Proportional pressure reducing valve, 3-way variant, pilot operated

Types 3DRE(M) and 3DRE(M)E

Sizes 10 and 16
Component series 7X
Maximum pressure setting 315 bar (size 10)
250 bar (size 16)
Maximum flow 125 l/min (size 10)
300 l/min (size 16)

Table of contents

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>1</td>
</tr>
<tr>
<td>Ordering code</td>
<td>2</td>
</tr>
<tr>
<td>Symbols</td>
<td>2</td>
</tr>
<tr>
<td>Function, section</td>
<td>3</td>
</tr>
<tr>
<td>Technical data</td>
<td>4</td>
</tr>
<tr>
<td>Electrical connection, mating connectors</td>
<td>6</td>
</tr>
<tr>
<td>Integrated electronics (OBE) with type 3DRE(M)E</td>
<td>7</td>
</tr>
<tr>
<td>Characteristic curves</td>
<td>8</td>
</tr>
<tr>
<td>Unit dimensions of size 10</td>
<td>10</td>
</tr>
<tr>
<td>Unit dimensions of size 16</td>
<td>11</td>
</tr>
<tr>
<td>Pilot oil supply</td>
<td>12</td>
</tr>
</tbody>
</table>

Features

- Pilot operated valve for reducing a pressure (P to A) and limiting a system pressure (A to T)
- Actuation by proportional solenoid
- Proportional solenoid with central thread and detachable coil
- For subplate mounting:
  Porting pattern to DIN 24340-A and ISO 4401
- Maximum pressure relief function optionally
- Valve and control electronics from a single source
- External control electronics for type 3DRE(M)
- Linear command value/pressure characteristic curve
- Integrated electronics (OBE) for type 3DRE(M)E with low manufacturing tolerance of the command value/pressure characteristic curve

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

<table>
<thead>
<tr>
<th>3DRE</th>
<th>P−7X</th>
<th>G24</th>
<th>V</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without maximum pressure relief function</td>
<td>= No code</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With maximum pressure relief function</td>
<td>= M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For external electronics</td>
<td>= No code</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With integrated electronics (OBE)</td>
<td>= E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size 10</td>
<td>= 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size 16</td>
<td>= 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subplate mounting</td>
<td>= P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component series 70 to 79</td>
<td>= 7X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(70 to 79: unchanged installation and connection dimensions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pressure rating

- 50 bar = 50
- 100 bar = 100
- 200 bar = 200
- 250 bar (size 16 only) = 250
- 315 bar (size 10 only) = 315

### Pilot oil supply/drain

- Internal pilot oil supply, external pilot oil drain = Y
- External pilot oil supply, external pilot oil drain = XY

### Seal material

Seal material: FKM seals

### Interface to electronics

- A1 = Command value 0 to 10 V
- F1 = Command value 4 to 20 mA
- No code = For 3DRE

### Electrical connection

- **K4** = Without mating connectors, with component plug to DIN EN 175301-803
- **K31** = Without mating connector, with component plug to DIN EN 175201-804

### Supply voltage of control electronics

Supply voltage of control electronics: DC voltage 24 V

### Accessories (not included in scope of supply)

- Subplates size 10 to data sheet RE 45054
  - G 535/01 (G3/4), Material no. R900476061
  - G 536/01 (G1), Material no. R900476059
- Subplates size 16 to data sheet RE 45056
  - G 172/01 (G3/4), Material no. R900424410
  - G 172/02 (M27 x 2), Material no. R900424411
  - G 174/01 (G1), Material no. R900424413
  - G 174/02 (M33 x 2), Material no. R900424414
  - G 174/08 (flange), Material no. R900429264
- External control for type 3DRE:
  - Analog amplifier VT-MSPA1-11-1X/V0/0 of modular design to data sheet RE 30223
  - Digital amplifier VT-VSPD-1.2X/V0/.-0-1 of Euro-card format to data sheet RE 30523
  - Analog amplifier VT-VSPA1-11-1X/V0/0 of Euro-card format to data sheet RE 30100
- Mating connectors (for details, see page 8)
  - For 3DRE: according to DIN EN 175301-803, Material no. R901017011
  - For 3DREE: according to DIN EN 175201-804, Material no. R900021267 or R900223890
Symbols

Internal pilot oil supply
External pilot oil drain

External pilot oil supply
External pilot oil drain
Function, section

Valves of types 3DRE(M) and 3DRE(M)E are electrically pilot operated 3-way pressure reducing valves with actuator pressure relief function. They are used to reduce a system pressure.

Technical structure

The valve consists of three main groups:
- Pilot valve (1), optionally with maximum pressure relief valve (15)
- Proportional solenoid (2)
- Main valve (3) with main spool (4)

Function

General function:
- Command value-related adjustment of the pressure to be reduced in port A by means of proportional solenoid (2).
- When no pressure is applied in port P, main spool (4) is held in the central position by springs (5) and (6).
- In this case, the connections from P to A and A to T are blocked.
- Pilot oil flows from bore (7) via flow controller (8), via pilot valve (1) to throttling gap (9), via line (10) to port Y. This connection must be directed to the tank at zero pressure.

Pressure reduction:
- Build-up of the pilot pressure in control chamber (11) as a function of the command value.
- Via orifice (12), pressure is built up in spring chamber (13), and main spool (4) is pushed to the right. Hydraulic fluid flows from P to A.
- The actuator pressure in port A is present in spring chamber (14).
- When the pressure in port A increases to the value set on pilot valve (1), main spool (4) is pushed to the left. The pressure in port A is approximately the same as the pressure set on pilot valve (1).

Pressure relief function:
- When the pressure in port A exceeds the pressure set on pilot valve (1), main spool (4) is pushed further to the left.
- This causes the connection from A to T to open and the pressure applied in port A to be limited to the setpoint value.

Type 3DREM

Optionally, the valve is available with an additional, spring-loaded pilot valve (15) for maximum pressure relief.

Types 3DREE and 3DREME – with integrated electronics (OBE)

In terms of function and design, these valves correspond to types 3DRE and 3DREM, except for the integrated electronics. The electronics accommodated in housing (16) receives its supply and command value voltage via mating connector (17).

The command value/pressure characteristic curve is adjusted in the factory with very low tolerances.

For further details about the integrated electronics, see page 7.
## Technical data
(for applications outside these parameters, please consult us!)

### General

<table>
<thead>
<tr>
<th></th>
<th>10</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>3DRE and 3DREM</td>
<td>3DREE and 3DREME</td>
</tr>
<tr>
<td><strong>Weight</strong> (kg)</td>
<td>7.5</td>
<td>7.6</td>
</tr>
<tr>
<td><strong>Weight</strong> (kg)</td>
<td>10.3</td>
<td>10.4</td>
</tr>
<tr>
<td><strong>Installation orientation</strong></td>
<td>Optionally, preferably horizontal</td>
<td></td>
</tr>
<tr>
<td><strong>Storage temperature range °C</strong></td>
<td>–20 to +80</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature range °C</strong></td>
<td>–20 to +70</td>
<td></td>
</tr>
</tbody>
</table>

### Hydraulic (measured with HLP46, \( \theta_{\text{oil}} = 40 \, ^\circ \text{C} \pm 5 \, ^\circ \text{C} \))

<table>
<thead>
<tr>
<th></th>
<th>10</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum operating pressure Ports P and X bar</strong></td>
<td>350</td>
<td>315</td>
</tr>
<tr>
<td><strong>Maximum operating pressure Ports A and T bar</strong></td>
<td>315</td>
<td>250</td>
</tr>
<tr>
<td><strong>Maximum set pressure in channel A</strong></td>
<td>Separately and at zero pressure to tank</td>
<td></td>
</tr>
<tr>
<td><strong>Pressure rating 50 bar bar</strong></td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Pressure rating 100 bar bar</strong></td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Pressure rating 200 bar bar</strong></td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td><strong>Pressure rating 250 bar bar</strong></td>
<td>–</td>
<td>250</td>
</tr>
<tr>
<td><strong>Pressure rating 315 bar bar</strong></td>
<td>315</td>
<td>–</td>
</tr>
<tr>
<td><strong>Min. set pressure in channel A without flow, at zero command value; see Characteristic curves on page 8 bar</strong></td>
<td>(&lt;5)</td>
<td>(&lt;4)</td>
</tr>
<tr>
<td><strong>Maximum pressure relief function (steplessly adjustable)</strong></td>
<td>Pressure adjustment range: 30 to 70</td>
<td></td>
</tr>
<tr>
<td><strong>Pressure rating 50 bar bar</strong></td>
<td>50 to 130</td>
<td>to 130 bar</td>
</tr>
<tr>
<td><strong>Pressure rating 100 bar bar</strong></td>
<td>90 to 230</td>
<td>to 230 bar</td>
</tr>
<tr>
<td><strong>Pressure rating 200 bar bar</strong></td>
<td>130 to 270</td>
<td>to 270 bar</td>
</tr>
<tr>
<td><strong>Pressure rating 315 bar (size 10 only) bar</strong></td>
<td>150 to 350</td>
<td>to 350 bar</td>
</tr>
</tbody>
</table>

### Pilot flow l/min 1.1

### Hydraulic fluid

- **Mineral oil (HL, HLP) to DIN 51524, further hydraulic fluids on request!**

### Hydraulic fluid temperature range °C

- **–20 to +80**

### Viscosity range mm²/s

- **15 to 380**

### Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)

<table>
<thead>
<tr>
<th></th>
<th>Class 20/18/15 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hysteresis %</strong></td>
<td>± 3 of set max. pressure</td>
</tr>
<tr>
<td><strong>Repeatability %</strong></td>
<td>&lt; ± 2 of set max. pressure</td>
</tr>
<tr>
<td><strong>Linearity %</strong></td>
<td>± 3.5 of set max. pressure</td>
</tr>
</tbody>
</table>

1) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.
### Technical data (for applications outside these parameters, please consult us!)

<table>
<thead>
<tr>
<th><strong>Hydraulic (continued)</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturing tolerance</strong></td>
<td>3DRE(M)(^1) at 20% command value</td>
</tr>
<tr>
<td>of command value/pressure characteristic curve</td>
<td>3DRE(M)E(^1) at 100% command value</td>
</tr>
<tr>
<td><strong>Switching time/step response</strong></td>
<td>3DRE(M)(^2) at 20% command value</td>
</tr>
<tr>
<td>Command value: 0 - 90 % and dead volume in A: 1 l</td>
<td>Tu + Tg ms</td>
</tr>
</tbody>
</table>

1) Matched in the factory
2) For details, see page10

### Electrical

| **Minimum solenoid current** | mA | 100 |
| **Maximum solenoid current** | mA | 1600 ± 10 % |
| **Solenoid coil resistance** | Cold value at 20 °C | Ω | 5.5 |
| | Max. warm value | Ω | 8.05 |

### Electrical, integrated electronics (OBE)

| **Supply voltage** | Nominal voltage | VDC | 24 |
| | Lower limit value | VDC | 21 |
| | Upper limit value | VDC | 35 |
| **Current consumption** | A | ≤ 1.5 |
| **Required fuses** | A | 2, slow-blowing |
| **Inputs** | Voltage | V | 0 to 10 |
| | Current | mA | 4 to 20 |
| **Output** | Actual current value | mV | 1 mV ∆ 1mA |
| **Type of protection of the valve to EN 60529** | IP 65 with mating connector mounted and locked |
## Electrical connection (dimensions in mm)

### 3DRE(M)

- **Connection to component plug**
- **Connection to mating connector**

Mating connector (black) to DIN EN 175301-803
Material no. **R901017011** (separate order)

### 3DRE(M)E

<table>
<thead>
<tr>
<th>Component plug pinout</th>
<th>Contact</th>
<th>Pinout of interface “A1”</th>
<th>Pinout of interface “F1”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>A</td>
<td>24 VDC (u(t) = 21 V to 35 V); ( i_{max} \leq 1.5 \text{ A} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0 V</td>
<td></td>
</tr>
<tr>
<td>Actual value reference potential</td>
<td>C</td>
<td>Reference contact F; 0 V</td>
<td>Reference contact F; 0 V</td>
</tr>
<tr>
<td>Differential amplifier input</td>
<td>D</td>
<td>0 to 10 V; ( R_i = 100 \text{ kΩ} )</td>
<td>4 to 20 mA; ( R_i = 100 \text{ Ω} )</td>
</tr>
<tr>
<td>E</td>
<td>Command value reference potential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement output (actual value)</td>
<td>F</td>
<td>0 to 1.6 V actual value (1 mV ( \Delta ) 1 mA)</td>
<td>Load resistance &gt; 10 kΩ</td>
</tr>
<tr>
<td>PE</td>
<td>Connected to solenoid and valve housing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mating connectors to DIN EN 175201-804, soldered contacts for cable cross-section 0.5 to 1.5 mm²

- **Plastic variant,** Material no. **R900021267,** (separate order)
- **Metal variant,** Material no. **R900223890** (separate order)

---

**Crafted by** CMA/Flodyne/Hydradyne ▪ Motion Control ▪ Hydraulic ▪ Pneumatic ▪ Electrical ▪ Mechanical ▪ (800) 426-5480 ▪ www.cmafh.com
Integrated electronics (OBE) for type 3DRE(M)E

Function

The electronics is supplied with voltage via connections A and B. The command value is applied to differential amplifier connections D and E. The characteristic curve generator adapts the command value/solenoid current characteristic curve to the valve so that non-linearities in the hydraulics are compensated for and a linear command value/pressure characteristic curve is obtained.

The current regulator regulates the solenoid current independently of the solenoid coil resistance.

A chopper amplifier with a clock frequency of approx. 180 Hz to 400 Hz forms the power stage of the electronics for activating the proportional solenoid. The output signal is pulse-width-modulated (PWM).

For checking the solenoid current, a voltage can be measured between Pin F(+) and Pin C(–), which is proportional to the solenoid current. 1 mV corresponds to a solenoid current of 1 mA.

Block circuit diagram

- Connections:
  - A and B: Supply connection
  - D and E: Command value input
  - F: Current measurement point

- Components:
  - 24 VDC supply
  - GND
  - Reference potential, actual value
  - Command value
  - Differential amplifier
  - Characteristic curve generator
  - Current regulator
  - Chopper amplifier
  - Oscillator
  - Solenoid

- Electrical connection:
  - Connection cable for 3DREE:
    - Recommendation: 6-wire, 0.75 or 1 mm² plus protective earth conductor and shield
    - Connect shield to PE on the supply side only
    - Permissible max. length 100 m
  - The minimum supply voltage at the power supply unit depends on the length of the supply cable (see diagram).
Characteristic curves (measured with HLP46, $\theta_{oil} = 40 \, ^\circ \text{C} \pm 5 \, ^\circ \text{C}$)

Pressure in port A in dependence upon the command value (manufacturing tolerance)

![Graph showing pressure in port A in % vs. command value in %](image1)

1) For valve 3DRE(M) the manufacturing tolerance of the external amplifier (for type and data sheet, see page 2) can be modified with command value attenuator potentiometer "Gw". The digital amplifier is set with the parameter "Limit". The control current according to the technical data must, however, not be exceeded.

In order that several valves can be matched to the same characteristic curve, do not set the pressure higher than the maximum pressure setting of the relevant pressure rating at a command value of 100 %.

Pressure in port A in dependence upon the command value (at flow 0 l/min)

![Graph showing pressure in port A in bar vs. command value in %](image2)

Size 10, pressure rating 50 bar

Size 10, pressure rating 100 bar

Size 10, pressure rating 200 bar

Size 10, pressure rating 315 bar
Characteristic curves (measured with HLP46, $\theta_{oill} = 40 \degree C \pm 5 \degree C$)

Pressure in port A in dependence upon the command value (at flow 0 l/min)

- **Size 16, pressure rating 50 bar**
- **Size 16, pressure rating 100 bar**
- **Size 16, pressure rating 200 bar**
- **Size 16, pressure rating 250 bar**

(Images of graphs showing pressure in port A in bar as a function of command value in %)

Courtesy of CMA/Flodyne/Hydradyne ▪ Motion Control ▪ Hydraulic ▪ Pneumatic ▪ Electrical ▪ Mechanical ▪ (800) 426-5480 ▪ www.cmafh.com
Characteristic curves (measured with HLP46, $\theta_{oil} = 40\, ^\circ C \pm 5\, ^\circ C$)

Pressure differential in dependence upon the flow

Size 10

- $A \rightarrow T$
- $P \rightarrow A$

Size 16

- $A \rightarrow T$
- $P \rightarrow A$

Pressure in port A in dependence upon the flow

Size 10

- $A \rightarrow T$
- $P \rightarrow A$

- 315 bar 1)
- 200 bar 1)
- 100 bar 1)
- 50 bar 1)

Size 16

- $A \rightarrow T$
- $P \rightarrow A$

- 300 bar 1)
- 250 bar 1)
- 200 bar 1)
- 100 bar 1)
- 50 bar 1)

1) Pressure rating

Min. set pressure in dependence upon the flow at zero command value

Size 10

- $A \rightarrow T$
- $P \rightarrow A$

Size 16

- $A \rightarrow T$
- $P \rightarrow A$
Unit dimensions of size 10 (dimensions in mm)

1 Main valve
2 Pilot valve
3 Proportional solenoid
4 Space required to remove mating connector
5 Maximum pressure relief function (type 3DREM...)
6 Nameplate
7 Identical seal rings for ports A, B, P, TA and TB
8 Identical seal rings for ports X and Y

9 Machined mounting surface, porting pattern to DIN 24340-A10 and ISO 4401-05-05-0-05
10 In the case of “internal” pilot oil supply (variant Y), port X must be plugged in the subplate.
11 Port B must be plugged in the subplate
12 Mating connector for type 3DRE(M) (separate order)
13 Integrated electronics (type 3DREE, 3DREME) with component plug
14 Mating connector for type 3DRE(M)E, plastic or metal variant (separate order)

Valve mounting screws
4 hexagon socket head cap screws ISO 4762-M6x45-10.9-flZn-240h-L
(Friction coefficient $\mu_{\text{total}} = 0.09$ to 0.14);
tightening torque $M_T = 12.5 \text{ Nm} \pm 10\%$

or

4 hexagon socket head cap screws ISO 4762-M6x45-10.9
(Friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17);
tightening torque $M_T = 15.5 \text{ Nm} \pm 10\%$
Unit dimensions of size 16 (dimensions in mm)

For section, see page 14

9 Machined mounting surface, porting pattern to DIN 24340-A16 and ISO 4401-05-07-0-05
10 In the case of "internal" pilot oil supply (variant Y), port X must be plugged in the subplate.
11 Ports B and L must be plugged in the subplate
12 Mating connector for type 3DRE(M) (separate order)
13 Integrated electronics (types 3DREE, 3DREME) with component plug
14 Mating connector for type 3DRE(M)E, plastic or metal variant (separate order)

Valve mounting screws
2 hexagon socket head cap screws ISO 4762-M6x60-10.9-6Zn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14)
tightening torque M_T = 12.2 Nm ± 10%
Material no. R913000115

4 hexagon socket head cap screws ISO 4762-M10x60-10.9-6Zn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14)
tightening torque M_T = 59 Nm ± 10%
Material no. R913000116

or

2 hexagon socket head cap screws ISO 4762-M6x60-10.9
(Friction coefficient μ_{total} = 0.12 to 0.17)
tightening torque M_T = 15.5 Nm ± 10%

4 hexagon socket head cap screws ISO 4762-M10x60-10.9
(Friction coefficient μ_{total} = 0.12 to 0.17)
tightening torque M_T = 75 Nm ± 10%
Pilot oil supply

Type 3DRE…-…/…XY external pilot oil supply
external pilot oil drain

With this variant, the pilot oil is supplied from a separate pilot circuit (external).
The pilot oil drain is not directed to the T channel of the main valve, but separately to the tank via port Y (external).

Type 3DRE…-…/…Y… internal pilot oil supply
external pilot oil drain

With this variant, the pilot oil is supplied from the P channel of the main valve (internal).
The pilot oil drain is not directed to the T channel of the main valve, but separately to the tank via port Y (external).
Port X must be plugged in the subplate.

Item 1: Plug screw M6 DIN 906-8.8 3A/F

Size 10 For the complete section, see page 12

Size 16 For the complete section, see page 13

Pilot oil supply
external: 1 closed
(internal: 1 open
Pilot oil drain
external

Pilot oil supply
external: 1 closed
(internal: 1 open
Pilot oil drain
external
Notes