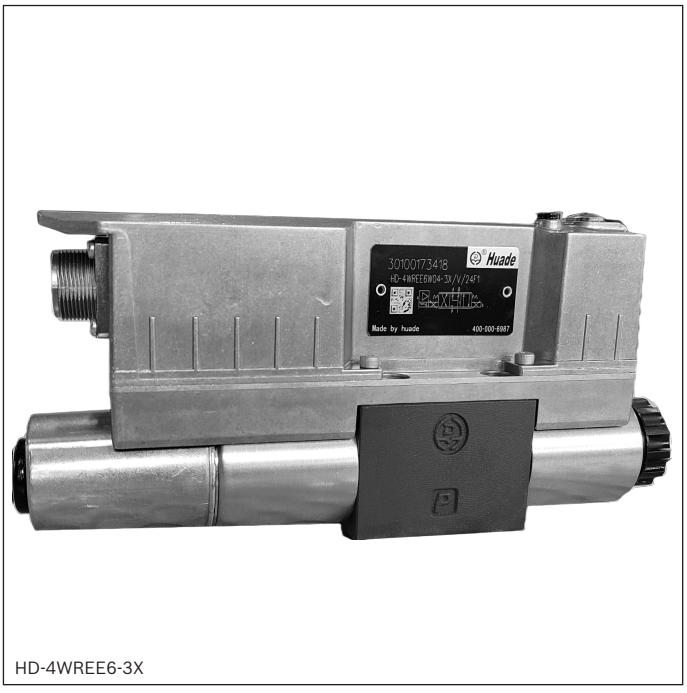
Proportional directional valve, direct operated, with electrical position feedback and integrated electronics (OBE)

Type 4WREE



HD-4WREE6-3X

- Size 6
- Component series 3X
- Maximum operating pressure 350 bar
- Maximum flow 80 l/min
- Rated flow 4 ... 32 l/min (***Δp*** = 10 bar)

Features

- 4/2 or 4/3-way version
- For subplate mounting
- Porting pattern according to ISO 4401-03-02-0-05
- Control of flow direction and size
- Operation by means of proportional solenoids with central thread
- Spring-centered control spool
- Integrated control electronics (OBE) with voltage or current input ("A1" and/or "F1")

Contents

Ordering code

01		02	03	04	05	06	07	08		09		10		11	12	13	
HD	**–**	**4**	**WRE**	**E**	**6**				**–**	**3X**	**/**		**/**	**24**			*****

01	4 main ports	**4**
02	4 main ports	**4**
03	Proportional directional valve direct operated, with electrical position feedback	**WRE**
04	With integrated electronics (OBE)	**E**
05	Size 6	**6**
06	Symbols; possible version see page 3	

Rated flow (***Δp*** = 5 bar/control edge)

07	4 l/min	**04**
	8 l/min	**08**
	16 l/min	**16**
	32 l/min	**32**
08	Without step function	**no code**
	Overlap jump (opening point 5 % command value with symbols E, W and W1-)	**J**
09	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**

Seal material (observe compatibility of seals with hydraulic fluid used, see page 15)

10	FKM seals	**V**
	NBR seals	**M**

Supply voltage

11	Direct voltage 24 V	**24**

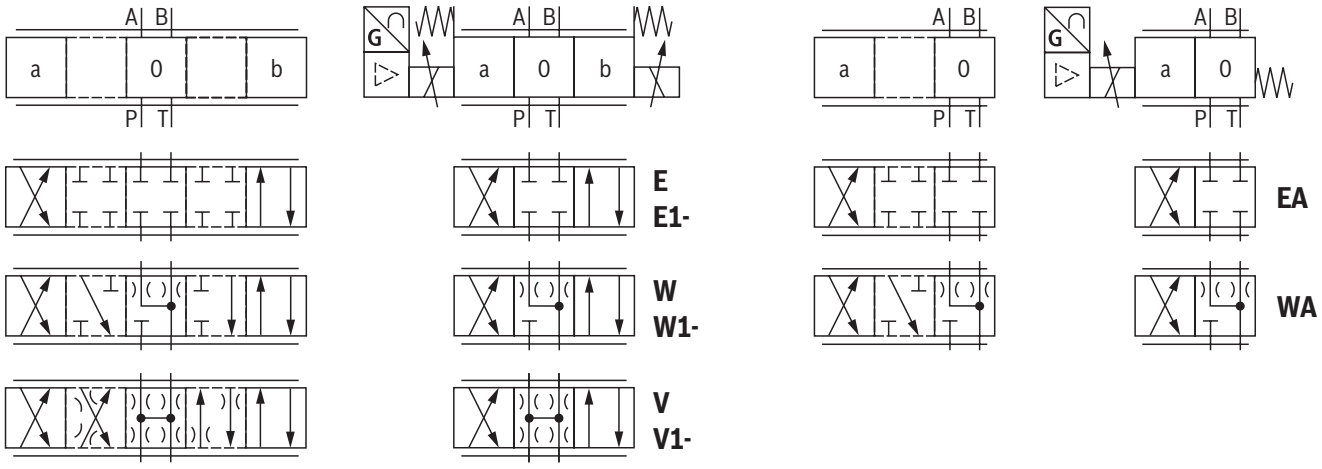
Interfaces of the control electronics

12	Command value input ±10 V	**A1**
	Command value input 4 ... 20 mA	**F1**

Special versions

13	Without pressure compensation element in the OBE	**no code**
	With pressure compensation element in the OBE	**-967**
14	Further details in the plain text	

Symbols



☞ **Notice:**
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

With symbol E1–, V1– and W1–:

P → A: $q_{V\,max}$ B → T: $q_V/2$
P → B: $q_V/2$ A → T: $q_{V\,max}$

Function, section

The type 4WREE valve is a direct operated proportional directional valve with electrical position feedback and integrated electronics (OBE).

Set-up
The valve basically consists of:
- Housing (1) with connection surface
- Control spool (2) with compression springs (3 and 4) and spring plate (5 and 6)
- Solenoids (7 and 8) with central thread
- Position transducer (9)
- Integrated electronics (13)
- Electric zero point adjustment (12) accessible via the rubber plug

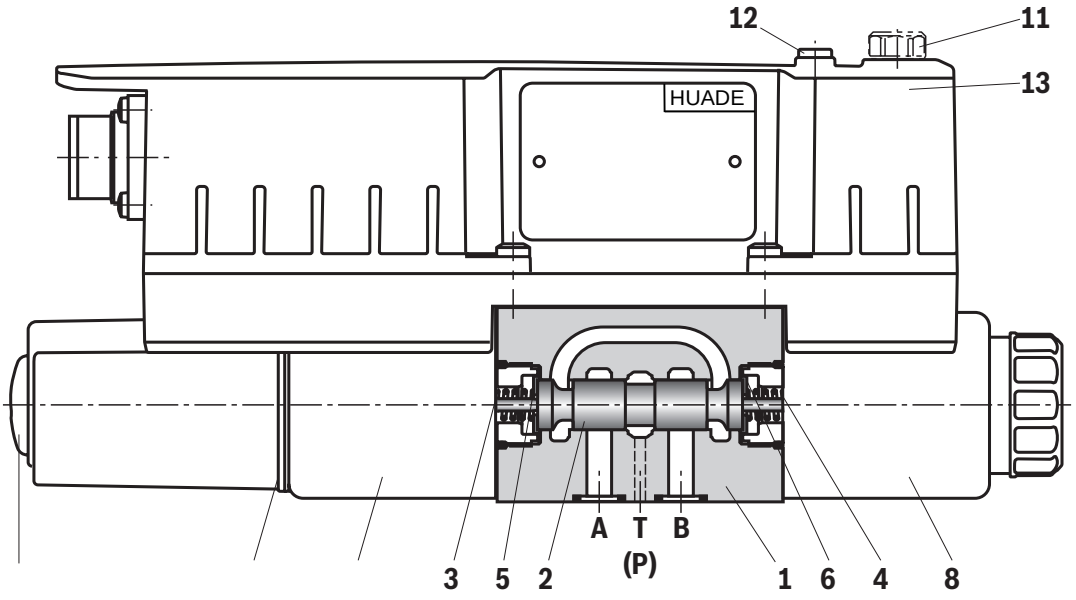
Function:
- With de-energized solenoids (7 and 8), central position of the control spool (2) by compression springs (3 and 4) between spring plates (5 and 6)
- Direct operation of the control spool (2) by controlling a proportional solenoid, e.g. solenoid "b" (8)
  - Displacement of the control spool (2) to the left proportional to the electric input signal
  - This opens the connection from P to A and B to T via orifice-type cross-sections with progressive flow characteristic

In the de-energized condition, the control spool (2) is held in a mechanical central position by the return springs of the solenoids. With control spool symbol "V", this position does not correspond to the hydraulic central position! When the electric valve control loop is closed, the control spool is positioned in the hydraulic central position.

Valve with 2 spool positions (version "4WREE...**A**...")
The function of this valve version basically corresponds to the valve with three spool positions. The 2 spool position valves are, however, only equipped with solenoid "a" (7). Instead of the 2nd proportional solenoid, there is a plug screw (10).

Pressure compensation element in the OBE "-967"
To prevent condensate formation in the housing of the integrated electronics (OBE), an electronics protection membrane (11) can be used.
Recommended for use outside industry-standard conditions with high ambient air humidity and significant cyclic temperature changes (e. g. outdoors).

☞ **Notes:**
- Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.
- The tank line must not be allowed to run empty. With corresponding installation conditions, a preload valve (preload pressure approx. 2 bar) must be installed.
- The PG fitting (14) must not be opened.



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

general			
Weight	▶ Valve with two solenoids	kg	2.6
	▶ Valve with one solenoid	kg	2.1
Installation position			any, preferably horizontal
Ambient temperature range		°C	–20 ... +60
Storage temperature range with UV protection		°C	+5 ... +40
Transport temperature		°C	–30 ... +80
Maximum storage time		Years	1
Sine test according to DIN EN 60068-2-6			10 ... 2000 Hz / maximum of 10 g / 10 cycles / 3 axes
Noise test according to DIN EN 60068-2-64			20 ... 2000 Hz / 10 g_{RMS} / 30 g peak / 30 min. / 3 axes
Transport shock according to DIN EN 60068-2-27			15 g / 11 ms / 3 shocks / 3 axes
Shock according to DIN EN 60068-2-27			15 g / 11 ms / 1000 shocks / 3 axes
Maximum relative humidity (no condensation)		%	95
Maximum solenoid surface temperature		°C	150 (individual operation)
$MTTF_d$ value according to EN ISO 13849		Years	150
Conformity			▶ CE according to EMC directive 2014/30/EU, tested according to EN 61000-6-2 and EN 61000-6-3 ▶ RoHS directive 2015/65/EU ▶ REACH ordinance (EC) no. 1907/2006
Environmental compatibility	▶ Climate		Environmental audit according to EN 60068-2

hydraulic			
Maximum operating pressure	▶ Port A, B, P	bar	350
	▶ Port T	bar	210
Maximum flow (recommended)		l/min	80
Rated flow (***Δp*** = 10 bar)		l/min	4; 8; 16; 32
Hydraulic fluid			see table page 15
Hydraulic fluid temperature range	▶ admissible	°C	–20 ... +70
	▶ recommended		–40 ... +50
Viscosity range	▶ admissible	mm^2/s	20 ... 380
	▶ recommended	mm^2/s	30 ... 46
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			class 20/18/15 [1]

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

☞ **Notice:**
The specified technical data were measured with HLP46 and ϑ_{oil} = 40 ±5 °C.

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	▶ Insoluble in water	HETG	FKM	ISO 15380
		HEES	FKM	
	▶ Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	▶ Water-free	HFDU (glycol base)	FKM	ISO 12922
		HFDU (ester base)	FKM	
		HFDR	FKM	
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	ISO 12922

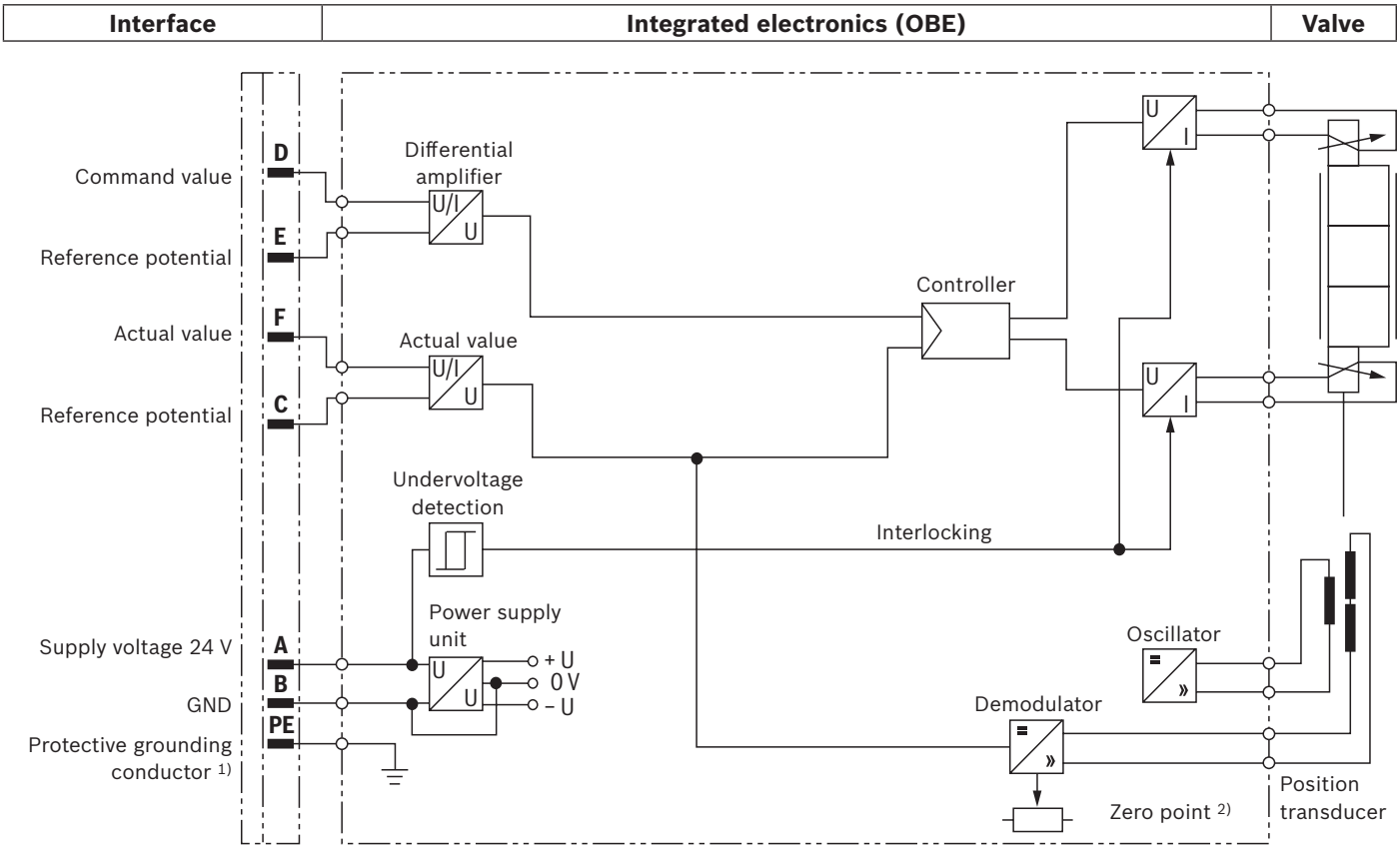
☞ **Important information on hydraulic fluids:**
- ▶ For further information and data on the use of other hydraulic fluids, please contact us.
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- ▶ The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- ▶ **Bio-degradable and flame-resistant – containing water:** If this hydraulic fluid is used, small amounts of dissolved zinc may get into the hydraulic system.
- ▶ **Flame-resistant – containing water:**
  - – Due to increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible specific to the installation - to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.
  - – Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, the command value profile is to be adjusted for proportional and high-response valves.

static /dynamic		
Hysteresis	%	< 0.1
Range of inversion	%	< 0.05
Response sensitivity	%	< 0.05
Zero shift upon change of hydraulic fluid temperature and operating pressure	%/10 K	≤ 0.15
	%/100 bar	≤ 0.1

electrical, integrated electronics (OBE)			
Voltage type			Direct voltage
Supply voltage	▶ Nominal voltage	VDC	24
	▶ Lower limit value	V	19
	▶ Upper limit value	V	36
Maximum admissible residual ripple		Vpp	2.5
Current consumption of the amplifier	▶ I_{max}	A	< 2
	▶ Impulse current	A	3
Solenoid coil resistance	▶ Cold value at 20 °C	Ω	2.65
	▶ Maximum hot value	Ω	4.05
Duty cycle		%	100
Maximum coil temperature [2]		°C	150
Protection class of the valve according to EN 60529			IP65 (with mating connector mounted and locked)
Electro-magnetic compatibility (EMC)			▶ Interference resistance prEN 50082-2 ▶ Interference emission EN 50081-1

[2] Due to the arising surface temperatures of the solenoid coils, the standards ISO 13732-1 and ISO 4413 are to be observed.

Block diagram/pin assignment



1) The protective grounding conductor (PE) is connected to the valve housing.

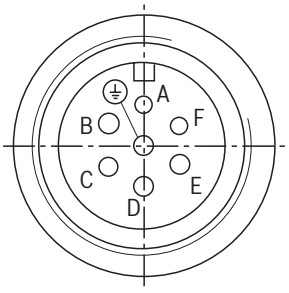
2) Zero point can be set from the outside

Notice:
Electrical signals provided via control electronics (e. g. actual value) must not be used to switch off safety-relevant machine functions.

Electrical connections and assignment

Connector pin assignment

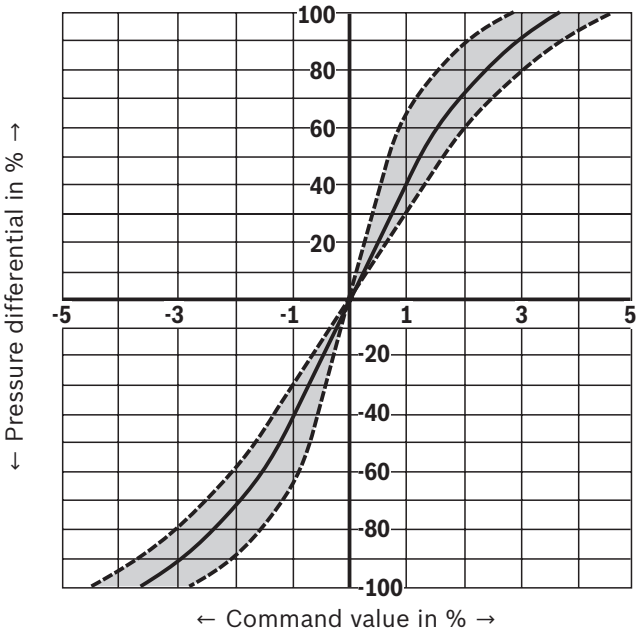
Pin	Signal	Assignment interface A1	Assignment interface F1
A	Supply voltage	24 VDC	
B		0 V	
C	Reference potential actual value	Reference contact F	
D	Differential amplifier input	Command value ±10 V; R_e > 50 kΩ	Command value 4 ... 20 mA; R_e > 100 Ω
E		Reference potential command value	
F	Measuring output (actual value)	Actual value ±10 V (limit load 5 mA)	Actual value 4 ... 20 mA (load resistance max. 300 Ω)
PE		Functional ground (directly connected to cooling element and valve housing)	



Command value:	▶ Positive command value (0 ... 10 V or 12 ... 20 mA) at D and reference potential at E cause flow from P → A and B → T.
	▶ Negative command value (0 ... −10 V or 12 ... 4 mA) at D and reference potential at E cause flow from P → B and A → T.
	▶ With valves with solenoid on side a (symbols EA and WA), a positive command value 0 ... +10 V or 4 ... 20 mA at D and reference potential at E result in flow from P → B and A → T.
Actual value:	▶ Actual value (0 ... 10 V or 12 ... 20 mA) at F and reference potential at C cause flow from P → B and A → T.
	▶ With valves with one solenoid, a positive actual value from 0 to +10V or 4 to 20 mA at F and reference potential at C cause flow from P → B and A → T.
Connection cable (recommendation)**:**	▶ Up to 20 m cable length type LiYCY 7 x 0.75 mm²
	▶ Up to 50 m cable length type LiYCY 7 x 1.0 mm²
	▶ Apply screening on supply side

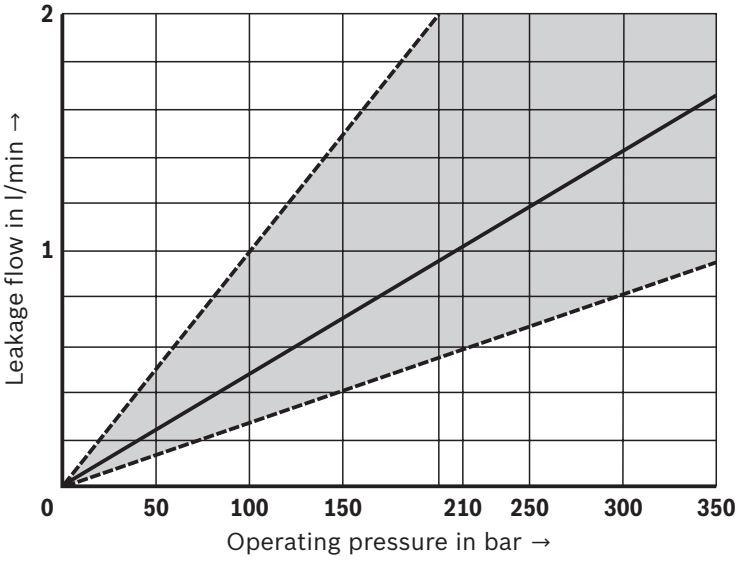
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Pressure/signal characteristic curve (symbol V), p_s = 100 bar



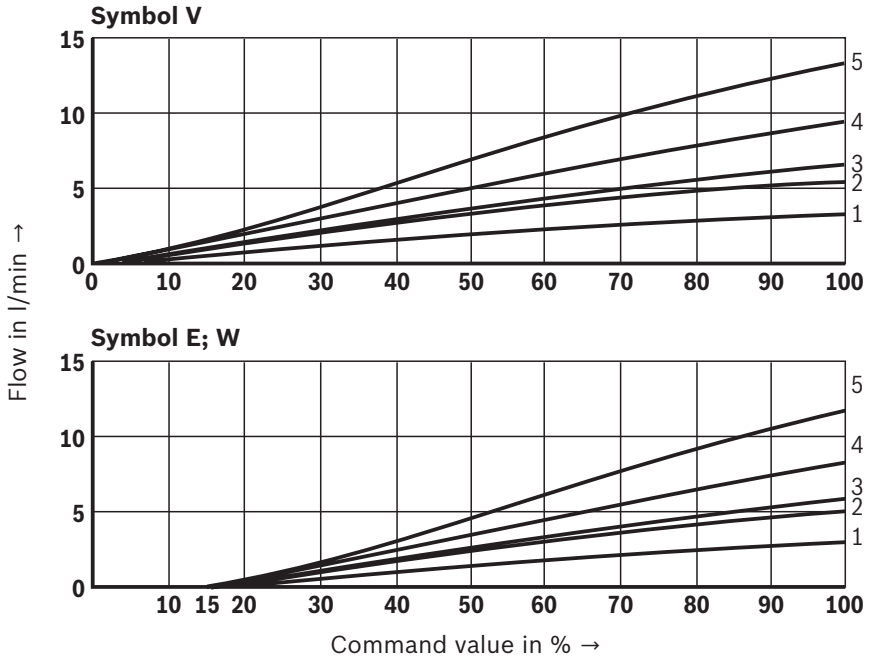
Leakage flow with central control spool position

Version "V32"



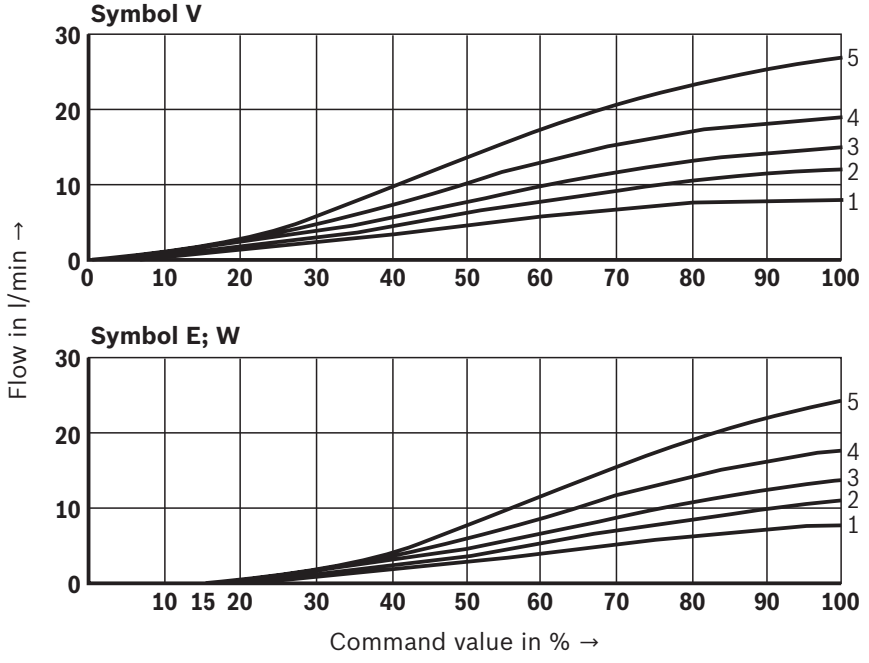
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Rated flow 4 l/min (P → A; B → T or P → B; A → T)



1 ***Δp*** 10 bar constant
2 ***Δp*** 20 bar constant
3 ***Δp*** 30 bar constant
4 ***Δp*** 50 bar constant
5 ***Δp*** 100 bar constant

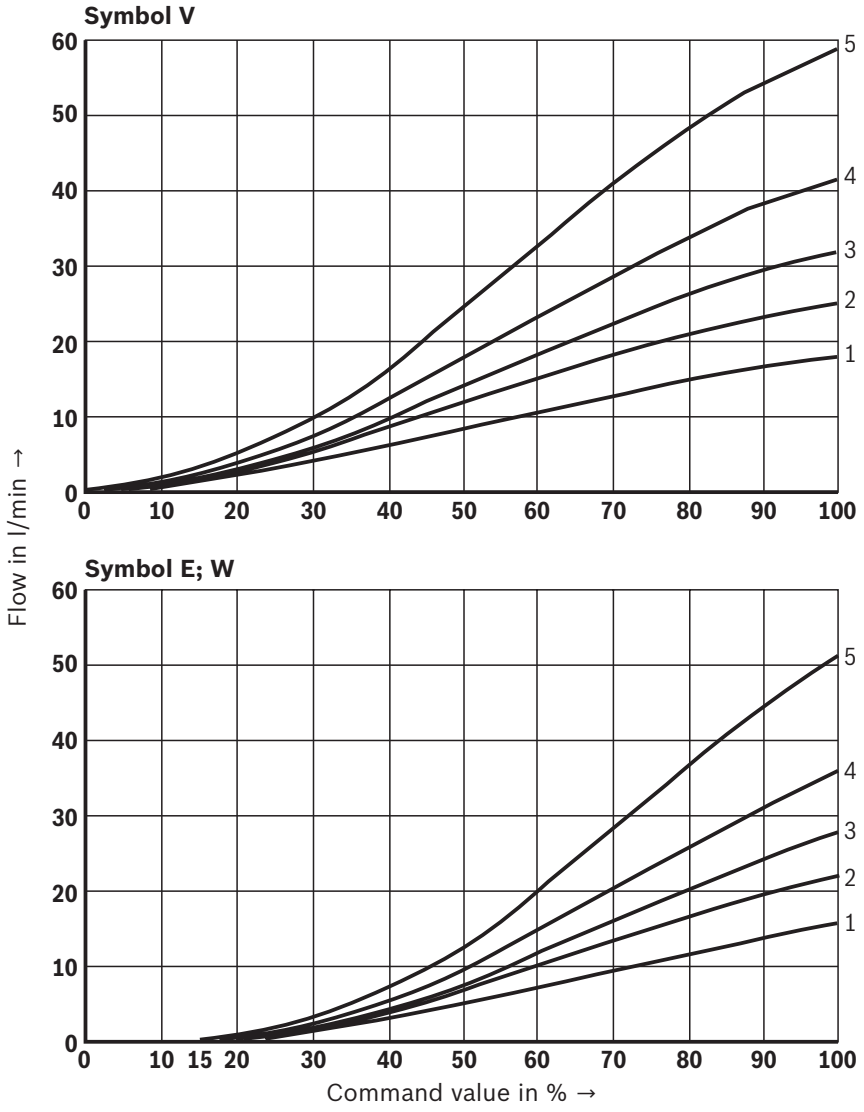
Rated flow 8 l/min (P → A; B → T or P → B; A → T)



1 ***Δp*** 10 bar constant
2 ***Δp*** 20 bar constant
3 ***Δp*** 30 bar constant
4 ***Δp*** 50 bar constant
5 ***Δp*** 100 bar constant

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

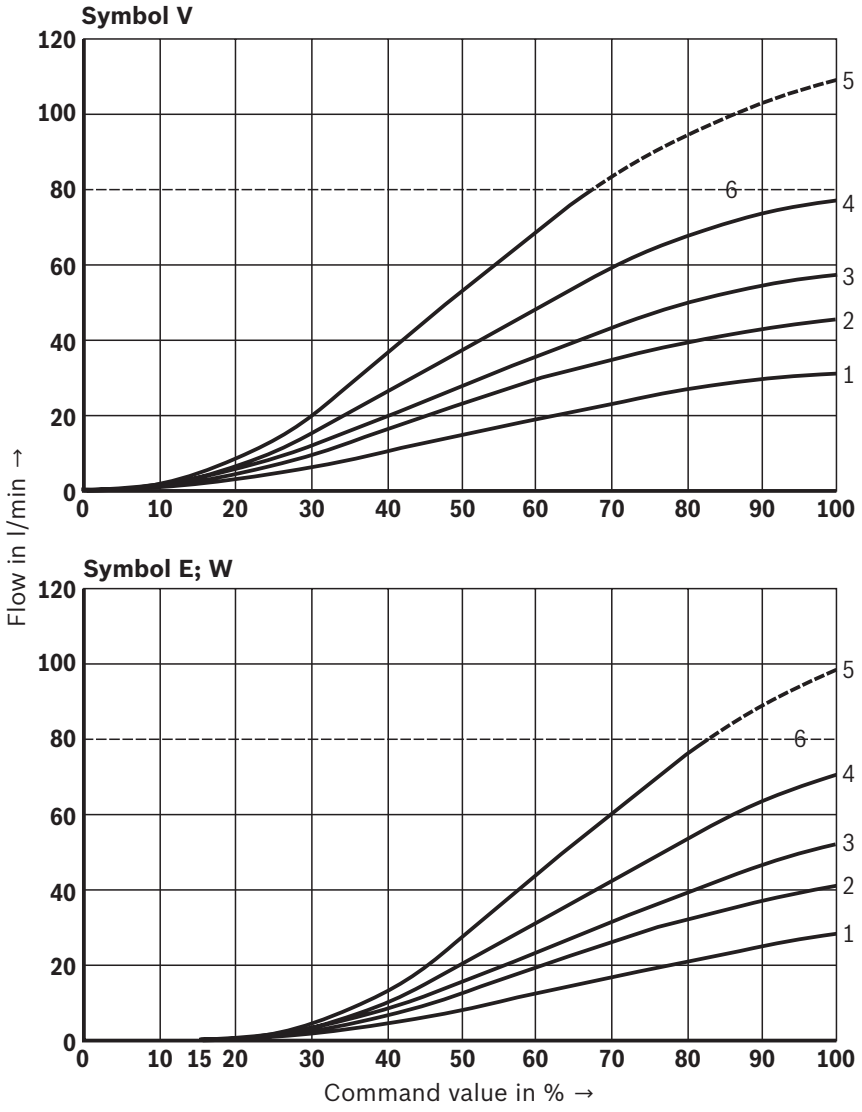
Rated flow 16 l/min (P → A; B → T or P → B; A → T)



1 ***Δp*** 10 bar constant
2 ***Δp*** 20 bar constant
3 ***Δp*** 30 bar constant
4 ***Δp*** 50 bar constant
5 ***Δp*** 100 bar constant

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Rated flow 32 l/min (P → A; B → T or P → B; A → T)



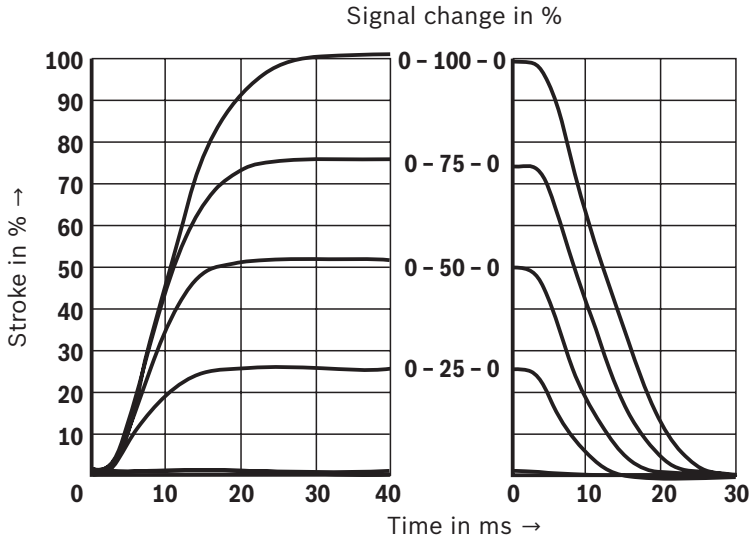
1 ***Δp*** 10 bar constant
2 ***Δp*** 20 bar constant
3 ***Δp*** 30 bar constant
4 ***Δp*** 50 bar constant
5 ***Δp*** 100 bar constant
6 Maximum flow (recommended)

Notes:
- Flow values in the maximum command value range (see tolerance field of the flow/signal function)
- $\Delta p = p_P - p_L - p_T$
  Δp valve pressure differential
  p_P inlet pressure
  p_L load pressure
  p_T return flow pressure

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

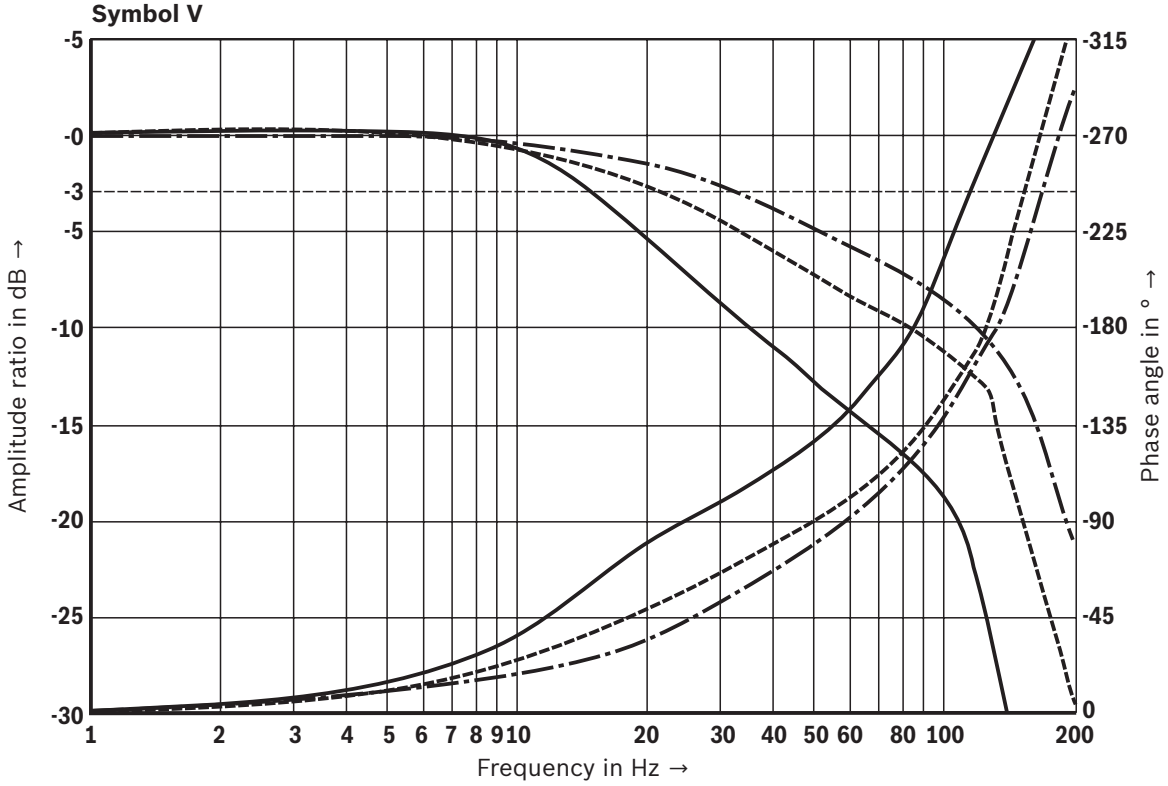
Transition function with stepped electric input signals (4/3 directional design)

Symbol V; E



Frequency response characteristic curves

Symbol V



Signal ±10 %

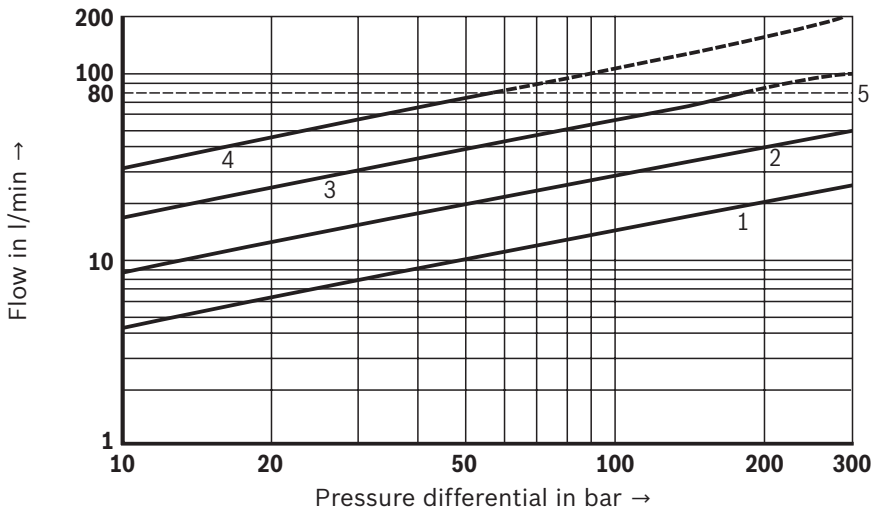
Signal ±25 %

Signal ±100%

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Flow / load function with maximum valve opening (P → A; B → T or P → B; A → T)

Symbol V

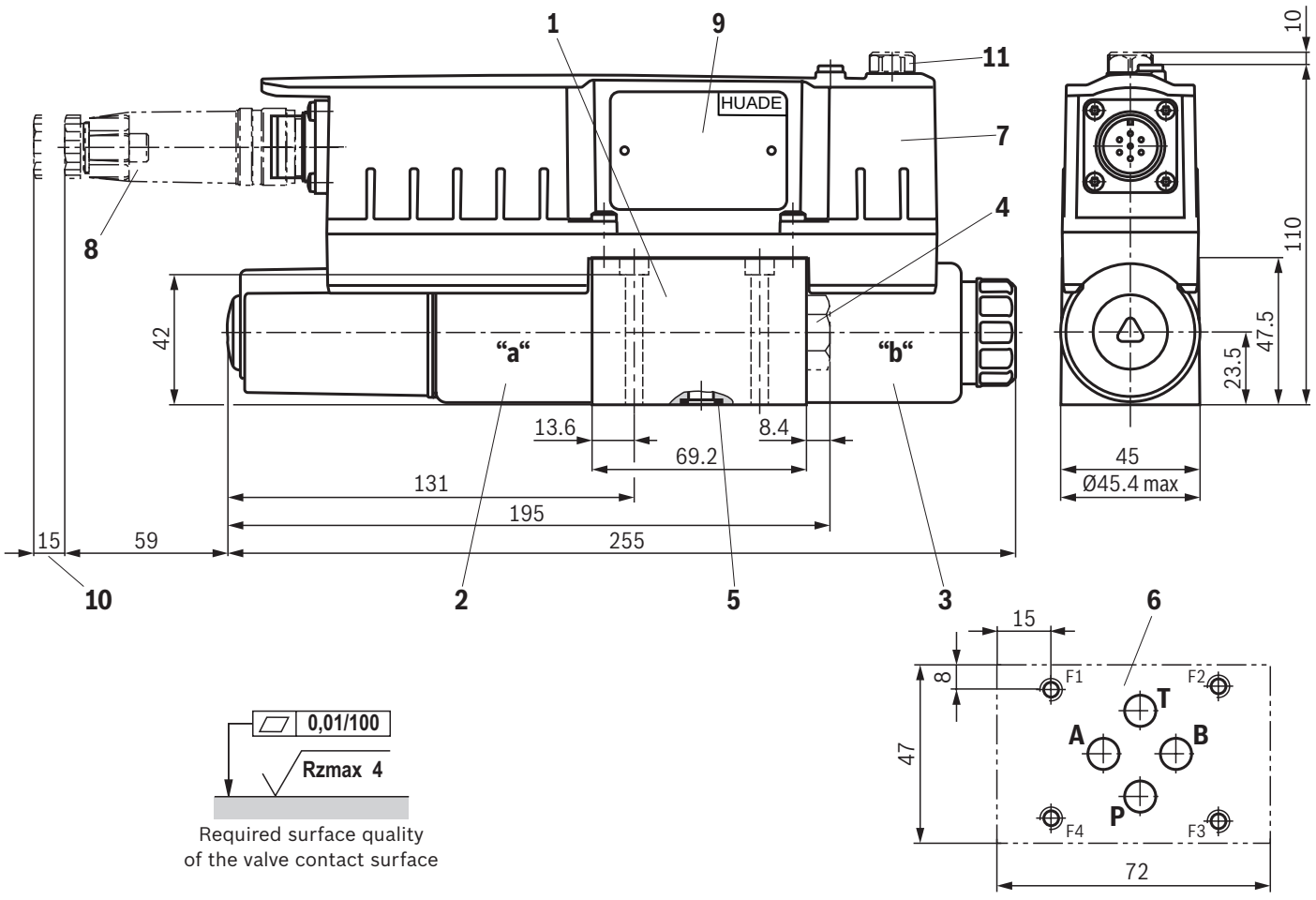


Rated flow

- **1** 4 l/min
- **2** 8 l/min
- **3** 16 l/min
- **4** 32 l/min
- **5** Maximum admissible flow

☞ **Notice:**
If the valve is operated outside the specified power limits for more than 10 seconds, the solenoid current is reduced by a ramp in order to avoid overload.

Dimensions
(dimensions in mm)



Required surface quality
of the valve contact surface

1 Valve housing
2 Proportional solenoid "a" with inductive position transducer
3 Proportional solenoid "b"
4 Plug screw for valve with one solenoid (2 spool positions, version "EA" or "WA")
5 Identical seal rings for ports A, B, P, and T
6 Machined valve contact surface; porting pattern according to ISO 4401-03-02-0-05
Deviating from the standard: Ports P, A, B, T Ø8 mm
7 Integrated electronics (OBE)
8 Mating connector
9 Name plate
10 Space required for removing the mating connector
11 Pressure compensation element in the OBE "-967"

Notes:
- The dimensions are nominal dimensions which are subject to tolerances.

Notice:
The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws see page 16.

Dimensions

Valve mounting screws

Nominal size	Quantity	Hexagon socket head cap screws	Notes
6	4	**ISO 4762 - M5 x 50 - 10.9** Tightening torque M_A = 8.9 Nm ±10 %	Factory prepared
	or		
	4	**ISO 4762 - M5 x 50 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B** Friction coefficient μ_{total} = 0.09 ... 0.14; tightening torque M_A = 7 Nm ±10 %	Not included in the Huade delivery range
	or		
	4	**ASME B18.3 - 1/4-20 UNC x 1 3/4" - ASTM-A574** Tightening torque M_A = 15 Nm *[11 ft-lbs]* ±10 %	Not included in the Huade delivery range

☞ **Notice:**
The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure.

Subplates (separate order) with porting pattern according to ISO 4401-05-04-0-05