4/4 controlled directional valve, directly operated, with electric position feedback and integrated electronics (OBE)

Type 4WRPEH10

Size 10
Component series 2X
Maximum operating pressure P, A, B 315 bar, T 250 bar
Rated flow 50...100 l/min (Δp 70 bar)

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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...20 mA (R_{sh} = 200 Ω)
- Used for electro-hydraulic control systems in production and test plants

Information on available spare parts:
www.boschrexroth.com/spc
### Ordering code

<table>
<thead>
<tr>
<th>4WRP</th>
<th>E</th>
<th>H</th>
<th>10</th>
<th>B</th>
<th>2X</th>
<th>G24</th>
<th>K0</th>
<th>M</th>
<th>*</th>
</tr>
</thead>
</table>

**With integrated electronics = E**

Control piston/sleeve = H

Size = 10

**Control spool symbol**

4/4 way design

With symbols C5 and C1:
- P → A: \( q_v \)
- P → B: \( q_v/2 \)
- A → T: \( q_v \)

**Installation side of the inductive position transducer**

With (standard) = B

Further details in the plain text

**Seal material**

M = NBR seals, suitable for mineral oils (HL, HLP) according to DIN 51524

**Interface of the control electronics**

- A1 = Command value input ±10 V
- F1 = Command value input 4...20 mA

**Electric port**

- K0 = Without mating connector, With connector according to DIN 43563-AM6

**Supply voltage of the control electronics**

G24 = +24 V direct current

**Component series 20 to 29**

(Identical installation and connection dimensions)

**Flow characteristics**

- L = Linear
- P = Inflected characteristic curve

**Rated flow**

at 70 bar valve pressure difference (35 bar/control edge)

- 50 = 50 l/min
- 100 = 100 l/min
Function, section

General
In the field of integrated electronics, the specified command value is compared with the actual position value. In case of deviations from the standard, the lifting solenoid is activated. Due to the changed magnetic force, the lifting solenoid adjusts the control valve against the spring. Lifting/control cross-section are adjusted proportionally to the command value. In case of a command value provision of 0 V, the electronics adjusts the control valve against the spring to center position. In deactivated condition, the spring is unloaded to a maximum and the valve is in fail-safe position.

Switch-off behavior
If the electronics is switched off, the valve immediately moves to the secured basic position (fail safe). In this process, the P-B/A-T position is passed which might cause movements at the controlled component. This must be taken into account when designing the plant.

Symbols

<table>
<thead>
<tr>
<th>L: Linear</th>
<th>P: Inflection 40 %</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Image of symbols" /></td>
<td><img src="image" alt="Image of symbols" /></td>
</tr>
<tr>
<td>C3, C5</td>
<td><img src="image" alt="Graph of symbol" /></td>
</tr>
<tr>
<td>C4, C1</td>
<td><img src="image" alt="Graph of symbol" /></td>
</tr>
<tr>
<td>C</td>
<td><img src="image" alt="Graph of symbol" /></td>
</tr>
</tbody>
</table>

Test and service device

- Service case Type VT-VETSY-1 with test device, see RE 29685
- Measuring adapter 6P+PE Type VT-PA-2, see RE 30068
### Technical data

#### general

<table>
<thead>
<tr>
<th>Type</th>
<th>Gate valve, directly operated, with steel sleeve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuation</td>
<td>Proportional solenoid with position control, OBE</td>
</tr>
<tr>
<td>Type of connection</td>
<td>Plate port, porting pattern (ISO 4401-05-04-0-05)</td>
</tr>
<tr>
<td>Installation position</td>
<td>Any</td>
</tr>
<tr>
<td>Ambient temperature range °C</td>
<td>-20...+50</td>
</tr>
<tr>
<td>Weight kg</td>
<td>7.1</td>
</tr>
<tr>
<td>Vibration resistance, test condition</td>
<td>Max. 25 g, space vibration test in all directions (24 h)</td>
</tr>
</tbody>
</table>

#### hydraulic (measured with HLP 46, \(\theta_{\text{oil}} = 40 \, ^\circ\text{C} \pm 5 \, ^\circ\text{C}\))

<table>
<thead>
<tr>
<th>Hydraulic fluid</th>
<th>Hydraulic oil according to DIN 51524…535, other media upon request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity range</td>
<td></td>
</tr>
<tr>
<td>Recommended mm²/s</td>
<td>20...100</td>
</tr>
<tr>
<td>Max admissible mm²/s</td>
<td>10...800</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range °C</td>
<td>-20...+70</td>
</tr>
<tr>
<td>Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)</td>
<td>Class 18/16/13 ¹)</td>
</tr>
</tbody>
</table>

#### Flow direction

<table>
<thead>
<tr>
<th>Flow direction</th>
<th>According to symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated flow at (\Delta p = 35 , \text{bar per edge}) ²) l/min</td>
<td>50 (1:1) 50 (2:1) 100 (1:1) 100 (2:1)</td>
</tr>
<tr>
<td>Max operating pressure Port P, A, B bar</td>
<td>315</td>
</tr>
<tr>
<td>Orifice T bar</td>
<td>250</td>
</tr>
<tr>
<td>Limitation of use (\Delta p) pressure loss at the valve C, C3, C5 bar</td>
<td>315 315 160 160</td>
</tr>
<tr>
<td>(Q_{\text{nom}} &gt; Q_N) values C4, C1 bar</td>
<td>250 250 100 100</td>
</tr>
<tr>
<td>Zero flow at 100 bar Linear characteristic curve L cm³/min</td>
<td>&lt; 1200 &lt; 1200 &lt; 1500 &lt; 1000</td>
</tr>
<tr>
<td>Inflected characteristic curve P cm³/min</td>
<td>&lt; 600 &lt; 500 &lt; 600 &lt; 600</td>
</tr>
</tbody>
</table>

#### Fail-safe position

<table>
<thead>
<tr>
<th>C</th>
<th>Flow at (\Delta p = 35 , \text{bar per edge}) l/min</th>
<th>50</th>
<th>50</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3, C5</td>
<td>cm³/min</td>
<td>50 P–A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero flow at 100 bar</td>
<td>cm³/min</td>
<td>70 P–B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3, C5</td>
<td>l/min</td>
<td>110...100 A–T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow at (\Delta p = 35 , \text{bar per edge}) l/min</td>
<td>10...25 B–T</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4, C1</td>
<td>cm³/min</td>
<td>50 P–A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero flow at 100 bar</td>
<td>cm³/min</td>
<td>70 P–B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cm³/min</td>
<td>70 A–T</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cm³/min</td>
<td>50 B–T</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaching the fail-safe position</td>
<td>0 bar</td>
<td>12 ms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 bar</td>
<td>16 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹) In hydraulic systems, the cleanliness classes indicated for components must be observed.
Effective filtration prevents faults and at the same time increases the service life of the components.
For the choice of filters, see technical data sheets RE 50070, RE 50076 and RE 50081.

²) Flow at different \(\Delta p\) \(Q_x = Q_{\text{nom}} \cdot \sqrt{\frac{\Delta p}{35}}\)
Technical data

**static / dynamic**

- **Hysteresis** % ≤ 0.2
- **Manufacturing tolerance** $q_{\text{max}}$ % < 10
- **Actuating time for signal step 0...100 %** ms ≤ 25
- **Temperature drift** Zero shift < 1 % at $\Delta T = 40$ °C
- **Zero compensation** ex factory ±1 %

**electric, control electronics integrated in the valve**

- **Relative duty cycle** % 100 ED
- **Protection class** IP 65 according to DIN 40050 and IEC 14434/5
- **Port** Mating connector 6P+PE, DIN 43563

**Supply voltage**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A:</td>
<td>Terminal A:</td>
<td>24 V nom</td>
</tr>
<tr>
<td>B: 0 V</td>
<td>Terminal B:</td>
<td>min. 21 V = max. 40 V = Ripple max. 2 V =</td>
</tr>
</tbody>
</table>

**Max. power consumption** 60 VA

**Fuse protection, external** 2.5 A

**Input, version A1**

- **Terminal D: $U_E$** Differential amplifier, $R_i = 100$ kΩ
- **Terminal E: 0 V**

**Input, version F1**

- **Terminal D: $I_{D-E}$** Load, $R_{\text{in}} = 200$ Ω
- **Terminal E: Current loop $I_{D-E}$ feedback**

**Max. voltage of the differential inputs almost 0 V**

- **D → B** max. 18 V =
- **E → B**

**Test signal, version A1**

- **Terminal F: $U_{\text{test}}$** LVDT
- **Terminal C: Reference 0 V**

**Test signal, version F1**

- **Terminal F: $I_{F-C}$** LVDT signal 4...20 mA, at external load 200...500 Ω max.
- **Terminal C: Current loop $I_{F-C}$ feedback**

**Protective earthing conductor and shielding** See pin assignment (CE-compliant installation)

**Adjustment** Calibrated in the factory, see characteristic curve of the valve

**Electromagnetic compatibility** tested according to EN 61000-6-2: 2005-08

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**Version A1:**

- **Standard**

  $I_a 24 V =$

  Signal 0...±10 V

  LVDT signal 0...±10 V

  LVDT Sign. ±10 V

  NG10

  Stroke sig.

  -10 V...0...+10 V

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**Version F1:**

- **mA signal**

  $I_a 24 V =$

  Signal 4...20 mA

  LVDT signal 4...20 mA

  Volt mA

  NG10

  Stroke sig.

  4...12...20 mA
Electrical connection

Electrical data, see page 5

1 Control
2 On the customer side
3 Mating connector
4 Valve
5 Contact surface
6 On Rexroth side

Technical notes with regard to 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

**Type:**
- e.g. Oilflex-FD 855 CP (Company Lappkabel)

**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

**OuterØ:**
- 9.4...11.8 mm – Pg11
- 12.7...13.5 mm – Pg16

**Note**
Supply voltage $24 \text{ V} = \text{nom}$.
If the value falls below $18 \text{ V} = \text{an internal fast switch-off is effected which can be compared with “Release OFF”.}$

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

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/Pinout
Version A1: $U_{D-E} \pm 10$ V

Pin assignment 6P+PE
Version A1: $U_{D-E} \pm 10$ V
$(R_i = 100 \, \text{k}\Omega)$
Integrated electronics

Block diagram/Pinout
Version F1: $I_{D-E} \ 4...12...20 \ mA$

Pin assignment 6P+PE
Version F1: $I_{D-E} \ 4...12...20 \ mA$
($R_{sh} = 200 \ \Omega$)
**Characteristic curves** (measured with HLP 46, $\theta_{\text{oil}} = 40 ^\circ \text{C} \pm 5 ^\circ \text{C})

Flow – signal function

\[ Q = f(U_{D-E}) \]
\[ Q = f(I_{D-E}) \]

Flow characteristics

L: Linear 1:1

Flow characteristics

P: (Inflection 40%) 1:1

Flow characteristics

L: Linear 2:1

Flow characteristics

P: (Inflection 40%) 2:1
Characteristic curves (measured with HLP 46, $\theta_{\text{oil}} = 40 \, ^\circ\text{C} \pm 5 \, ^\circ\text{C}$)

Pressure gain

![Pressure gain diagram]

Bode diagram

![Bode diagram]
Unit dimensions (dimensions in mm)

1 Valve housing
2 Integrated electronics
3 O-rings Ø 12 x 2 (ports P, A, B, T, T1)
4 Mating connector
   see technical data sheet RE 08008
   (separate order)
5 Control solenoids with position transducer
6 Machined valve mounting face, porting pattern according to ISO 4401-05-04-0-05
   Deviating from the standard:
   Ports P, A, B, T, T1 Ø 10.5 mm

Subplates, see technical data sheet RE 45055
   (separate order)

Valve mounting screws (separate order)
The following valve mounting screws are recommended:
4 hexagon socket head cap screws
ISO 4762-M6x40-10.9-N67F82170
(galvanized according to N67F82170)
Tightening torque $M_a = 11+3$ Nm
Mat. no. 2910151209
or
4 hexagon socket head cap screws ISO 4762-M6x40-10.9
(friction rate $\mu_{\text{total}} = 0.12 – 0.17$)