

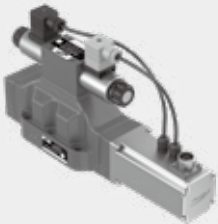


6.14

Pilot operated proportional directional valves

Type 4WRHE...H1

NG 10, 16, 25, 27
Up to 350 bar
Up to 500 L/min



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Features

- Pilot operated 2-stage proportional directional valve for the control of the size and direction of a flow.
- For subplate mounting, porting pattern to ISO 4401 standard.
- Spring centred main spool.
- Integrated control electronics .
- Equipped with an integrated proportional amplifier.
- Pilot control is a single-stage proportional directional valve. The pilot valve uses a threaded proportional solenoid, and the coil can be disassembled separately.

Function and configuration

· Proportional directional valve: type 4WRHE...H1...

The type 4WRHE valves are pilot operated 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.

Structure

The valves basically consists of the pilot control valve (1), housing (7), main spool (6), covers (4 and 5), centering spring (3), and the inductive position transducer (8).

Function

— If no input signal is being applied then the main spool (6) is held in the center position by the centering spring (3). The two control chambers in the covers (4 and 5) are connected via the valve spool (2) to tank.

— The main spool (6) is connected to suitable control electronics via the inductive position transducer (8). The positional change of the main spool (6) 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.

· Pilot control valve : type 4WRAP6W7...-H1/G12 ...(1st stage)

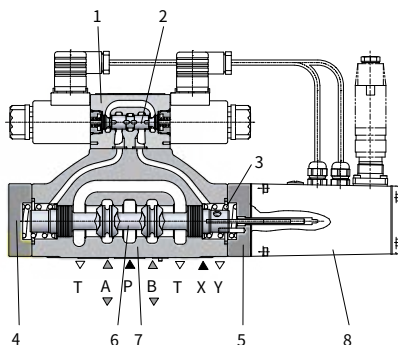
The pilot control valve is a direct operated proportional valve. The control edge geometrics were designed and optimised for the use as a pilot control valve for the proportional directional valves type 4WRHE.

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.

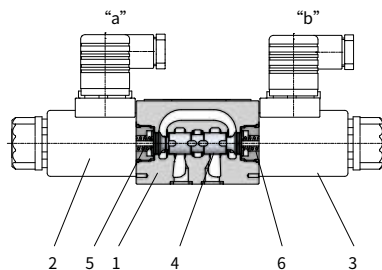
Structure

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.

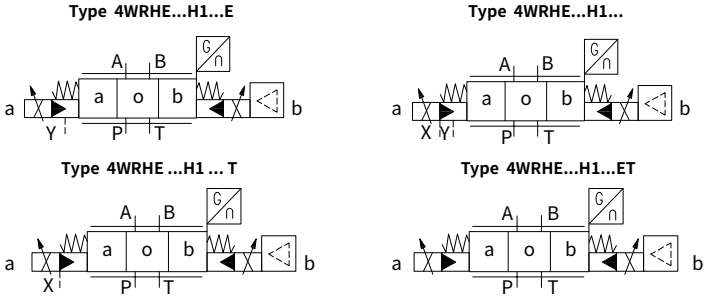


Type 4WRHE...H1...



Type 4WRAP6W7...-H1/G12 ...

Symbols (simplified)



Ordering code

4WRHE

H1 / 24

*

pilot operated proportional directional valve of 4-way design with integrated electronics

Nominal size 10 =10
Nominal size 16 =16
Nominal size 25 =25
Nominal size 27 =27

Spool symbols

		=E1-
		=E3-
		=W6-
		=W8-
		=R-
		=R3-
		=EA-
		=W6A-

Transitional symbols

Further information in plain text

-A = Special model
No code = Labeled model

V = FKM Seals
No code = NBR Seals

Interface:
A1= Command value input ±10V
F1= Command value input 4 to 20mA

No code = Electrical connections
With component plug,
without plug-in connector.

P = With component plug and
plug-in connector.

Pilot oil supply and drain
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
+ 24 V DC

24=

H1=

L= Characteristic curve form
P= Linear with fine control range

Size	Nominal flow in L/min at 10bar valve pressure differential
10	105 =105 120 =120
16	220 =220 250 =250
25	400 =400 450 =450
27	500 =500 -

Note: With symbol E1-, W8-:
P → A: $q_{v,max}$ B → T: $q_{v,2}$
P → B: $q_{v,2}$ A → T: $q_{v,max}$

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

Technical data

General

Nominal size		10	16	25	27
Installation and commissioning guidelines		Optional, preferably horizontal			
Storage temperature range	°C	+ 5 to + 40			
Ambient temperature range	°C	– 20 to + 50			
Weight	kg	6.5	8.9	13.5	13.2
Sine test according to EN 60068-2-6		10...2000 Hz / maximum of 10 g / 10 cycles / 3 axes			
Noise test according to EN 60068-2-64		20...2000 Hz / 10 gRMS / 30 g peak / 1h / 3 axes			
Transport shock according to EN 60068-2-27		15g / 11 ms / 3 shocks / 3 axes			

Hydraulic (measured at p=100bar, with HLP46 at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Operating pressure	-Pilot control valve	Pilot oil supply	bar	25 to 350			
	-Main valve	Ports P, A, B	bar	Up to 350			
Return pressure	Port T	Internal	bar	Static < 10			
	(Pilot oil drain)	External	bar	Up to 250			
	Port Y		bar	Static < 10			
Nominal flow $q_{Vnom} \pm 10\%$ at $\Delta p=10\text{bar}$ (Δp = valve pressure differential)			L/min	105	220	400	500
				120	250	450	-
Flow of main valve (max. permissible)			L/min	180	460	870	1000
Pilot oil flow at port X or Y with a step form of input signal from 0 to 100% (350 bar)			L/min	8.5	11	13	13
Pressure fluid				Mineral oil (HL, HLP) to DIN 51 524 Phosphate ester (HFD-R)			
Pressure fluid temperature range			°C	-20 to +80, preferably 40 to 50			
Viscosity range			mm ² /s	20 to 380, preferably 30 to 45			
Maximum permissible degree of contamination of the pressure fluid is to ISO 4006 (c).		Pilot control valve		Class 17/15/12			
		Main valve		Class 20/18/15			
Hysteresis			%	≤ 1			
Response sensitivity			%	≤ 0.5			

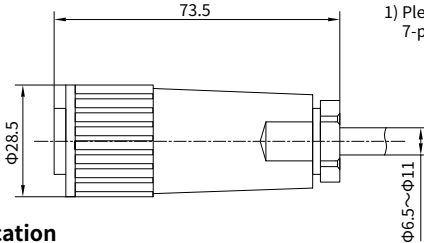
Electrical

Voltage type	Standard	V	24V DC
	Max		36V DC
	Min		18V DC
Electrical connection			Plug-in connector to DIN EN175 201-804
Power, max.		W	72 (average = 24W)
Control electronics			Integrated into the valve
Protection class according to EN 60529			IP65 (If suitable and correctly mounted mating connectors are used)

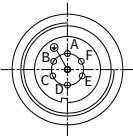
Electrical connections, plug-in connector ¹⁾

For pin allocation also see block circuit diagram.

Plug-in connector to DIN EN 175201-804



1) Please indicate the material of the 7-pin plug when placing an order.



Component plug allocation

	Contact	Signal
Supply voltage	A	24 VDC (18 to 36 VDC); $I_{max} = 1.5A$; impulse load $\leq 3A$
	B	0V
Ref. (actual value)	C	Ref. potential for actual value (contact F)
Differential amplifierinput (command value)	D	$\pm 10V$ or 4 – 20mA
	E	0V ref. potential
Measurement output (act. value)	F	$\pm 10V$ or 4 – 20 mA
	PE	Connected with cooling body and valve housing

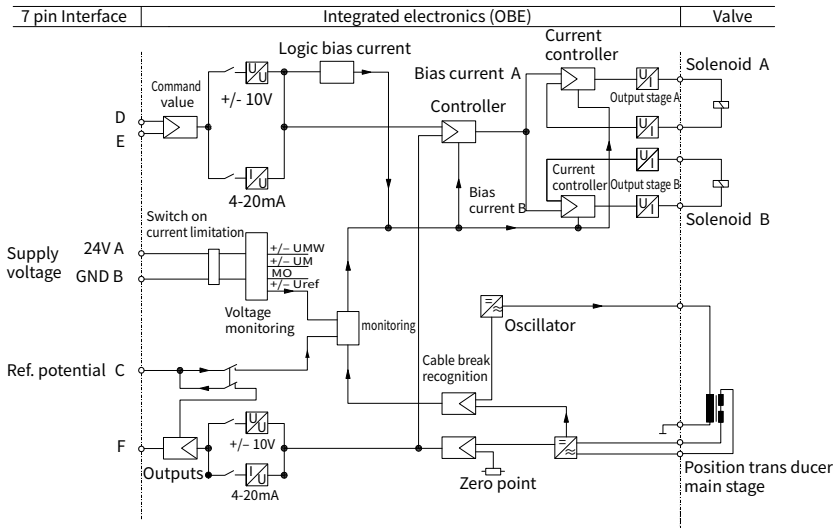
Command value:

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:

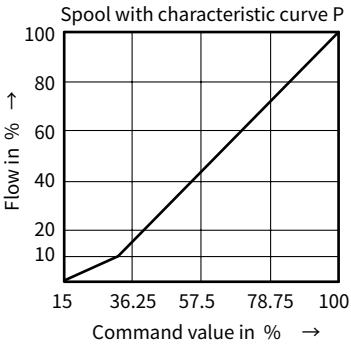
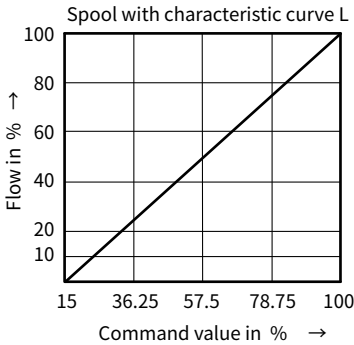
- Recommendation: – Up to 25m cable length type LiYCY 7×0.75 mm²
– Up to 50m cable length type LiYCY 7×1.0 mm²
External diameter: – 6.5 to 11mm (plastic plug-in connection)
– 8 to 12mm (metal plug-in connector)
Connect screen to $\perp$ only on supply side.

Blockcircuit diagram / connection allocation of the integrated control electronics for type 4WRHE



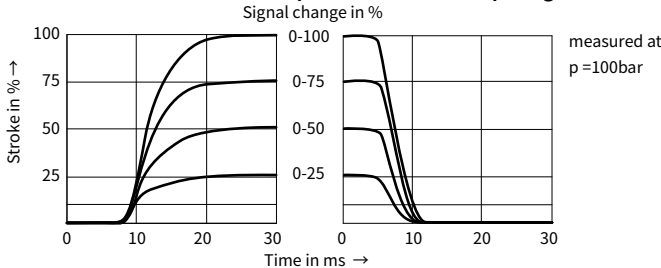
Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Flow - command value curve



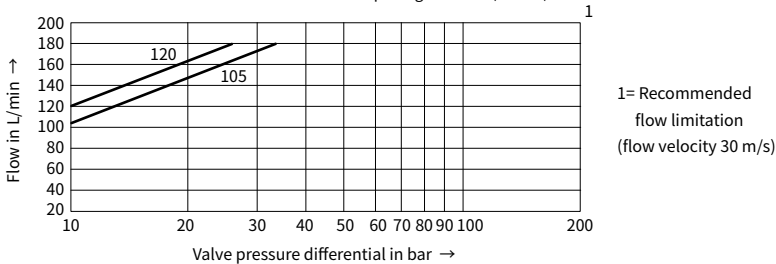
NG 10

Transient function with a step form of electrical input signal



Flow-pressure differential curve

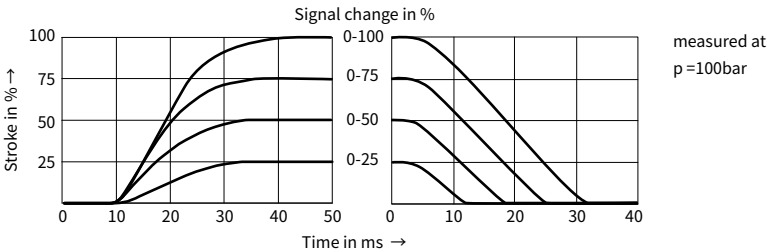
Flow load function at maximum valve opening tolerance ($\pm 10\%$)



Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

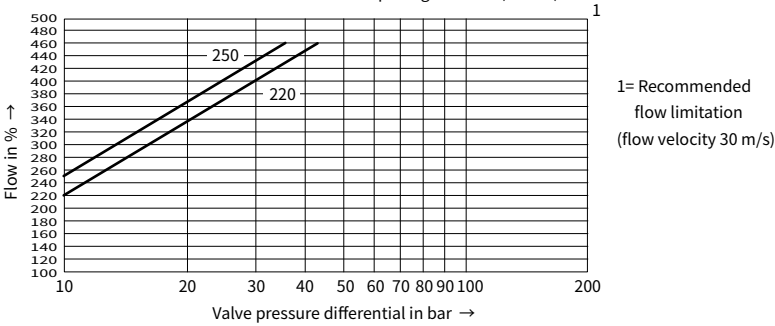
NG 16

Transient function with a step form of electrical input signal



Flow-pressure differential curve

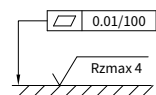
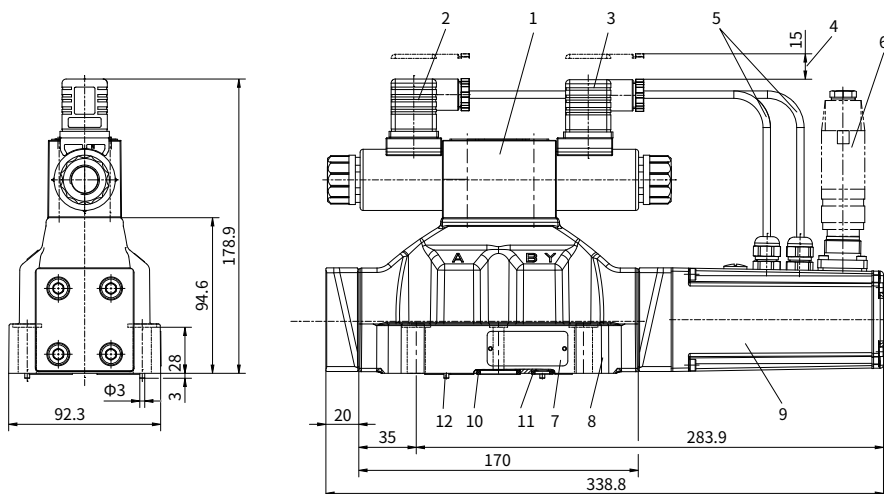
Flow load function at maximum valve opening tolerance ($\pm 10\%$)



Unit dimensions

(Dimensions in mm)

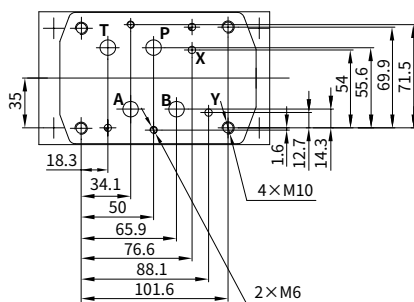
NG 16



Required surface finish of mating piece

- 1 Pilot control valve
- 2 Plug-in connector "B"
- 3 Plug-in connector "A"
- 4 Space required to remove the plug-in connector
- 5 Cable
- 6 Plug-in connector
- 7 Name plate
- 8 Main valve
- 9 Integrated control electronics
- 10 R-ring $22.53 \times 2.3 \times 2.62$, ports A, B, P, T
- 11 R-ring $10 \times 2 \times 2$, ports X and Y
- 12 Locating pin

Machined valve mounting surface ¹⁾



Note:

1) For details, please refer to ISO 4401-07-07-0-05

Valve mounting screws:

2- M6×40 GB/T 70.1-10.9;

$M_A = 12.2 \pm 10\% \text{ Nm}$

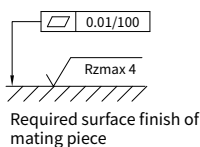
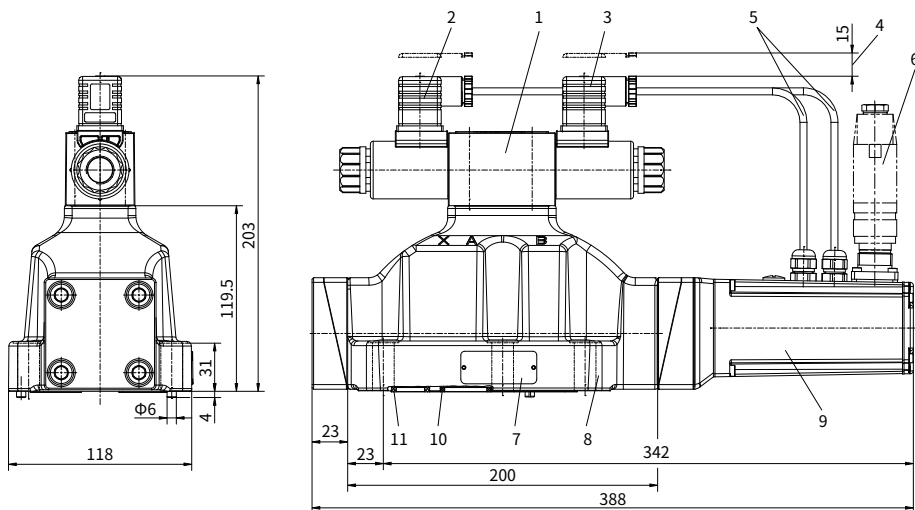
4- M10×45 GB/T 70.1-10.9;

$M_A = 58 \pm 20\% \text{ Nm}$

Unit dimensions

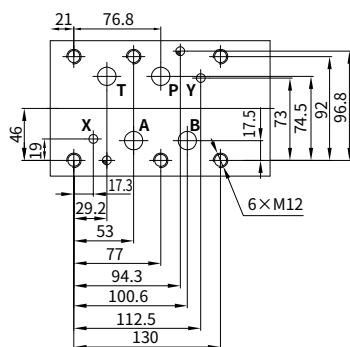
(Dimensions in mm)

NG 25, 27



06

- 1 Pilot control valve
- 2 Plug-in connector "B"
- 3 Plug-in connector "A"
- 4 Space required to remove the plug-in connector
- 5 Cable
- 6 Plug-in connector
- 7 Name plate
- 8 Main valve
- 9 Integrated control electronics
- 10 R-ring 27.8×2.6×3, ports A, B, P, T
- 11 R-ring 19×3×3, ports X and Y

Machined valve mounting surface ¹⁾

Note:

- 1) For details, please refer to
ISO 4401-08-08-0-05

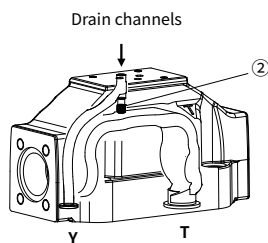
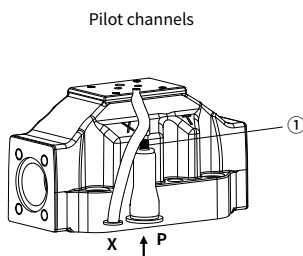
Valve mounting screws:

6- M12×50 GB/T 70.1-10.9;

 $M_A = 100 \pm 10\% \text{ Nm}$

Supply and arrangement method

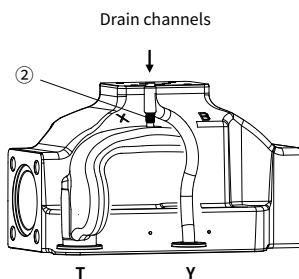
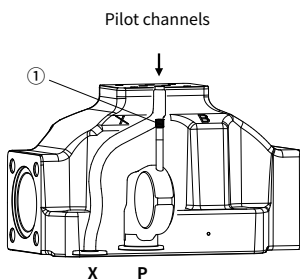
4WRHE16



↑ ↓ indicates the installation
direction of the plug.

Internal piloting: remove plug ①
External piloting: install plug ①
Internal drain: remove plug ②
External drain: install plug ②

4WRHE10、25、27



↑ ↓ indicates the installation
direction of the plug.

Internal piloting: remove plug ①
External piloting: install plug ①
Internal drain: remove plug ②
External drain: install plug ②

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