SWRPEH

Proportional Servo Valve

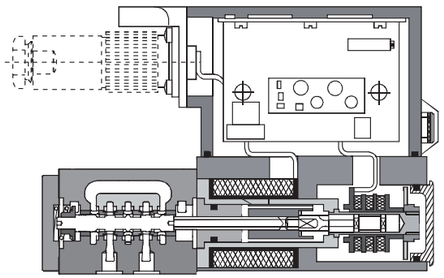
☑Direct-acting☑ High-Performance Proportional Servo Valve

SWRPEH6

with integrated amplifier

The control solenoid features built-in position feedback and provides directional control and non-pressure-compensated flow control based on the input electrical signal. The proportional valve incorporates a four-edge spool that slides within a precision-machined and hardened sleeve to achieve minimal overlap and high precision. The sleeve is pressed into a five-chamber valve body. The spool is directly actuated by proportional solenoids, and its position is controlled in a closed loop by an LVDT position sensor.

The signal detected by the displacement sensor is demodulated by the circuit board and converted into a measurable analog output. The electronic amplifier supplies the appropriate current to the proportional valve to calibrate its setting. The feedback from the displacement sensor corresponds to the input signal provided to the electronic amplifier.



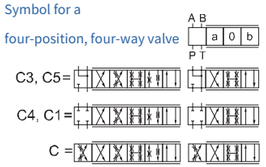
Size	6 / 10	Pmax	350bar
Qmax	40l/min(size:6,△p=70bar)/100l/min(size:10,△p=70bar)		

Product Model

SWRPEH6 - C3 B - 04 L - G24 /C1F2 /E /M

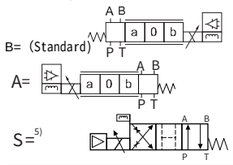
SWRPEH6=size6 (with amplifier)
SWRPEH10=size10 (with amplifier)

Symbol for a four-position, four-way valve



Witch symbol C5 or C1[3]
P → A: q_v B → T: q_v/2
P → B: q_v/2 A → T: q_v

Inductive position sensor side



Seal
M=NBR V=FKM

None=Without Enable E=With Enable

C=Input F=Feedback
1=+/-10V 2=4...20mA 3=+/-10mA
C1F1=A1(=Command Input ±10V)
C2F2=F1(=Command Input 4...20 mA)

Amplifier Supply Voltage
G24=24V *Note: 7-pin plug is not standard and must be ordered separately.

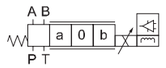
Flow Characteristics
L = Linear
P = P-Curve (Non-linear, modified linear)
V = Parabolic

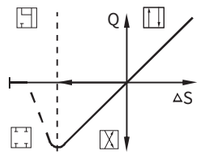
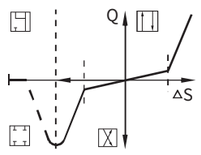
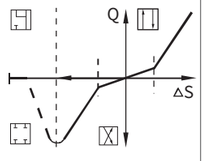
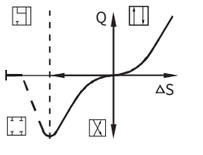
Nominal flow rate at 70 bar valve pressure drop (35 bar per metering edge).)
Size:6
01 = 1 l/min 12 = 12 l/min 16[4]=16 l/ min 25[1] = 25 l/min
04[3]= 4 l/min 15[1] = 15 l/min 24 = 24 l/min 32[4]=32 l/min
40[3] = 40 l/min
Size:10
50=50 l/min 100=100 l/min

1) Relates only to the flow characteristic 'p'
2) A knee point of 60% applies to NG6 nominal flows "15" and "25", whereas a knee point of 40% applies in all other cases.
3) For NG6 valves, a 2:1 flow attenuation ratio (q 2:1) is applicable for the nominal flow rates of 04 and 40 L/min.
4) Applicable only to parabolic spools (V-type).
5) Without de-energized protection. The valve centers when supplied with 24V and a 12mA signal. Upon power loss, P connects to A, and B connects to T.

Spool Configuration Symbol

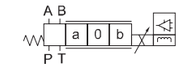
SWRPEH6

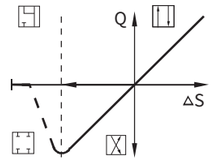
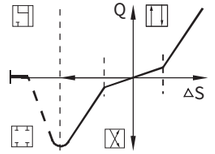


	Linear	P:60% knee point [q_n 15,25 l/min]	P:40% knee point [q_n 40 l/min]	V-type
C3, C5				
C4, C1				
C	C3,C5,C4,C1,C	C3,C5,C4,C1		

Standard setting = 1:1. A 2:1 ratio also applies at a nominal flow rate (Qn) of 40 L/min.

SWRPEH10



	Linear	P:40% knee point
C3, C5		
C4, C1		
C	C3,C5,C4,C1,C	C3,C5,C4,C1

Technical Data Sheet: SWRPEH6

Overview

Design		Direct-operated spool valve with sleeve
Actuation		Proportional solenoid with position controller, OBE (Oil-Bath Environment)
Mounting Type		Subplate, mounting interface size 06 (ISO 4401-03-02-0-94)
Installation Position		Any
Ambient Temperature Range	°C	-20...+50
Weight	kg	2.7
Vibration Resistance / Test Conditions		Maximum 25g vibration in 3 axes (24h)

Hydraulic Data (Measured with HLP 46, Oil Temperature θ_{oil} = 40°C ± 5°C)

Hydraulic Fluid		Oils according to DIN 51524-535; for other fluids, please consult us.					
Recommended Viscosity Range	mm²/s	20...100					
Maximum Permissible Viscosity	mm²/s	10...800					
Oil Temperature	°C	-20...+70					
Maximum Permissible Fluid Contamination Level (per ISO 4406(c))		18/16/13 [1]					
Flow Direction		Refer to the center position symbol (spool configuration symbol).					
Nominal Flow Rate (L/min) at Δp = 35 bar per metering edge²		1	4	12	15	24	40
Maximum Operating Pressure	bar	Ports P, A, B: 320					
Maximum Pressure	bar	Port T: 250					
Operating Limit at Valve Pressure Drop Δp Qvnom:＞Qn valve	bar	320	320	320	320	320	160
	bar	320	320	320	280	250	100
Leakage at 100 bar	cm³ /min	＜150	＜180	＜300	-	＜500	＜900
	cm³/min	-	-	-	＜180	＜300	＜450

Steady-State / Dynamic Characteristics

Hysteresis	%	≦0.2
Manufacturing Tolerance (with reference to qmax)	%	＜10
Response Time (for 0...100% signal change)	ms	≦10
Temperature Drift:		*Zero shift < 1% for ΔT = 40°C*
Zero Adjustment		*Factory set ±1%*

1) The cleanliness class required by the component must be achieved in the hydraulic system. Effective filtration prevents malfunctions and increases the service life of components.

2) Flow rate at a specific pressure drop Δp $\Delta q_x = q_{nom.} \cdot \sqrt{\frac{\Delta p_x}{35}}$

Technical Data Sheet: SWRPEH10

Overview

Design		Direct-operated spool valve with sleeve
Actuation		Proportional solenoid with position controller, OBE (Oil-Bath Environment)
Mounting Type		Subplate, mounting interface size10 (ISO 4401-05-04-0-94
Installation Position		Any
Ambient Temperature Range	°C	-20...+50
Weight	kg	7.1
Vibration Resistance / Test Conditions		Maximum 25g vibration in 3 axes (24h)

Hydraulic Data (Measured with HLP 46, Oil Temperature θ_{oil} = 40°C ± 5°C)

Hydraulic Fluid		Oils according to DIN 51524-535; for other fluids, please consult us			
Recommended Viscosity Range	mm²/s	20...100			
Maximum Permissible Viscosity	mm²/s	10...800			
Oil Temperature	°C	-20...+70			
Maximum Permissible Fluid Contamination Level (per ISO 4406(c))		18/16/13 [1]			
Flow Direction					
Nominal Flow Rate (L/min) at Δp = 35 bar per metering edge²		50 (1:1)	50 (2:1)	100 (1:1)	100 (2:1)
Maximum Operating Pressure	bar	Ports P, A, B: 320			
Maximum Pressure	bar	Port T: 250			
Operating Limit at Valve Pressure Drop Δp Qvnom:＞Qn valve	bar	320	320	160	160
	bar	250	250	100	100
Leakage at 100 bar	cm³ /min	< 1,200	< 1,200	<1,500	<1,000
	cm³/min	<600	<500	<600	<600

Steady-State / Dynamic Characteristics

Hysteresis	%	≦0.2
Manufacturing Tolerance (with reference to qmax)	%	＜10
Response Time (for0...100% signal change)	ms	≦25
Temperature Drift		*Zero shift < 1% for ΔT = 40°C*
Zero Adjustment		*Factory set ±1%*

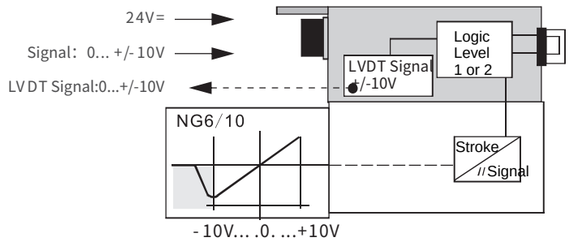
1) The cleanliness class required by the component must be achieved in the hydraulic system. Effective filtration prevents malfunctions and increases the service life of components.

2) Flow rate at a specific pressure drop Δp $\Delta q_x = q_{nom.} \cdot \sqrt{\frac{\Delta p_x}{35}}$

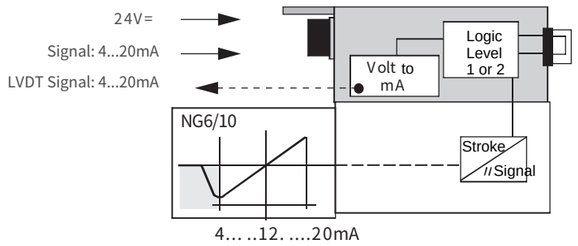
Electronics, Amplifier Integrated in the Valve

Duty Cycle	%	100
Protection Degree		IP 65 according to DIN 40050 and IEC 14434/5
Connection		Plug, 6P+PE, DIN 43563
Power Supply Terminal A: Terminal B:0V		24V DC nom Minimum 21 V DC/ Maximum 40 V DC Ripple max. 2 V DC
Power Consumption		SWRPEH6:Solenoid ⊠ 45mm=40 VA max. SWRPEH10:Solenoid ⊠ 60 mm=60 VA max.
External Fuse		2.5 AF
Input, "Standard" Type Terminal D: UE Terminal E:		Differential Amplifier，Ri=100kΩ 0...±10 V 0 V
Input, "mA Signal" Type Terminal D:/D-E Terminal E:/D-E		Load, Rsh = 200 Ω 4...20 mA Current Loop/ D-E (Feedback)
Max. Differential Input Voltage at 0V		D → B E → B } max.18DC
Monitor Signal, "Standard" Type Terminal F:U text Terminal C:		LVDT 0...+10V Standard 0V
Monitor Signal, "mA Signal" Type Terminal F:/F-C Terminal C:/F-C		LVDT Signal 4...20 mA (with external load 200...500 Ω) 4...20 mA Output Current Current Loop / F-C Feedback
Protective Conductor and Shield		Refer to terminal markings (Installation complies with CE)
Recommended Cable		For terminal identification, refer to the corresponding markings. Cable specification: Up to 20 m: 7 x 0.75 mm² Up to 40 m: 7 x 1 mm²
Calibration		Calibrated at the factory, refer to valve characteristic curves

Model A1:
Standard

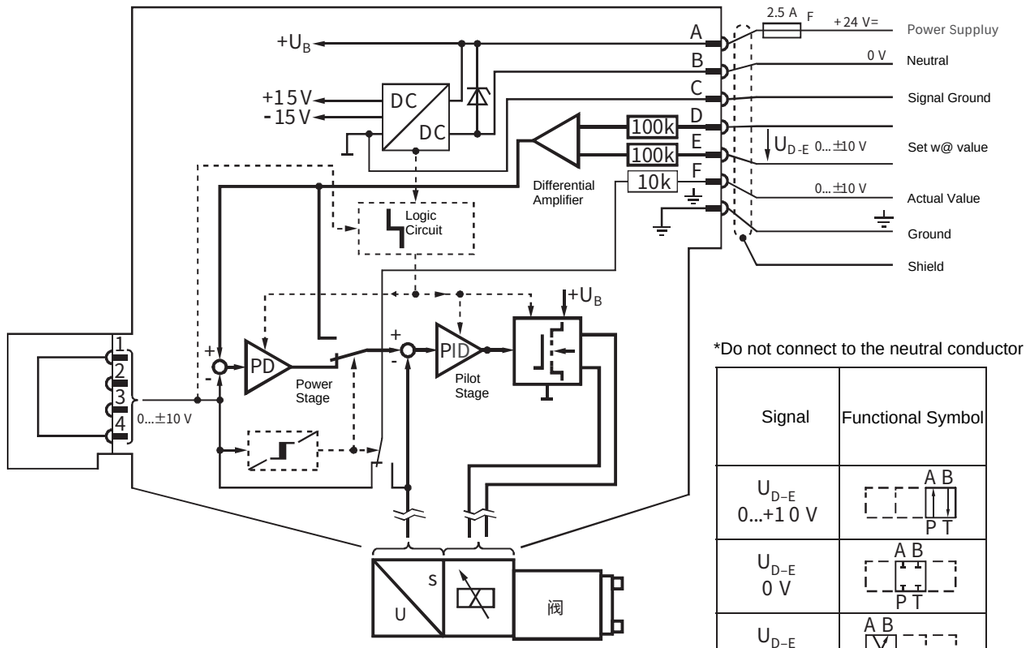


Model F1:
mA-Signal



SWRPEH6: Circuit Block Diagram and Terminal Configuration

Model:A1:Ud-e±10V

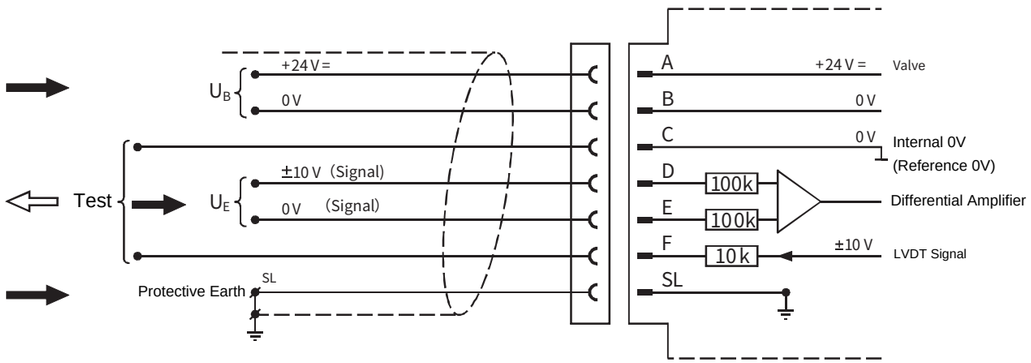


*Do not connect to the neutral conductor

Signal	Functional Symbol
U_{D-E} 0...+10 V	A B P T
U_{D-E} 0 V	A B P T
U_{D-E} 0...–10 V	A B P T

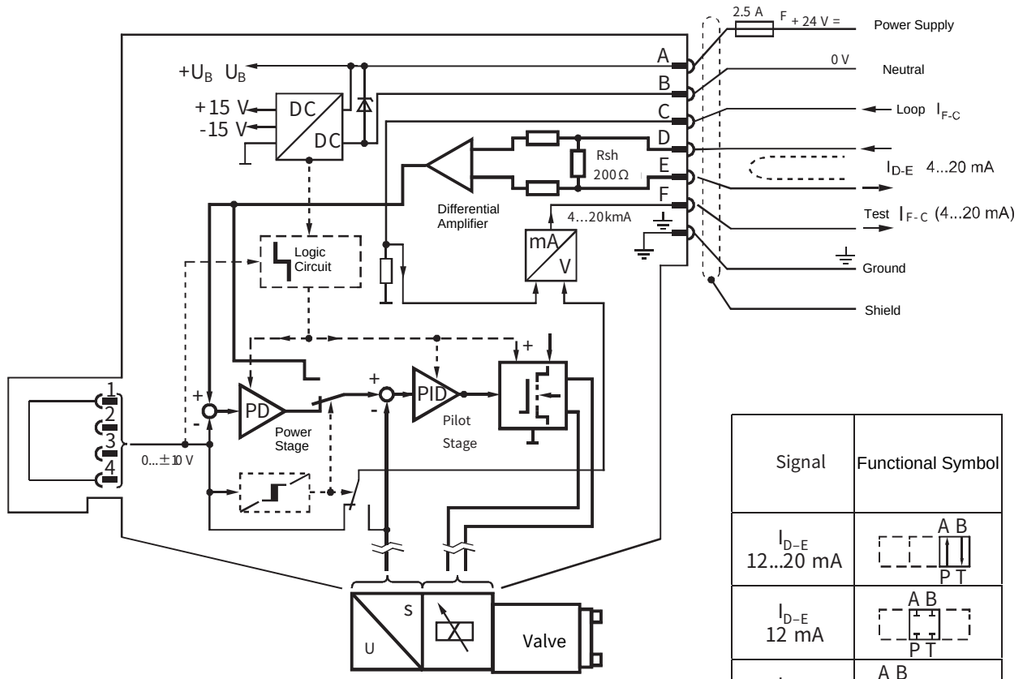
Plug Pinout: 6 Positions (Poles) + Protective Earth (PE)

A1: U_{D-E} ±10V(R =100kΩ)



SWRPEH6 Circuit Block Diagram and Terminal Configuration

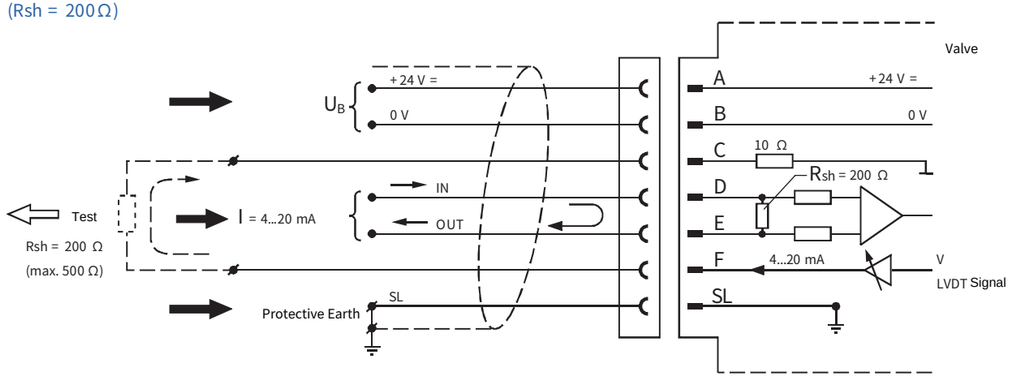
F1: I_{D-E}4...12...20 mA



Signal	Functional Symbol
I_{D-E} 12...20 mA	A B P T
I_{D-E} 12 mA	A B P T
I_{D-E} 4...12 mA	A B P T

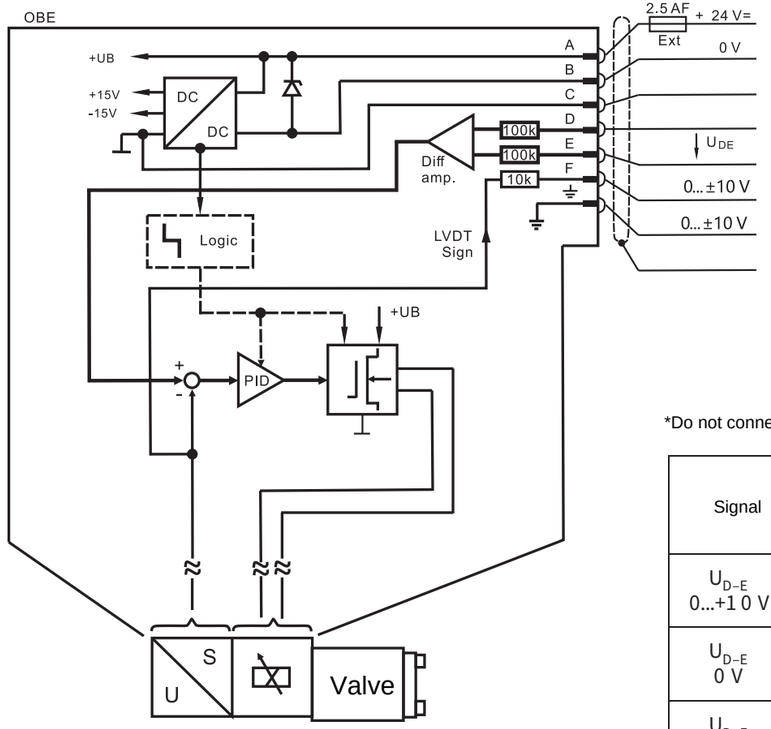
I_{D-E} ≦2mA: Valve stroke limit

Plug pin configuration: 6P + PE
F1: I_{D-E}4...12...20mA
(Rsh = 200Ω)



SWRPEH10 Circuit Block Diagram and Terminal Configuration

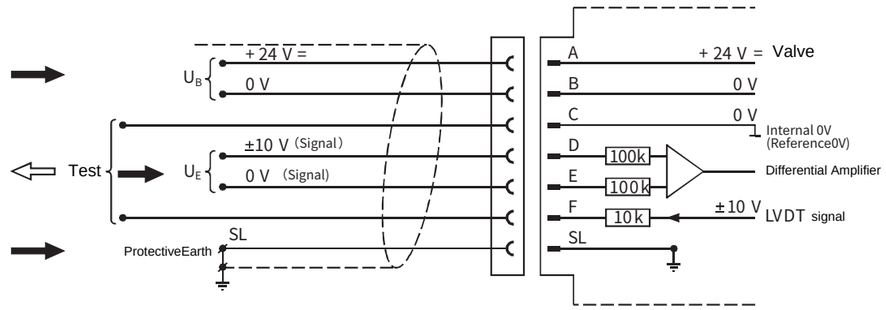
FB217-8
SWRPEH10 Model:A1



*Do not connect to the neutral conductor

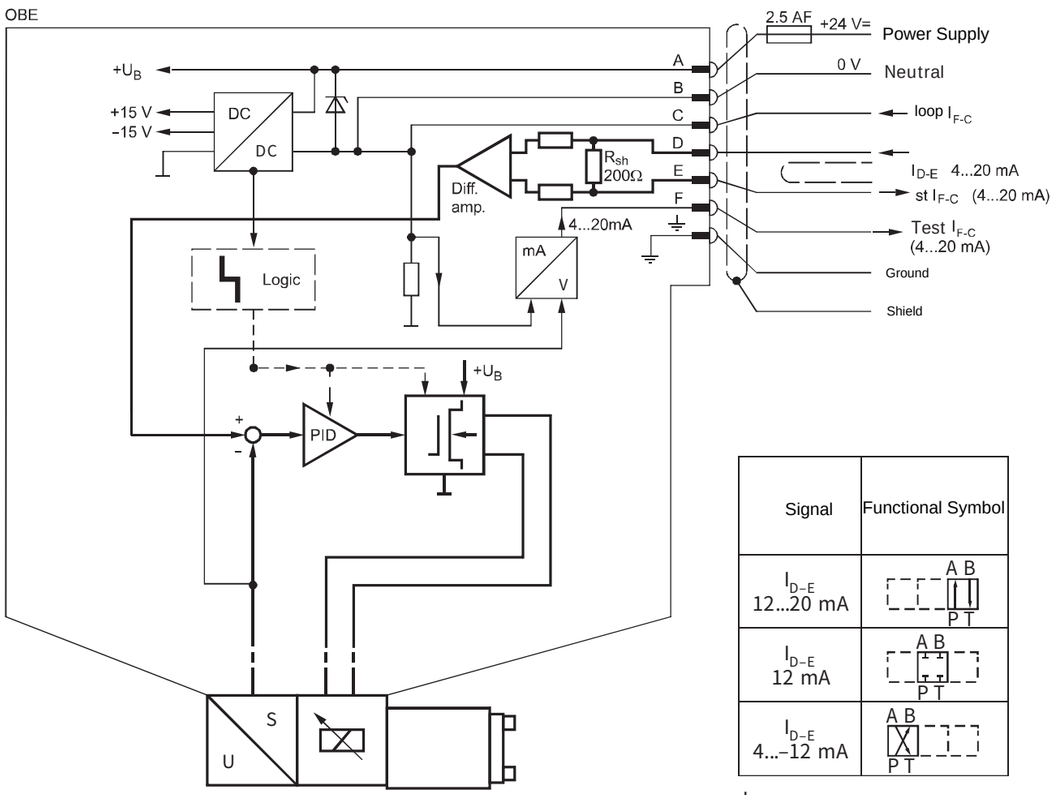
Signal	Functional Symbol
U_{D-E} 0...+10 V	A B P T
U_{D-E} 0 V	A B P T
U_{D-E} 0...−10 V	A B P T

Plug Pin Configuration
A1: U_{D-E} 0...+10 V(R = 10ρ kΩ)



SWRPEH10 Circuit Block Diagram and Terminal Configuration

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



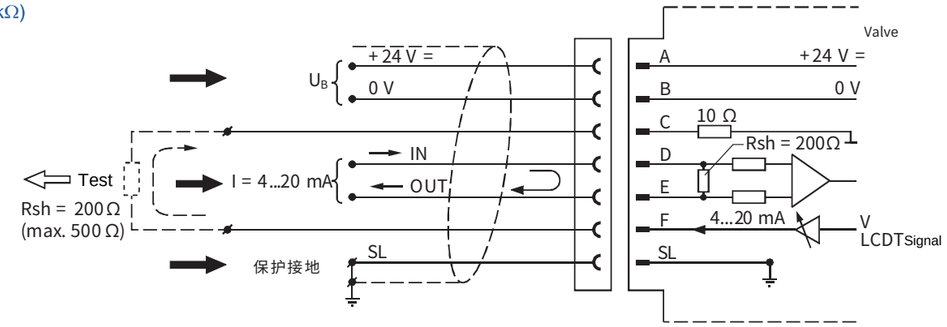
Signal	Functional Symbol
I_{D-E} 12...20 mA	A B P T
I_{D-E} 12 mA	A B P T
I_{D-E} 4...−12 mA	A B P T

I_{D-E} ≦2 mA: Valve failure to operate

Plug pin configuration: 6P + PE

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

(R_{sh} = 200 kΩ)

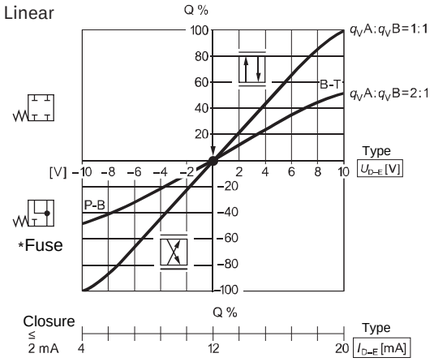


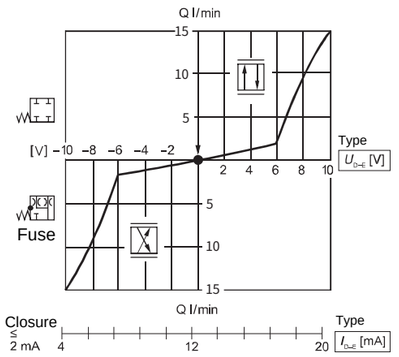
Performance Curve (Measured with HLP46, Oil Temp. = 40°C ±5°C)

SWRPEH6

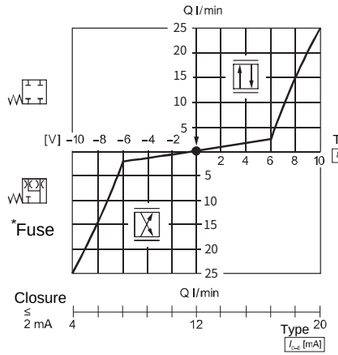
Flow / Signal Function Q = f (U_{D-E}) Q = f (I_{D-E})

L: Linear

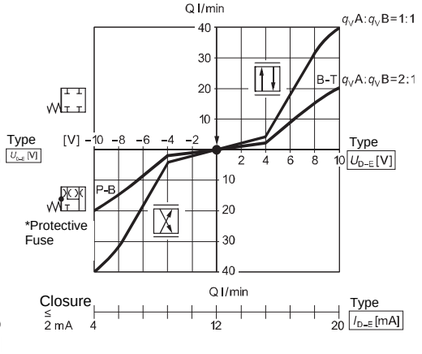




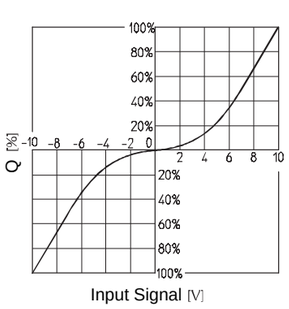
P: (Inflection point: 60%)



P: (Inflection point: 40%)



Type:V

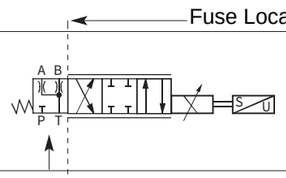


*Fuse: U_B ≦ 18 V DC
(Type U_{D-E})

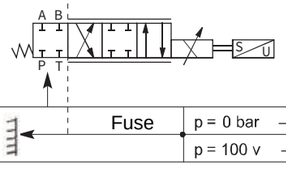
*Fuse: U_B ≦ 18 V DC / I_{D-E} ≦ 2 mA
(Type I_{D-E} 4 ... 20 mA)

Calibration ±1%

Fuse Location



Leakage rate at 100 bar		P–A	50 cm³/min
		P–B	70 cm³/min
Flow at	Δp = 35 bar	A–T	10 ... 20 l/min
		B–T	7 ... 20 l/min



Leakage rate at 100 bar		P–A	50 cm³/min
		P–B	70 cm³/min
		A–T	70 cm³/min
		B–T	50 cm³/min

Fuse	p = 0 bar → 7 ms	Internal Enable Shutdown U_B ≦ 18 V DC
	p = 100 v → 10 ms	(I_{D-E} ≦ 2 mA)

Performance Curve (Measured with HLP46, Oil Temp. = 40°C ±5°C)

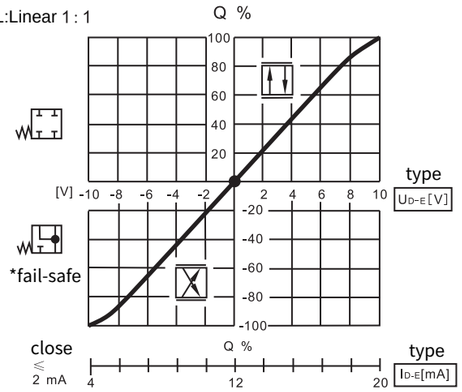
SWRPEH10

Flow / Signal Function

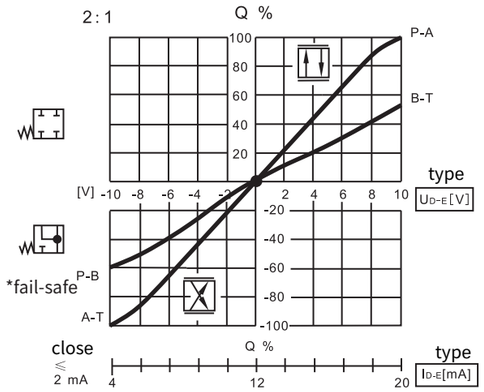
Q=f(U_{D-E})

Q=f(I_{D-E})

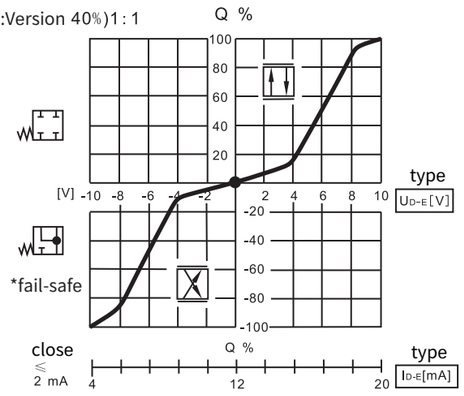
L:Linear 1 : 1



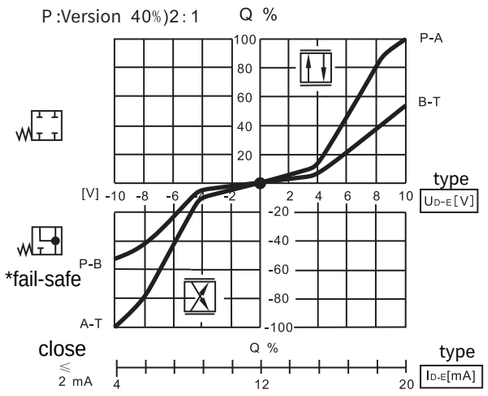
2 : 1

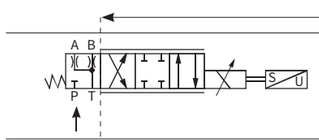


P :Version 40%)1 : 1



P :Version 40%)2 : 1

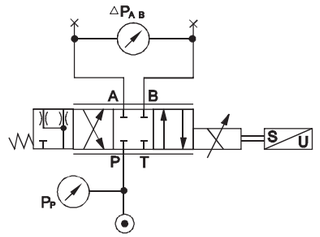


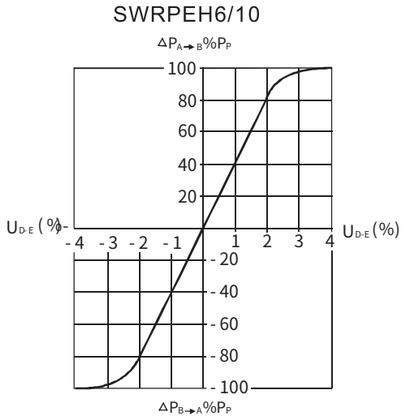


Leakage flow at	100 bar	P–A	50 cm³/min
		P–B	70 cm³/min
Flow at	△p=35 bar q_n 50/100 l/min	A–T	110...100 l/min
		B–T	10/25 l/min
	100 bar	P–A	50 cm³/min
		P–B	70 cm³/min
		A–T	70 cm³/min
		B–T	50 cm³/min
fail-safe	P= 0bar → 12 ms	Enable Disable	U_B ≤ 18 V DC
	P= 100bar → 16ms		(I_{D-E} ≤ 2 mA)

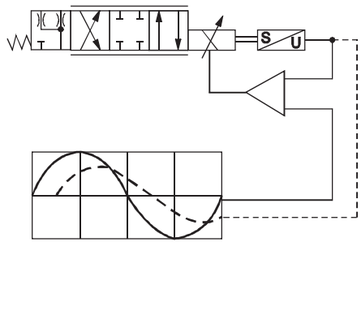
Performance Curve (measured with HLP46, oil temp. = 40°C ±5°C)

Pressure Gain

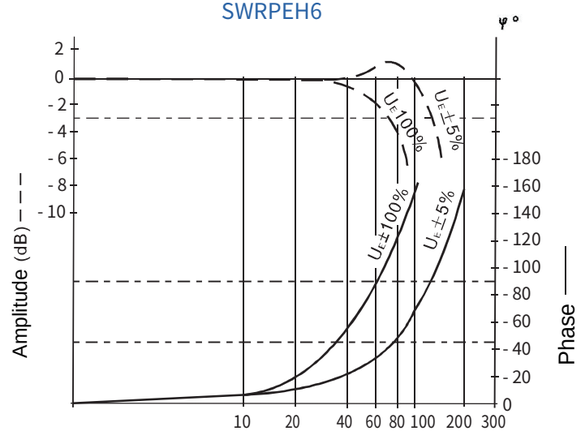




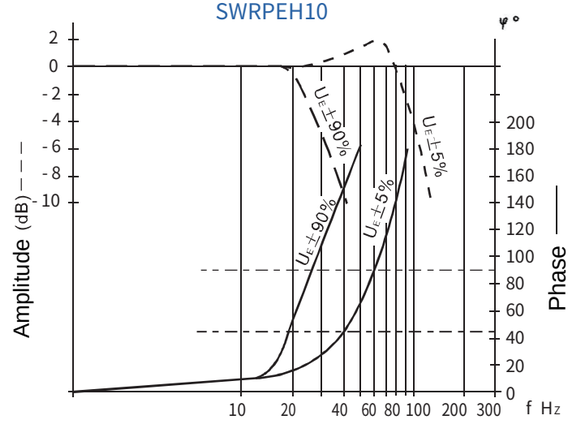
Bode Plot



SWRPEH6

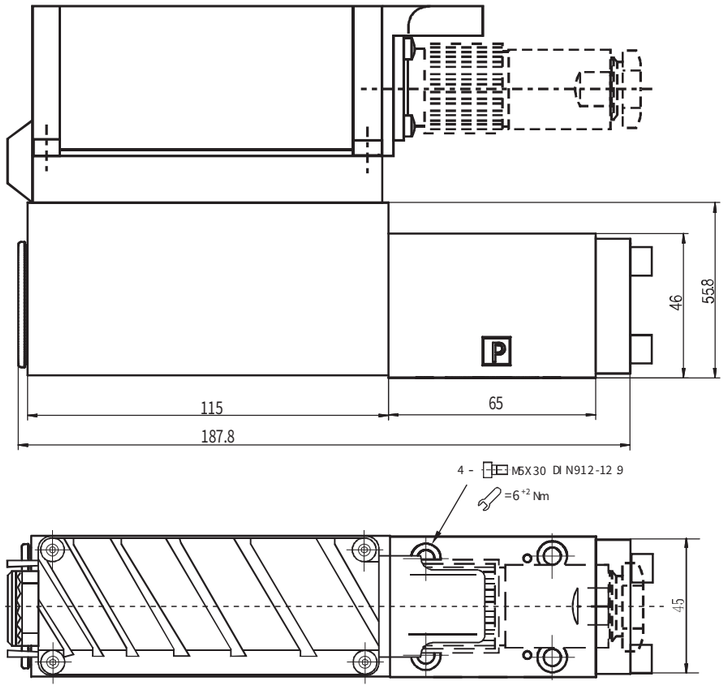


SWRPEH10

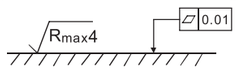


Product Dimensions

SWRPEH6



Required Surface Finish for Mating Parts



Non-standard (Nominal diameter: Ø7.5 mm)

Thread Depth:
1) Ferrous metal: min. 8.5 mm
2) Non-ferrous metal: min. 10 mm

Tolerances:

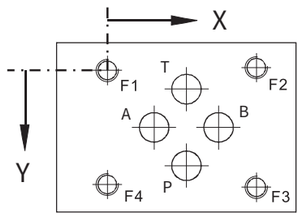
Oil passage connection holes: ±0.2 mm in X and Y axes

Mounting holes: ±0.1 mm in X andY axes

Surface roughness: Rmax 4 μm

Surface flatness: 0.01 mm per 100 mm

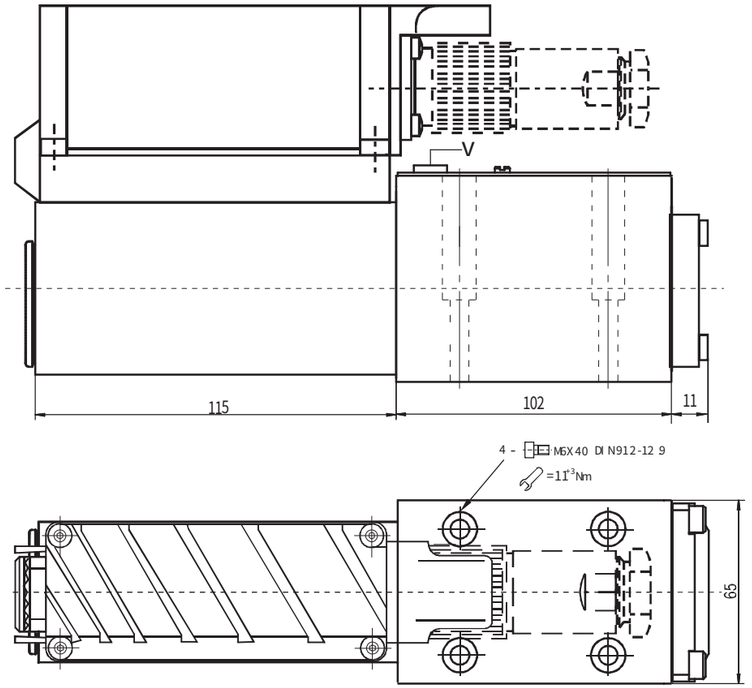
Mounting Hole Baseplate ISO 4401



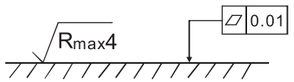
	P	A	T	B	F1	F2	F3	F4
X	21· 5	12· 7	21· 5	30· 2	0	40· 5	40· 5	0
Y	25· 9	15· 5	5· 1	15· 5	0	⁻0· 75	31· 75	31
⌀	8[1])	8[1])	8[1])	8[1])	M5[2])	M5[2])	M5[2])	M5[2])

Product Dimensions

SWRPEH10



Required Surface Finish for Mating Parts



Tolerances:

Oil passage connection holes: ±0.2 mm in X and Y axes

Mounting holes: ±0.1 mm in X andY axes

Surface roughness: Rmax 4 μm

Surface flatness: 0.01 mm per 100 mm

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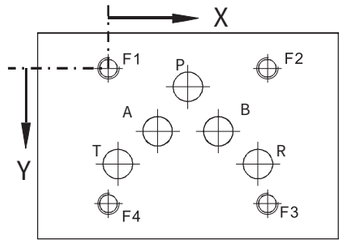
Mounting Hole Baseplate ISO 4401



	P	A	T	B	F1	F2	F3	F4	R
X	27	16· 7	3· 2	37· 3	0	54	54	0	50· 8
Y	6· 3	21· 4	32· 5	21· 4	0	0	46	46	32· 5
⌀	10. 5[1])	10. 5[1])	10. 5[1])	10. 5[1])	M6[2])	M6[2])	M6[2])	M6[2])	10. 5[1])