PROFILE

The pressure transmitter PM4DM works on the two wire principle and, depending on the measuring range, it features a ceramic or polysilicon measuring element. Gauge pressures from 5 mbar up to 400 bar, and absolute pressures from 20 mbar up to 400 bar are converted into a standard pressure proportional 4...20 mA signal. The pressure itself is transferred from the isolating diaphragm via the internal filling liquid onto the measuring cell, ensuring that the process coupling is performing its function according to the process conditions.

Microprocessor technology ensures reliable and simple operation. Remote operation via the supply leads is possible for FSK protocol.

DESCRIPTION

Transmitter PM4DM comprises the measuring cell, the process flange with isolating diaphragm and the electronics housing. The connecting terminals are in a separate compartment. An ASIC in the sensor module stores all the sensor-specific data, so that exchange or replacement of the electronics becomes quite simple. The flat sealing diaphragm is welded or brazed into a ring carrier. Depending on the respective positions of sealing diaphragm it can be supplied also with a capillary tube.

Pressure transfere is achieved by different types of oil, which are sealed under vacuum into the system.

Process flanges, wetted by the process media are made of:
- Stainless steel 316 L
- Tantalum

Material of diaphragm is available in:
- Stainless steel 316 L
- PTFE foil on Stainless steel
- Hastelloy C
- Tantalum

Process flanges itself are also available for hygienic conditions according to:
- DIN 11851
- Clamp
- SMS
- Others

for standard flanges according to:
- DIN 2501 raised face type D
- ANSI B 16.5 with raised face for threaded flanges
- G thread
- NPT thread

An optional LCD indicator with integrated bargraph is very useful for on-site adjustment and display.

If the mounting position makes access to the terminal compartment difficult, or the display cannot be viewed easily, the entire transmitter can be rotated up to 320 degree.

Microprocessor controlled electronics convert the pressure signal into a high precision output signal, and provides comprehensive monitoring functions. The self-monitoring feature of the measuring cell ensures exceptional operating safety and reliability for industrial processes.

Electronics and connecting terminals are housed in separate hermetic compartments. This ensures that the electronics are protected from aggressive environments when the terminal compartment is opened.

Span start (zero) and span are adjustable on-site by means of four push buttons. Remote adjustment is possible by using the „HART“ protocol.

A turn-down ratio of 100 : 1 is possible within the range of each measuring cell*).

If an internal fault is detected, the self-monitoring function generates an alarm which drives the output signal into a pre-defined condition (upscale, downscale or no effect).

*) depending from flange and isolating diaphragm
### TECHNICAL DATA

#### INPUT

**CERAMICAL CELL UP TO 40 BAR**

**Gauge pressure**

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Measuring limits [bar]</th>
<th>Smallest span</th>
<th>Max. Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4 bar</td>
<td>-1/+04</td>
<td>depending 10 bar</td>
<td></td>
</tr>
<tr>
<td>2 bar</td>
<td>-1/+2</td>
<td>from 20 bar</td>
<td></td>
</tr>
<tr>
<td>10 bar</td>
<td>-1/+10</td>
<td>flange 40 bar</td>
<td></td>
</tr>
<tr>
<td>40 bar</td>
<td>-1/+40</td>
<td>dimensions 60 bar</td>
<td></td>
</tr>
</tbody>
</table>

**Absolute pressure**

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Measuring limits [bar]</th>
<th>Smallest span</th>
<th>Max. Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4 bar</td>
<td>0/+04</td>
<td>depending 10 bar</td>
<td></td>
</tr>
<tr>
<td>2 bar</td>
<td>0/+2</td>
<td>from 20 bar</td>
<td></td>
</tr>
<tr>
<td>10 bar</td>
<td>0/+10</td>
<td>flange 40 bar</td>
<td></td>
</tr>
<tr>
<td>40 bar</td>
<td>0/+40</td>
<td>dimensions 60 bar</td>
<td></td>
</tr>
</tbody>
</table>

**POLYSILICON CELL FROM 40 BAR UP TO 400 BAR**

**Gauge pressure**

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Measuring limits [bar]</th>
<th>Smallest span</th>
<th>Max. Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 bar</td>
<td>-1/+100</td>
<td>1 bar 400 bar</td>
<td></td>
</tr>
<tr>
<td>400 bar</td>
<td>-1/+400</td>
<td>4 bar 600 bar</td>
<td></td>
</tr>
</tbody>
</table>

**Absolute pressure**

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Measuring limits [bar]</th>
<th>Smallest span</th>
<th>Max. Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 bar</td>
<td>0/+100</td>
<td>1 bar 400 bar</td>
<td></td>
</tr>
<tr>
<td>400 bar</td>
<td>0/+400</td>
<td>4 bar 600 bar</td>
<td></td>
</tr>
</tbody>
</table>

### FILLING MEDIA FOR SEALING DIAPHRAGM

Selecting the filling liquid for the isolating diaphragm depends on pressure and temperature conditions of the process. Second criteria is the immunity of the filling liquid with the process. Details see list above.

- **Minimum pressure** 10 mbar absolute

### PROCESS MEDIA

Liquids and gases (aggressive or corrosive with suitable material selection)

### MATERIALS

**Diaphragm**

- Stainless steel 316 L
- PTFE foil on stainless steel
- Hastelloy C
- Tantalum

**Process coupling**

- Stainless steel 316 L

### TEMPERATURE EFFECTS

Main temperature effect depends mainly from the process temperature adjacent to the sealing diaphragm.

- The temperature coefficient given in the technical specification applies to glycerine calibrated at 20 °C.
- These values are to be doubled for other filling fluids.
- The total temperature coefficient $T_k$ is the result of adding $T_k$ of the transmitter to that of the isolating diaphragm.

### SMALLEST SPAN

Based upon the thermal expansion of the filling liquid, isolating diaphragms cause an additional temperature effect with the measurement. Following points should be considered for selection:

- The nominal width of the diaphragm seal is determined by the diameter of the diaphragm.
- Large diameter of diaphragm results in smaller temperature effect.
- Small spans require large diameter to minimize temperature effects.
- The larger the diameter of the diaphragm, the larger permissible process temperature range.

### Table 1 Threading coupling with isolating diaphragm

<table>
<thead>
<tr>
<th>Thread</th>
<th>$d_1$</th>
<th>$d$</th>
<th>$d_2$</th>
<th>$x_1$</th>
<th>SW</th>
<th>$dM$</th>
<th>$Tk$</th>
<th>$A$</th>
<th>$\Delta p_{\text{abs}}$</th>
<th>$\Delta T_{\text{limit}}$</th>
<th>$G_{1/2}A$</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPT 1 in</td>
<td>400</td>
<td>28</td>
<td>41</td>
<td>21</td>
<td>60</td>
<td>23</td>
<td>20</td>
<td>175</td>
<td>1.9</td>
<td>2.3</td>
<td>1.9</td>
</tr>
<tr>
<td>NPT 1 1/2 in</td>
<td>400</td>
<td>34</td>
<td>22</td>
<td>50</td>
<td>38</td>
<td>3</td>
<td>180</td>
<td>0.4</td>
<td>180</td>
<td>3.2</td>
<td>0.4</td>
</tr>
</tbody>
</table>

---

**Remarks**

- Silicone oil -40 up to +130 °C -10 up to +200 °C
- High-temperature oil -10 up to +200 °C -10 up to +350 °C
- Halocarbon -40 up to +80 °C -40 up to +175 °C
- Fluorocone -40 up to +80 °C -40 up to +175 °C
- Veilalene -40 up to +80 °C -40 up to +175 °C
- Glycerine +15 up to +200 °C
- Vegetable oil -10 up to +120 °C -10 up to +200 °C

**Medium temperature at**

- $50 mbar \leq P_{\text{abs}} \leq 1$ bar
- $P_{\text{abs}} \geq 1$ bar
**OUTPUT**

*Standard signal:* 4...20 mA  
*max. output current:* 20.5 mA  
*Ripple:* ≤ 0.25 % fsd  
*Characteristic:* pressure proportional

**CONFORMITY**

(zero based to DIN 16 084)  
≤ 0.1 % of set span up to TD 10:1  
For TD 100:1 Conformity error  
$$E = \pm 0.1 \times \frac{0.1 \times \text{nominal value}}{\text{set span}}$$

**Table 2 DIN flanged isolating diaphragm**

<table>
<thead>
<tr>
<th>DIN flanged process coupling</th>
<th>Bolt holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange</td>
<td>Ø</td>
</tr>
<tr>
<td><strong>Flange</strong></td>
<td><strong>bar</strong></td>
</tr>
<tr>
<td>50</td>
<td>10/40</td>
</tr>
<tr>
<td>80</td>
<td>10/40</td>
</tr>
<tr>
<td>25</td>
<td>64/160</td>
</tr>
<tr>
<td>25</td>
<td>250</td>
</tr>
<tr>
<td>25</td>
<td>400</td>
</tr>
<tr>
<td>50</td>
<td>64</td>
</tr>
<tr>
<td>50</td>
<td>100/160</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
</tr>
</tbody>
</table>

**Table 3 ANSI flanged isolating diaphragm**

<table>
<thead>
<tr>
<th>ANSI flanged process coupling</th>
<th>Bolt holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe</td>
<td>Ø</td>
</tr>
<tr>
<td><strong>Pipe</strong></td>
<td><strong>in lb/sq.in</strong></td>
</tr>
<tr>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>300</td>
</tr>
<tr>
<td>1</td>
<td>400/600</td>
</tr>
<tr>
<td>1</td>
<td>900/1500</td>
</tr>
<tr>
<td>1</td>
<td>2500</td>
</tr>
<tr>
<td>2</td>
<td>1500</td>
</tr>
<tr>
<td>2</td>
<td>2500</td>
</tr>
</tbody>
</table>

**Table 4 Flange to DIN 11851 with isolating diaphragm (hygienic)**

<table>
<thead>
<tr>
<th>DIN 11851 flanged process coupling</th>
<th>Isolating diaphragm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø Cone-</td>
<td>Ø</td>
</tr>
<tr>
<td><strong>Ø</strong></td>
<td><strong>bar</strong></td>
</tr>
<tr>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
</tr>
</tbody>
</table>

---

**Fig. 2 DIN flanged isolating diaphragm**

**Fig. 3 ANSI flanged isolating diaphragm**

**Fig. 4 Flange to DIN 11851 (hygienic)**
**getDisplay**

4 digit LDC display of pressure, and LCD bargraph with 28 segments for output signal.

**Operation**

Local operation is performed by means of four keys protected by a cover plate for adjustment of zero and span and for balancing any offset due to the mounting position. Damping can be set with the rotary switch accessible after removing the lid for the electronic compartment. Remote operation is possible by using the HART protocol facilities.

**Power Supply**

Supply voltage

11.5...45 VDC

11.5...30 VDC for intrinsic safety

Voltage effect

\[ \leq 0.1 \% \text{ between 12 and 36 VDC} \]

Ripple

no effect for \( U_{PP} \leq 0.5 \% \) at 24 VDC

Ripple

\[ \leq 0.1 \% \text{ between 12 and 36 VDC} \]

**Damping**

Adjustable 0...16 s

(settling time for 63% of final value)

Undamped delay for \( T_90 \): 150 ms

**Fig 5 Hygienic flange, Tri-clamp**

**Fig 6 Hygienic flange SMS**

**Table 5 Tri-clamp hygienic flange with isolating diaphragm**

<table>
<thead>
<tr>
<th>Tri-clamp flanged process coupling</th>
<th>Isolating diaphragm</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN</td>
<td>PN</td>
</tr>
<tr>
<td>in</td>
<td>bar</td>
</tr>
<tr>
<td>1 ½</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
</tr>
</tbody>
</table>

**Table 6 Hygienic flange with isolating diaphragm to SMS**

<table>
<thead>
<tr>
<th>SMS flanged process coupling</th>
<th>Isolating diaphragm</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN</td>
<td>PN</td>
</tr>
<tr>
<td>in</td>
<td>bar</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>1 ½</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
</tr>
</tbody>
</table>

**Explosion Protection**

Protection type: EEx ia IIC T4, zone 1

Certificate of conformity

KEMA Nr. Ex 95.C.3881

Installation

Transmitter in zone 1 hazardous area

**Environmental Conditions**

Permissible temperatures

For operation: -40... + 85 °C

For storage: -40.... +100 °C

**Temperature effects**

\[ 1) \text{ referred to nominal span of the cell.} \]

\[ 2) \text{ referred to adjusted span.} \]

\[ -10...+60 °C: \pm 0.1\% \times TD + 0.1\%, \]

\[ +60...+85 °C \]

\[ \pm 0.5\% \times TD + 0.5\%. \]

\[ \pm 0.05\% \times TD + 0.05\%. \]
RELATIVE HUMIDITY
100 %, no condensation

CLIMATIC CATEGORY
Class GPC to DIN 40 040

VIBRATION EFFECT
(For electronics only) No effect from mechanical vibrations with 4 mm stroke at 5...15 Hz, or 2g at 15...150 Hz, or 1 g at 150...2000 Hz

ELECTROMAGNETIC COMPATIBILITY
Meets EN 50 082-2 and EN 50 011. Tests according to IEC 801-1 to 801-6

GENERAL

Electronic housing
Die-cast aluminium AlSi12 with fully chromated surface, epoxy polyester coated

Housing protection type
IP 65 to IEC 529

Electrical connections
Screw terminals for 0.5...2.5 mm² via cable entry gland

Mounting position: not critical

Weight: depending from process coupling, see tables

Accessories: operating instructions
9499-040-43501

ACCESSORY
Mounting set, for version with capillary
9404-290-01201

ORDERING STRUCTURE
See next page!
Please use clear text for the specification. Final order numbers will be given in effect of orders.
### ORDERING STRUCTURE

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Version with HART protocol no display, non EEx</td>
</tr>
<tr>
<td>05</td>
<td>EEx ia IIC T4/T6</td>
</tr>
<tr>
<td>06</td>
<td>with LCD display, non EEx</td>
</tr>
<tr>
<td>07</td>
<td>with LCD display, EEx ia IIC T4/T6</td>
</tr>
</tbody>
</table>

Missing codes will be given in effect of orders, please select and use clear text.

- **Sensor, ceramic, gauge pressure**
  - 400 mbar, 2 bar, 10 bar, 40 bar
- **Sensor, Silicon, gauge pressure**
  - 100 bar, 400 bar
- **Sensor, ceramic, absolute pressure**
  - 400 mbar, 2 bar, 10 bar, 40 bar
- **Sensor, Silicon, absolute pressure**
  - 100 bar, 400 bar

- **Calibration / unit**
  - Calibrated from 0...nominal value of cell
    - in mbar/bar, linear
    - in kPa/Mpa, linear
    - in mm H2O, linear
    - in inch H2O, linear
    - in kgf/cm², linear
    - in psi, linear

- **Span start, span, technical units in clear text**

- **Filling liquid / temperature isolator**
  - Silicon oil, none
  - Vegetable oil, none
  - Glycerine, none
  - High temperature oil, 100 mm isolator
  - High temperature oil, 1 m capillary
  - Silicone oil, 1 m capillary
  - Inert oil, for oxygen duty

- **Diaphragm material**
  - SS 1.4435 (SS 316 L) or 1.4571 (SS 316 Ti)
  - Hastelloy C 276
  - Tantalum
  - PTFE laminate on 1.4435

- **Process flanges to**
  - DIN 2501, ANSI B 16.5
  - Thread G / NPT
  - Hygienic DIN, clamp, SMS

- **Material flanges**
  - DIN / ANSI flange, hygienic flange:
    - Stainless steel 1.4435 (SS 316 L)

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Deutschland
PMA Prozess- und Maschinen-Automation GmbH
Miramstrasse 87, D-34123 Kassel

Tel./Fax: (0561) 505-1307/-1710
E-mail: mailbox@pma-online.de
Internet: http://www.pma-online.de

Your local distributor

Printed in Germany - Edition 0302 - Subject to change without notice - 9498 737 34913