Proportional pressure reducing valves type PM and PMZ preferably as pilot valve up to approx. 30 bar

Pressure difference $\Delta p_{\text{max}} = 30$ bar
Flow $Q_{\text{max}} = 2$ lpm

1. General

The pressure reducing valves type PM and PMZ are directly actuated valves in all-steel design. They consist of valve body, controller spool and -sleeve, and prop. actuation solenoid. The higher, eventually varying system pressure $p_p$ apparent at port P is reduced down to a lower constant pressure level at port A. This pressure level corresponds to the current fed to the prop. solenoid with a limit $|p_A| = p_A - p_R$. The pressure $p_A$ apparent at port A is used for hydraulic actuators or for stepless switching operations at variable displacement pumps, proportional valves etc. The power consumption of the prop. solenoid is low, enabling use of prop. amplifiers type EV acc. to D 7817/1, D 7831/1, D 7831 D or D 7835 as well as the programmable logic valve control type PLVC acc. to D 7845 ++.

The max. inlet (system) pressure at port P is rated at 40 bar to prevent any controller inaccuracies or stepwise operation after steady-state periods. When the system pressure is higher than 40 bar it is recommended to use a pressure reducing valve e.g. type ADC 1-25 or AM 1-25 acc. to D 7458, see also examples in sect. 5.

Resting position (de-energized prop. solenoid), maintained by the tapered return spring
Consumer side connected to port R (tank)
Inlet (primary side) completely blocked
Screen filter prevents sudden malfunctions caused by coarse debris eventually flushed through the system.

Optional return pressure stop, may be also retrofitted. It prevents migration of pressure surges from R to A, when R is not individually connected to the tank but connected to the main return line where pressure peaks from other consumers are to be anticipated.

Optional orifice $\phi 0.6$, may be also retrofitted (only when required). Commonly used to dampen oscillations of the connected control elements.

Travel based control element e.g. piston opposing spring e.g. electro-hydraulic actuation for prop. directional control spool valves type PSL acc. to D 7700 ++
Pressure based control element e.g. piston opposing ball (area ratio) e.g. prop. pressure limiting valve type PMV acc. to D 7485/1

HAWE HYDRAULIK SE
STREITFELDSTR. 25 • 81673 MÜNCHEN

© 1991 by HAWE Hydraulik

D 7625
Prop. pressure reducing valve PM(2)
2. Available versions, main data

2.1 Individual valves

Order example:

PM 11 - 7 - B 0,6 - G 24 /1
PMZ 1 - 40 - 30 - G 24 - 1/4

Table 1: Basic type

<table>
<thead>
<tr>
<th>Coding</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM 1</td>
<td>Single valve</td>
</tr>
<tr>
<td>PMZ 1</td>
<td>Twin valve</td>
</tr>
<tr>
<td>PMZ 01</td>
<td>Twin valve (small solenoid)</td>
</tr>
<tr>
<td>PM 11</td>
<td>Single valve</td>
</tr>
<tr>
<td>PM 12</td>
<td>Double valve</td>
</tr>
</tbody>
</table>

Symbols

Type PM 1

Type PM 11

Type PM 12

Type PMZ 1... - 1/4

Table 2: Proportionally adjustable nominal pressure difference

<table>
<thead>
<tr>
<th>Coding</th>
<th>$\Delta p_A = p_A - p_R$ (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>11</td>
<td>11,5</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>7,5</td>
</tr>
<tr>
<td>5,5</td>
<td>5,5</td>
</tr>
<tr>
<td>4</td>
<td>4,5</td>
</tr>
</tbody>
</table>

1) Not available as valve bank
2) Options ...T and ...TH only available with type PMZ 1 and PMZ 01

Table 3: Additional elements

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ohne)</td>
<td>Standard</td>
</tr>
<tr>
<td>R</td>
<td>Return pressure stop at R only PM 11 and PM 12</td>
</tr>
<tr>
<td>B 0,6</td>
<td>Throttle 0,6 at A and B</td>
</tr>
</tbody>
</table>

Table 4: Nom. solenoid voltage

<table>
<thead>
<tr>
<th>Coding</th>
<th>Nominal voltage</th>
<th>Description</th>
<th>PM 1</th>
<th>PMZ 1</th>
<th>PMZ 01</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 12, G 12 T(H) 1)</td>
<td>X 12, X 12 T(H) 2)</td>
<td>12 V DC Standard, version with connection conf. EN 175 301-803 with (G ..) or without (X ..) plug G(X)..T with manual emergency actuation, G(X)..TH with additional push button</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>G 24, G 24 T(H) 4)</td>
<td>X 24, X 24 T(H) 2)</td>
<td>24 V DC Like G 24 (X 24), but solenoid for electrical actuation 4-pin</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G 24 H 4</td>
<td>X 24 H 4</td>
<td>24 V DC Version with connection conf. EN 175 301-803, 4-pin, with (G ..) or without (X ..) plug</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G 24 C 4</td>
<td>X 24 C 4</td>
<td>24 V DC Version with connection via AMP Junior Timer, 4-pin at electrical actuation</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>AMP 24 H 4</td>
<td></td>
<td>24 V DC Connection via plug Co. DEUTSCH DT 04-4P, suited for socket DT 06-4S</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>DT 12</td>
<td></td>
<td>12 V DC Poing, suited for taper with bayonet 10 SL, version S..T with additional manual emergency actuation. Plug is not scope of delivery.</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>DT 24</td>
<td></td>
<td>24 V DC For use in areas with explosion hazardous atmosphere. Suited for category 2 and 3, zone 1, 21, 2, 22. Protection class EEEx m II 120° (T4), with cable length 3 m (no coding) or 10 m</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>S 12, S 12 T 1)</td>
<td></td>
<td>12 V DC Protection class M2 Ex d I (flame proof, intrinsic safe), with cable length 5 m (no coding) or 10 m</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>S 24, S 24 T 1)</td>
<td></td>
<td>24 V DC For use in mines and its on-surface systems, where a MSHA (USA) or MA (China) approval is mandatory. Protection class M2 Ex d I (flame proof, intrinsic safe), with cable length 5 m (no coding) or 10 m</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>G 24 EX 1)</td>
<td>G 24 EX-10 m 1)</td>
<td>24 V DC For use in mines and its on-surface systems, where a MSHA (USA) or MA (China) approval is mandatory. Protection class M2 Ex d I (flame proof, intrinsic safe), with cable length 5 m (no coding) or 10 m</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
</tbody>
</table>
2.2 Valve bank

It is possible to arrange the individual valves type as valve banks via sub-plates. A maximum of 10 valves can be combined. **Attention:** Not available are valves with ex-proof solenoids!

Order example: PMZ 1 A51 - 11/1 - 11/1 - 1 - G 24

- Basic type and connection block with pressure reducing valve on the inlet side
- Pressure reducing valve acc. to table 2

Symbol

Ports: P, R, A and B = G 1/4 (BSPP)
3. **Additional parameters**

3.1 **General and hydraulic**

Nomenclature, design

Proportional pressure reducing valve; directly actuated spool type valve with additional safety valve function (conf. DIN ISO 1219-1)

Material

All-steel design; controller sleeve nitrous hardened and honed. Controller spool hardened and ground. Both components polish-deburred. Optimum wear resistance against erosion and cavitation caused by the passing fluid.

Surface treatment

Valve body: gal Zn 5-8bk

Proportional solenoid: gal Zn 12mtcD

Port coding

P = Inlet (primary side)

A = Consumer outlet (secondary side)

R = Return (to the tank)

Pipe connection

PM 1, PMZ 1: Corresponding ports are to be located in the customer furnished manifold.

**Attention:** Provide a contamination screen at the P-side, e.g. type HFC 1/4 F acc. to D 7235

PM 11, PM 12, PMZ 1...-1/4: For dimensions, see sect. 4.3

Installed position

Any

Flow direction

P → A (→ R) (Controller position at fluid removal mode)

A → R (Controller position at safety valve function mode)

Operating pressure

Inlet P (P1, P2):

\[ P_{\text{Pr max}} = 40 \text{ bar, when the system pressure is higher a pressure reducing valve should be provided e.g. type ADC 1 or AM 1 acc. to D 7488, see also examples in sect. 5.} \]

Outlet A (B):

\[ P_A = \Delta P_A + P_R \]

proportionally adjustable pressure difference \( \Delta P_A = (0) \ldots 4 \) to \( (0) \ldots 30 \) bar dep. on type, see also curves at page 4

Outlet R:

best depressurized to the tank, \( P_R \leq 20 \) bar with PM 1, PM 11, PM 12

\( P_R < 5 \) bar with PMZ 1

permissible static load capacity (idle mode)

PM 1, PM 11, PM 12 = 315 bar (all ports)

PMZ 1: P (P1, P2) = 40 bar; A (B) = 20 bar; R = 5 bar

Flow

\[ Q_{\text{max}} \approx 2 \text{lpm} \]

Mass (weight)

PM 1 = 200 g; PM 11 = 300 g; PM 12 = 600 g; PMZ 1 = 500 g; PMZ 1...-1/4 = 600 g

Pressure fluid

Hydraulic oil acc. to DIN 51524 table 1 to 3; ISO VG 10 to 68 conf. DIN 51 519

Viscosity range: min. approx. 4; max. approx. 600 mm²/sec

Optimum: 10 to 500 mm²/sec

Also suitable are biologically degradable pressure fluids type HEES (synth. Ester) at operation temperatures up to approx. +70°C.

Temperature

Ambient: approx. -40...+80°C

Fluid: -25...+80°C, pay attention to the viscosity range!

Start temperature down to -40°C are allowable (Pay attention to the viscosity range during start!), as long as the operation temperature during subsequent running is at least 20K higher.

Biological degradable pressure fluids: Pay attention to manufacturer’s information. With regard to the compatibility with sealing materials do not exceed +70°C.

**Restriction regarding ex-proof solenoid**

max. ambient temperature -35 ... +40°C, Fluid: max. 70°C

Notes regarding use of ex-proof solenoids:

Observe the operation manual B 01/2002!

The assembly kit type PMZ 1 can only be used when a manifold with minimum dimension of 96 x 80 x 49.5 mm is provided.

It is therefore not possible to use ex-proof versions in valve banks type PMZ 1 A51... acc. to sect. 2.2.

Both coils of the twin solenoid must not be energized simultaneously!
3.2 Electrical data

Solenoid

Manufactured and tested acc. to VDE 0580
The armature cavity of the wet armature solenoid is sealed to the outside and internally connected to R. This way the armature is maintenance free lubed by the hydraulic fluid and protected against corrosion.

<table>
<thead>
<tr>
<th>Valve type</th>
<th>PM</th>
<th>PMZ 1 / PMZ 01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom. voltage $U_N$ (V DC)</td>
<td>12 24</td>
<td>12 24 24 (ex-proof) ripple 15%</td>
</tr>
<tr>
<td>Coil resistance $R_{20} \pm 5%$ (Ω)</td>
<td>5.9 24</td>
<td>6.7 / 6.7 27.2 / 28 27.0 / --</td>
</tr>
<tr>
<td>Current, cold $I_{20}$ (A)</td>
<td>2.0 1.0</td>
<td>1.8 / 1.8 0.88 / 0.86 0.88 / --</td>
</tr>
<tr>
<td>Max. current $I_D$ (A)</td>
<td>1.26 0.63</td>
<td>1.26 / 1.16 0.63 / 0.58 0.63 /--</td>
</tr>
<tr>
<td>Power, cold $P_{20} = U_N \times I_{20}$ (W)</td>
<td>24 24</td>
<td>22 / 22 21 / 21 21.5 /--</td>
</tr>
<tr>
<td>Max. power $P_D = U_N \times I_D$ (W)</td>
<td>9.5 9.5</td>
<td>10.6 / 13.9 10.8 / 13.9 10.8 /--</td>
</tr>
<tr>
<td>Switch-off energy $W_A$ (Ws)</td>
<td>≤ 0.3 ≤ 0.3</td>
<td>≤ 0.3 ≤ 0.3 ≤ 0.3</td>
</tr>
<tr>
<td>Relative duty cycle</td>
<td>100%</td>
<td>100% ED (only one coil)</td>
</tr>
<tr>
<td>Protection class</td>
<td>X.., G..: IP 65 with properly mounted plug</td>
<td>S..: IP 67 (IEC 60529)</td>
</tr>
<tr>
<td>Protection class</td>
<td>IEC 70 (Co) 13</td>
<td>IEC 703 (Co) 13</td>
</tr>
<tr>
<td>IEC 70 (Co) 13</td>
<td>S..: IP 67 (IEC 60529)</td>
<td></td>
</tr>
<tr>
<td>Required dither frequency</td>
<td>50 ... 150 Hz</td>
<td></td>
</tr>
<tr>
<td>Dither amplitude $A_D (%) = \frac{I_{peak} - I_{peak}}{I_{D}} \cdot 100$</td>
<td>20% ≤ $A_D$ ≤ 40%</td>
<td></td>
</tr>
</tbody>
</table>

Electr. connection

Type PM

Circuitry for coding -G 12, -G 24 -X 12, -X 24
Industrial standard (like EN 175 301-803)

Type PMZ

Circuitry for coding -G 12, -G 24 -X 12, -X 24
Industrial standard (like EN 175 301-803)

3-pin
Coil a (1) Coil b (2)
IP 65 (IEC 60529)

4-pin
Coil a (1) Coil b (2)
IP 65 (IEC 60529)

Type PMZ

Circuitry for coding -AMP 12 K 4 -AMP 24 K 4
AMP Junior Timer,
4-pin
IP 65 (IEC 60529)

4-pin
Coil a (1) Coil b (2)
IP 65 (IEC 60529)

The IP-specification only applies when the plug is mounted as specified.
Additional notes regarding versions with ex-proof solenoid  
(see also restrictions at page 3!)  

**Letter of conformity**  
TÜV - A02 ATEX 0007 X  
© II 2 GD T120°C IP67 EEex m II 120°C(T4)  

**Attention:** Additionally observe operating manuals B 01/2002 and  
B ATEX.  

**Coding**  
TÜV - A02 ATEX 0007 X  

- **II 2 GD T120°C IP67 EEex m II 120°C(T4)**  

**Required electrical fusing (acc. to IEC 127)**  

- If < 1.8 A medium  

**Installation**  
Protect against direct sun light  
(see also restrictions at „Temperature“)  
conforming EN 50014, DIN VDE 0170/0171 T1 and T9

**Electrical layout and testing**  
conforming EN 50014, DIN VDE 0170/0171 T1 and T9

---

### ΔpA-I-curves

<table>
<thead>
<tr>
<th>Proportional pressure PA (bar)</th>
<th>ΔpA (bar)</th>
<th>ΔpA/ΔpA max</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>18</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>22</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>24</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>26</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>28</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>30</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Oil viscosity during measurement approx. 60 mm²/sec

---

**Oil viscosity during measurement approx. 60 mm²/sec**

Control current (A)
4. Unit dimensions  All dimensions in mm, subject to change without notice!

4.1 Assembly kits

Individual valve type PM 1
Solenoid coding G..

Twin valve PMZ 1
Solenoid coding G..

Prop. pressure reducing valve insert

Type PM
Solenoid coding S

Twin valve type PMZ 01
Solenoid coding G..

1) This dimension depends on the manufacturer and may be max. 40 mm acc. to EN 175 301-803.

2) Accessories (to be ordered individually):
   SCHLEMMER-plug, 90° 10SL  part No. 6217 8071-00
   SCHLEMMER-plug, straight 10SL  part No. 6217 8070-00
Type PMZ 1

Solenoid coding S
Quarter turn type plug (Bayonet) PA 6

Solenoid coding S..T

Solenoid coding AMP 24 H 4

Solenoid coding G.. T
X.. TH

Solenoid coding G.. C 4
X.. C 4

Solenoid coding DT 12
DT 24

Manual emergency operation
Pushbutton coding TH

Solenoid coding G.. EX

Solenoid coding G.. T EX

Solenoid coding G 24 MSHA

approx. 58
approx. 50.2
approx. 34
approx. 37
approx. 37
approx. 37
approx. 34
Type PMZ 01

Solenoid coding  S 12
S 24

Solenoid coding  AMP 12 K 4
AMP 24 K 4

Solenoid coding  DT 12
DT 24

Manual emergency operation

Solenoid coding  G(X) 12 T
G(X) 24 T

Solenoid coding  G(X) 24 C 4

Manual emergency operation

Pushbutton coding TH

Approx. 53

67

70.5

30.5

49

69.8
Mounting hole

PM 1

Sharp-edged, but deburred

M3, 5 deep

PMZ 01

For missing dimension, see type PM 1

PMZ 1

M5, 5 deep

M4, 5 deep
4.2 Version for sub-plate mounting

Individual valve type PM 11

Sealing of ports A, B, P and R via O-rings 6.07x1.78 NBR 90 Sh

Centering pin, roll pin ISO 8750 2.5x8-St

Double valve type PM 12

Sealing of ports A, B, P and R via O-rings 6.07x1.78 NBR 90 Sh

Centering pin, roll pin ISO 8750 2.5x8-St

Hole pattern of the manifold (viewed from top)

Solenoid orientation /1 (preferred)

Solenoid orientation /2

Solenoid orientation /3

Hole pattern of the manifold (viewed from top)
4.3 Versions for direct pipe connection

Ports:
P1, P2, R, A and B = G 1/4 (BSPP)

1) This dimension depends on the manufacturer and may be max. 40 mm acc. to EN 175 301-803.

4.4 Valve bank version type PMZ

Ports:
P, R, A and B = G 1/4 (BSPP)
5. Appendix

Notes for lay-out

A pressure reducing valve type ADC 1-... or AM 1-... acc. to D 7458 should be provided upstream of the prop. pressure reducing valve to limit the pressure entering down to approx. 40, when the system pressure is between 40 and $p_{\text{max}} = 400$ bar.

Case 1:

Joined, depressurized return for control and return oil from the piloting and prop. pressure reducing valve via separate line. This way the influence of $p_R$ in the return line can be neglected and will show no influence on the characteristic of the valve i.e. pressure $p_A$.

Case 2:

All control and return oil from the piloting and prop. pressure reducing valve is fed into the system return line. Drawback is that the varying system return pressure $p_R$ shows a significant influence on the characteristic of the valve i.e. pressure $p_A$. This negative influence can be prevented by compensation via a connection between system return line and the rear cavity of the actuator.