

4WRPH

High-response directional control valves, direct operated, with electrical position feedback

Nominal sizes: NS 6 and NS 10

series: 2X

Max. operating pressure: 350bar

Rated flow: 2 ... 100 L/min ($\Delta p=70\text{bar}$)



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Features

- 1 - High-response directional control valves, direct operated, with electrical position feedback
- 1 - High quality - control spool and sleeve in servo quality
- 3 - Actuated on one side, 4/4 fail-safe position in switched off condition
- 4
- 5 - Control solenoid with integral position feedback and electronics for position transducer (LVDT DC/DC)
- 6
- 8 - External trigger electronics (order separately)
- 11 For NS 6: RT-MRPD1-PH6-30
 For NS 10: RT-MRPD1-PH10-30
- Precise - high response sensitivity and little hysteresis
- Suitable for electro-hydraulic servo control system with high precision of position, speed and pressure control.
- For subplate mounting: porting pattern to ISO 4401-03-02-0-05 (NS 6) and ISO4401-05-04-0-05 (NS 10)

Ordering details

4WRP		H	6	C3	B	04	L	-	2X	/	G24	Z4	/	M	*
01	02	03	04	05	06	07	08	09	10	11	12	13			

01	4WRP	4 main ports design, directional control valve, direct operated
02	No code	External trigger electronics (order separately)
03	H	Control spool/sleeve
04	6	NS 6
	10	NS 10

Symbols

05	C3	C, C1, C3, C4, C5; See hydraulic symbol table for details
06	B	The inductive position transducer is on the side of the B oil port. (Standard)
	A	The inductive position transducer is on the side of the A oil port.

4WRP		H	6	C3	B	04	L	-	2X	/	G24	Z4	/	M	*
01	02	03	04	05	06	07	08		09		10	11		12	13

Rated flow at 70 bar valve pressure difference ($\Delta p = 35\text{bar}$ / metering notch)

07	Flow characteristic				NS 6
			"L"	"P"	
	02	2 L/min	✓	—	
	04	4 L/min	✓	✓ (Inflection 20%)	
	12	12 L/min	✓	—	
	15	15 L/min	—	✓ (Inflection 60%)	
	24	24 L/min	✓	—	
	25	25 L/min	—	✓ (Inflection 60%)	
	40	40 L/min	✓	✓ (Inflection 40%)	
	50	50 L/min	✓	✓ (Inflection 40%)	
	100	100 L/min	✓	✓ (Inflection 40%)	NS 10

Flow characteristic

08	L	Linear
	P	Inflected characteristic curve, linear

09	2X	Series 20 to 29 (20 to 29: unchanged installation and connection dimensions)
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10	G24	Supply voltage : 24VDC
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Electrical connections

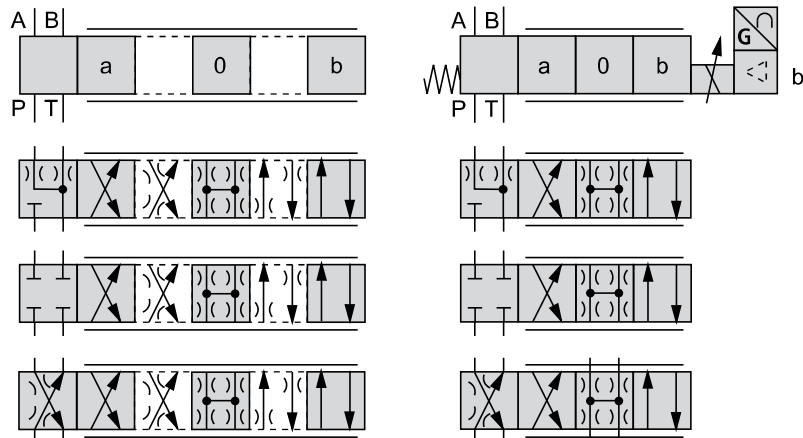
11	Z4	Sockets conforming to DIN EN 175301-803 (plugs need to be ordered separately), see page 7
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Sealing material

13	M	NBR seals
	V	FKM seals

14	*	Further details in the plain text
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Symbols



With symbols C1 and C5: ¹⁾

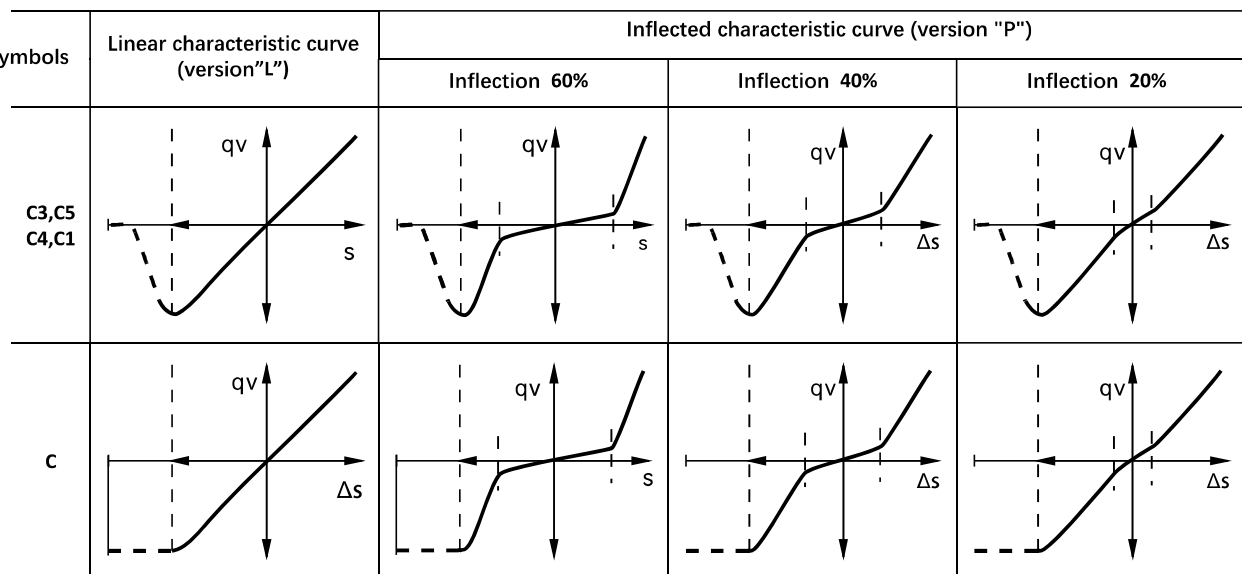
$P \rightarrow A: q_{V \text{ nom}}$ $B \rightarrow T: q_{V \text{ nom}} / 2$

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

1) $q_{V \text{ nom}}$ 2:1 in connection with flow characteristic "L" only rated flow 2 L/min has no symbols C1 and C5.

$q_{V \text{ nom}}$ 2:1 in connection with flow characteristic "P" only for rated flow 40 L/min.

Flow characteristic



Function, section

Normal state

After the valve is powered on normally, the inductive position transducer of the electromagnet (1) feeds back the actual displacement of the spool to the external controller, and the external controller compares the actual displacement value with the instruction value. If the actual value deviates from the instruction value, the electromagnetic thrust of the electromagnet will change until the new electromagnetic thrust is equal to the feedback spring thrust, so as to ensure that the actual displacement value is equal to the instruction value.

The control throttle area of the spool / sleeve is proportional to the spool displacement, that is, proportional to the instruction value of the valve. If the instruction value of the valve is zero, the spool is in the middle position. If the instruction value is not zero, the spool works in the position corresponding to the instruction value.

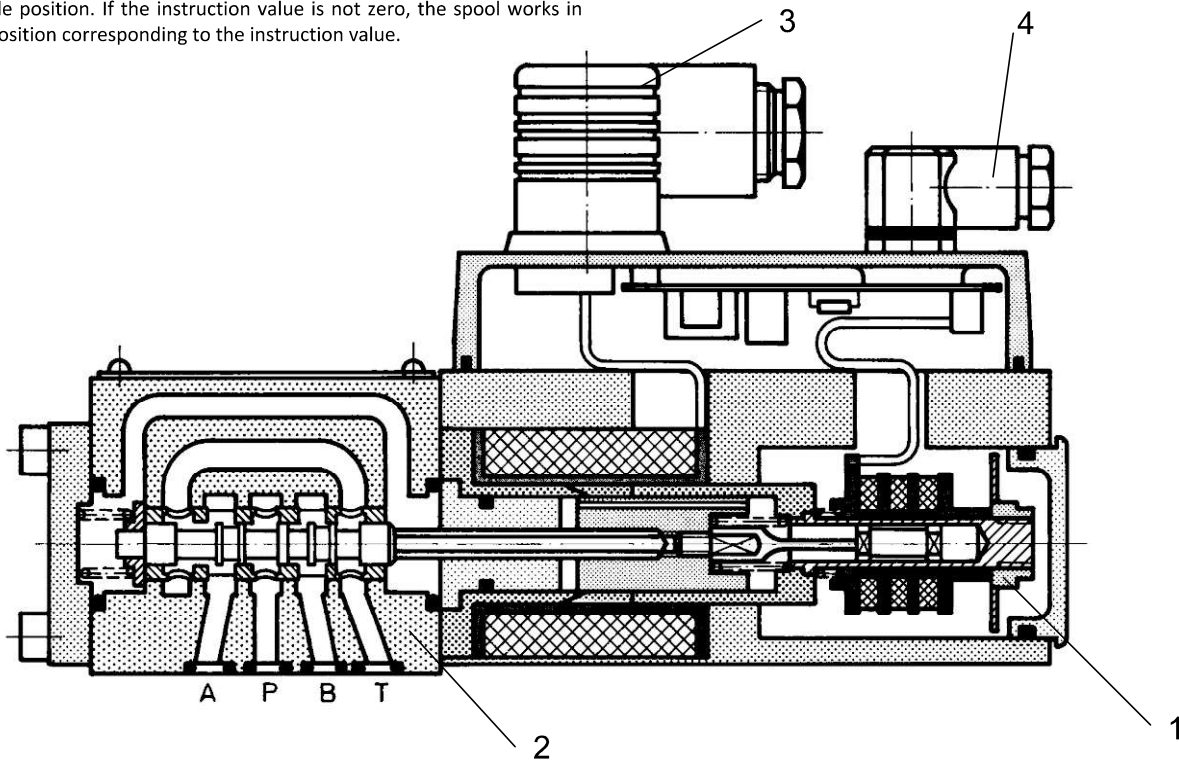
Fault state.

In the following fault cases, the external controller will power off the electromagnet and the spool will move to a safe position immediately under the action of the feedback spring force.

→ Below the minimum power supply voltage.

→ For interface "F1" of external controller : when the command value is lower than 2 mA (including control cable disconnection)

In the process of the spool moving from the working position to the safe position, the spool passes through the P-B and A-T, which may cause actuator action. This situation needs to be taken into account in the process of designing hydraulic systems.



1. Control solenoid and inductive position transducer
2. Valve housing
3. Connector conforming to DIN EN 175301-803 (Need to order separately)
4. LVDT connector: 4 pins Pg7-G4W1F

Technical data, 4WRPH6 (for applications outside these parameters, please consult us!)

General

Design		Spool type valve, operated directly, with steel sleeve
Design		Proportional solenoid with position control, external amplifier
Type of connection		Subplate, mounting hole configuration NG 6 (ISO4401-03-02-0-05)
Installation position		Optional
Ambient temperature range	°C	-20...+60
Weight	Kg	2.5

Hydraulic (with HLP46 at 40 °C ± 5 °C)

Max. operating pressure	Ports A, B, P	bar	315					
	Port T	bar	250					
Nominal flow $q_{V\ nom}$ ($\Delta p = 35\text{bar}$ / metering notch) ¹⁾		L/min	2	4	12	15	24	40
Leakage flow ($P_s=100\text{bar}$)	Linear characteristic curve "L"	mL/min	<150	<180	<300	-	<500	<900
	Inflected characteristic curve "P"	mL/min	-	<150	-	<180	<300	<450
Limitation of use (Δp) with regard to the transition to fail-safe (values apply to summated edge)	C, C3, C5	bar	315	315	315	315	315	160
	C4, C1	bar	315	315	315	280	250	100
Hydraulic fluid	DIN51524...535 other fluids after prior consultation							
Hydraulic fluid temperature range (flown-through)		°C	-20 ... +70					
Viscosity range		mm ² /s	10 ... 800 (preferably: 20 ... 100)					
Degree of contamination			ISO4406: 1999 18/16/13 ²⁾					

Fail-safe position

Nominal flow ($\Delta p = 35\text{bar}$ / metering notch)	Symbol C	L/min	2	4	10	13	18	20
Leakage flow ($P_s=100\text{bar}$)	Symbols C3, C5	mL/min	50 (P→A)					
		mL/min	70 (P→B)					
Nominal flow ($\Delta p = 35\text{bar}$ / metering notch)	Symbols C3, C5	L/min	10...20 (A→T)					
		L/min	7...20 (B→T)					
Leakage flow ($P_s=100\text{bar}$)	Symbols C4, C1	mL/min	50 (P→A)					
		mL/min	70 (P→B)					
		mL/min	70 (A→T)					
		mL/min	50 (B→T)					
Response time to reach fail-safe position	0bar	ms	7					
	100bar	ms	10					

Static/Dynamic

Hysteresis	%	≤0.2
Manufacturing tolerance for $q_{V\ max}$	%	<10
Response time for signal change 0...100%	ms	≤10
Thermal drift	%	<1 (at $\Delta T=40^\circ\text{C}$)

Electrical

Cyclic duration factor	%	100	
Degree of protection		IP65	
Power supply	VDC	24	
Max. solenoid current	A	2.7	
Coil resistance R ₂₀	Ω	2.5	
Max. power consumption at 100% load and operational temperature	VA	40	
Position transducer DC/DC technology		Supply: +15V/35mA -15V/25mA	Signal: 0...±10V (R _L ≥ 10kΩ)

1) Flow rate at a different Δp : $q_x = q_{V\ nom} \cdot \sqrt{\frac{\Delta p_x}{35}}$

- 2) The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components.

Technical data, 4WRPH10 (for applications outside these parameters, please consult us!)

General

Design	Spool type valve, operated directly, with steel sleeve		
Design	Proportional solenoid with position control, external amplifier		
Type of connection	Subplate, mounting hole configuration NG 6 (ISO4401-05-04-0-05)		
Installation position	Optional		
Ambient temperature range	°C	-20...+60	
Weight	Kg	7.1	

Hydraulic (with HLP46 at 40 °C ± 5 °C)

Max. operating pressure	Ports A, B, P	bar	315			
	Port T	bar	250			
Nominal flow $q_{V\ nom}$ ($\Delta p = 35\text{bar}$ / metering notch) ¹⁾		L/min	50 (1: 1)	50 (2: 1)	100 (1: 1)	100 (2: 1)
Leakage flow ($P_s=100\text{bar}$)	Linear characteristic curve "L"	mL/min	<1200	<1200	<1500	<1000
	Inflected characteristic curve "P"	mL/min	<600	<500	<600	<600
Limitation of use (Δp) with regard to the transition to fail-safe (values apply to summated edge)	C, C3, C5	bar	315	315	160	160
	C4, C1	bar	250	250	100	100
Hydraulic fluid			DIN51524...535 other fluids after prior consultation			
Hydraulic fluid temperature range (flown-through)			°C -20 ...+70			
Viscosity range			mm²/s 10 ... 800 (preferably: 20 ... 100)			
Degree of contamination			ISO4406: 1999 18/16/13 ²⁾			

Fail-safe position

Nominal flow ($\Delta p = 35\text{bar}$ / metering notch)	Symbol C	L/min	50	50	100	100
Leakage flow ($P_s=100\text{bar}$)	Symbols C3, C5	mL/min	50 (P→A)			
		mL/min	70 (P→B)			
Nominal flow ($\Delta p = 35\text{bar}$ / metering notch)	Symbols C3, C5	L/min	10...100 (A→T)			
		L/min	10...25 (B→T)			
Leakage flow ($P_s=100\text{bar}$)	Symbols C4, C1	mL/min	50 (P→A)			
		mL/min	70 (P→B)			
		mL/min	70 (A→T)			
		mL/min	50 (B→T)			
Response time to reach fail-safe position	0bar	ms	12			
	100bar	ms	16			

Static/Dynamic

Hysteresis	%	≤0.2
Manufacturing tolerance for $q_{V\ max}$	%	<10
Response time for signal change 0...100%	ms	≤25
Thermal drift	%	<1 (at $\Delta T=40^\circ\text{C}$)

Electrical

Cyclic duration factor	%	100
Degree of protection		IP66
Power supply	VDC	24
Max. solenoid current	A	3.7
Coil resistance R_{20}	Ω	2.4
Max. power consumption at 100% load and operational temperature	VA	60
Position transducer DC/DC technology	Supply: +15V/35mA -15V/25mA	Signal: 0...±10V ($R_L \geq 10\text{k}\Omega$)

1) Flow rate at a different Δp : $q_x = q_{V\ nom} \cdot \sqrt{\frac{\Delta p_x}{35}}$

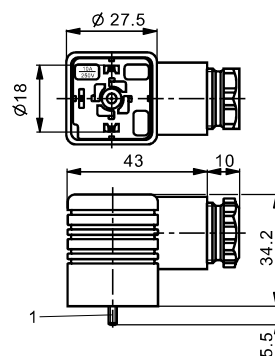
- 2) The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components.

Electrical connections, plug-in connector

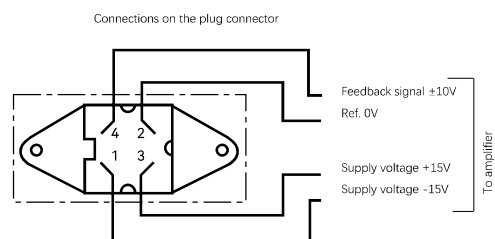
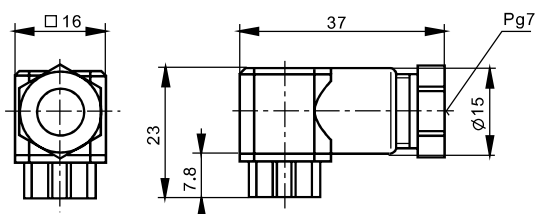
Electrical				
Duty			%	100
Solenoid connector		1		
		2		
LVDT connector	Supply voltage	3	VDC	+15
		1	VDC	-15
	Feedback signal	4	V	±10
		2	V	Ref. 0V
Degree of protection				IP65

Connector conforming to DIN EN 175301-803 (Need to order separately)

Separate order under material no. HP18110741
 Fixing screw: M3,torque 0.5 Nm



Inductive position transducer (LVDT)

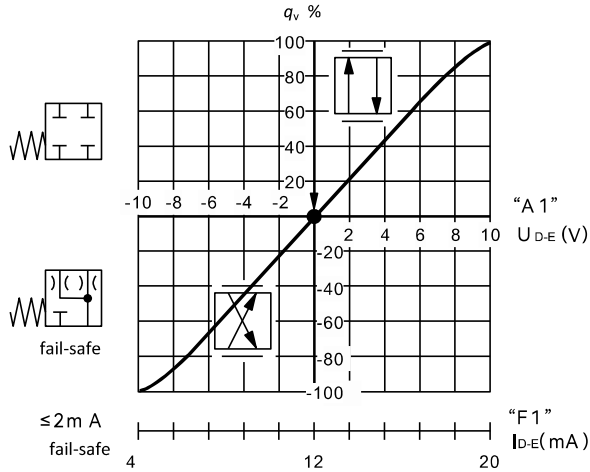


LVDT connector: 4-pin Pg7-G4W1F(Delivery with valve);
 Recommended: Up to 50 m cable length type LiYCY 4 x 0.25 mm²

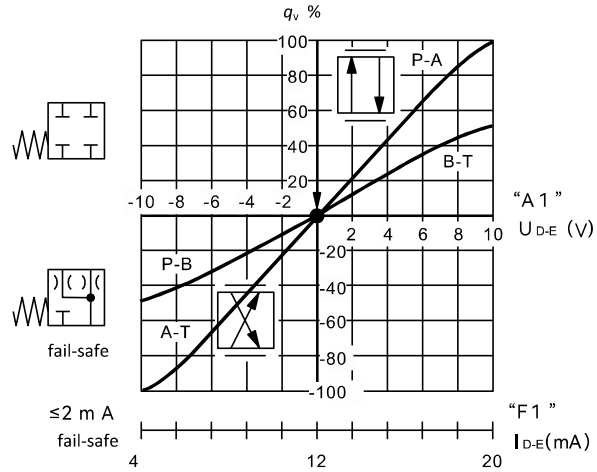
Characteristic curves (HLP46 at 40 °C ± 5 °C, Δp = 35 bar/control edge)

4WRPH6 flow characteristic $Q=f(U_{D-E})$, $Q=f(I_{D-E})$

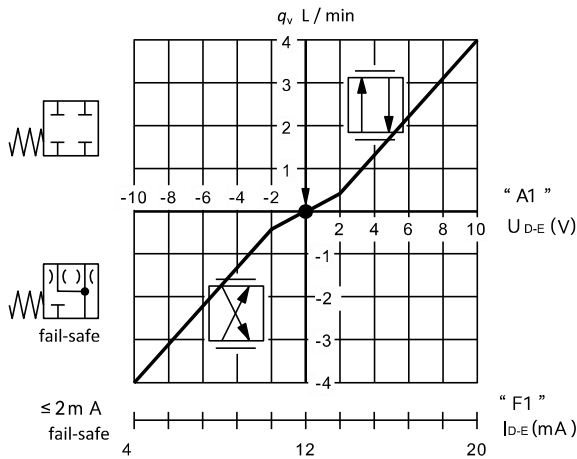
"L" linear: symbols C3, C4 and C



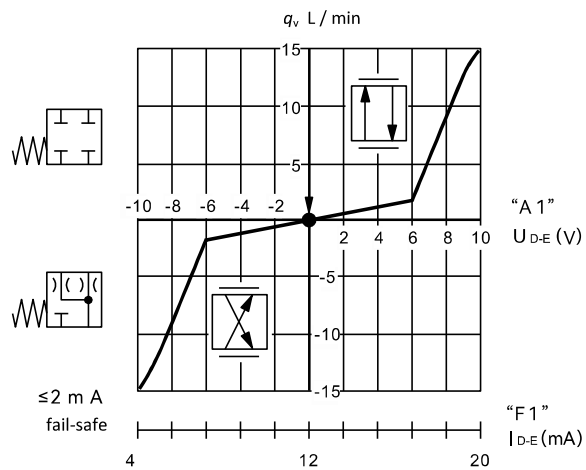
"L" linear: symbols C1 and C5



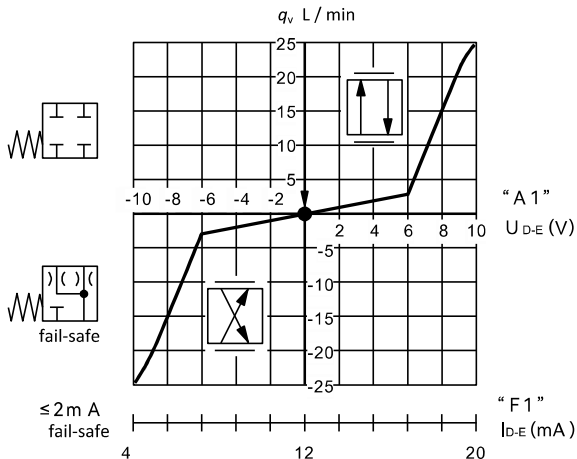
04P (Inflection 20%) : 4 L/min



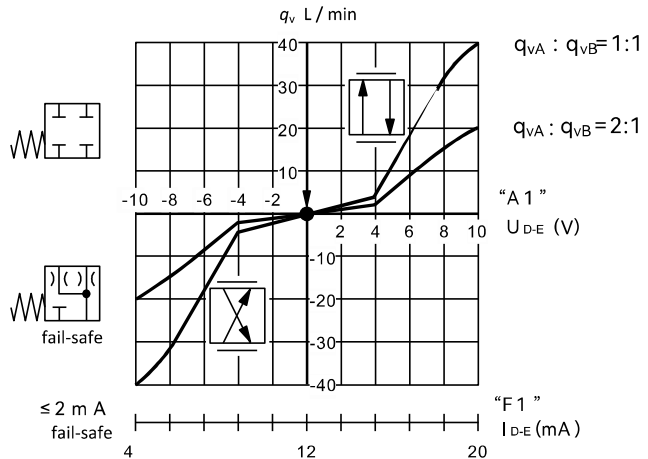
15P (Inflection 60%) : 15 L/min



25P (Inflection 60%) : 25 L/min



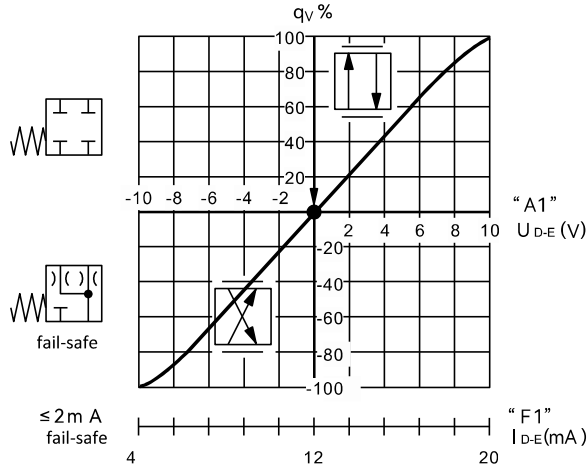
40P (Inflection 40%) : 40 L/min



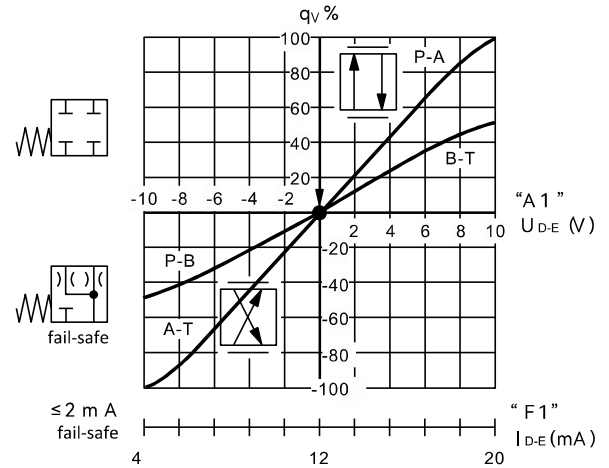
Characteristic curves (HLP46 at 40 °C ± 5 °C, Δp = 35 bar/control edge)

4WRPH10 flow characteristic $Q=f(U_{D-E})$, $Q=f(I_{D-E})$

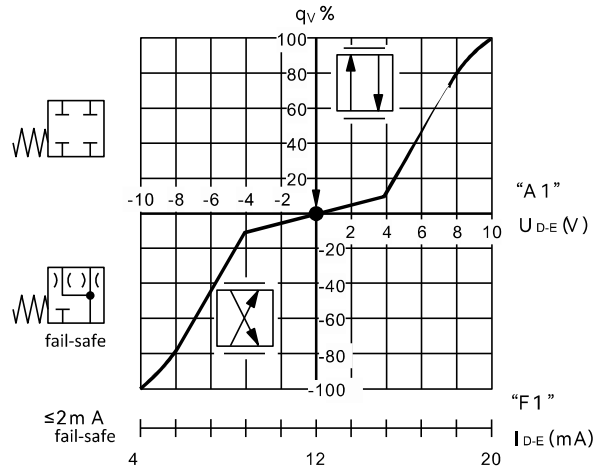
"L" linear: symbols C3、C4 and C



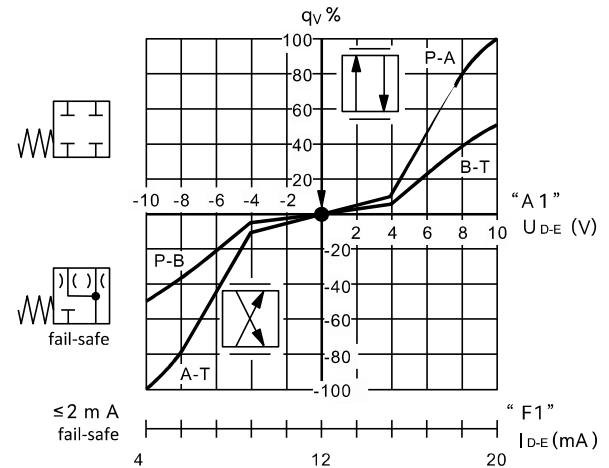
"L" linear: symbols C1 and C5



P (Inflection 40%): symbols C3、C4 and C

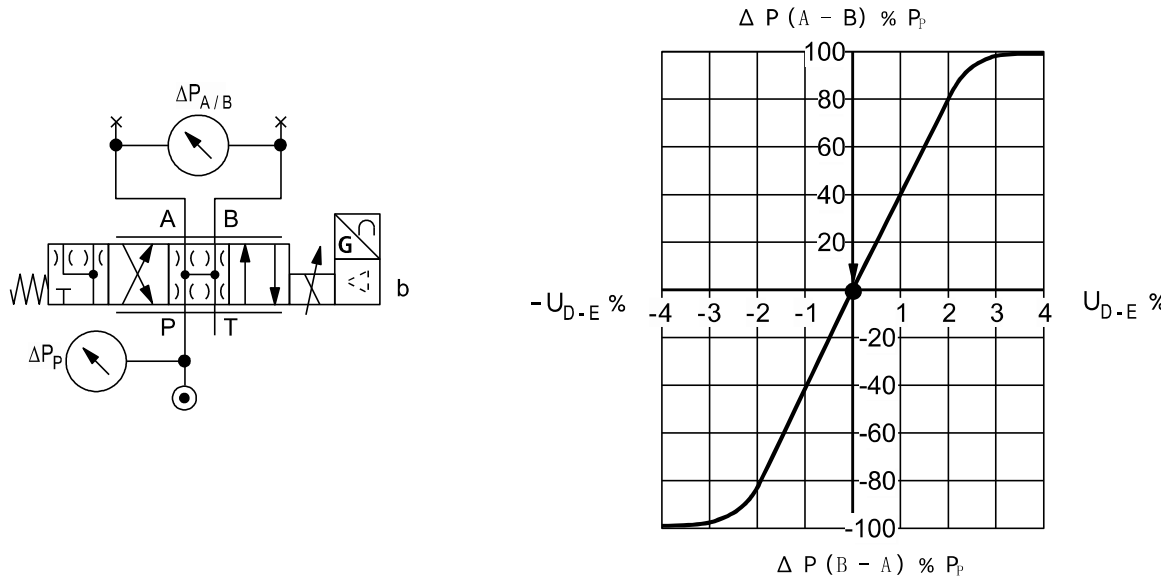


P (Inflection 40%): symbols C1 and C5

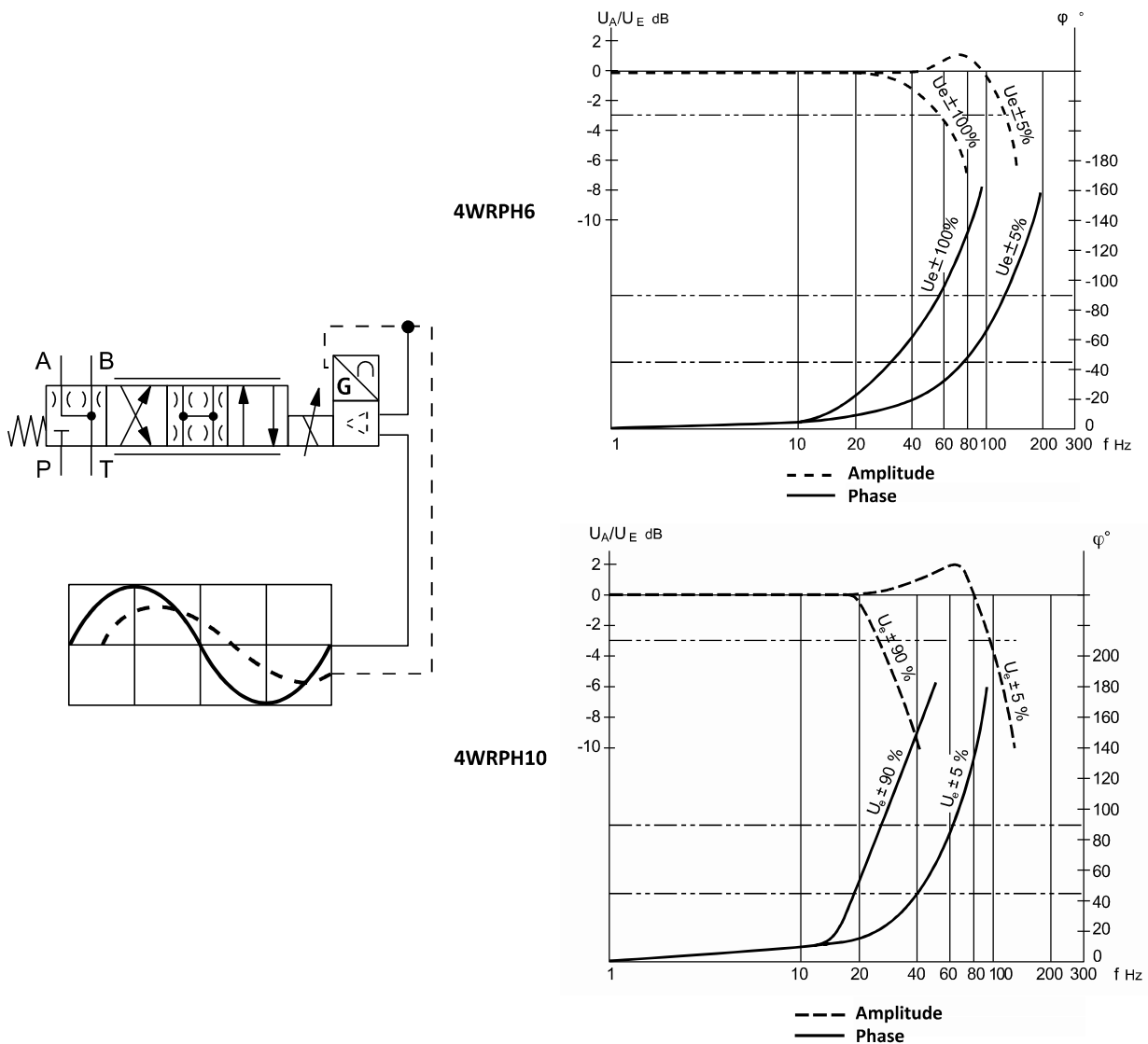


Characteristic curves (HLP46 at 40 °C ± 5 °C)

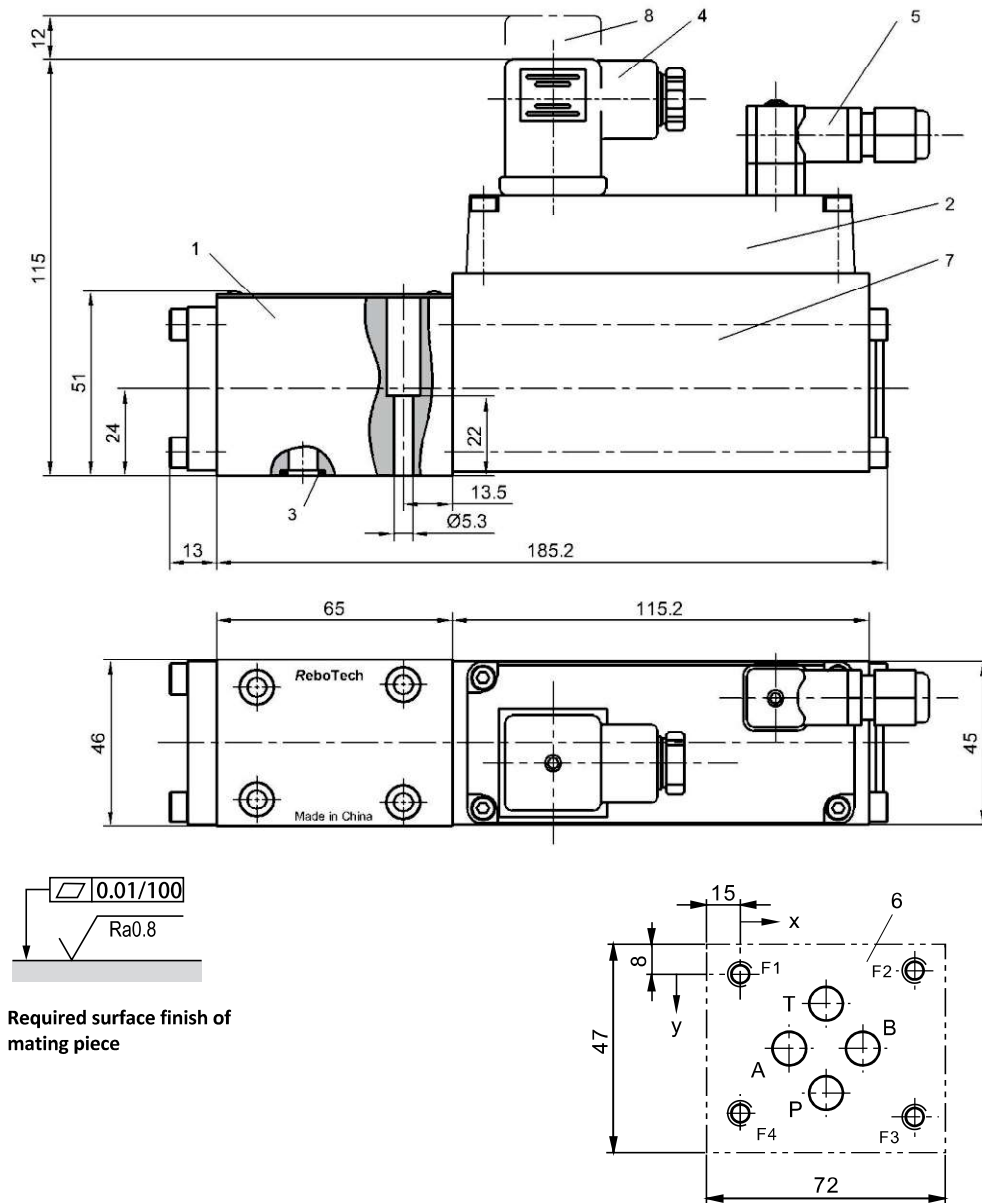
Pressure gain



Frequency response characteristic curves



Unit dimensions: NS 6 (Dimensions in mm)



Dimensions in mm	P	A	B	T	Y	F1	F2	F3	F4	G
Diameters/threads	$\varnothing 7.5$	$\varnothing 7.5$	$\varnothing 7.5$	$\varnothing 7.5$	$\varnothing 3.3$	M5	M5	M5	M5	$\varnothing 4$
x	21.5	12.7	30.2	21.5	40.5	0	40.5	40.5	0	33
y	25.9	15.5	15.5	5.1	9	0	-0.75	31.75	31	31.75

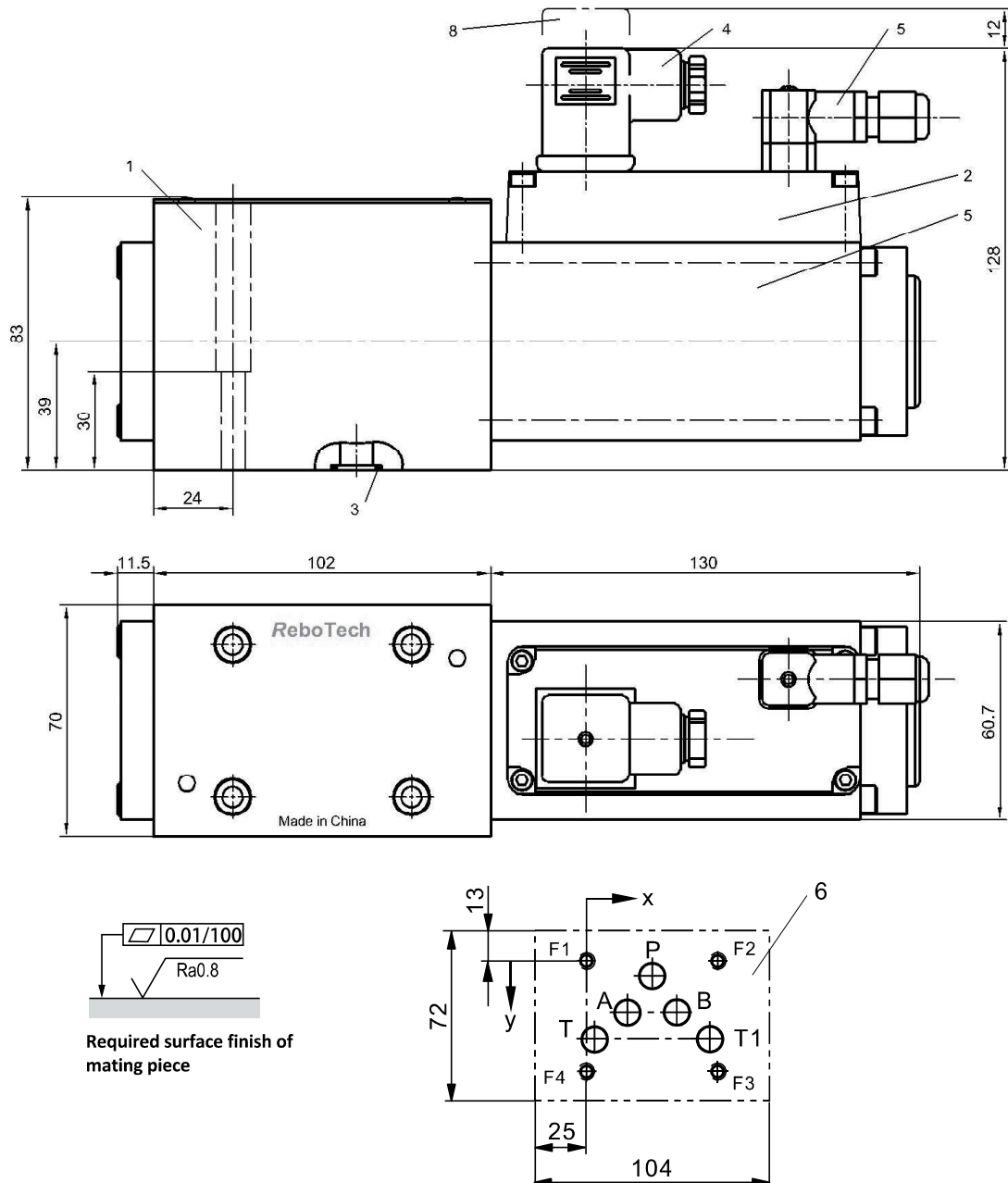
- Valve housing
- Integrated modulation and demodulation board
- R-ring 9.81 x 1.5 x 1.78 (ports A, B, P, T)
- Solenoid connector
- LVDT connector
- Mounting surface, in accordance with ISO4401-03-02-0-05 oil port connection position and standard tolerances
Diameters of the ports P, A, B and T are 7.5 mm

- Solenoid with Inductive position transducer
- Installation space required to remove the plug

Fixing screws: 4 GB/T 70.1 - M5 x 50 10.9

Torque: 8.9 Nm $\pm$ 10 %

Unit dimensions: NS 10 (Dimensions in mm)



Dimensions in mm	P	A	T	(T1)	B	F1	F2	F3	F4
Diameters/threads	ø11.2 max	ø11.2 max	ø11.2 max	ø11.2 max	ø11.2 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

- Valve housing
- Integrated modulation and demodulation board
- R-ring 13.0 x 1.6 x 2.0 (ports A, B, P, T)
- Solenoid connector
- LVDT connector
- Mounting surface, in accordance with ISO4401-05-04-0-05 oil port connection position and standard tolerances
Diameters of the ports P, A, B and T are 11.2 mm

- Solenoid with Inductive position transducer
- Installation space required to remove the plug

Fixing screws: 4 GB/T 70.1 - M6 x 40 10.9

Torque: 15.5 Nm $\pm$ 10 %