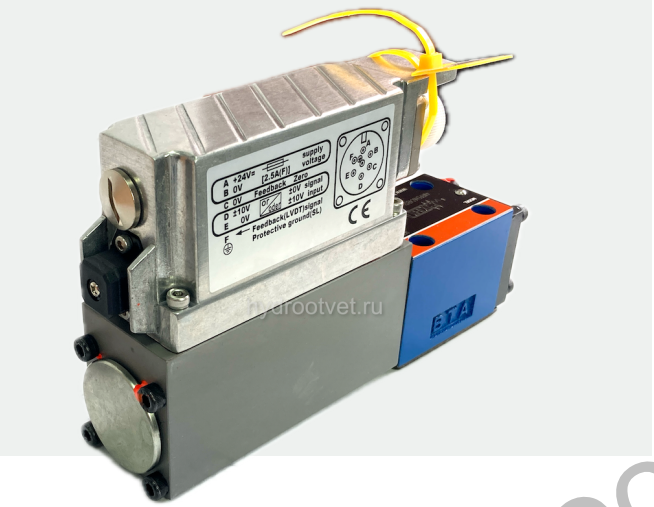
Proportional Directional Valve

Model: 4WRPEH6...2X



- Size 6
- Maximum working pressure 315 bar
- Maximum working flow 40 L/min

Contents

Features

- Direct operated servo solenoid valve with control piston and valve sleeve, with servo performance
- Operated on one side, 4/4-fail-safe position in switched-off condition
- Control solenoid with built-in position feedback and integrated amplifier board (OBE), calibrated in the factory
- Electrical connection 6P+PE signal input differential amplifier with interface A1 (± 10V) or interface F1 (4... 20mA) (RS200 Ω)
- Electro-hydraulic controllers for production and testing systems
- Subplate mounting

Function description, sectional drawing

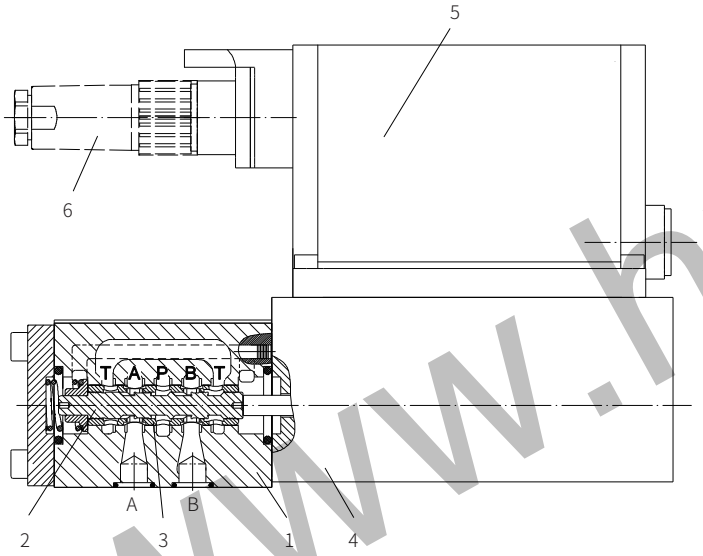
The 4WRPEH valve is high-performance servo proportional valve with zero cover structure on the valve spool and valve sleeve, and LVDT position transducer, it can regulate the directional and flow steplessly according to the input electrical signals.

The valve mainly consists of valve body (1), valve spool (2), valve sleeve (3), control solenoid with position transducer (4), and optionally integrated amplifier (5).

The valve drives the movement of the spool on one side through the proportional solenoid. The specified command value is compared with the actual position value in the integrated electronics (OBE). In case of control deviation, the stroke solenoid is activated, which adjusts the control spool against the spring due to the changed solenoid force. The stroke/control spool cross-section is regulated proportionally to the command value. When the command value presetting of 0V, the electronics adjusts the control spool against the spring to the central position. In deactivated condition, the spring is untensioned to a maximum and the valve is in fail-safe position.

When the solenoid switched off, the valve is moved to fail-safe position. And after powered on, the valve spool is pushed from the rest position to the required position according to the size of the input electrical signal to achieve free flow of oil from P to A and B to T, or P to B and A to T.

The 7-pin connector (6) is used for connecting power, analog signal input, and detection signals.

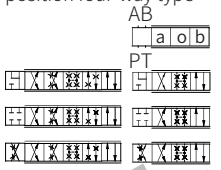


Model 4WRPEH6...-2XJ/

Models and specifications

4WRP | E | H | 6 | | B | | | -2X | | /G24 | K0 | / | | | *

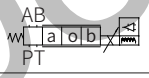
- with integrated electronics =E
- control piston valve sleeve =H
- size 6 =6
- symbols four position four-way type



=C3,C5
=C4,C1
=C

with symbols C5 and C1[3] :
P→A: q_v B→T: q_v/2
P→B: q_v/2 A→T: q_v

- Installation side of the inductive position transducer



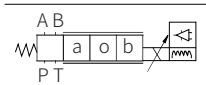
(standard)=B

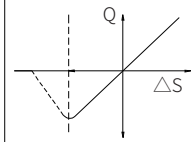
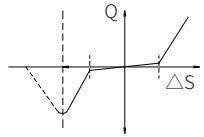
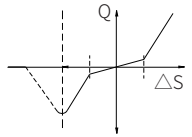
- more information in text
- sealing material
  - No code= NBR seals
  - V= FKM seals
  - (consult for other seals)
- electrical connection
  - A1= command value input ±10V
  - F1= command value input 4 to 20 mA
  - K0= electrical connections without plug-in connector with component plug to DIN 43563-AM6
- power supply to amplifier
  - G24= +24V DC
- 2X= 20 to 29 series (20 to 29 series installation and connection size unchanged)
- flow characteristic
  - L= linear
  - P= inflected characteristic curve[2]
- nominal flow rate at 70 bar differential pressure (35 bar/throttle edge)

size 6
02=2 L/min 12=12 L/min 24=24 L/min 40[3]= 40 L/min
04=4 L/min 15[1]=15 L/min 25[1]= 25 L/min

1) only related to the flow characteristic "p"
2) Inflection 60% is for nominal flow rates of "15" and "25" with size 6, otherwise the inflection is 40%
3) q_v2:1 is only used for nominal flow rate=40L/min

Functional symbols



	Linear	P: Inflection 60% (q_v=15, 25 L/min)	P: Inflection 40% (q_v=40 L/min)
C3, C5 C4, C1 C			
	C3, C5, C4, C1, C	C3, C5, C4, C1	C3, C5, C4, C1

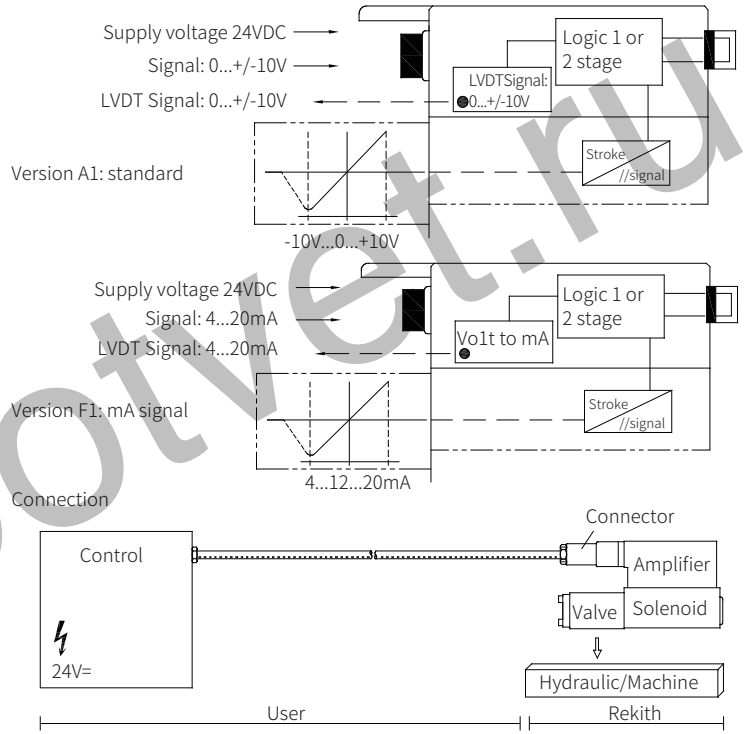
Technical parameters

Overview							
Structure			Direct operated spool valve with steel sleeve				
Actuation			Proportional solenoid valve with position controller, OBE				
Installation type			subplate mounting, porting pattern to ISO 4401 -03-02-05				
Installation position			Optional				
Environment temperature range		°C	-20 ~ +50				
weight		kg	2.75				
Vibration resistance (testing conditions)			Maximum 25g, space vibrating test in all directions (24h)				
Hydraulic (Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)							
Fluid			Oil according to DIN 51524. For other oils, please consult our company				
Viscosity range	Recommended value	mm²/s	20…100				
	Maximum allowable value	mm²/s	10…800				
Oil temperature range		°C	-20 to +70				
The maximum allowable pollution level of oil to ISO 4406 (c)			Class 18/16/13[1)]				
Nominal flow rate (△p=35 bar per throttle edge)		L/min	2	4	12	24	40
Maximum working pressure		bar	Port A, B, P: 315				
			Port T: 250				
Leakage flow at 100 bar	Linear	cm³/min	<150	<180	<300	<500	<900
	Nonlinear	cm³/min	—	—	—	<300	<450
Static/dynamic							
Hysteresis		%	⩽0.2				
Response time for signal changes 0-100%		ms	10				
Zero drift			At △T=40 °C, zero drift <1%				
Zero position adjustment			Factory setting ±1%				

Electrical, amplifier integrated in valve		
Power on rate	%	100ED
Protection grade		IP65 (plug installed)
Connection		Plug-in connector 6P+PE, DIN 43563
Supply voltage		24V DC_{nom}
Terminal A		Min. 21VDC/max. 40VDC
Terminal B		0V (ripple max.2)
External fuse	A_F	2.5
Input, version "A1"		Analog differential signal input, Ri=100k Ω
Terminal D(U_E)		0...±10V
Terminal E		0V
Input, version "F1"		Load, Rsh=200 Ω
Terminal D(I_{D-E})		4...12...20mA
Terminal E(I_{D-E})		Current loop I_{D-E} feedback
Test signal, version "A1"		LVDT
Terminal F(UI_{test})		0….±10V
Terminal C		Reference 0V
Test signal, version "F1"		LVDT signal 4... (12).. 20 mA 200 ...500Ω
Terminal F(I_{F-C})		4... (12)... 20 mA (output current)
Terminal C(I_{F-C})		Current loop I_{F-C} feedback
Adjustment		Calibrate at the factory and see the characteristic curve of the valve

The oil must meet the cleanliness degree requested by the components in the hydraulic system.
Effective oil filtration can prevent failure and increase the service life of the components.

Electrical connections



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

Wire number: - determined by the valve model, plug model, and signal arrangement

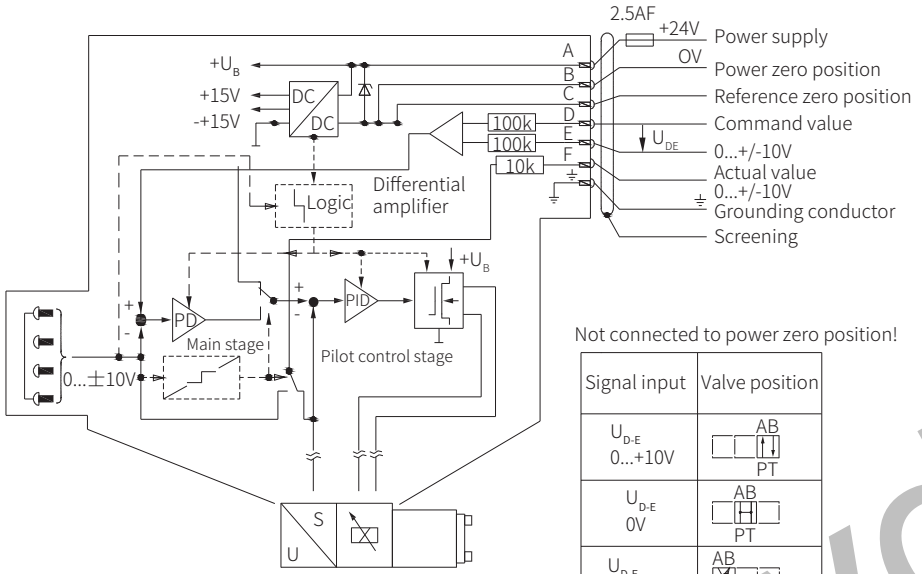
Line Ø: - 0.75 mm² to 20m of length
- 1.0 mm² to 40m of length

Outer Ø: - 9.4...11.8 mm
- 12.7...13.5mm

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} ⩾ 3mA - valve is active
I_{D-E} ⩽ 2mA - 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 the European standard "Safety requirements for fluid power systems and their components - Hydraulics", EN 982.)

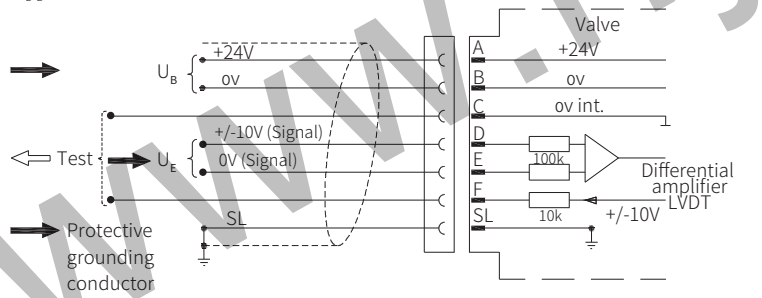
Integrated amplifier (OBE)
Circuit block diagram/wiring diagram
Model A1: U_{D-E} 0...±10V



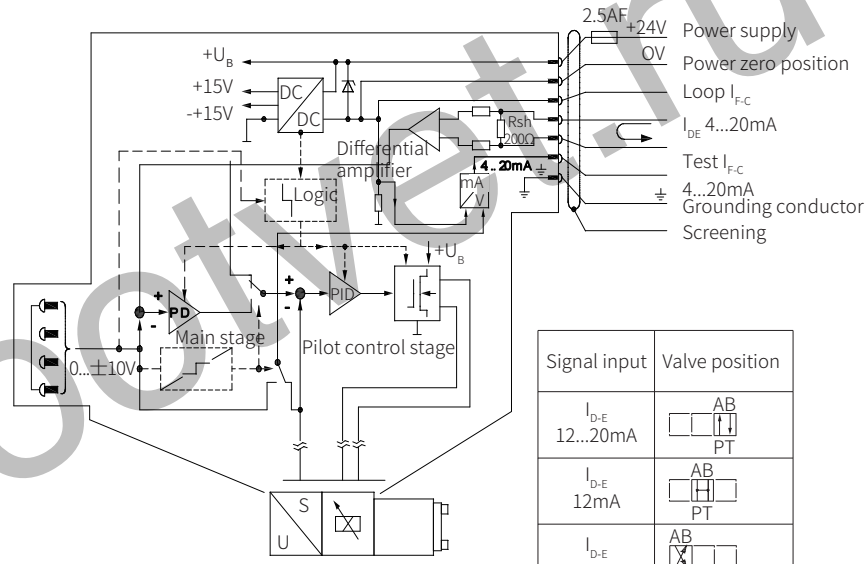
Not connected to power zero position!

Signal input	Valve position
U_{D-E} 0...+10V	AB PT
U_{D-E} 0V	AB PT
U_{D-E} 0...-10V	AB PT

Terminal identification 6P+PE
Model A1: U_{D-E}±10V (Ri=100KΩ)



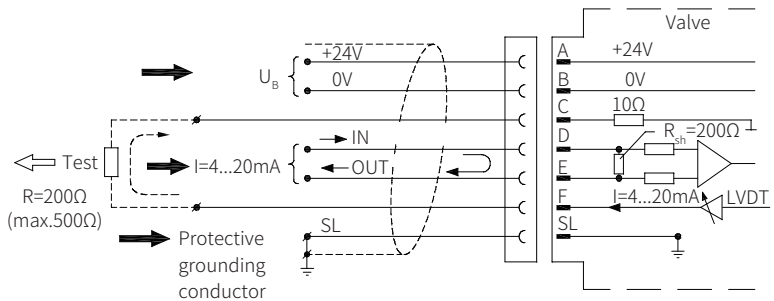
Integrated amplifier (OBE)
Circuit block diagram/wiring diagram
Model F1: I_{D-E} 4...20mA



Signal input	Valve position
I_{D-E} 12...20mA	AB PT
I_{D-E} 12mA	AB PT
I_{D-E} 4...12mA	AB PT

I_{D-E}≤2m A, Valve shut-off

Terminal identification 6P+PE
Model F1: I_{D-E}4...20mA (R_{sh}=200Ω)

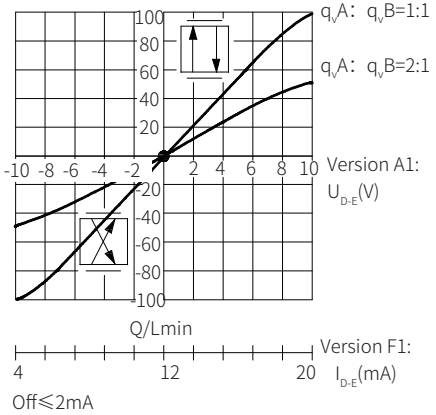


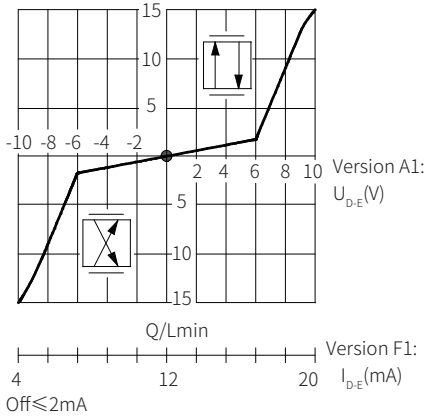
Characteristic curve

(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

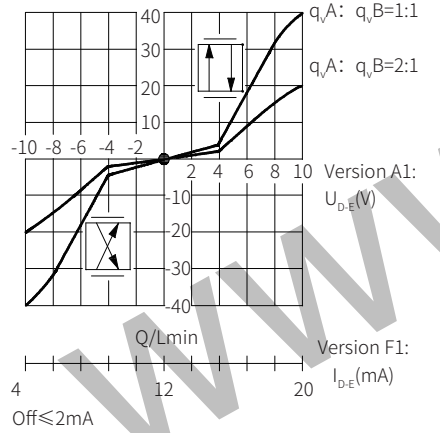
Flow/signal function $q_v=f(U_{D-E})$, $q_v=f(I_{D-E})$

Linear characteristic curve (version "L")

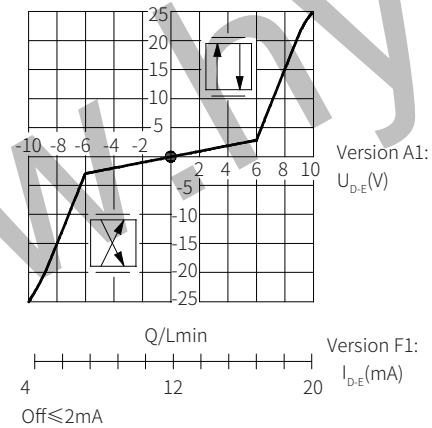




P: Inflection at 40%

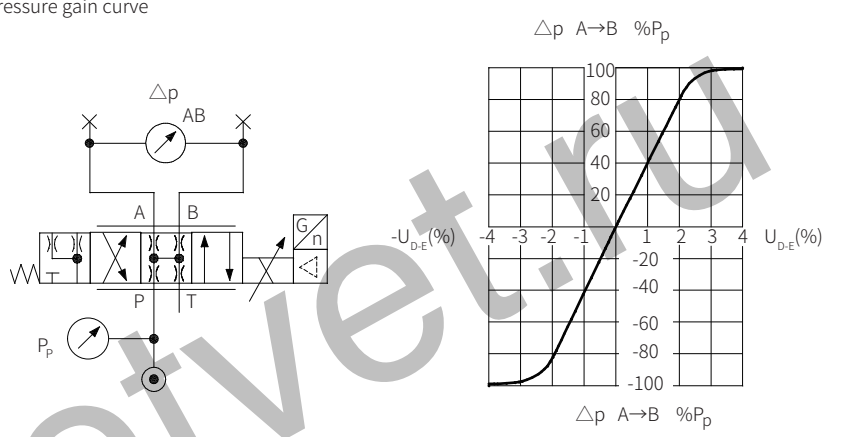


P: Inflection at 60%

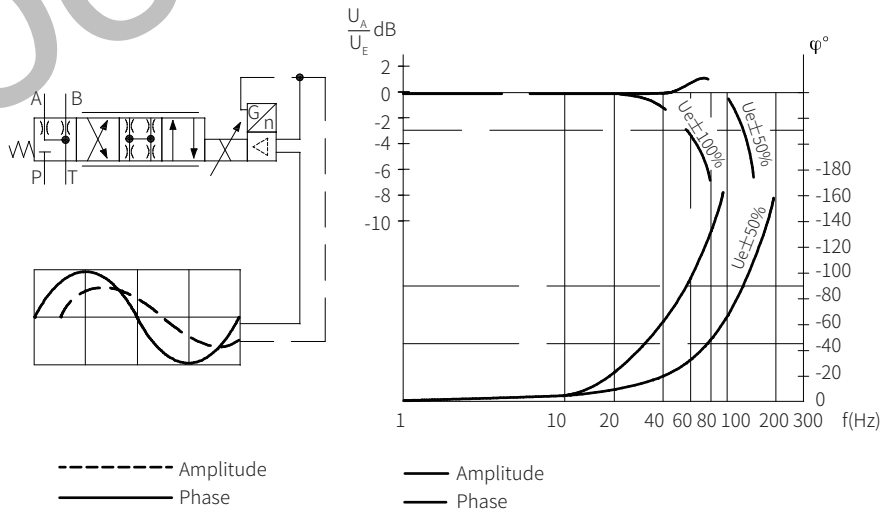


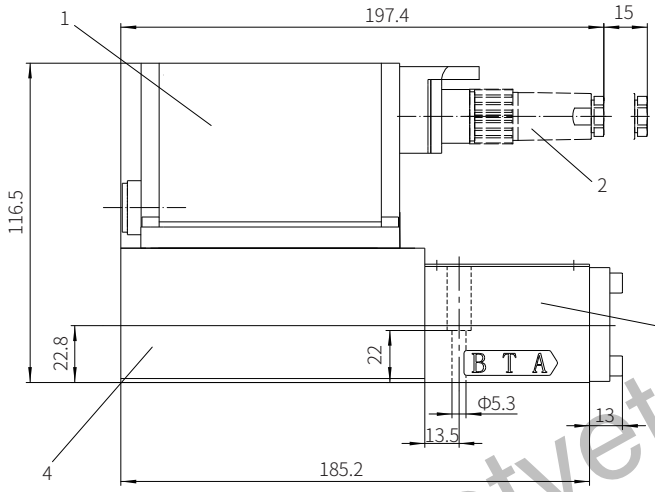
Characteristic curve

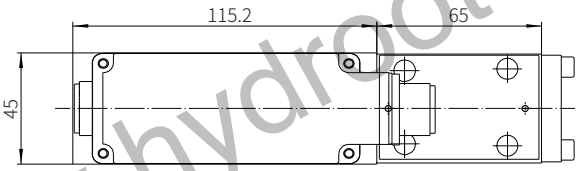
Pressure gain curve

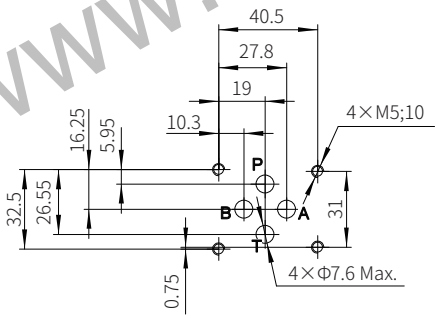


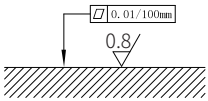
Bode diagram











Required surface finishing of mating components

Valve fixing screw
M5x50-10.9 grade GB/T70.1-2000
Tightening torque M_A=7.8Nm

1 Integrated amplifier (OBE)
2 Connector
3 Valve body
4 Control solenoid with position transducer