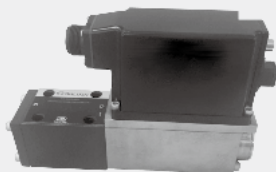


6.12

Proportional directional valves

Type 4WRPEH6...L2X

NG 6
Up to 315 bar
Up to 40L /min



Contents

Function and configuration	02
Ordering code	03
Symbols	03
Technical data	04
Electrical connection	05
Technical data for the cable	05
Integrated electronics (OBE)	06-07
Characteristic curves	08-09
Unit dimensions	10

Features

- With control spool and sleeve in servo quality
- Operated on one side, 4/4-fail-safe position in switched off state
- Electric position feedback and integrated electronics(OBE), calibrated in the factory
- Electrical connection 6P+PE signal input differential amplifier with interface "A1": $\pm 10V$ or interface "F1": 4...20mA ($R_{sh} = 200\Omega$)
- Subplate mounting, porting pattern to ISO 4401-03-02

Function and configuration

The 4WRPEH type high-response valve is a pilot-operated directional control valve with electrical position feedback and integrated electronics (OBE).

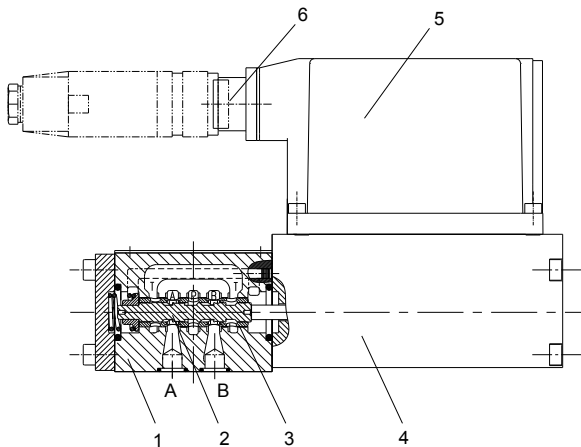
The valves basically consists of the housing(1), spool(2), sleeve(3), control solenoid with position transducer(4) and so on.

The specified command value is compared with the actual position value in the integrated electronics (OBE). In the event of a control deviation, the stroke solenoid is activated, which adjusts the control spool against the spring due to the change in the magnetic force.

Lifting/control cross-section is proportionally regulated to the command value. In case of a command value presetting of 0 V, the electronics adjusts the control spool against the spring to central position. In deactivated condition, the spring is untensioned to a maximum and the valve is in fail-safe position.

Switch-off behavior. With the electronics switched off, the valve moves immediately into the relevant safe basic position (fail-safe). The switch position P-B/A-T is passed through during this process, which can result in movements on the controlled component. This must be taken into account in system.

Type 4WRPEH6...-L2X/G24...



Ordering code

4WRP	E	H	6				-L2X / G24	/		*
------	---	---	---	--	--	--	------------	---	--	---

Directional control valve direct operated


With integrated electronics


Control spool/sleeve =H


NG 6 =6

Spool symbols

AB
a o b
PT

 =C3, C5

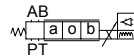
 =C4, C1

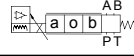
 =C

Transitional symbols

With symbols C5 and C1:
P→A:qv B→T:qv/2
P→B:qv/2 A→T:qv

Solenoid position

 Type B (Standard) = B

 Type A = A

Further information in plain text

V = FKM Seals
No code = NBR Seals

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

K31= With component plug,
Without plug-in connector
Z31= With component plug and
plug-in connector

Supply voltage of the control electronics
G24= + 24 V DC

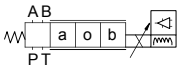

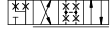
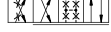
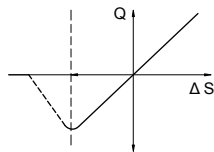
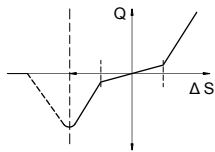
L2X= L20 to L29: unchanged installation and
connection dimensions

Flow characteristics:
L= Linear
P= Inflected characteristic curve

Rated flow of with 70 bar pressure differential
(35bar/control edge)

02=2 L/min	04=4 L/min	12=12L/min
	24=24L/min	40=40L/min

Symbols

	Linear	P: Inflection 40%
 C4, C1  C3, C5  C		
	C3, C5, C4, C1, C	C3, C5, C4, C1

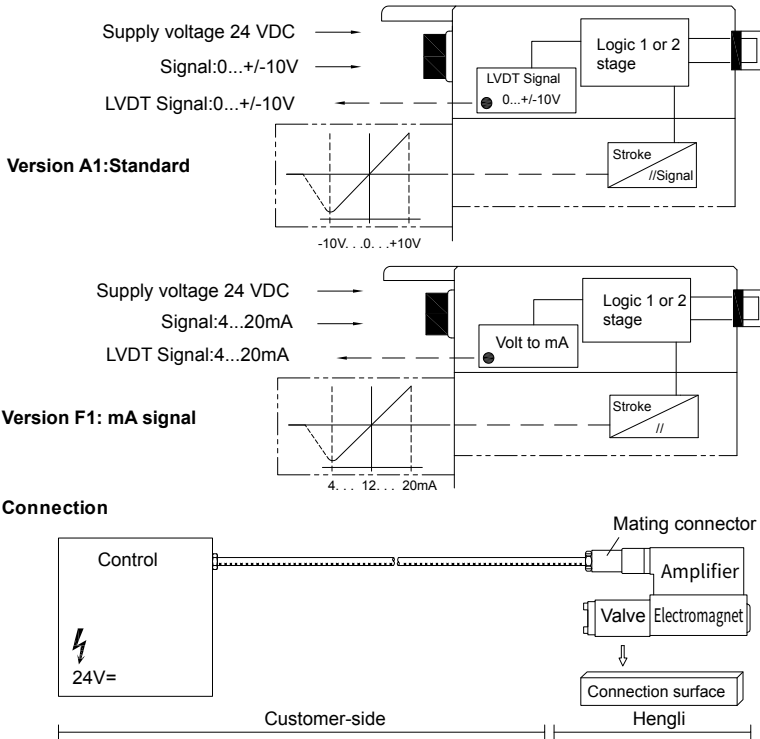
Technical data

General							
Design		Spool valve, direct operated, with steel sleeve					
Actuation		Proportional solenoid with position control, OBE					
Connection type		Subplate mounting, porting pattern according to ISO 4401-03-02-0-05					
Installation position		Any					
Ambient temperature range		°C	-20~+50				
Weight		Kg	~2.75				
Maximum vibration resistance (test condition)		Max. 25 g, space vibration test in all directions (24h)					
Hydraulic (measured at p=100bar, with HLP46 at $\vartheta_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)							
pressure fluid		Mineral oil (HL, HLP)to DIN 51 524					
Viscosity range	Recommended	mm ² /s	20...100				
	Maximum admissible	mm ² /s	10...800				
Hydraulic fluid temperature range		°C	-20 to +70				
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)		Class 18/16/13					
Rated flow ($\Delta p = 35$ bar per edge)		L/min	2	4	12	24	40
Maximum operating pressure		bar	Port A, B, P: 315				
Maximum operating pressure		bar	Port T: 250				
Leakage flow at 100 bar	Linear	cm ³ /min	< 150	< 180	< 300	< 500	< 900
	Nonlinear	cm ³ /min	—	—	—	< 300	< 450
Static/Dynamic							
Hysteresis		%	≤ 0.2				
Actuating time for signal step 0 ... 100%		ms	10				
Temperature drift		Zero shift < 1% at $\Delta T = 40^{\circ}\text{C}$					
Zero compensation		Ex factory $\pm 1\%$					

Electric, control electronics integrated in the valve						
Relative duty cycle		%	100ED			
Protection class according to EN 60529		IP 65.				
Connection		Plug-in connector 6P+PE, DIN 43563				
Supply voltage		24VDC _{nom}				
Terminal A		min. 21VDC / max. 40VDC				
Terminal B		0V (ripple max. 2)				
Fuse protection, external		A _F	2.5			
Input, version "A1"		Differential amplifier, Ri = 100 kΩ				
Terminal D (U _D)		0... ± 10V				
Terminal E		0V				
Input, version "F1"		Load, R _{sh} = 200 Ω				
Terminal D (I _{D,E})		4...12...20mA				
Terminal E (I _{D,E})		Current loop I _{D,E} return				
Test signal, version "A1"		LVDT				
Terminal F (U _{Test})		0... ± 10V				
Terminal C		Reference 0 V				
Test signal, version "F1"		LVDT signal 4 ... (12) ... 20 mA on external load				
Terminal F (I _{F,C})		200 ... 500 Ω maximum				
Terminal C (I _{F,C})		4 ... (12) ... 20mA (output)				
		Current loop I _{F,C} return				
Adjustment		calibrated before delivery, see characteristic curves				

¹⁾ The cleanliness level of the component must be reached in the hydraulic system. Effective filtering prevents failures and increases the service life of components.

Electrical connection



Technical data for the cable

- Version:**
- Multi-core wire
 - Litz wire structure, extra fine wire according to VDE 0295, class 6
 - Protective earthing conductor, green-yellow
 - Cu shielding braid
- Number of wires:** - Determined by the valve type, connector type and signal configuration
- Line Ø:**
- 0.75 mm² to 20 m of length
 - 1.0 mm² to 40 m of length
- Outer Ø:**
- 9.4...11.8 mm
 - 12.7...13.5 mm

Note:
Supply voltage 24 V DC_{nom}

if the value falls below 18V = an internal fast switch-off is effected which can be compared with "Release OFF".

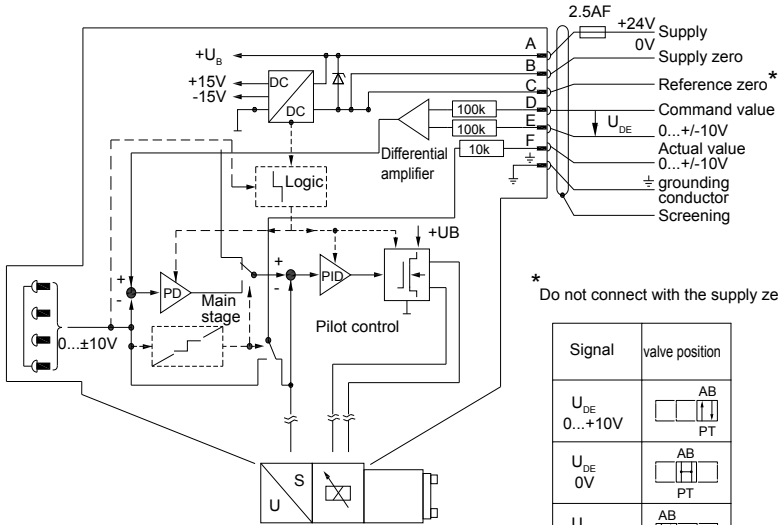
Additionally for version F1:
 $I_{D,E} \geq 3\text{mA}$ - valve is active
 $I_{D,E} \leq 2\text{mA}$ - valve is deactivated.

Electric signals taken out via control electronics (e.g. actual value) may not be used for the switch-off of safety-relevant machine functions! (See also the European standard "Safety requirements for fluid power systems and their components - Hydraulics", EN 982.)

Integrated electronics (OBE)

Block diagram/pin assignment

A1: $U_{D,E} 0 \dots \pm 10V$



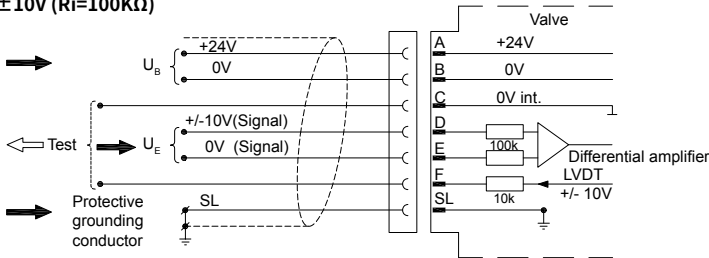
* Do not connect with the supply zero!

Signal	valve position
U_{DE} $0 \dots +10V$	
U_{DE} 0V	
U_{DE} $0 \dots -10V$	

06

In assignment 6P+PE

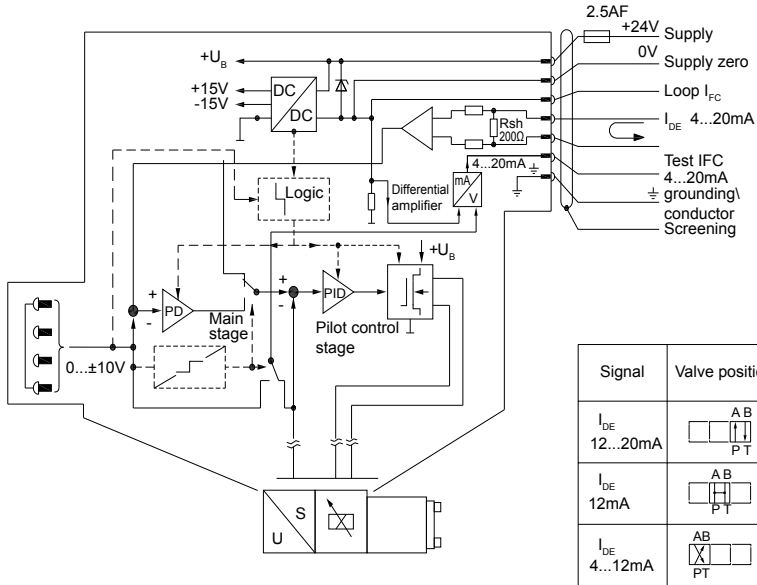
A1: $U_{D,E} \pm 10V$ ($R_i=100K\Omega$)



Integrated electronics (OBE)

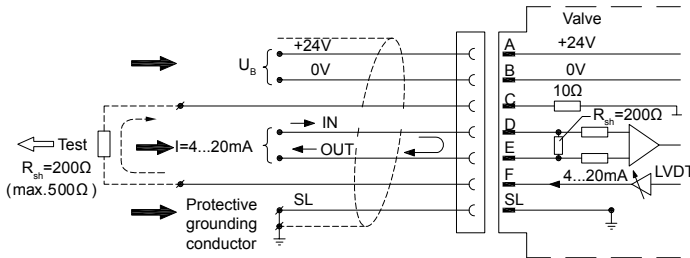
Block diagram/pin assignment

F1: $I_{D,E}$ 4...20mA



In assignment 6P+PE

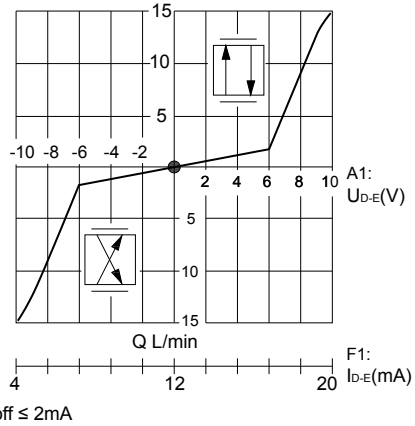
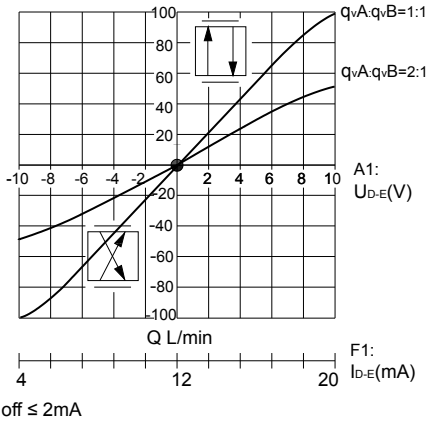
F1: $I_{D,E}$ 4...20mA ($R_{sh} = 200\ \Omega$)



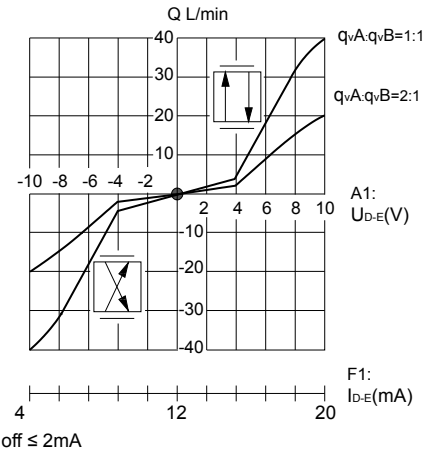
Characteristic curves (measured at $p=100\text{bar}$, with HLP46, $\vartheta_{\text{oil}}=40^\circ\text{C} \pm 5^\circ\text{C}$)

Flow-signal function $q_v=f(U_{D-E}), q_v=f(I_{D-E})$

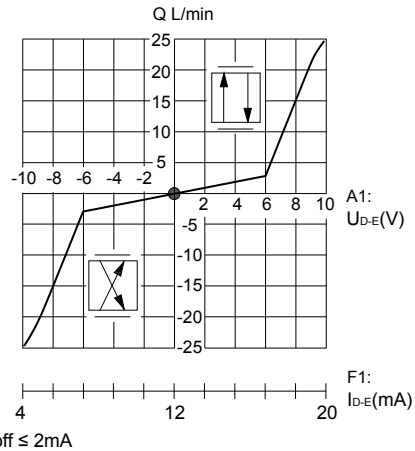
Linear characteristic curve (version "L")



Inflected characteristic curve "P", inflection at 40%

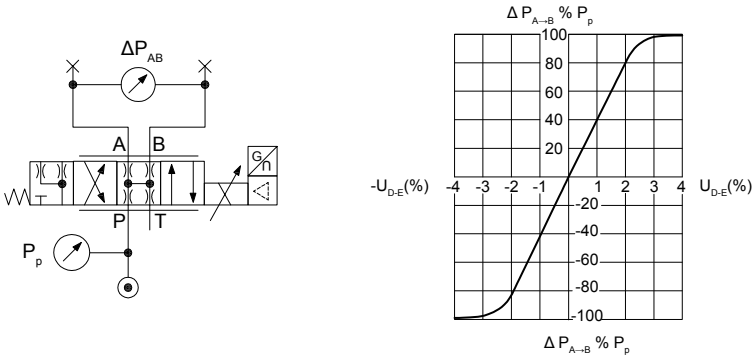


Inflected characteristic curve "P", inflection at 60%

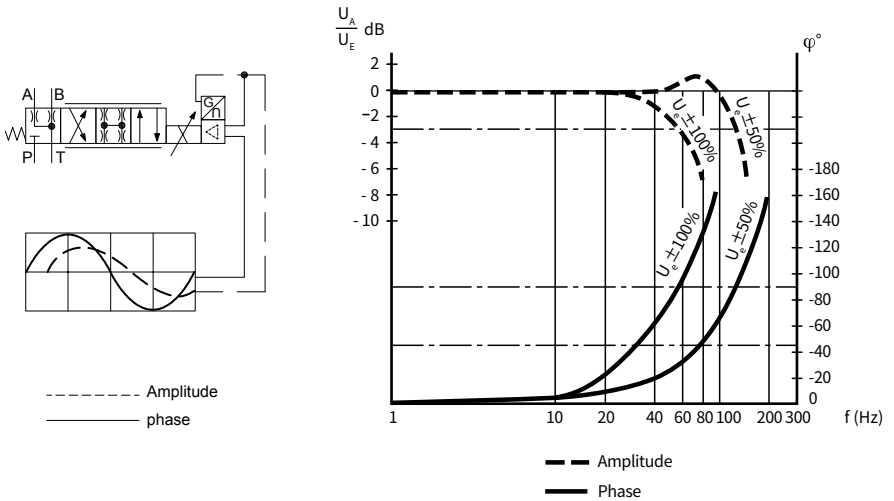


06

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



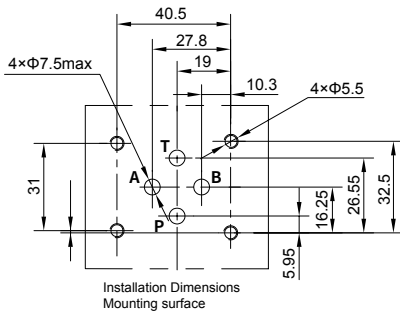
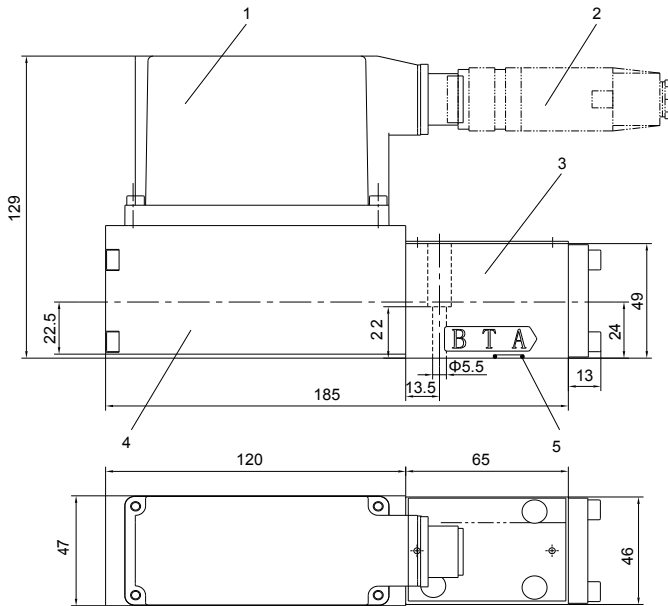
Characteristic curves: Bode diagram (measured at $p=100\text{bar}$, with HLP46, $\vartheta_{\text{oil}}=40^\circ\text{C} \pm 5^\circ\text{C}$)



06

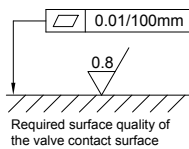
Unit dimensions

(Dimensions in mm)



- 1 Integrated electronics (OBE)
- 2 Mating connectors
- 3 Valve housing
- 4 Control solenoid with position transducer
- 5 O-ring 9.25×1.78 (for ports P, A, B, T)

Valve mounting screws:
 4- M5×30 GB/T 70.1-10.9;
 $M_A = 7.9 \text{ Nm} \pm 10\%$

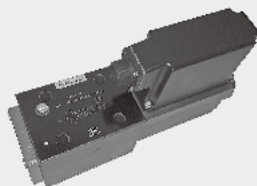


6.13

Proportional directional valves

Type 4WRPEH10...L2X

NG 10
Up to 315 bar
Up to 100 L/min



Contents

Function and configuration	02
Ordering code	03
Symbols	03
Technical data	04
Electrical connection	05
Technical data for the cable	05
Integrated electronics	06-07
Characteristic curves	08-09
Unit dimensions	10

Features

- Directly actuated controlled directional valve, with control spool and sleeve in servo quality
- Single-side operated, 4/4 fail-safe position in deactivated state
- Electric position feedback and integrated electronics (OBE), calibrated in the factory
- Electric port 6P+PE Signal input of differential amplifier with interface A1: ± 10 V or interface F1: 4...20mA (Rsh=200 Ω)
- Subplate mounting, porting pattern to ISO 4401-05-04

Function and configuration

The 4WRPEH type high-response valve is a pilot-operated directional control valve with electrical position feedback and integrated electronics (OBE).

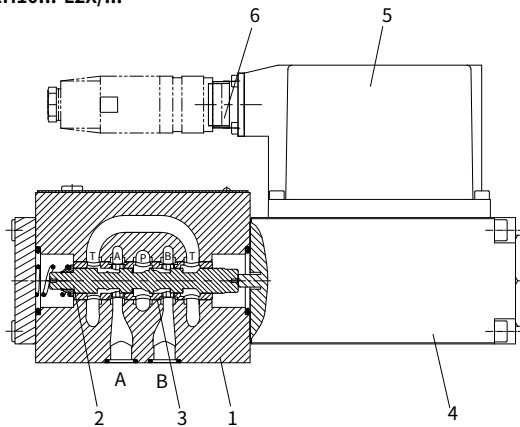
The valves basically consists of the housing(1),spool(2),sleeve(3),control solenoid with position transducer(4) and so on.

The specified command value is compared with the actual position value in the integrated electronics (OBE).In the event of a control deviation, the stroke solenoid is activated, which adjusts the control spool against the spring due to the change in the magnetic force.

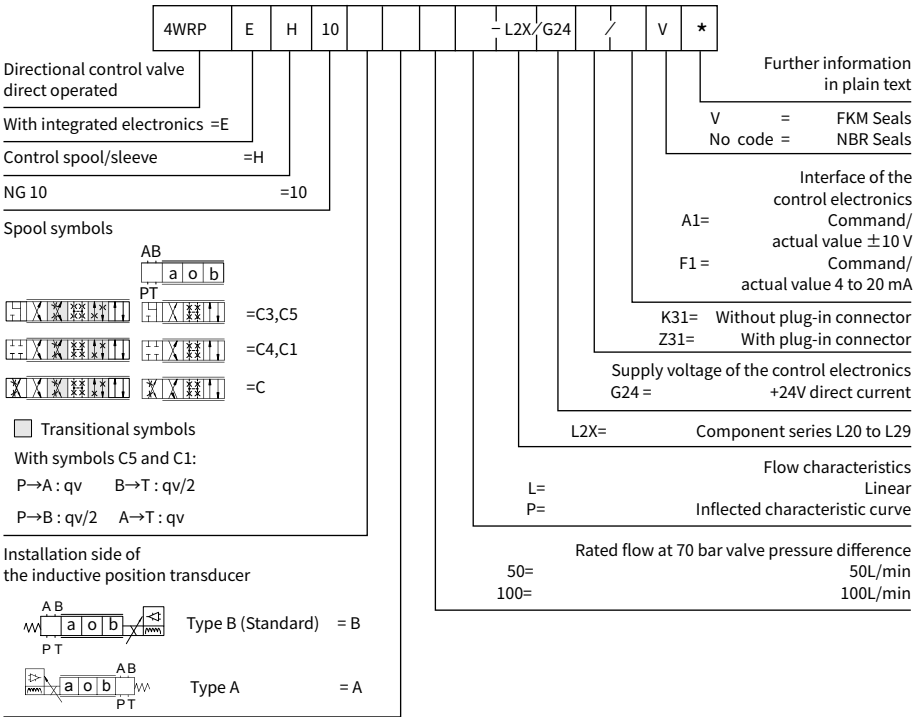
Lifting/control cross-section is proportionally regulated to the command value. In case of a command value presetting of 0 V, the electronics adjusts the control spool against the spring to central position. In deactivated condition, the spring is untensioned to a maximum and the valve is in fail-safe position.

With the electronics switched off, the valve moves immediately into the relevant safe basic position (fail-safe). The switch position P-B/A-T is passed through during this process, which can result in movements on the controlled component. This must be taken into account in system designs.

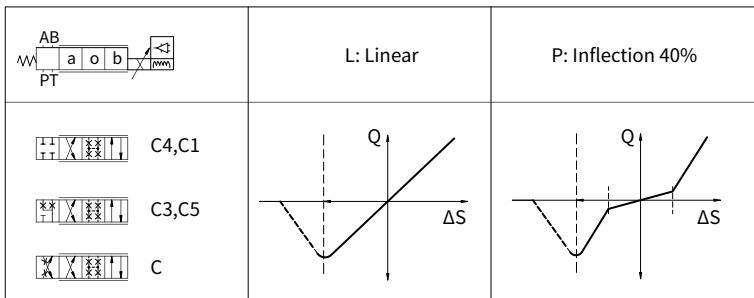
Type 4WRPEH10...-L2X/...



Ordering code



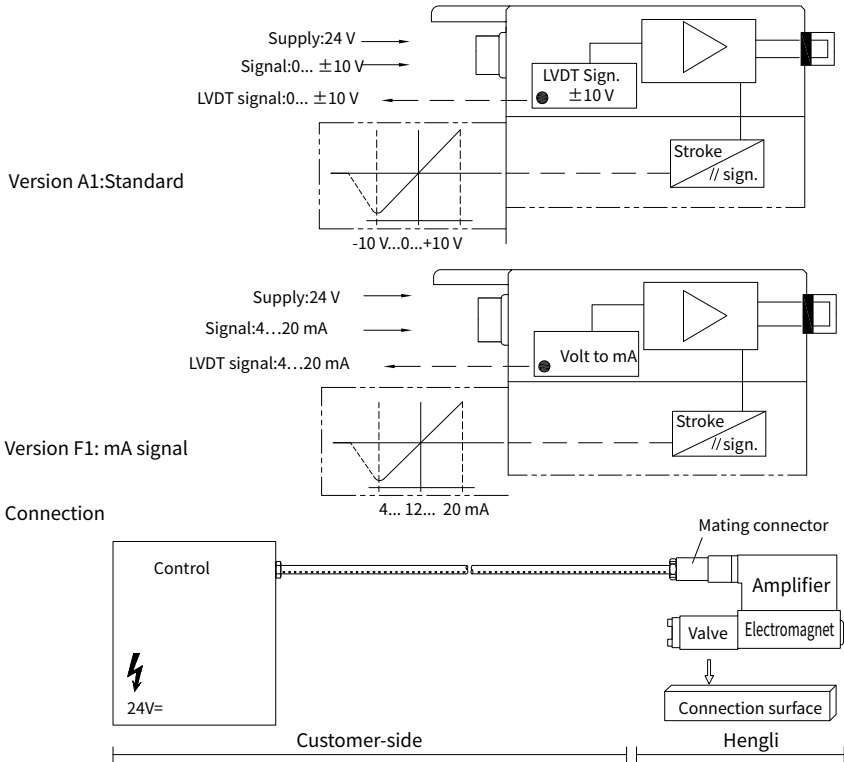
Symbols



Technical data

General			
Design		Spool valve, directly operated, with steel sleeve	
Actuation		Proportional solenoid with position control, OBE	
Connection type		Plate port, porting pattern (ISO 4401-05-04-0-05)	
Installation position		Any	
Ambient temperature range		°C	-20...+50
Weight		Kg	7.1
Maximum vibration resistance (test condition)		Max. 25 g, space vibration test in all directions (24h)	
Hydraulic (measured with HLP 46, $\vartheta_{\text{oil}}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)			
Hydraulic fluid		Hydraulic oil according to DIN 51524...535	
Viscosity range	Recommended	mm ² /s	20...100
	Max. admissible	mm ² /s	10...800
Hydraulic fluid temperature range		°C	-20 to +70
Max. admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)		Class 18/16/13	
Rated flow ($\Delta p = 35$ bar per edge)		L/min	50 100
Maximum operating pressure		bar	Port P, A, B: 315
Maximum operating pressure		bar	Port T: 250
Leakage flow at 100 bar	Linear	cm ³ /min	<1200 <1500
	Nonlinear	cm ³ /min	<600 <600
Static/Dynamic			
Hysteresis		%	≤ 0.2
Actuating time for signal step 0 ... 100%		ms	25
Temperature drift		Zero shift < 1% at $\Delta T=40^{\circ}\text{C}$	
Zero compensation		Ex factory $\pm 1\%$	
Electric, control electronics integrated in the valve			
Relative duty cycle		%	100ED
Protection class		IP 65 (with mating connector mounted and locked)	
Connection		Mating connector 6P+PE, DIN 43563	
Supply voltage		24VDC _{nom}	
Terminal A		min. 21VDC / max. 40VDC	
Terminal B: 0V		Ripple max. 2 VDC	
Fuse protection, external		A _F	2.5
Input, version "A1"		Differential amplifier, Ri = 100 kΩ	
Terminal D (U _D)		0... ± 10V	
Terminal E		0V	
Input, version "F1"		Load, R _{sh} = 200 Ω	
Terminal D (I _{D,E})		4...12...20mA	
Terminal E (I _{D,E})		Current loop I _{D,E} return	
Test signal, version "A1"		LVDT	
Terminal F (U _{Test})		0... ± 10V	
Terminal C		Reference 0 V	
Test signal, version "F1"		LVDT	
Terminal F (I _{F,C})		4...20 mA output	
Terminal C (I _{F,C})		Current loop I _{F,C} feedback	

Electrical connection



Technical data for the cable

- Version: - Multi-core wire
 - Litz wire structure, extra fine wire according to VDE 0295, class 6
 - Protective earthing conductor, green-yellow
 - Cu shielding braid
- Number of wires: - Determined by the valve type, connector type and signal configuration
- Line Ø: - 0.75 mm² to 20 m of length
 - 1.0 mm² to 40 m of length
- Outer Ø: - 9.4...11.8 mm
 - 12.7...13.5 mm

Note:
 Supply voltage 24 V DC_{nom}

if the value falls below 18V DC= an internal fast switch-off is effected which can be compared with "Release OFF".

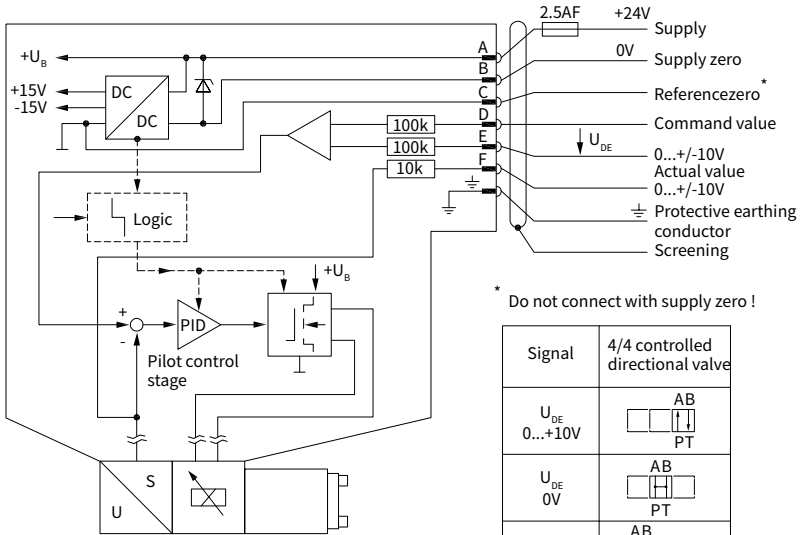
Additionally for version F1:
 $I_{D-E} \geq 3\text{mA}$ - valve is active
 $I_{D-E} \leq 2\text{mA}$ - valve is deactivated.

Electric signals taken out via control electronics (e.g. actual value) may not be used for the switch-off of safety-relevant machine functions! (See also the European standard "Safety requirements for fluid power systems and their components - Hydraulics", EN 982.)

Integrated electronics

Block diagram/pin assignment

Version A1: $U_{D-E} 0... \pm 10V$



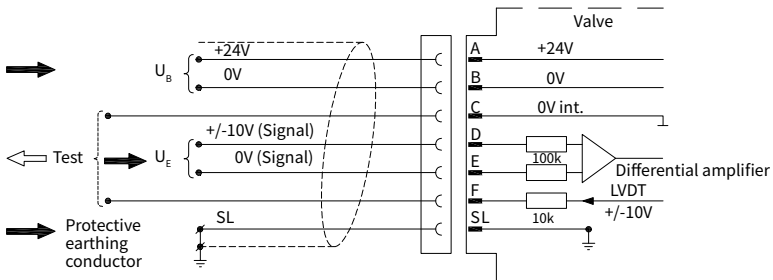
* Do not connect with supply zero !

Signal	4/4 controlled directional valve
$U_{D-E} 0...+10V$	
$U_{D-E} 0V$	
$U_{D-E} 0...-10V$	

06

Pin assignment 6P+PE

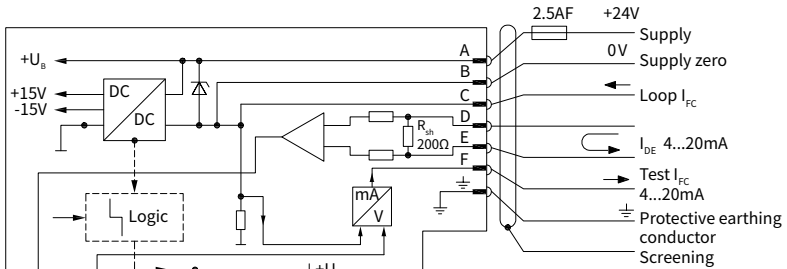
Version A1: $U_{D-E} 0... \pm 10V$



Integrated electronics

Block diagram/Pinout

Version F1: I_{D-E} 4...20mA

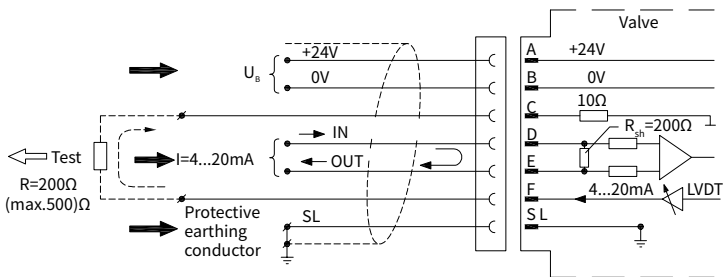


Signal	4/4 controlled directional valve
I_{D-E} 12...20mA	
I_{D-E} 12mA	
I_{D-E} 4...12mA	

$I_{D-E} \leq 2\text{mA}$, Valve inactive

Pin assignment 6P+PE

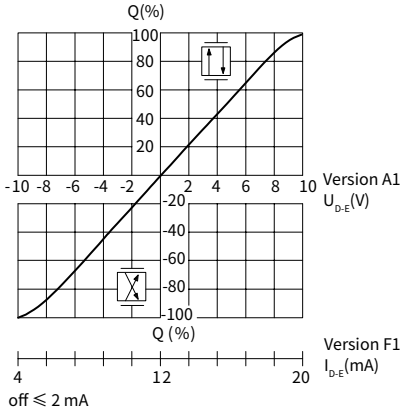
Version F1: I_{D-E} 4...20mA



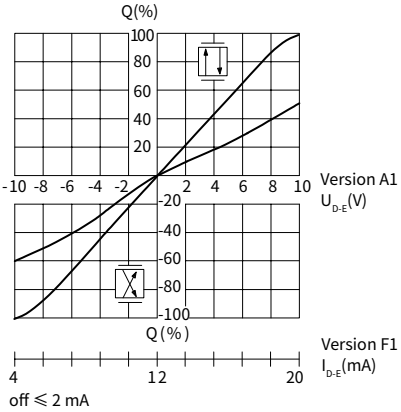
Characteristic curves (measured with HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Flow-signal function $Q=f(U_{D-E}), Q=f(I_{D-E})$

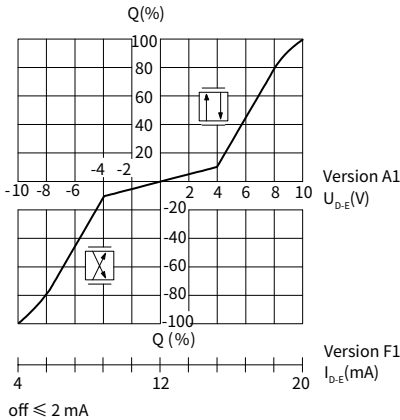
Linear characteristic curve (version "L", 1 : 1



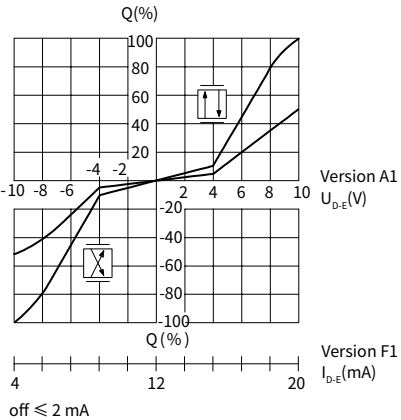
Linear characteristic curve (version "L", 2 : 1



**Inflected characteristic curve "P",
inflection at 40% , 1 : 1**

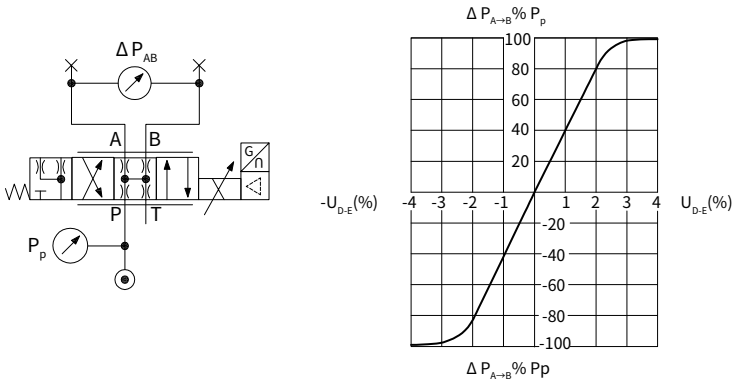


**Inflected characteristic curve "P",
inflection at 40% , 2 : 1**

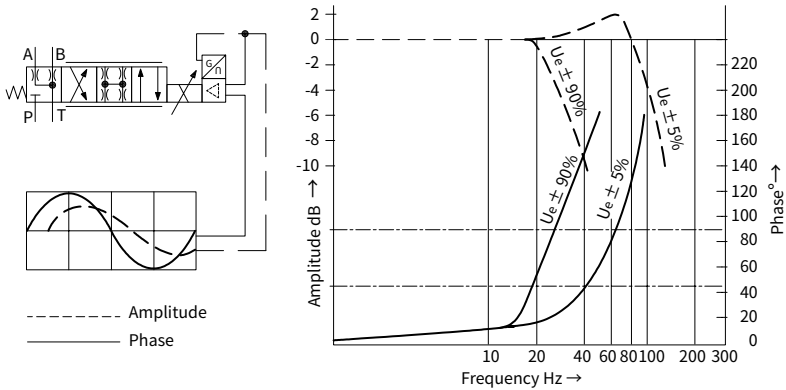


06

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



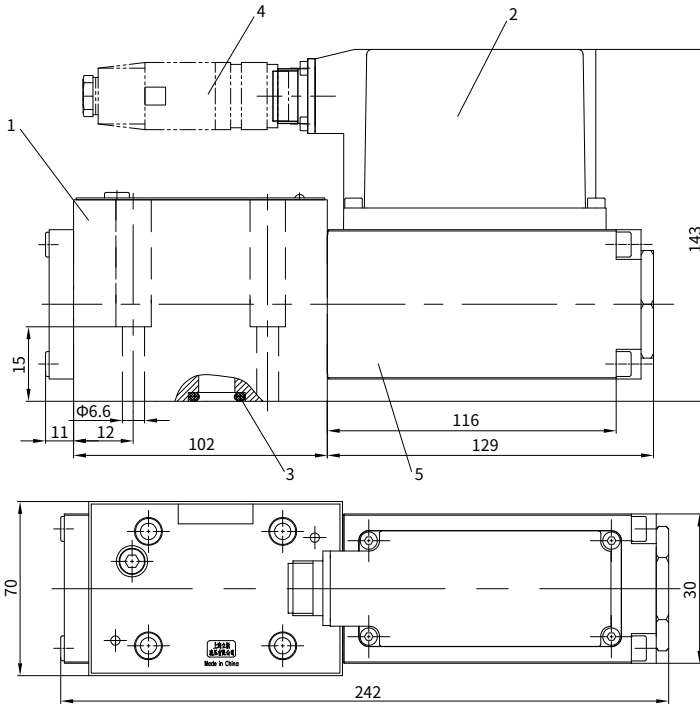
Characteristic curves: Bode diagram



06

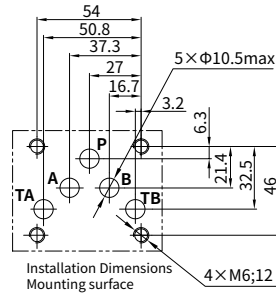
Unit dimensions

(nominal dimensions in mm)



06

- 1 Valve housing
- 2 Integrated electronics
- 3 Identical seal rings for ports A, B, P and T (O-ring 12×2)
- 4 Plug-in connector
- 5 Proportional solenoid with inductive position transducer



Valve mounting screws

The following valve fixing screws are recommended:

- 4 GB/T 70.1 - M6×40 - 10.9
- Tightening torque $M_A = 11 \pm 3$ Nm

