Proportional Directional Control Valve, with Analog Control Electronics

PRM2-06

Size 06 (D03) • \( Q_{\text{max}} \geq 40 \text{l/min (11 GPM)} \) • \( p_{\text{max}} \geq 350 \text{ bar (5100 PSI)} \)

**Technical Features**

- Direct acting, proportional control valve without or with integrated analog electronic (OBE) with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 03) standards
- Used for directional and speed control of hydraulic actuators
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the fullest
- Analog converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the valve performance
- Five chambers housing design with reduced hydraulic power dependence on fluid viscosity
- For versions without OBE a wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The correct function of the control unit is signaled by LEDs. Stabilized voltage +10 V (+5 V for 12 V voltage) is also available to the user.

**Functional Description**

**PRM2-06* Versions without on board electronics**

The valve can be controlled directly by a current control supply unit or by the external electronic card directly mounted to the electrical terminal (see catalog of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

**PRM2-06*EK Versions with on board electronics**

A control box, which comprises one or two electronic control cards, depending on the number of controlled solenoids, can be mounted onto either solenoid. For models with two solenoids, the solenoid mounted opposite the control box is connected to the box by a DIN connector, a two-lead cable and a bushing. The connection of the control box with the supply source and with the control signal is implemented by a 4-pin connector of type M12x1. The electric control unit supplies the solenoid with current, which varies with the control signal.

The electronic control unit provides the following adjustment possibilities:
- Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator.
- Using this voltage and a potentiometer \( \geq 1 \Omega \) a voltage control signal can be generated.

The electronic control card enables voltage or current control to be used, depending on the position of the switches SW1 to SW3.

**Technical Data**

<table>
<thead>
<tr>
<th>ISO 4401-03-02-0-05</th>
<th>4xM5-6Hx13</th>
<th>31.75 (1.25)</th>
<th>0.75 (0.03)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>12.7 (0.50)</td>
<td>31.0 (1.22)</td>
<td>5.1 (0.20)</td>
</tr>
<tr>
<td>T</td>
<td>5.1 (0.20)</td>
<td>31.0 (1.22)</td>
<td>15.5 (0.61)</td>
</tr>
</tbody>
</table>

**Nominal Size**

- \( p_{\text{max}} \) of type M12x1.

**Limit current**

- A: 1.6
- \( - \) with electronic

**Mean resistance value at 20 °C (68 °F)**

- A: 2.3
- \( - \) with electronic

**Technical Data of the Electronics**

<table>
<thead>
<tr>
<th>Control signal</th>
<th>Ucc 12 V DC</th>
<th>Ucc 24 V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage range</td>
<td>11.2...14.7</td>
<td>20...30</td>
</tr>
<tr>
<td>Stabilized voltage for control</td>
<td>5 DC (( R &gt; 1 \Omega ))</td>
<td>10 DC (( R &gt; 1 \Omega ))</td>
</tr>
</tbody>
</table>

**Nominal supply voltage**

- V: 12 DC
- I: 24 DC

**Maximum output current**

- A: 2.4 for \( R < 4 \Omega \), 1.5 for \( R < 10 \Omega \)

**Ramp adjustment range**

- s: 0.05...3

**Dither frequency**

- Hz: 90 / 60

**Dither amplitude**

- %: 0...30

**Data Sheet**

- General information
  - GI_0060

- Products and operating conditions
  - C_8007 / K_8008
  - C22B* / K*

- Mounting interface
  - SMT_0019

- Size 06

- Spare parts
  - SP_8010

- Subplates
  - DP_0002
  - DP*-06

**Subject to change · PRM2-06_5104_3en_06/2018**

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For valve versions with one solenoid the designation “B” with OBE is not shown.

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 lbf.ft)
- Contact our technical support for their identification, feasibility and operating limits.

### Spool Symbols

<table>
<thead>
<tr>
<th>Type</th>
<th>Symbol</th>
<th>Type</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Z51</td>
<td><img src="image" alt="2Z51" /></td>
<td>3Z11</td>
<td><img src="image" alt="3Z11" /></td>
</tr>
<tr>
<td>2Z11</td>
<td><img src="image" alt="2Z11" /></td>
<td>3Z12</td>
<td><img src="image" alt="3Z12" /></td>
</tr>
<tr>
<td>2Y51</td>
<td><img src="image" alt="2Y51" /></td>
<td>3Y11</td>
<td><img src="image" alt="3Y11" /></td>
</tr>
<tr>
<td>2Y11</td>
<td><img src="image" alt="2Y11" /></td>
<td>3Y12</td>
<td><img src="image" alt="3Y12" /></td>
</tr>
</tbody>
</table>

*Model for cylinders with asymmetric piston area ratio 1:2
Operating limits:
Flow direction P → A / B → T or P → B / A → T

Nominal flow 5 l/min (1.3 GPM)

Nominal flow 15 l/min (4.0 GPM)

Nominal flow 30 l/min (7.9 GPM)

Regulated flow related to control signal
Δp=10 bar (145 PSI)

Flow Q [%] with Integrated Electronics

Flow Q [%] without Integrated Electronics

Transient Characteristic measured at v = 32 mm²/s (156 SUS), Δp=10 bar (145 PSI)

The values in table have only an informative character.
The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

Stealth Spool Position S [%] tₕ [ms] tₚ [ms]
100 85 100
75 70 85
50 55 75
25 45 55

--- the control signal course of the integrated electronics

Frequency Response

--- signal 90 %
--- signal 25 %

Solenoid current:
1 = 40%
2 = 60%
3 = 80%
4 = 100%
Table of the Switch Configuration for the Control Signal Choices

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
<th>Wire Colors, Connection Connector - Electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 V (Ucc) (+12 V)</td>
<td>(1) brown</td>
</tr>
<tr>
<td>2</td>
<td>control</td>
<td>(2) white</td>
</tr>
<tr>
<td>3</td>
<td>0 V</td>
<td>(3) blue</td>
</tr>
<tr>
<td>4</td>
<td>+10 V (+5 V)</td>
<td>(4) black</td>
</tr>
</tbody>
</table>

SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

Attention: The control signal must have the same ground potential as the supply.

For PRM2-062

<table>
<thead>
<tr>
<th>MASTER M</th>
<th>SW1</th>
<th>SW2</th>
<th>SW3</th>
<th>SW4</th>
<th>Ucc/2 ± 10 V (± 5 V)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ... 5 V</td>
<td>ON</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>60 Hz</td>
</tr>
<tr>
<td>0 ... 10 V</td>
<td>(0...5 V)*</td>
<td>ON</td>
<td>0</td>
<td>2</td>
<td>90 Hz</td>
</tr>
</tbody>
</table>

For PRM2-063

<table>
<thead>
<tr>
<th>SLAVE S</th>
<th>SW1</th>
<th>SW2</th>
<th>SW3</th>
<th>SW4</th>
<th>± 10 V (± 5 V)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ... 10 V</td>
<td>± 10 V</td>
<td>ON</td>
<td>0</td>
<td>2</td>
<td>90 Hz</td>
</tr>
</tbody>
</table>

Designation of the basic manufacture setting.
The ramp functions are adjusted to their minimum values, the dither is set to the optimal value with respect to hysteresis.
Offset and gain are adjusted according to the characteristic on page 3 and 4. The manufacturer does not recommend to change these adjusted values.

* Input signal level for the 12 V electronic unit.
Setting of Control Electronics

Valve PRM2-062*EK (with one solenoid)

Control with external voltage source 0...10 V, 0 ... 5 V (factory setting) or with external potentiometer R > 1 kΩ

Master card for solenoid a (b)

Factory set values:
- Control signal: 0 - 10 V (0 - 5 V)
- Dither: frequency 90 Hz amplitude - optimum
- Ramps: 0.05 s
- Offset, gain: according to the characteristics on page 3

Wire colors (connection connector - electronics)
- (1) - brown
- (2) - white
- (3) - blue
- (4) - black

The control signal must have the same ground potential as the supply source.

Master card for solenoid a (b)
Setting of Control Electronics

Valve PRM2-062*EK (with one solenoid)
Control with external source 0 ... 5 V, 0 ... 20 mA, 4 ... 20 mA

Master card for solenoid a (b)

Control with external source

<table>
<thead>
<tr>
<th></th>
<th>0 ... 5 V</th>
<th>0 ... 20 mA</th>
<th>4 ... 20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN 1 (1)</td>
<td>+24 V</td>
<td>+24 V (+12 V)</td>
<td>+24 V (+12 V)</td>
</tr>
<tr>
<td>PIN 2 (2)</td>
<td>0 ... 5 V</td>
<td>0 ... 20 mA</td>
<td>4 ... 20 mA</td>
</tr>
</tbody>
</table>

Follow the subsequent steps to modify the factory settings:

1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 (2 or 3) in position shown in the table
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector
6. Bring the control voltage (current) from an external source to terminals 2 and 3 of the connector

Wire colors (connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

The control signal must have the same ground potential as the supply source.

Designation of the basic factory setting.
The ramp functions are adjusted on their minimum values.
The dither is set to the optimal value with respect to hysteresis.
Offset and gain are adjusted according to the characteristic on page 1 and 2.
The manufacturer does not recommend to change these adjusted values.
**Setting of control electronics**

Valve PRM2-063*EK (with two solenoids), factory setting, other control possibilities

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**Factory setting**
Control with external source 0±10 V (0±5 V)

**Other control possibilities**
Control Ucc/2±10 V (Ucc/2±5) with external potentiometer R>1 kΩ

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**Factory set values:**
- Control signal: 0 - 10 V (0 - 5V)
- Dither: frequency 90 Hz
- Ramps: 0.05 s
- Offset, gain: according to the characteristics on page 3

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Follow the subsequent steps to modify the factory settings:
1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 in position shown in the picture
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector

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The control signal must have the same ground potential as the supply source.
Ramp Adjustment (Up, Down)

Ramp adjustment for slave solenoid

Ramp adjustment for master solenoid

* The value has only an informative character with respect to the particular type of the proportional directional valve (see page 3).

⚠️ The factory setting of the ramp is at the minimum value.

Dither Adjustment

Amplitude - potentiometer (dither) (0 - 30 %)

Frequency - switch SW4

Amplitude adjustment for master solenoid

Amplitude adjustment for slave solenoid

The dither is adjusted to minimize hysteresis.
Offset, Gain Parameters Adjustment

The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend to change these settings.

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

<table>
<thead>
<tr>
<th>No Designation</th>
<th>Designation N1</th>
<th>Designation N2</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Standard</td>
<td>- Cap Nut Covered</td>
<td>- Rubber Boot Protected</td>
</tr>
</tbody>
</table>

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.
Dimensions in millimeters (inches)

PRM2-063.../...E1
Valve with two solenoids
Example with electrical terminal
EN 175301-803-A (E1, E2)

PRM2-062.../...E1
Valve with one solenoid „a“
Spool symbols 2Z51, 2Y51

PRM2-063x/xEK*
Valve with one solenoid
OBE on side “a” version EK

Valve with one solenoid „a“
Spool symbols 2Z51, 2Y51
OBE on side “a” version EK

Valve with two solenoids
Spool symbols 3Z11, 3Z12, 3Y11, 3Y12
OBE on side “a” version EK

Plastic nut
3 x 1 Nm
(2.2 ± 0.7 lbf-ft)

PRM2-063x/xEK*
Valve with two solenoids
OBE on side “a” version EK

Valve with one solenoid „b“
Spool symbols 2Z11, 2Y11
OBE on side “b” version EK

Valve with two solenoids
Spool symbols 3Z11, 3Z12, 3Y11, 3Y12
OBE on side “b” version EKB

Valve with two solenoids
OBE on side “b” version EKB
Spool symbols 3Z11, 3Z12, 3Y11, 3Y12

Dimensions in millimeters (inches):

- Valves: 74.5, 12.5
- Spool symbols: 2Z51, 2Y51
- Plastic nut: 3 x 1 Nm
- Tentative: ± 0.7 lbf-ft