Proportional flow control valve, with integrated pressure compensator

Type KUDSR

Features
- Size 3
- Component series A
- Maximum operating pressure 350 bar
- Maximum flow 120 l/min

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Ordering code (valve without coil) ¹)

<table>
<thead>
<tr>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
</tr>
</thead>
<tbody>
<tr>
<td>KUDS</td>
<td>R</td>
<td>3</td>
<td>A</td>
<td>/</td>
<td>F</td>
<td>N9</td>
<td>V</td>
<td>*</td>
</tr>
</tbody>
</table>

01 Proportional flow control valve, with integrated pressure compensator, direct operated
02 Maximum operating pressure 350 bar
03 Size 3

Symbol

04 Flow in the main port ③
80 l/min
60 l/min
40 l/min

05 Component series
06 High Performance and mounting cavity R/UNF-16-03-0-06, see page 13
07 With concealed manual override ²)

Seal material

08 FKM seals
(other seals upon request) Attention! Observe compatibility of seals with hydraulic fluid used!

09 Further details in the plain text

¹) Complete valves with mounted coil on request.
²) Screwable manual override with star handle "N14" (separate order, material no. R913009058, see page 12).

Valve types (without coil) ¹)

<table>
<thead>
<tr>
<th>Type</th>
<th>Material no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>KUDSR3CA/FN9V</td>
<td>R901255657</td>
</tr>
<tr>
<td>KUDSR3C1A/FN9V</td>
<td>R901287409</td>
</tr>
<tr>
<td>KUDSR3C2A/FN9V</td>
<td>R901265879</td>
</tr>
</tbody>
</table>
Available coils (separate order) 1)

<table>
<thead>
<tr>
<th>Direct voltage DC 4)</th>
<th>&quot;K4&quot;</th>
<th>Material no. for coil with connector 3)</th>
<th>&quot;K40&quot;</th>
<th>&quot;C4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 V (1.8 A)</td>
<td>03pol (2+PE) DIN EN 175301-803</td>
<td>R901022180</td>
<td>R901272648</td>
<td>R901022680</td>
</tr>
<tr>
<td>24 V (1.2 A)</td>
<td>02pol K40 DT 04-2PA, make Deutsch</td>
<td>R901022174</td>
<td>R901272647</td>
<td>R901022683</td>
</tr>
</tbody>
</table>

3) Mating connectors, separate order, see data sheet 08006.
4) Other voltages upon request.

Symbols

By closing the main port ②, the valve can also be operated as 2-way flow control valve.

① = Main port 1 (P)
② = Main port 2 (T)
③ = Main port 3 (A)
**Function**

**General**
The proportional flow control valve is a direct operated cartridge valve in spool design with integrated pressure compensator. It regulates the flow proportionally to the input signal in a continuous form from the main port ① to ③. Superfluous residual flow is led to the tank or to another actuator via the port ②.
The valve basically comprises of housing, control spool, control spring, pressure compensator piston, orifice bush, pressure compensator spring as well as proportional solenoid (1) with central thread and detachable coil.

**Function**
With de-energized proportional solenoid (1), the control spool that is always pressure-compensated to the actuating forces due to its structural design is held in the initial position by the control spring and blocks the flow between main port ① and ③. By energizing the proportional solenoid (1), the control spool is adjusted directly proportional to the electrical input signal and, via orifice-like cross-sections (with progressive flow characteristic), connects the main ports ① and ③. Due to the integrated pressure compensator piston together with the pressure compensator spring, the pressure drop across the valve is kept constant, independent of the pressures at ①, ② and ③. In case of superfluous flow from ① the pressure compensator piston moves to the right and opens the connection ① to ②. In case of de-excitation of the proportional solenoid (1), the control spring returns the control piston into its initial position. The whole flow is now directly led from main port ① to main port ②.
The manual override (2) allows for the adjustment of the valve without solenoid energization.

① = Main port 1 (P)
② = Main port 2 (T)
③ = Main port 3 (A)

Version “K4”
(with mating connector)

Version “C4”

Version “K40”

Type KUDSR3...
Technical data
(For applications outside these parameters, please consult us!)

**general**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>kg</td>
<td>0.97</td>
</tr>
<tr>
<td>Installation position</td>
<td></td>
<td>Any - if it is ensured that no air can collect upstream the valve. Otherwise, we recommend suspended installation of the valve.</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>°C</td>
<td>see page 11</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>°C</td>
<td>−20 to +80</td>
</tr>
</tbody>
</table>

**Environmental audits**

- Salt spray test according to DIN 50021: h 720
- Surface protection DC solenoids: Coating according to DIN 50962-Fe//ZnNi with thick film passivation

**hydraulic**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum operating pressure – Main port ①</td>
<td>bar</td>
<td>350</td>
</tr>
<tr>
<td>Bypass pressure – Main port ②</td>
<td>bar</td>
<td>350 with ( q_{\text{Vmax}} )</td>
</tr>
<tr>
<td>Prio pressure – Main port ③</td>
<td>bar</td>
<td>330 with ( q_{\text{Vmax}} )</td>
</tr>
<tr>
<td>Control pressure differential – ① to ③</td>
<td>bar</td>
<td>12 to 15</td>
</tr>
<tr>
<td>Minimum pressure differential – ① to ③</td>
<td>bar</td>
<td>&gt; 10</td>
</tr>
<tr>
<td>Maximum flow – Main port ①</td>
<td>l/min</td>
<td>120</td>
</tr>
<tr>
<td>Rated flow – ① to ③</td>
<td>l/min</td>
<td>80 (regulated)</td>
</tr>
<tr>
<td>Leakage</td>
<td>ml/min</td>
<td>&lt; 100 (with ( 4p = 100 \text{ bar in } ① ); HLP46, ( \theta_{\text{oil}} = 40^\circ \text{C} ))</td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td></td>
<td>See table below</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>°C</td>
<td>−40 to +100 (preferably +40 to +50)</td>
</tr>
<tr>
<td>Viscosity range</td>
<td>mm²/s</td>
<td>5 to 400 (preferably 10 to 100)</td>
</tr>
<tr>
<td>Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)</td>
<td></td>
<td>Class 20/18/15 1)</td>
</tr>
<tr>
<td>Load cycles</td>
<td>Million</td>
<td>10</td>
</tr>
<tr>
<td>Hysteresis 2)</td>
<td>%</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Range of inversion 2)</td>
<td>%</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Response sensitivity 2)</td>
<td>%</td>
<td>≤ 1</td>
</tr>
</tbody>
</table>

**Hydraulic fluid Classification**

<table>
<thead>
<tr>
<th>Fluid Type</th>
<th>Classification</th>
<th>Suitable sealing materials</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral oils</td>
<td>HLP, HLP</td>
<td>FKM</td>
<td>DIN 51524</td>
</tr>
<tr>
<td>Bio-degradable</td>
<td>– Insoluble in water</td>
<td>HEES</td>
<td>FKM</td>
</tr>
<tr>
<td></td>
<td>– Soluble in water</td>
<td>HEPG</td>
<td>VDMA 24568</td>
</tr>
</tbody>
</table>

**Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the hydraulic fluids used must be 40 K higher than the maximum solenoid surface temperature.

**Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid.

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1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. For the selection of the filters see www.boschrexroth.com/filter.

2) Measured with analog amplifier type RA2-1/10 according to data sheet 95230 (PWM = 100 Hz).
# Technical data

(For applications outside these parameters, please consult us!)

### Electric

<table>
<thead>
<tr>
<th></th>
<th>Direct voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage type</strong></td>
<td>Direct voltage</td>
</tr>
<tr>
<td>Supply voltages</td>
<td>3) V</td>
</tr>
<tr>
<td>Maximum solenoid current</td>
<td>A 1.8</td>
</tr>
<tr>
<td><strong>Coil resistance</strong></td>
<td>– Cold value at 20 °C Ω 3.3</td>
</tr>
<tr>
<td></td>
<td>– Max. hot value Ω 5.8</td>
</tr>
<tr>
<td><strong>Duty cycle</strong></td>
<td>% See characteristic curve page 11</td>
</tr>
<tr>
<td><strong>Maximum coil temperature</strong></td>
<td>4) °C 150</td>
</tr>
<tr>
<td>Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9</td>
<td>– Version &quot;K4&quot; IP 65 with mating connector mounted and locked</td>
</tr>
<tr>
<td></td>
<td>– Version &quot;C4&quot; IP 66 with mating connector mounted and locked</td>
</tr>
<tr>
<td></td>
<td>– Version &quot;K40&quot; IP 69K with Rexroth mating connector (material no. R901022127)</td>
</tr>
<tr>
<td>Control electronics (separate order)</td>
<td>Analog amplifier module type VT-MSPA1... Data sheet 30223</td>
</tr>
<tr>
<td></td>
<td>Plug-in proportional amplifier type VT-SSPA1... Data sheet 30116</td>
</tr>
<tr>
<td></td>
<td>Analog amplifier type RA... Data sheet 95230</td>
</tr>
<tr>
<td></td>
<td>BODAS control unit type RC... Data sheet 95200</td>
</tr>
</tbody>
</table>

3) Other voltages upon request
4) Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and ISO 4413 need to be adhered to!

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When establishing the electrical connection, the protective earthing conductor (PE) has to be connected properly.
Characteristic curves
(measured with HLP46, $\vartheta_{\text{oil}} = 40 \pm 5 ^\circ \text{C}$ and 24 V coil)
Characteristic curves: Version "C"
(measured with HLP46, $\vartheta_{\text{oil}} = 40 \pm 5 \, ^\circ\text{C}$ and $q_{V(0)} = 80 \, \text{l/min}$)

- **Regulated flow at the main port ③ across load pressure**
  - 3-way function (main port ② open to the tank)

- **Regulated flow at the main port ③ across load pressure**
  - 2-way function (main port ② closed)

- **Flow at the main port ③ across command value**
**Characteristic curves:** Version "C1"
(measured with HLP46, $\vartheta_{\text{oil}} = 40 \pm 5 \, ^\circ\text{C}$ and $q_{V_2} = 60 \, \text{l/min}$)

**Regulated flow at the main port** $\odot$ **across load pressure**
3-way function (main port $\ominus$ open to the tank)

**Regulated flow at the main port** $\odot$ **across load pressure**
2-way function (main port $\ominus$ closed)

**Flow at the main port** $\odot$ **across command value**
Characteristic curves: Version "C2"
(measured with HLP46, $\vartheta_{\text{oil}} = 40 \pm 5 \, ^{\circ}\text{C}$ and $q_{\text{V}_{\varnothing}} = 40 \, \text{l/min}$)

**Regulated flow at the main port $\varnothing$ across load pressure**
3-way function (main port $\varnothing$ open to the tank)

**Regulated flow at the main port $\varnothing$ across load pressure**
2-way function (main port $\varnothing$ closed)

**Flow at the main port $\varnothing$ across command value**

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Minimum terminal voltage at the coil and relative duty cycle

Admissible working range against the ambient temperature

- **Version “G12”**

- **Version “G24”**

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**Notices!**
The characteristic curves have been determined for coils with valve with medium test block size (80 x 80 x 80 mm), without flow in calm air. Depending on the installation conditions (block size, flow, air circulation, etc.) there may be a better heat dissipation. Thus, the area of application is broadened. In single cases, more unfavorable conditions may lead to limitations of the area of application.
Unit dimensions
(dimensions in mm)

1 = Main port 1 (P)
2 = Main port 2 (T)
3 = Main port 3 (A)

**LS** = Location Shoulder

1. Mating connector without circuitry for connector "K4" (separate order, see data sheet 08006)
2. Space required to remove the mating connector
3. SW36, tightening torque \( M_A = 165^{+15} \text{ Nm} \)
4. Dimension for "K4" mating connector, without circuitry
5. Dimension (\( \) \) for "K4" mating connector, with circuitry
6. Mating connector for connector "K40" (separate order, see data sheet 08006)
7. Mating connector for connector "C4" (separate order, see data sheet 08006)
8. Nut, tightening torque \( M_A = 5^{+2} \text{ Nm} \)
9. Coil (separate order, see page 3)
10. Concealed manual override "N9"
11. Screwable manual override with star handle "N14" (separate order, see page 3)
Mounting cavity R/UNF16-03-0-06; 3 main ports; thread 1 5/16-12 UN-2B
(dimensions in mm)

1) Visual inspection

① = Main port 1 (P)
② = Main port 2 (T)
③ = Main port 3 (A)

LS = Location Shoulder

All seal ring insertion faces are rounded and free of burrs
Available individual components

<table>
<thead>
<tr>
<th>Item</th>
<th>Denomination</th>
<th>Material no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>910</td>
<td>Nut</td>
<td>R900029574</td>
</tr>
<tr>
<td>920</td>
<td>O-ring for pole tube</td>
<td>R900002507</td>
</tr>
<tr>
<td>999</td>
<td>Seal kit of the valve</td>
<td>R961003236</td>
</tr>
<tr>
<td>A</td>
<td>Manual override &quot;N14&quot;</td>
<td>R913009058</td>
</tr>
</tbody>
</table>

Coils, separate order, see page 3.

More information

- Control electronics:
  - Analog amplifier module type VT-MSPA1...
  - Plug-in proportional amplifier type VT-SSPA1...
  - Analog amplifier type RA...
  - BODAS control unit type RC...
- Selection of the filters

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KUDSR | Proportional flow control valve

Notes