 (pilot valve)			
Nominal flow rate q_{vnom} ± 10% (at Δ P=10bar) △P=valve pressure differential		L/min	25 50 100	- 125 180	- 220 350	- 400 600
Flow of the main valve (maximum permissible flow)		L/min	170	460	870	1600
Control oil flow in port X and Y with stepped input signal (0 to 100 %) (315 bar)		L/min	4.1	8.5	11.7	13
Fluid			Mineral oil (HL, HLP) to DIN 515241; Biology can quickly decompose oil according to VDMA 24568; HETG (Rapeseed oil)[1]; HEPG(Polyethyleneglycol)[2] ; HEES (Synthetic Fats) [2]			
The maximum allowable pollution degree of the oil	Pilot valve		Class 17/15/12[3]			
According to ISO 4406 (c)	Main valve		Class 120/18/15[3]			
Oil temperature range		°C	-20 to +80 (preferably +40 to +50)			
Viscosity range		mm^2/s	20 to 380 (preferably 30 to 45)			
Hysteresis		%	⩽1			
Response sensitivity		%	⩽0.5			
Electrical						
Voltage type			DC			
Signal type			Analog			
Maximum power		W	72 (average=24W)			
Electrical connection			With plug-in connector to DINEN 175201-804			
Valve protection to EN 60529			IP65, plug installed and locked			
Electric controller			Integrated in the valve			

1) For NBR seal and FKM seal.
2) Only for FKM seal.
3) 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.

Characteristic curve

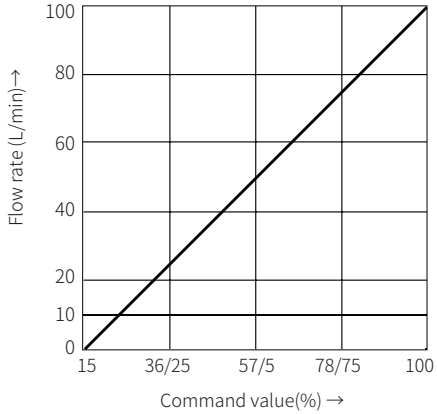
(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

Flow-command value characteristic curve, e.g.

P → A /B → T: 10bar pressure differential (symbols E and W6)
P → A or A → T: 5bar pressure drop

Applicable to functional symbol E..., W... and R...

The characteristic curve of the valve spool is L

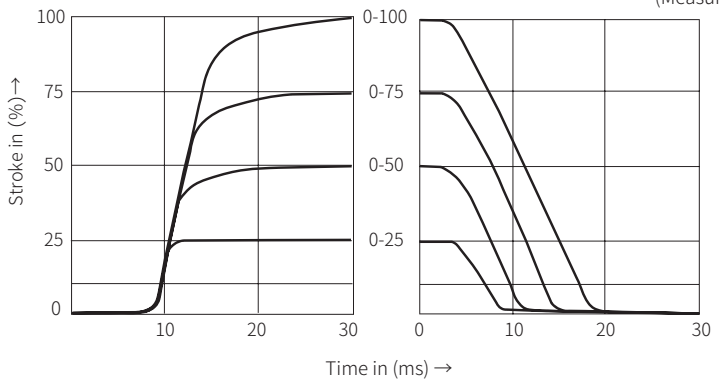


Characteristic curve

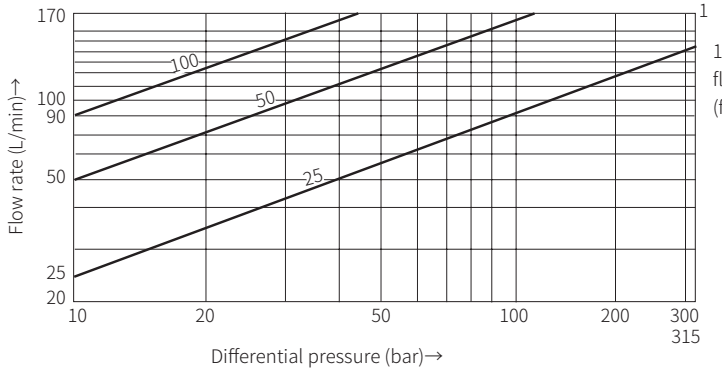
(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

Transition performance of the valve when the input signal is a step signal — Size 10

Signal change in (%) (Measured at P_{st}=100bar)



Flow load curve at maximum valve opening
(Tolerance ± 10%)



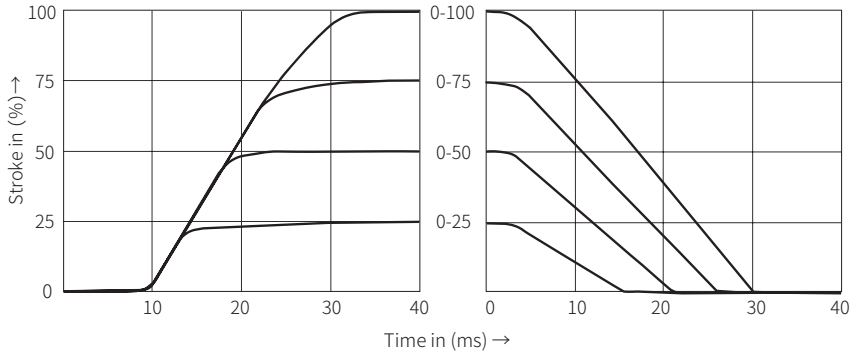
1=Recommended flow limitation (flow rate 30 m/s)

Characteristic curve

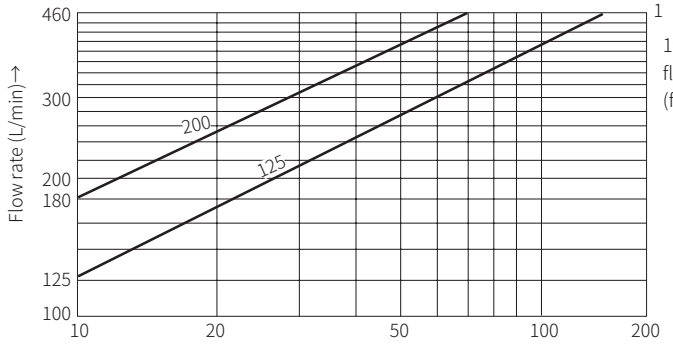
(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

Transition performance of the valve when the input signal is a step signal — Size 16

Signal change in (%) (Measured at P_{st}=100bar)



Flow load curve at maximum valve opening
(Tolerance ± 10%)

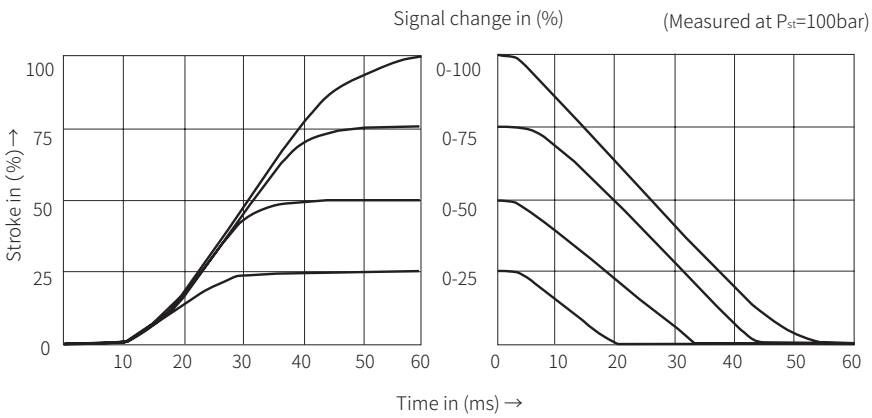


1=Recommended flow limitation (flow rate 30 m/s)

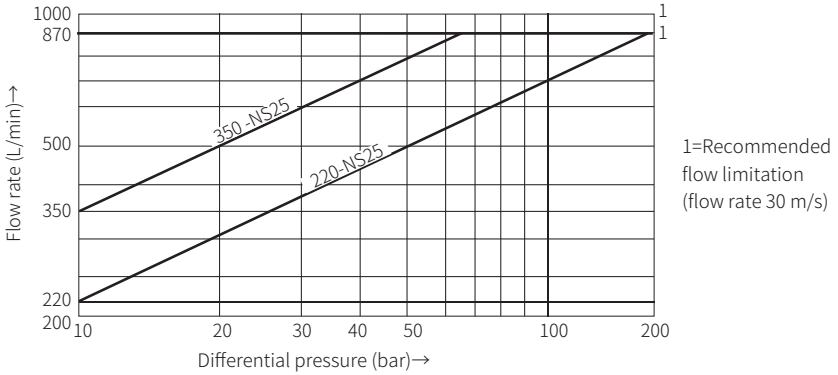
Characteristic curve

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

Transition performance of the valve when the input signal is a step signal Size 25



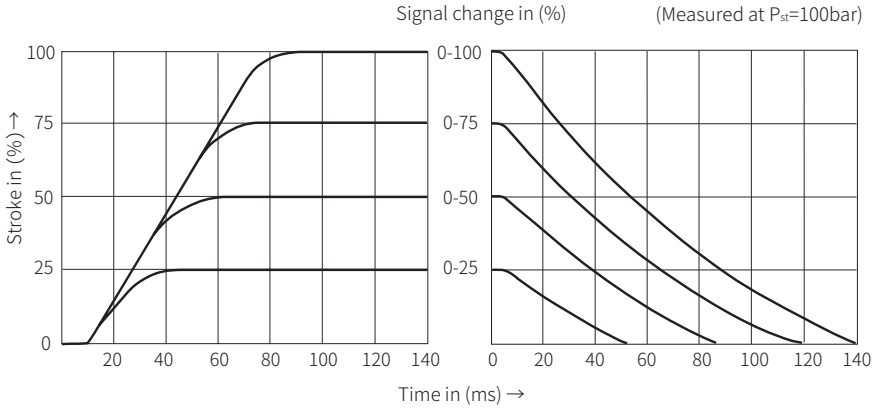
Flow load curve at maximum valve opening
(Tolerance ± 10%)



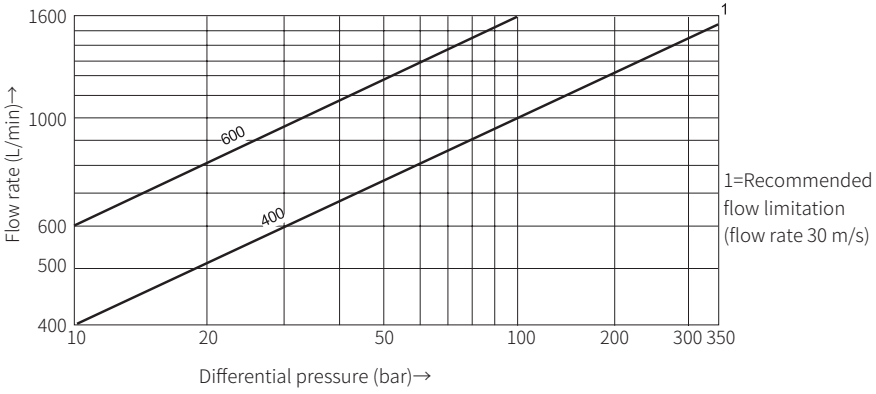
Characteristic curve

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

Transition performance of the valve when the input signal is a step signal Size 32



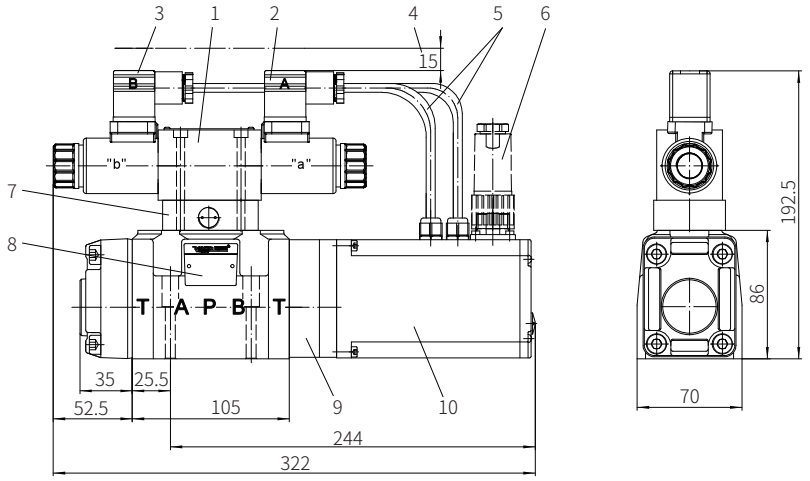
Flow load curve at maximum valve opening
(Tolerance ± 10%)

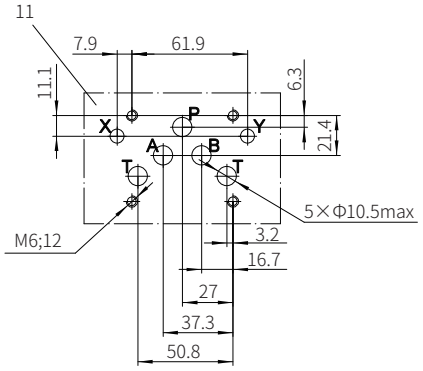


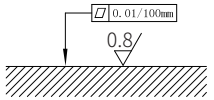
Component size

Size unit: mm

Model 4WRKE10...-3XJ/...







Required surface finishing of mating components

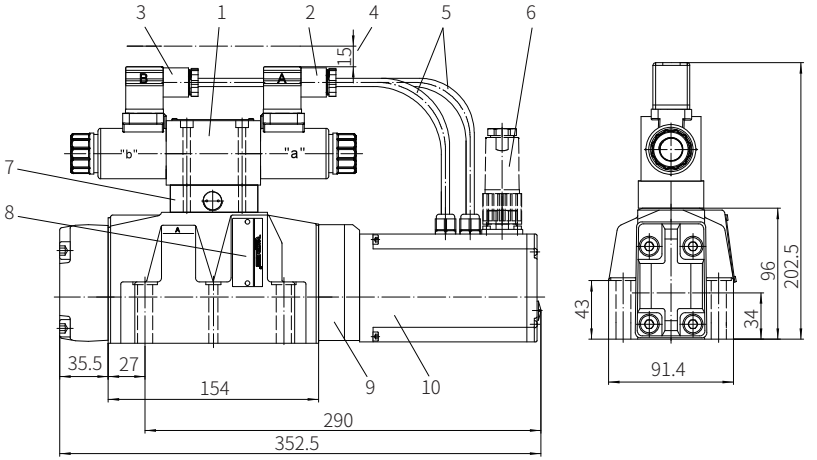
Valve fixing screw
M6x40-10.9 grade GB/T70.1-2000
Tightening torque M_A=13.7Nm

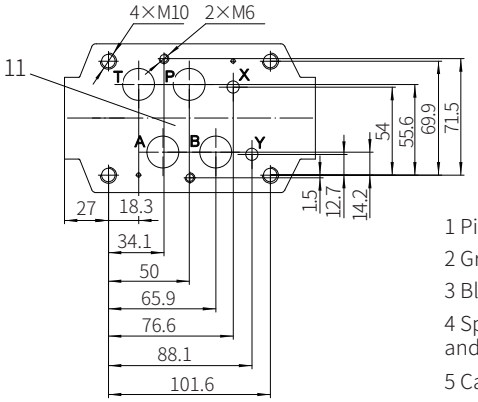
1 Pilot control valve
2 Grey plug “A”
3 Black plug “B”
4 Space required to connect cable and remove plug
5 Cable
6 Plug-in connector
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated amplifier
11 Valve connection surface

Component size

Size unit: mm

Model 4WRKE16...-3XJ...





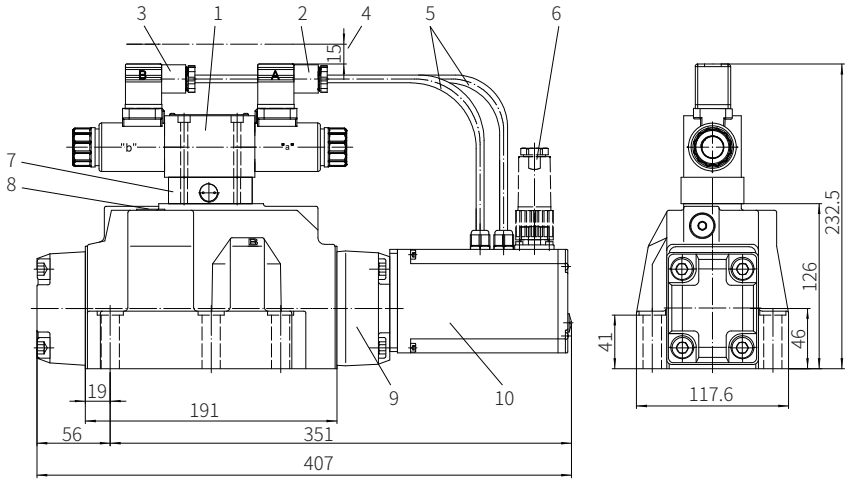
Valve fixing screw
4xM10x60-10.9 grade GB/T70.1-2000
Tightening torque M_A=60Nm
2xM6x55-10.9 grade GB/T70.1-2000
Tightening torque M_A=13.7Nm

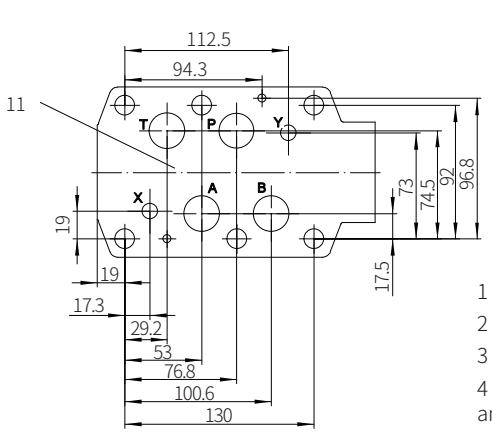
1 Pilot control valve
2 Grey plug “A”
3 Black plug “B”
4 Space required to connect cable and remove plug
5 Cable
6 Plug-in connector
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated amplifier
11 Valve connection surface

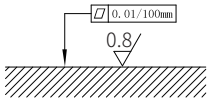
Component size

Size unit: mm

Model 4WRKE25...-3XJ/...







Required surface finishing of mating components

Valve fixing screw

6xM12x60-10.9 grade GB/T70.1-2000

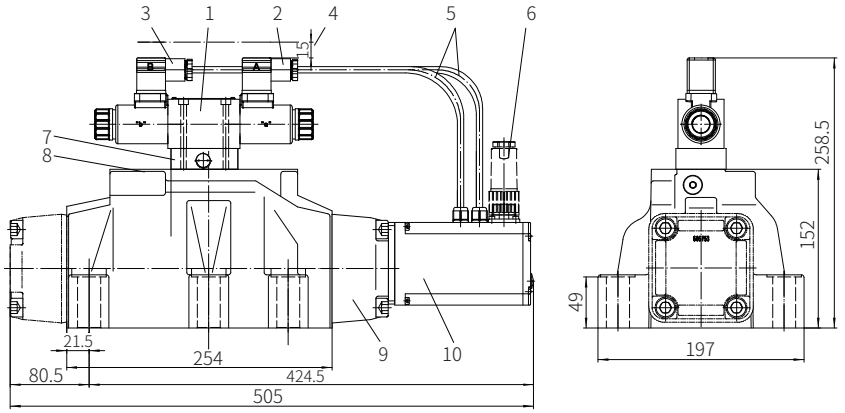
Tightening torque M_A=95Nm

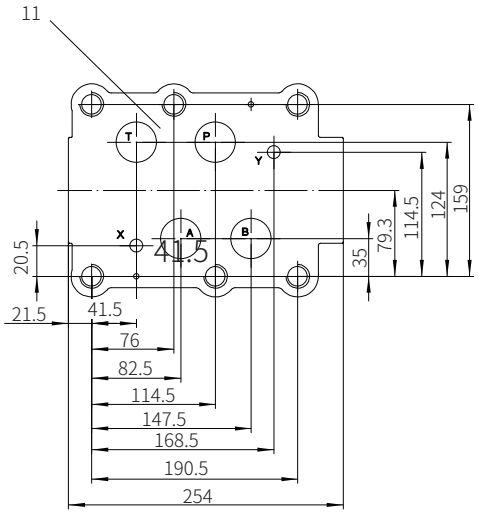
1 Pilot control valve
2 Grey plug “A”
3 Black plug “B”
4 Space required to connect cable and remove plug
5 Cable
6 Plug-in connector
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated amplifier
11 Valve connection surface

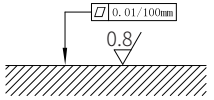
Component size

Size unit: mm

Model 4WRKE32...-3XJ/...







Required surface finishing of mating components

Valve fixing screw

6x20x80-10.9 grade GB/T70.1-2000

Tightening torque M_A=373Nm

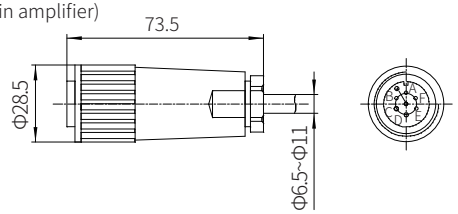
1 Pilot control valve
2 Grey plug “A”
3 Black plug “B”
4 Space required to connect cable and remove plug
5 Cable
6 Plug-in connector
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated amplifier
11 Valve connection surface

Electrical connection

Model 4WRKE...-3XJ/...(With built-in amplifier)

Plug settings refer to the built-in amplifier block diagram.

The plug-in connector to DINEN 175201-804



Plug allocation

Terminal identification	Contact	Signal type
Supply voltage	A	24VDC (u (t) =18 to 35V) , I_{max}=1.5 A, Impulse load≤3A
	B	0V
Reference potential (actual value)	C	Reference potential actual value (contact F)
Differential amplifier input (command value)	D	±10V or 4~20mA
	E	0V reference potential command value
Measurement output (actual value)	F	±10V or 4~20mA
	PE	Connected with the valve body and cooling element

04

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:

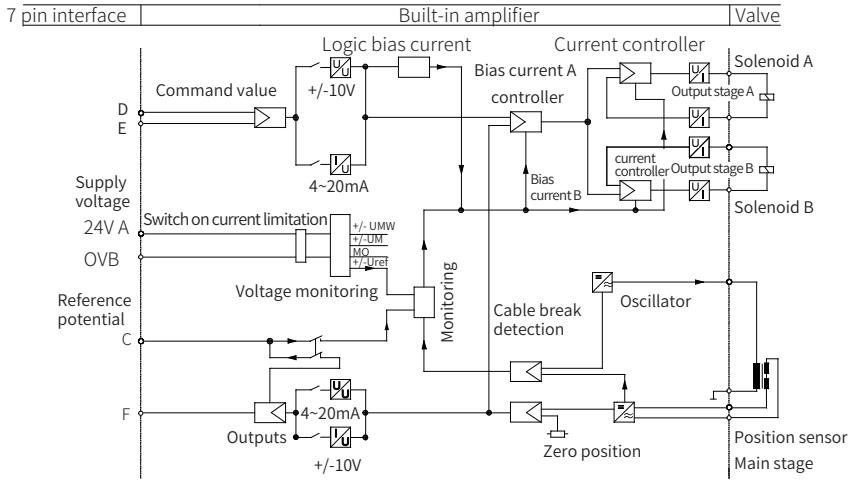
Recommendation:

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.

Wiring diagram/block diagram of integrated amplifier board (OBE)



Proportional Relief Valve

Model: DBET and DBETE

- ◆ Size 6
- ◆ Maximum working pressure 350 bar
- ◆ Maximum working flow 2 L/min

Contents

Features

- ● Direct actuated valve
- ● Operation by proportional solenoids with central thread and detachable coil
- ● For subplate mounting
- ● Model DBETE: internal integrated amplifier
- ● Model DBET: external control amplifier