

4WRAF

Direct-acting two-position four-way and three-position four-way proportional directional valves without electrical position feedback, with integrated amplifiers and fieldbus interfaces.

Nominal sizes: NS 6 and NS 10

Series: 2X

Max. operating pressure: 315 bar

Max. flow: NS 6 42 l/min

NS 10 75 l/min

Document number: RD A1R101 2308a



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Features

- Direct - acting proportional directional valve, used for controlling the flow rate and direction switching.
- The proportional electromagnet is thread - mounted, and the electromagnet coil can be replaced.
- The valve spool is spring - centered.
- Optional with emergency manual operation.
- The mounting surface complies with ISO 4401 - 03 - 02 - 0 - 05/ISO 4401 - 05 - 04 - 0 - 05.
- Equipped with an integrated amplifier.
- With a field - bus interface CANopen DS408.
- Can be interchanged with similar products from Europe and America.

Ordering details

4WRA	F	6	E	07	-	2X	/	M	-	24	N9	C	A1	/	*
01	02	03	04	05		06		07		08	09	10	11		12

01	4WRA	4 main ports design, directional control valve, direct operated
02	F	With integrated amplifier and fieldbus interface
03	6	NS 6
	10	NS 10
Symbols		
04	E	E, E1-, W, W1-, EA, WA; See hydraulic symbol table for details
Nominal flow rate (valve $\Delta p = 10$ bar)		
05	07	7 l/min
	15	15 l/min
	30	26 l/min
	30	30 l/min
	60	60 l/min
		NS 6
		NS 10
06	2X	Series (20 to 29: unchanged installation and connection dimensions)
Sealing material		
07	M	NBR seals
	V	FKM seals
	DW	(H-NBR) seals
08	24	Supply voltage : 24VDC

4WRA	F	6	E	07	-	2X	/	M	-	24	N9	C	A1	/	*
01	02	03	04	05		06		07		08	09	10	11		12

09	No code	Solenoid without emergency manual operation
	N9	Solenoid with emergency manual operation

Bus interface

10	C	CANopen DS408
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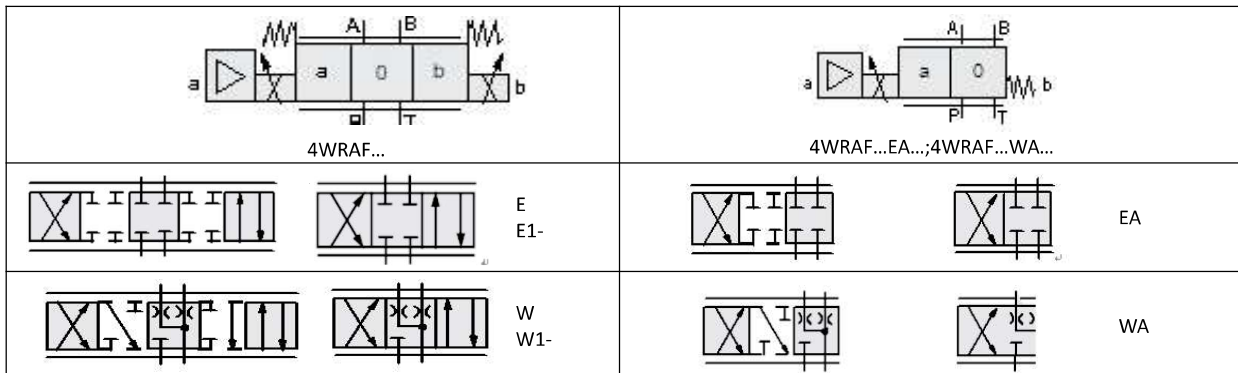
Command value of amplifier

11	A1	Command value input $\pm 10V$, actual value feedback $\pm 10V$
	F1	Command value input 4~(12)-20mA, actual value feedback 4~(12)-20mA
	A5	Command value input $\pm 10V$, with enable, actual value feedback $\pm 10V$
	F5	Command value input 4~(12)-20mA, with enable, actual value feedback 4~(12)-20mA

Other options

12	No code	None
	MH1	Vertical handle
	MH2	Horizontal handle
	BMH1	The vertical handle is installed on the side of port B.
	BMH2	The horizontal handle is installed on the side of port B.
	12	1.2A solenoid on side B

Symbols



E1-and W1-valve

$P \rightarrow A: q_{V\text{ nom}}$ $B \rightarrow T: q_{V\text{ nom}} / 2$
 $P \rightarrow B: q_{V\text{ nom}} / 2$ $A \rightarrow T: q_{V\text{ nom}}$

Note: When the spools W and WA are in the middle position, A is connected to T, and B is connected to T. The flow area is approximately 3% of the nominal flow area.

Functions, section

This valve is a direct-acting proportional directional valve with a plate connection. The proportional solenoid with a detachable coil is installed on the valve body via a centering thread. An integrated amplifier or an external amplifier is used to drive the solenoid.

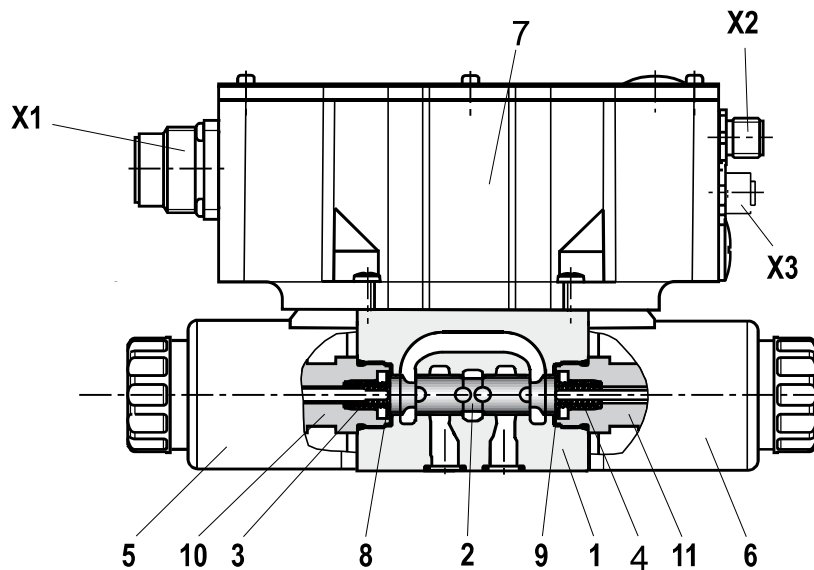
Design of the valve:

- 1, Valve body with mounting surface (1);
- 2, Control spool (2), compression springs (3, 4);
- 3, Solenoids (5, 6);
- 4, Optional integrated amplifier (7).

Function:

After the coils (5, 6) are de-energized, the control spool (2) is held in the center position by the compression springs (3, 4). When the solenoids are energized, the spool starts to move. For example, when the solenoid "b" (6) is energized, the control spool moves to the left in proportion to the input electrical signal. At this time, P is connected to A, and B is connected to T. When the solenoid "b" (6) is de-energized, the control spool (2) returns to the center position through the compression spring (3). In the de-energized state, the spool (2) is held in the mechanical center position by the coil return spring.

4WRAF10...-2X/...



Two - position four - way valve

The functions of this type of valve are generally the same as those of the three - position valve. However, for the two - position four - way valve, only the coil on the a side is installed. For the valves with a 6 - mm nominal diameter and a 10 - mm nominal diameter, the coils on the b side are replaced with end caps.

Note:

Internal leakage of hydraulic valves is inevitable. The leakage volume will increase as the hydraulic valve is used.

Note:

The return oil line of the proportional valve must not be emptied. To ensure proper operating conditions, a check valve with an opening pressure of approximately 2 bar can be installed on the return oil line of the valve if necessary.

Technical data (for applications outside these parameters, please consult us!)

General

NS		6	10
Installation		optional	
Storage temperature range	°C	-20 to +80	
Ambient temperature range	°C	-20 to +50	
Weight	Kg	2.2	6.8

Hydraulic (HLP46 at 40 °C ± 5 °C)

Max. operating pressure	Ports A, B, P	bar	315	
	Port T	bar	210	
Nominal flow $q_{V\ nom}$ $\Delta p=10\text{bar}^{1)}$		l/min	7	30
			15	60
			26	
Max. permissible flow		l/min	42	75
Oil temperature range	°C	-20 to +80 (preferably +40 to +50)		
Viscosity range	mm ² /s	20 to 380 (preferably 30 to 46)		
Degree of contamination		ISO4406: 1999 20/18/15		
Hysteresis	%	≤ 5		
Repeatability accuracy	%	≤ 1		
Response sensitivity	%	≤ 0.5		

Electrical

Supply voltage		DC		
Command signal For 4WRAF	Voltage signal input A1	V	±10	
	Current signal input F1	mA	4 ~ 20	
Maximum current of a single solenoid		A	2.5	3
Coil resistance	Measured value at 20°C	Ω	2	2
	Measured value at the maximum operating temperature	Ω	3	3
Electrical connection	4WRAF	Seven-pin socket complying with the standard of DIN EN 175201 - 804		
Duty	%	100		
Maximum temperature of the coil	°C	150		
Protection level (according to EN60529 standard)		IP65		

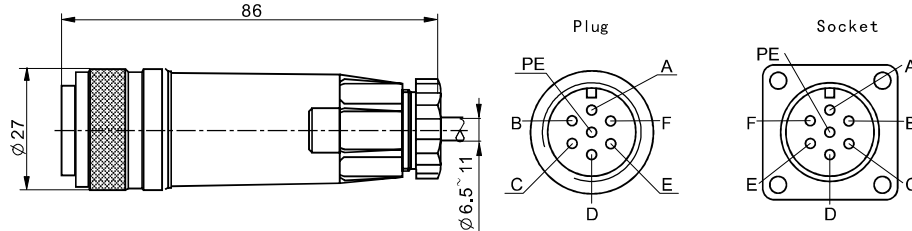
Integrated amplifier

4WRAF6	Digital	RT-4WRAF6-2X-10		
4WRAF10	Digital	RT-4WRAF10-2X-10		
Supply voltage	Rated voltage	VDC	24	
	Lower limit value	V	19.4	
	Upper limit value	V	35	
Amplifier power consumption	Maximum current	A	1.8	
	Pulse current	A	3	

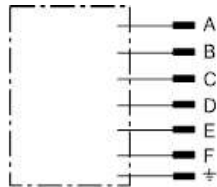
1) Other pressure differences $\Delta p\ q_x = q_{V\ nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

Electrical connections

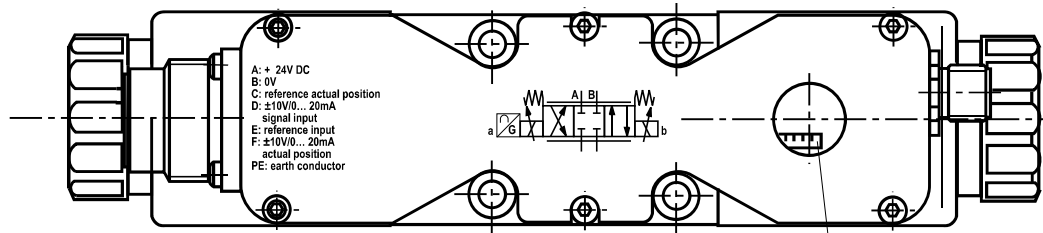
For type 4WRAF (with integrated amplifier): Seven - pin plug conforming to DIN EN 175201 - 804 (to be ordered separately)



Pin assignment

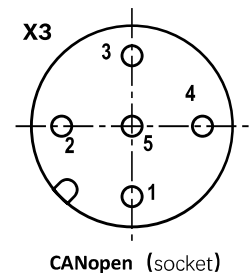
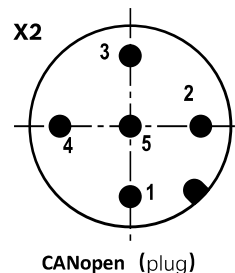


Metal nut structure (preferred model)
Order separately, order number: R00050406
Plastic nut structure
Order separately, order number: R00050408
All - metal structure
Order separately, order number: R00050407



Function	Slot	Allocation interface A1	Allocation interface F1	Allocation interface A5	Allocation interface F5
Supply voltage	A	24VDC (19. 4~35VDC)			
	B	GND		GND,enable the reference potential	
Position feedback reference	C	Not connected		Enable input 24VDC enable ≥ 11 VDC, disable ≤ 5 VDC)	
Amplifier input	D	± 10 V com. value: $R_e > 50k\Omega$	4~20mA com. value: $R_e < 250\Omega$	± 10 V com. value: $R_e > 50k\Omega$	4~20mA com. value: $R_e < 250\Omega$
	E	ref. potential com. value			
Position feedback	F	Not connected			
	PE	Connected with cooling body and valve housing			

Pin assignment of connectors for CAN bus " X2" /" X3" . Plug: M12, 5 - pin, A - coded.			
Pin	Assignmentdefinition	Transmission rate (kbit/s)	Location
1	CANshielding	20-1000	1-127
2	N.C		
3	CAN_GND	Note:Thebaudrateandidentifiercanbe setvia the host computer.	
4	CAN_H		
5	CAN_L		

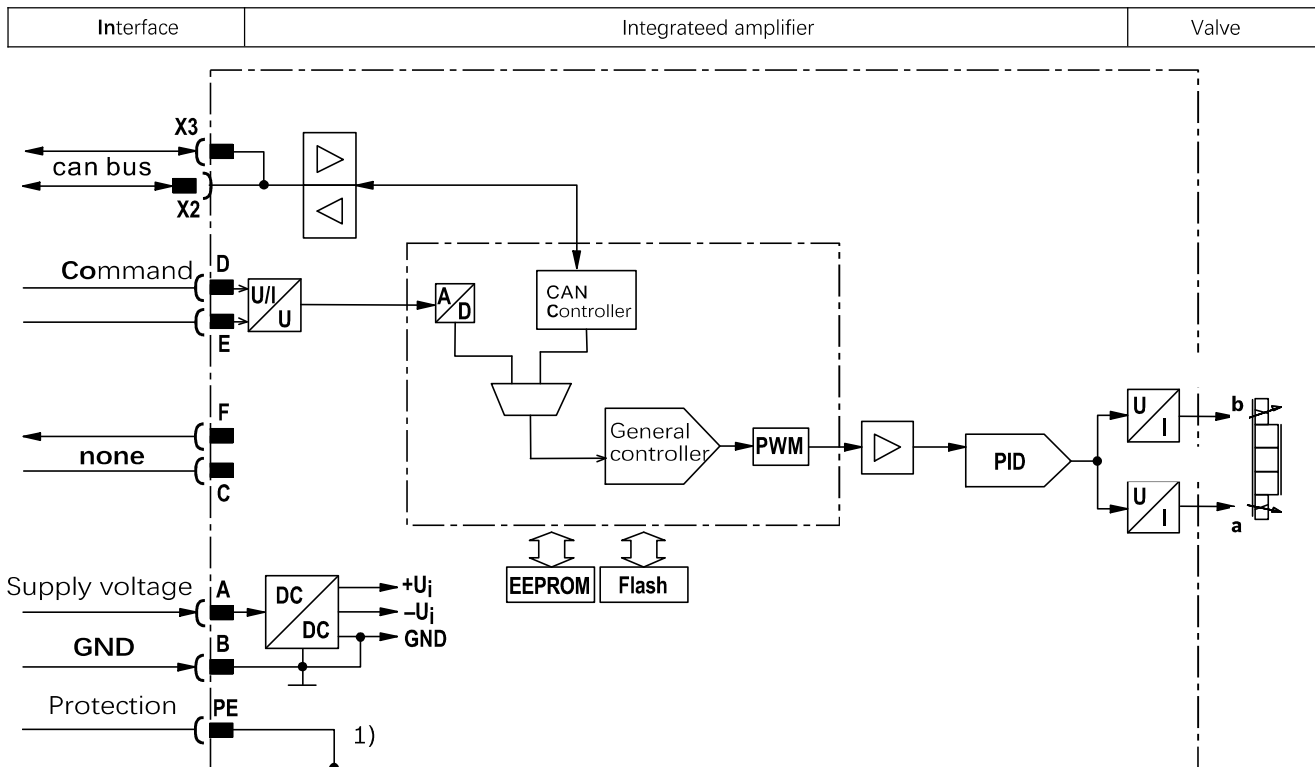


Control value Forward command: 0 to +10V (or 12 to 20mA) corresponds to P→A, B→T.
 -Input command between DE: Reverse command: 0 to -10V (or 12 to 4mA) corresponds to P→B, A→T.

-For valves with only one electromagnetic coil (functions EA and WA), 0 - 10V (or 4 - 20mA) corresponds to PB, AT.

Connection cables:

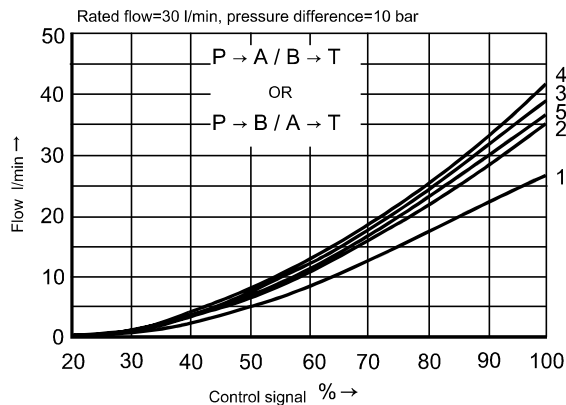
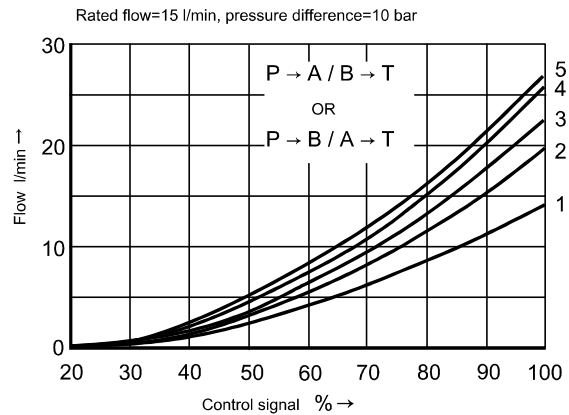
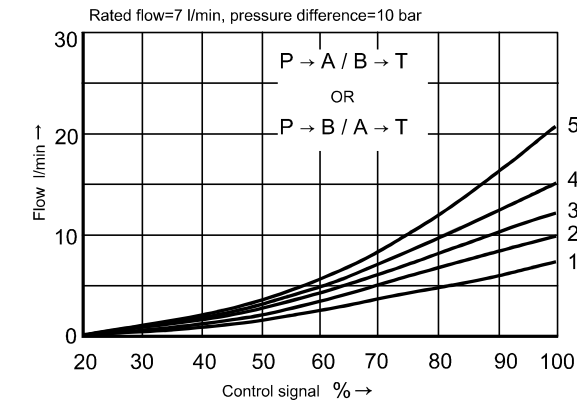
- Select LiYCY 7x0.75mm² for cable lengths within 25m.
 - Select LiYCY 7x1mm² for cable lengths within 50m.
 - Cable outer diameter: 6.5 - 11. The shielding wire of the cable is only allowed to be connected to PE at the power supply end.
- Circuit diagram/Terminal assignment (4WRAF)



The protective earth (PE) is internally short - circuited to the heat sink and the valve body.

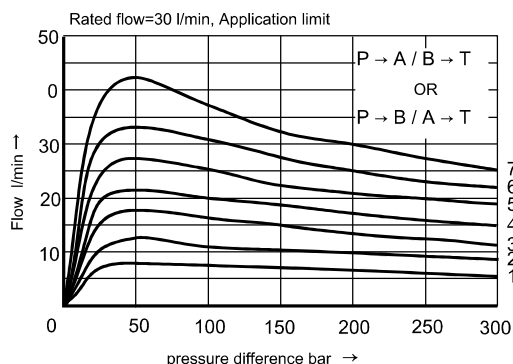
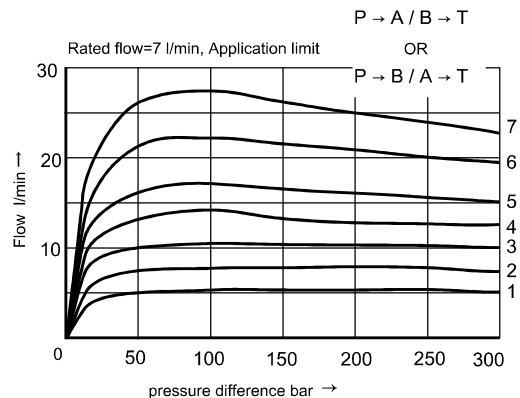
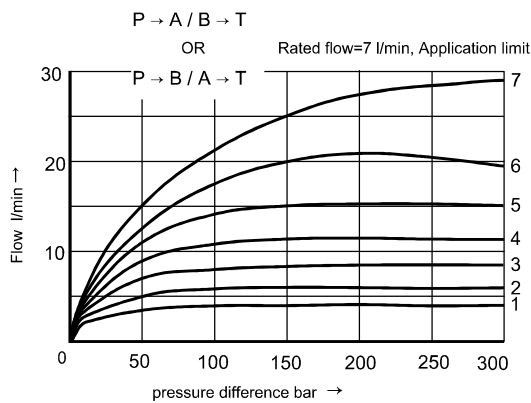
Characteristic curves NG6 (HLP46 at 40 °C ± 5 °C)

Characteristic curves, $P_p=100\text{bar}$



- 1 $\Delta p=10\text{ bar}$ Constant
 - 2 $\Delta p=20\text{ bar}$ Constant
 - 3 $\Delta p=30\text{ bar}$ Constant
 - 4 $\Delta p=50\text{ bar}$ Constant
 - 5 $\Delta p=100\text{ bar}$ Constant
- $\Delta p = P_p - P_L - P_T$
 Δp ; Pressure difference of the valve
 P_p ; Inlet pressure
 P_L ; Load pressure
 P_T ; Return oil pressure

Power limit



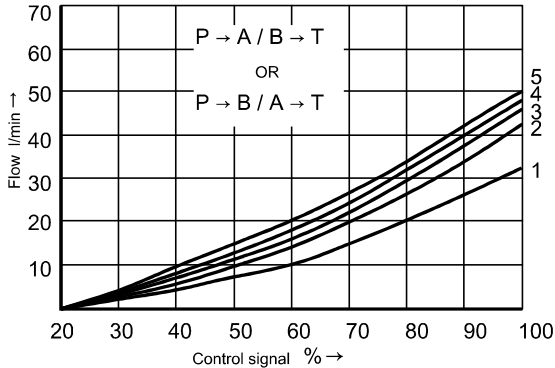
- 1 Command value=40%
- 2 Command value=50%
- 3 Command value=60%
- 4 Command value=70%
- 5 Command value=80%
- 6 Command value=90%
- 7 Command value=10%

If the performance limits are exceeded, it will cause the valve spool to be out of control.

Characteristic curves NG10 (HLP46 at 40 °C ± 5 °C)

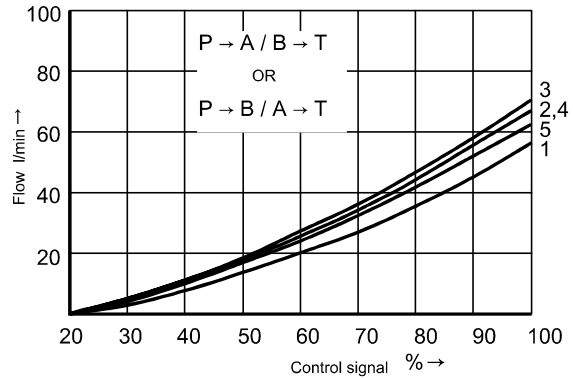
Flow characteristic curve

Rated flow=30 l/min, pressure difference=10 bar



- 1 $\Delta p=10$ bar Constant
- 2 $\Delta p=20$ bar Constant
- 3 $\Delta p=30$ bar Constant
- 4 $\Delta p=50$ bar Constant
- 5 $\Delta p=100$ bar Constant

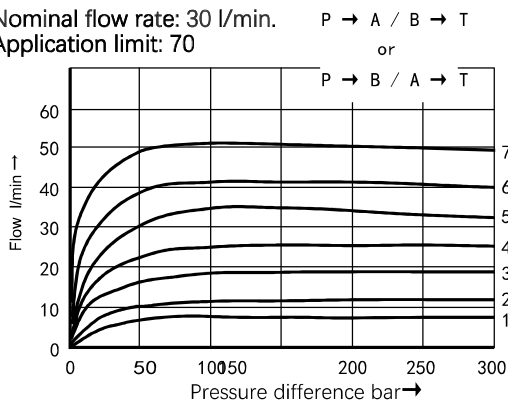
Rated flow=60 l/min, pressure difference=10 bar



$\Delta p = P_P - P_L - P_T$
 Δp Pressure difference of the valve
 P_P Inlet pressure
 P_L Load pressure
 P_T Return oil pressure

Power limit

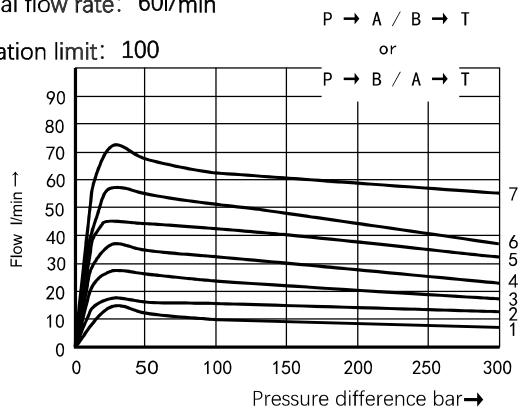
Nominal flow rate: 30 l/min.
Application limit: 70



- 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=10%

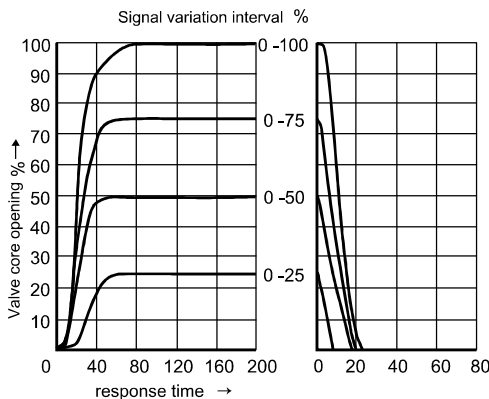
Nominal flow rate: 60 l/min

Application limit: 100

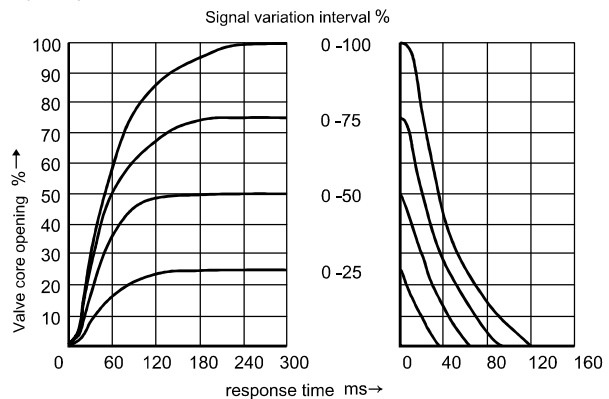


If the performance limits are exceeded, it will cause the valve spool to be out of control.

Flow characteristic curve (NG6)

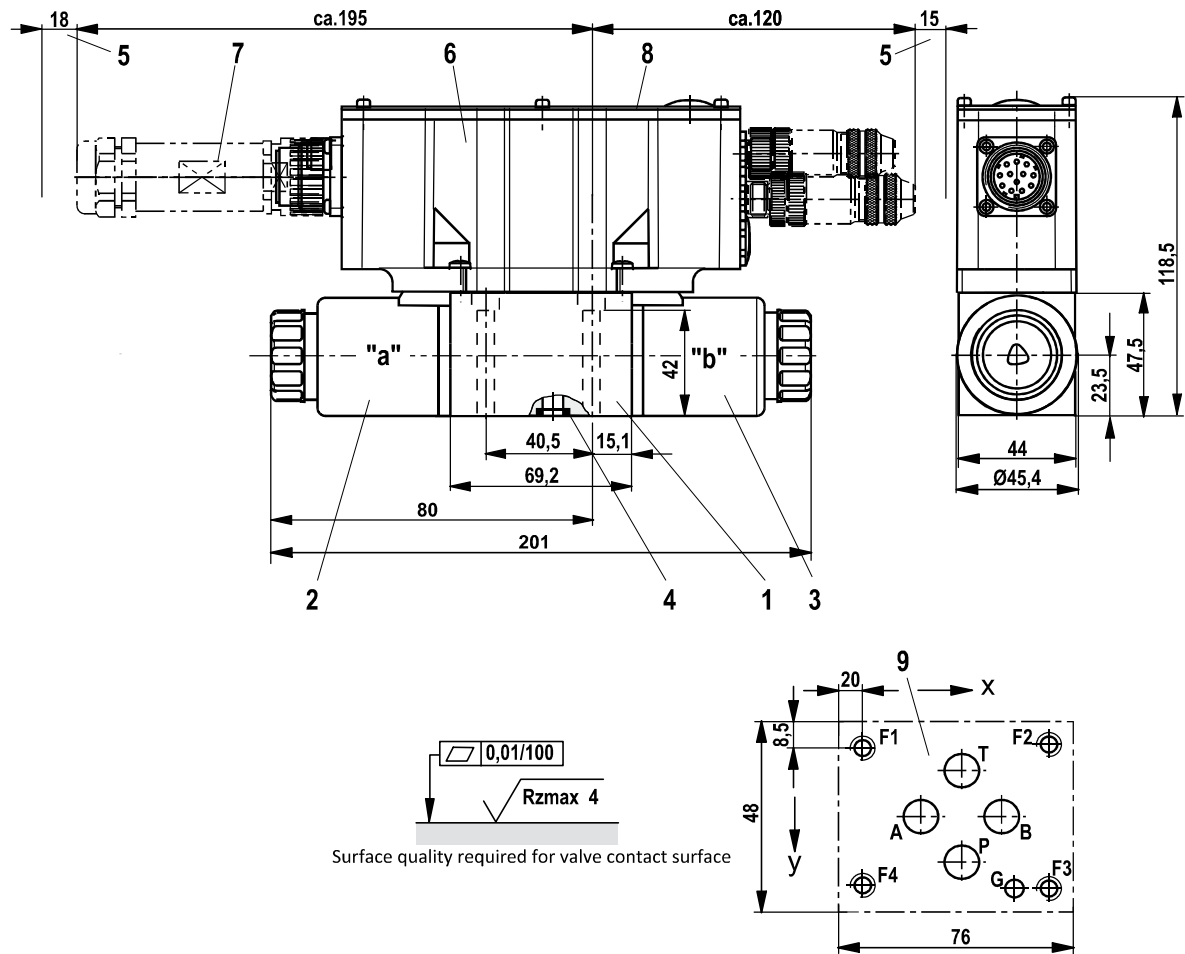


Step response curve (NG10)



Dimensions (dimensions in mm)

4WRAF6



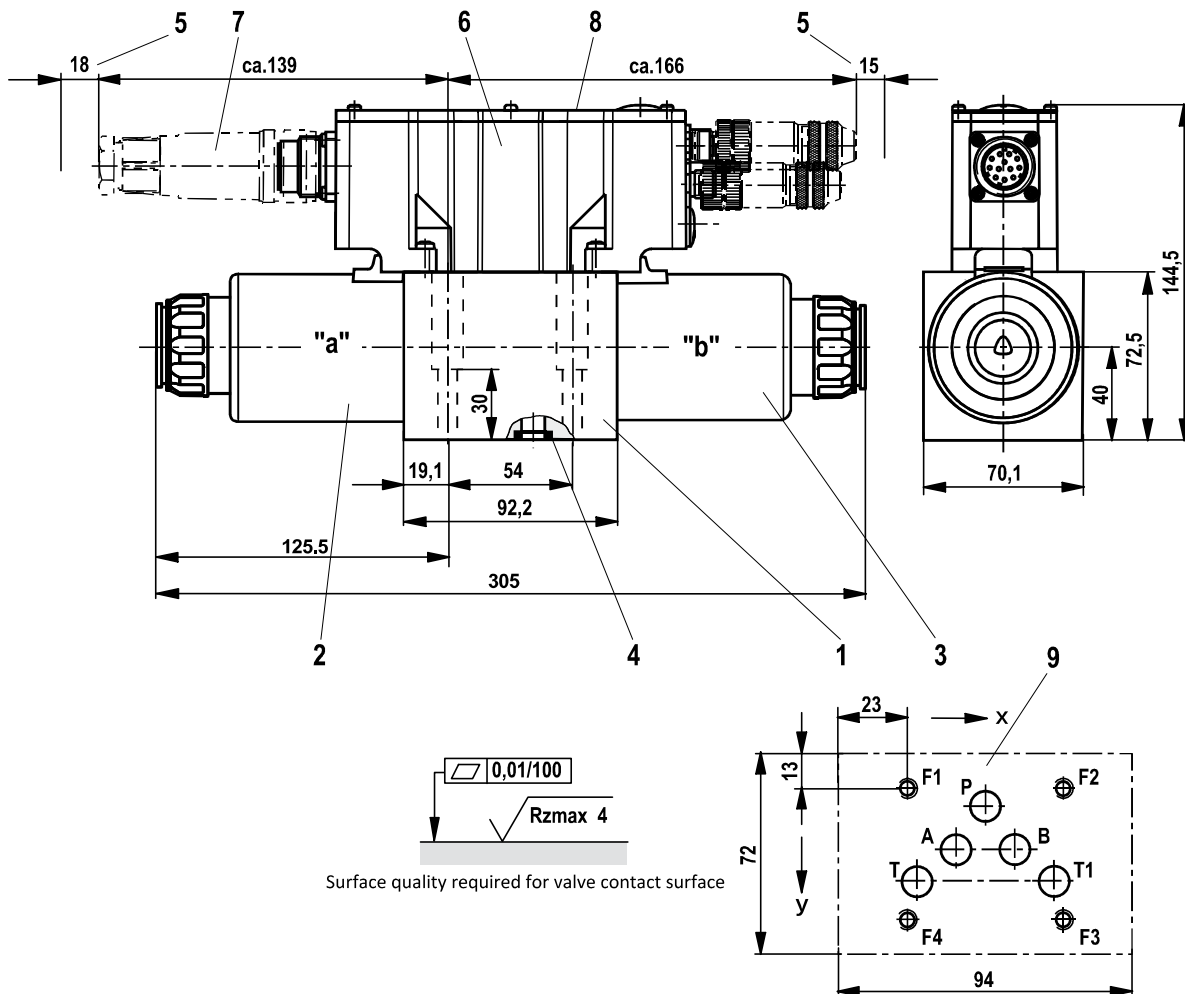
Dimensions in mm	P	A	T	B	F1	F2	F3	F4	G
Diameters/threads	7.5 max	7.5 max	7.5 max	7.5 max	M5	M5	M5	M5	4
X	21.5	12.7	21.5	30.2	0	40.5	40.5	0	33
Y	25.9	15.5	5.1	15.5	0	-0.75	31.75	31	31.75

- 1 Valve body
 - 2 Proportional coil a
 - 3 Proportional coil b
 - 4 Seals and nameplate for ports P/T/A/B
 - 5 Space required for plug removal
 - 6 Integrated amplifier
 - 7 Seven - pin socket conforming to DIN EN 175201 - 804 (plug to be ordered separately)
 - 8 Nameplate
 - 9 Mounting surface of the hydraulic valve, conforming to ISO 4401 - 03 - 02 - 0 - 05.
- Deviation from the standard for port connection positions and standard tolerances: Ports P, A, B and port T have a diameter of $\varnothing 7$.
5mm

Fixing screws: : 4 GB/T 70.1-M5x50 10.9
Torque: 8.9Nm $\pm$ 10%

Dimensions (dimensions in mm)

4WRAF10



Dimensions in mm	P	A	T	(T1)	B	F1	F2	F3	F4
Diameters/threads	11.2 max	11.2 max	11.2 max	11.2 max	11.2 max	M6	M6	M6	M6
x	27	16.7	3.2	50.8	37.3	0	54	54	0
y	6.3	21.4	32.5	32.5	21.4	0	0	46	46

- 1Valve body
- 2Proportional coil a
- 3Proportional coil b
- 4Nameplate for the seals of ports P, T, A and B
- 5Space required for removing the plug
- 6Integrated amplifier
- 7Seven - pin socket complying with DIN EN 175201 - 804 (the plug needs to be ordered separately)

- 8Nameplate
 - 9Mounting surface of the hydraulic valve, complying with the port connection positions and standard tolerances of ISO 4401 - 03 - 02 - 0 - 05.
- Fixing screws: 4 GB/T70.1-M6x4010.9
 Torque: 15.5Nm±10%