



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

## Technical Information

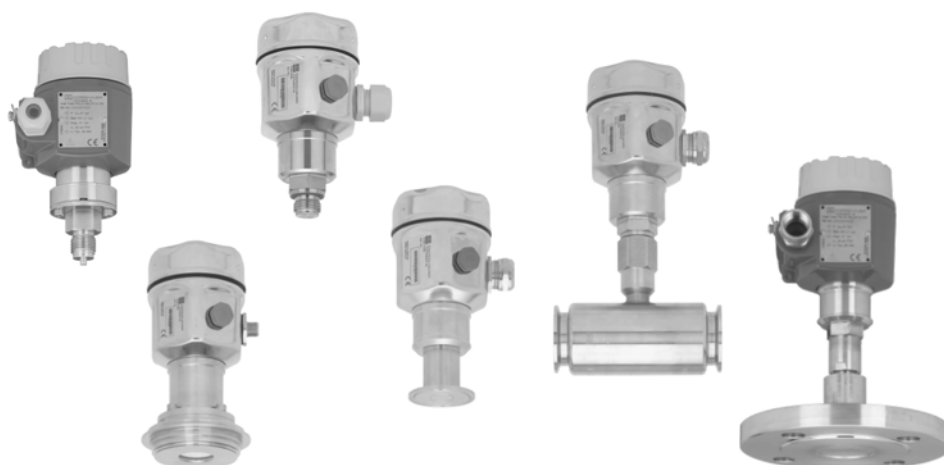
# Cerabar M PMC41/45, PMP41/45/46/48

Pressure transmitters

With ceramic and metal sensors

Overload-resistant and function-monitored

With analog, HART or PROFIBUS PA electronics



### Application

The Cerabar M pressure transmitters measure gauge pressure and absolute pressure in gases, steams, liquids and dusts. Thanks to the modular instrument concept, Cerabar M suits all areas of process engineering. All process connections are available as hygienic connections, threaded connections, separators and flanges (also as diaphragm seals).

### Your benefits

- Accuracy
  - Measured error better than 0.2% of the set measuring range  
(optional: non-linearity better than 0.1%)
  - Configurable measuring range with TD 10:1
  - Long-term stability better than 0.1%/year
- Deployed for pressure monitoring up to SIL 2 as per IEC 61508/IEC 61511-1
- Sensors
  - Dry capacitance ceramic sensor (Ceraphire®) for measuring ranges up to 40 bar – overload-resistant, vacuum-proof, stable against alternating load
  - Piezoresistive sensor with metal diaphragm for measuring ranges up to 400 bar
- Output signals: 4 to 20 mA, 4 to 20 mA with HART, PROFIBUS PA
- Housing
  - With its stainless steel housing free of dead space, Cerabar M meets the hygienic requirements of food and pharmaceutical industries.
  - The coated aluminum housing has proven its worth in the process industry.
- Device versions in conformity with ASME-BPE

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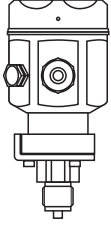
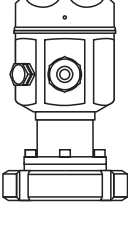
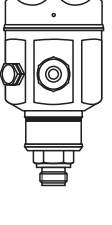
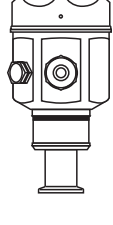
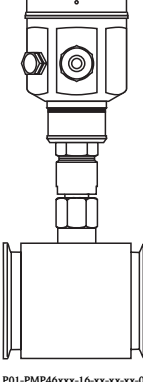
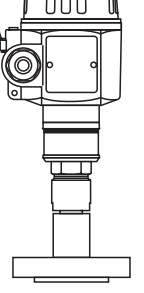
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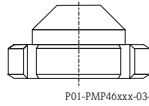
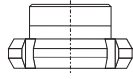
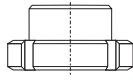
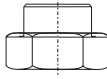
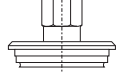
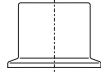
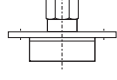


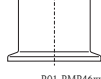
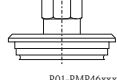
## Function and system design

### Device selection





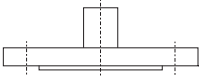
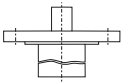
Cerabar M – product family	PMC41	PMC45	PMP41	PMP45	PMP46	PMP48
	 P01-PMC41xxx-16-xx-xx-xx-000	 P01-PMC45xxx-16-xx-xx-xx-000	 P01-PMP41xxx-16-xx-xx-xx-000	 P01-PMP45xxx-16-xx-xx-xx-000	 P01-PMP46xxx-16-xx-xx-xx-000	 P01-PMP48xxx-16-xx-xx-xx-000
	<b>With capacitive measuring cell and ceramic measuring diaphragm (Ceraphire®)</b>		<b>With piezoresistive measuring cell and metallic measuring diaphragm</b>		<b>With piezoresistive measuring cell and diaphragm seals</b>	
Field of application	Absolute pressure and gauge pressure					
Process connections	Threaded connections	Flush-mounted hygienic connections	Threaded connections	Flush-mounted hygienic connections	Hygiene diaphragm seal, diaphragm seals in conformity with ASME-BPE → see following section "Overview of PMP46 diaphragm seals"	Flange diaphragm seal, separator with threaded connection → see following section "Overview of PMP48 diaphragm seals"
Measuring ranges	Up to 40 bar		Up to 400 bar			
Over pressure limit (OPL) <sup>1</sup>	Max. 60 bar		Max. 600 bar			
Process temperature range	–40 to +100°C (–40 to +212°F)	–40 to +125°C (–40 to +257°F), +150°C (+302°F) for 1 h	–40 to +100°C (–40 to +212°F)	–40 to +125°C (–40 to +257°F), +150°C (+302°F) for 1 h	up to +350°C (+662°F)	
Ambient temperature range	–40 to +85°C (–40 to +185°F)					
Maximum measured error	– ±0.2% of set span – Optional: non-linearity ±0.1% of set span				±0.2% of set span	
Supply voltage	– For non-hazardous areas: 11.5 to 45 V DC – EEx ia: 11.5 to 30 V DC					
Output	4 to 20 mA, 4 to 20 mA with superposed HART protocol, PROFIBUS PA					
Options	– 3.1 Inspection certificate – Materials in conformity with FDA – Mounting bracket	– 3.1 Inspection certificate – Materials in conformity with FDA	– 3.1 Inspection certificate – Materials in conformity with FDA – Mounting bracket	– 3.1 Inspection certificate – Materials in conformity with FDA	– 3.1 Inspection certificate – Materials in conformity with FDA – Temperature isolator – Capillary isolator – Mounting bracket	
Specialties	<ul style="list-style-type: none"> <li>– Large selection of approvals, including ATEX, FM and CSA</li> <li>– Wide range of cable entries, cable glands and plugs</li> <li>– Choice of robust housing for strict hygienic requirements made of stainless steel (AISI 316L) or coated aluminum housing</li> <li>– Best price/performance ratio</li> <li>– Dry ceramic cell (without fill fluid), resistant to abrasion and corrosion, in conformity with FDA: Ceraphire®</li> <li>– Flexibility thanks to modular design</li> </ul>					

1) Dependent on the weakest element, with regard to pressure, of the selected components

**Overview of diaphragm seals for PMP46**

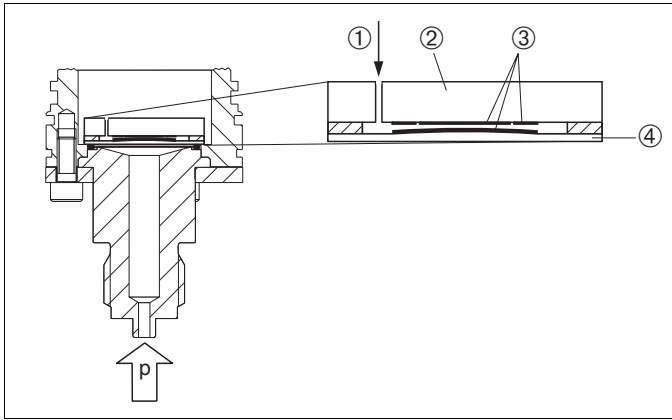
Design	Diaphragm seal	Connection	Version	Standard	Nominal diameter	Nominal pressure/ Class	
Hygienic version	Membrane diaphragm seal (MDM)	Nozzles with coupling nut	 P01-PMP46xxx-03-xx-xx-xx-000	DIN 11851	- DN 32 - DN 40 - DN 50	- PN 40 - PN 40 - PN 25	
			 P01-PMP46xxx-03-xx-xx-xx-001	SMS	- 1 1/2" - 2"	PN 25	
			 P01-PMP46xxx-03-xx-xx-xx-002	RJT	- 1 1/2" - 2"	PN 40	
			 P01-PMP46xxx-03-xx-xx-xx-003	ISS	- 1 1/2" - 2"	PN 40	
		Varivent	 P01-PMP46xxx-03-xx-xx-xx-004		- Type F for pipes DN 25 – DN 32 - Type N for pipes DN 40 – DN 162	PN 40	
		Clamp	 P01-PMP46xxx-03-xx-xx-xx-005	ISO 2852	- DN 25 (1") - DN 38 (1 1/2") - DN 51 (2") - DN 76.1 (3")	Dependent on the clamp used	
		DRD	 P01-PMP46xxx-03-xx-xx-xx-006		d = 65 mm	PN 25	
		Pipe diaphragm seal (RDM)	Threaded adapter	 P01-PMP46xxx-03-xx-xx-xx-007	DIN 11851	- DN 25 - DN 40 - DN 50	PN 40
			Clamp	 P01-PMP46xxx-03-xx-xx-xx-008	ISO 2852	- DN 10 (3/4") - DN 25 (1") - DN 38 (1 1/2") - DN 51 (2")	Dependent on the clamp used
	Versions in conformity with ASME-BPE for use in biotechnical processes; wetted surfaces $R_a \leq 0.4 \mu\text{m}$ (15.75 $\mu\text{in}$ ; 180 grit), electropolished	Membrane diaphragm seal (MDM)	Clamp	 P01-PMP46xxx-03-xx-xx-xx-005	ISO 2852	- DN 38 (1 1/2") - DN 51 (2")	Dependent on the clamp used
Varivent			 P01-PMP46xxx-03-xx-xx-xx-004		- Type N for pipes DN 40 – DN 162	PN 40	

**Overview of diaphragm seals  
for PMP48**

Design	Diaphragm seal	Connection	Version	Standard	Nominal diameter	Nominal pressure/ Class
Threaded connection	Membrane diaphragm seal (MDM)	G	 P01-PMP48xxx-03-xx-xx-xx-000	DIN ISO 228/1	– G 1 A – G 1 1/2 A – G 2 A	Up to 400 bar
		NPT	 P01-PMP48xxx-03-xx-xx-xx-001	ANSI B1.20.1	– 1 NPT – 1 1/2 NPT – 2 NPT	
Threaded connection with separator		G	 P01-PMP48xxx-03-xx-xx-xx-002	ISO 228/ EN 837	G 1/2	Up to 160 bar
		NPT	 P01-PMP48xxx-03-xx-xx-xx-003	ANSI B1.20.1	1/2 NPT	
Flange		EN/DIN Flange	 P01-PMP48xxx-03-xx-xx-xx-004	EN 1092-1/ DIN 2527 and DIN 2501-1	– DN 25 – DN 50 – DN 80	– Up to PN 400 – Up to PN 400 – Up to PN 40
		ANSI Flange		ANSI B.16.5	– 1" – 2" – 3" – 4"	– Up to 2500 lbs – Up to 2500 lbs – Up to 300 lbs – Up to 300 lbs
		JIS Flange		B 2220	– 25 A – 50 A – 80 A	Up to 10 K
Flange with extended diaphragm seal		EN/DIN Flange	 P01-PMP48xxx-03-xx-xx-xx-005	EN 1092-1/ DIN 2527	– DN 50 – DN 80	Up to PN 40
		ANSI Flange		ANSI B.16.5	– 2" – 3" – 4"	Up to 150 lbs

Measuring principle

Ceramic measuring diaphragm used in PMC41 and PMC45 (Ceraphire®)

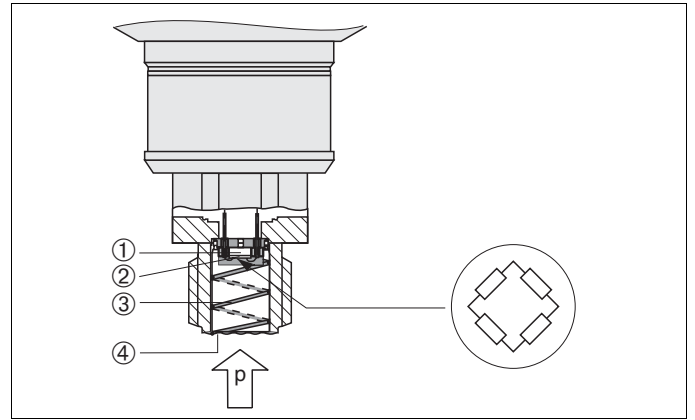


P01-PMC71xxx-03-xx-xx-xx-000

Ceramic sensor

- 1 Air pressure (gauge pressure sensors)
- 2 Ceramic carrier
- 3 Electrodes
- 4 Ceramic diaphragm

Metallic measuring diaphragm used in PMP41, PMP45, PMP46 and PMP48



P01-PMP4xxxx-03-xx-xx-xx-000

Metal sensor

- 1 Silicon measuring element, carrier
- 2 Measuring diaphragm with Wheatstone bridge
- 3 Channel with fill fluid
- 4 Flush-mounted metal diaphragm

Ceramic measuring diaphragm used for PMC41 and PMC45 (Ceraphire®)

The ceramic sensor is a dry sensor, i.e. the process pressure acts directly on the robust ceramic diaphragm and deflects it. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic carrier and the diaphragm. The measuring range is determined by the thickness of the ceramic diaphragm.

Advantages:

- Guaranteed overload resistance up to 40 times the nominal pressure (max. 60 bar)
- Thanks to highly-pure 99.9% ceramic (Ceraphire®, → see also [www.endress.com/ceraphire](http://www.endress.com/ceraphire))
  - Extremely high chemical stability
  - Less relaxation
  - High mechanical stability
- Suitable for vacuums
- Very suitable for hygienic processes as the ceramic material  $Al_2O_3$  is safe and not harmful to health (FDA 21CFR186.1256, USP Class VI)

Metallic measuring diaphragm used for PMP41, PMP45, PMP46 and PMP48

PMP41 and PMP45

The operating pressure deflects the separating diaphragm and a fill fluid transfers the pressure to a resistance measuring bridge (semiconductor technology). The pressure-dependent change of the bridge output voltage is measured and processed further.

Advantages:

- Can be used with process pressures up to 400 bar
- High long-term stability
- Guaranteed overload resistance up to 4 times the nominal pressure (max. 600 bar)
- Compact solution also for small hygienic connections

PMP46 and PMP48

The operating pressure acts on the diaphragm of the diaphragm seal and is transferred to the separating diaphragm of the sensor by a diaphragm seal fill fluid. The separating diaphragm is deflected and a fill fluid transfers the pressure to a resistance measuring bridge. The pressure-dependent change of the bridge output voltage is measured and processed further.

Advantages:

- Can be used with process pressures up to 400 bar
- High long-term stability
- Guaranteed overload resistance up to 4 times the nominal pressure (max. 600 bar)

**Communication protocol**

- 4 to 20 mA without communication protocol
  - 4 to 20 mA with HART communication protocol
  - PROFIBUS PA
    - The Endress+Hauser devices meet the FISCO model requirements.
    - Due to the low current consumption of 11 mA  $\pm$  1 mA the following can be operated at one bus segment when installing to FISCO:
      - Up to 9 Cerabar M for EEx ia, CSA IS and FM IS applications
      - Up to 32 Cerabar M for all other applications, e.g. in non-hazardous areas, EEx nA, etc.
- Further information on PROFIBUS PA can be found in Operating Instructions BA034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO guideline.

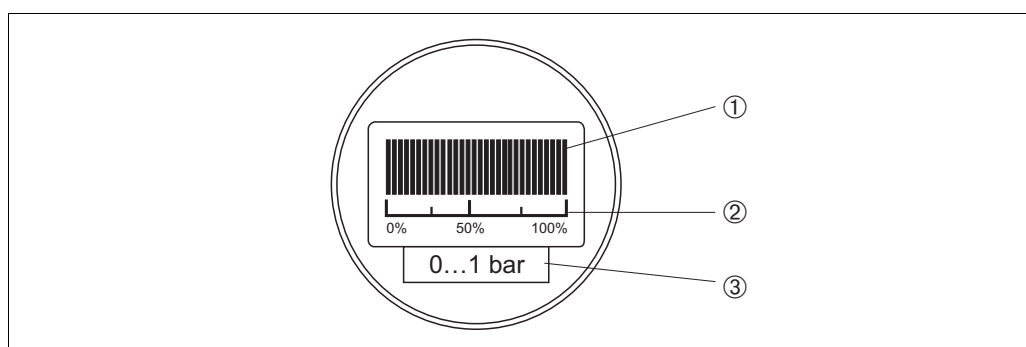
## Human interface

**Onsite display (optional)****Analog display for devices with analog electronics**

A pluggable liquid crystal display (LCD) with bar graph for current display (30 segments) is used as the display. The display can be rotated in 90° stages.

Functions:

- Bar graph as display of measured value from 0 to 100%. This corresponds to a signal current of 4 to 20 mA.
- The scale flashes to indicate signal undershoot (current < 3.8 mA).
- The bar graph and scale flash to indicate signal overshoot (current > 20.5 mA).



*Onsite display for devices with analog electronics*

- 1 Bar graph
- 2 Scale
- 3 Cell measuring range

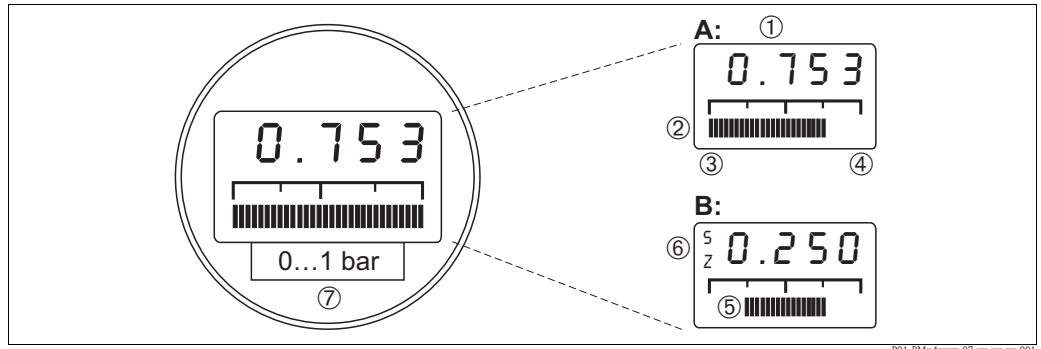
**Digital display for devices with 4 to 20 mA HART or PROFIBUS PA electronics**

A pluggable digital display with 4-digit pressure display and bar graph (28 segments) is used as the display. The display can be rotated in 90° stages.

Functions:

- 4-digit pressure display
- Bar graph
  - 4 to 20 mA HART: the bar graph displays the current value (4 to 20 mA) belonging to the pressure value.
  - PROFIBUS PA: the bar graph displays the current pressure value in relation to the set measuring range.
- Simplified diagnosis by displaying an error code





P01-PMx4xxxx-07-xx-xx-xx-001

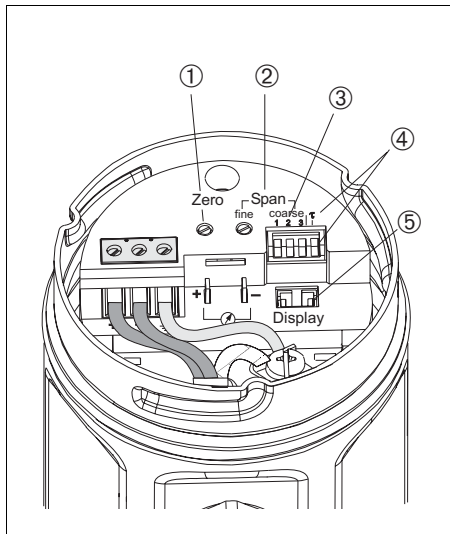
Onsite display for devices with 4 to 20 mA HART or PROFIBUS PA electronics

- A Display in measuring mode
- B Display in calibration mode

- 1 4-digit display of measured values and input parameters
- 2 Bar graph, display of current measured value
- 3 Lower range value
- 4 Upper-range scale
- 5 Set measuring range in measuring limits
- 6 Display of calibration point (Z (Zero) = lower range value (LRV) or S (Span) = upper range value (URV))
- 7 Nominal measuring range

**Operating elements**

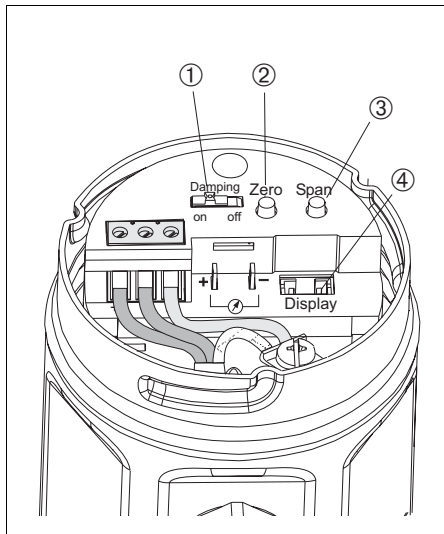
The operating elements are located under the optional onsite display on the electronic insert.



P01-PMx4xxxx-19-xx-xx-xx-000

Analog electronic insert

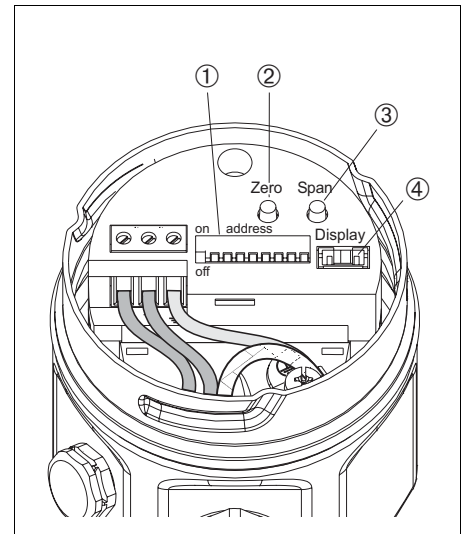
- 1 Potentiometer for calibrating the lower range value (zero)
  - 2 Potentiometer for fine adjustment of the span
  - 3 DIP switches 1 to 3 for coarse adjustment of the span
  - 4 DIP switches for damping on/off
  - 5 Slot for optional onsite display
- 1) Lower range value (LRV) = zero
  - 2) Upper range value (URV) = span



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4 to 20 mA HART electronic insert

- 1 Switch for damping on/off
- 2 Key for calibrating the lower range value (zero)<sup>1</sup>
- 3 Key for calibrating the upper range value (span)<sup>2</sup>
- 4 Slot for optional onsite display



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PROFIBUS PA electronic insert

- 1 DIP switches for bus address
- 2 Key for calibrating the lower range value (zero)<sup>1</sup>
- 3 Key for calibrating the upper range value (span)<sup>2</sup>
- 4 Slot for optional onsite display

**Onsite operation****Functions 4 to 20 mA**

- Calibrating the display value e.g. on the onsite display to zero
- Setting lower range value and upper range value – reference pressure applied at the device
- Switching damping on and off

**Functions 4 to 20 mA HART**

- Calibrating the display value e.g. on the onsite display to zero
- Setting lower range value and upper range value – reference pressure applied at the device
- Switching damping on and off
- Performing reset

**Functions PROFIBUS PA**

- Calibrating the display value on the onsite display to zero
- Setting lower range value and upper range value – reference pressure applied at the device
- Setting the bus address of the device

**Handheld terminals – HART**

With a handheld terminal, all the parameters can be configured anywhere along the 4 to 20 mA line via menu operation.

**FieldCare –  
HART, PROFIBUS PA**

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard. The following operating systems are supported: WinNT4.0, Win2000 and Windows XP.

FieldCare supports the following functions:

- Configuration of transmitters in offline and online operation
- Loading and saving device data (upload/download)
- Documentation of the measuring point

Connection option:

- HART via Commubox FXA195 and the USB interface of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

**Commuwin II –  
HART, PROFIBUS PA**

Commuwin II is a graphically supported operating program for intelligent measuring devices with the HART and PROFIBUS PA communication protocols. The following operating systems are supported: Win 3.1/3.11, Win 95, Win 98, WinNT4.0 and Win2000. Commuwin II displays the most important parameters.

Commuwin II supports the following functions:

- Configuration of measuring devices in online operation via matrix operation
- Loading and saving device data (upload/download)
- Visualization of measured and limit values
- Presentation and recording of measured values with a line recorder.

Connection option:

- HART via Commubox FXA191 and the serial interface RS 232 C of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

## Input

**Measured variable** Absolute pressure or gauge pressure

**Measuring range** PMC41 and PMC45 with ceramic measuring diaphragm (Ceraphire®) for gauge pressure

Nominal value	Measurement limits		Minimum span [bar]	OPL <sup>1</sup> [bar]	MWP <sup>2</sup> [bar]	Vacuum resistance [bar <sub>abs</sub> ]	Version in the order code <sup>3</sup>
	lower (LRL) [bar]	upper (URL) [bar]					
100 mbar	0	0.1	0.01	4	2.7	0.7	1C
400 mbar	0	0.4	0.04	8	5.3	0	1F
1 bar	0	1	0.1	10	6.7	0	1H
4 bar	0	4	0.4	25	16.7	0	1M
10 bar	0	10	1	40	26.7	0	1P
40 bar	0	40	4	60	40	0	1S

PMC41 and PMC45 with ceramic measuring diaphragm (Ceraphire®) for negative gauge pressure

Nominal value	Measurement limits		Minimum span [bar]	OPL <sup>1</sup> [bar]	MWP <sup>2</sup> [bar]	Vacuum resistance [bar <sub>abs</sub> ]	Version in the order code <sup>3</sup>
	lower (LRL) [bar]	upper (URL) [bar]					
100 mbar	-0.1	0.1	0.02	4	2.7	0.7	5C
400 mbar	-0.4	0.4	0.08	8	5.3	0	5F
1 bar	-1	1	0.2	10	6.7	0	5H
4 bar	-1	4	0.5	25	16.7	0	5M
10 bar	-1	10	1.1	40	26.7	0	5P

PMC41 and PMC45 with ceramic measuring diaphragm (Ceraphire®) for absolute pressure

Nominal value	Measurement limits		Minimum span [bar]	OPL <sup>1</sup> [bar <sub>abs</sub> ]	MWP <sup>2</sup> [bar <sub>abs</sub> ]	Vacuum resistance [bar <sub>abs</sub> ]	Version in the order code <sup>3</sup>
	lower (LRL) [bar <sub>abs</sub> ]	upper (URL) [bar <sub>abs</sub> ]					
400 mbar	0	0.4	0.04	8	5.3	0	2F
1 bar	0	1	0.1	10	6.7	0	2H
4 bar	0	4	0.4	25	16.7	0	2M
10 bar	0	10	1	40	26.7	0	2P
40 bar	0	40	4	60	40	0	2S

1) OPL: Over pressure limit

2) The MWP (maximum working pressure) for the measuring device depends on the weakest element of the components selected with regard to pressure, i.e. the process connection (→ see Page 26 ff) has to be taken into consideration in addition to the measuring cell (→ see Table above). Also observe pressure-temperature dependency. For the appropriate standards and further information, see Page 25, "Pressure specifications" section.

3) Version in the order code → see also Page 60 ff, feature 30 "Sensor range; MWP, OPL"

## PMP41, PMP 45, PMP46 and PMP48 with metallic measuring diaphragm for gauge pressure

Nominal value	Measurement limits		Minimum span	OPL <sup>1</sup>	MWP <sup>2</sup>	Vacuum resistance <sup>3</sup>	Version in the order code <sup>4</sup>
	lower (LRL) [bar]	upper (URL) [bar]					
1 bar	0	1	0.1	4	2.7	0.01	3H
4 bar	0	4	0.4	16	10.7	0.01	3M
10 bar	0	10	1	40	26.7	0.01	3P
40 bar	0	40 <sup>5</sup>	4	160	106.7	0.01	3S
100 bar	0	100 <sup>5</sup>	10	400	100	0.01	3U <sup>6</sup>
400 bar	0	400 <sup>5</sup>	40	600	400	0.01	3S <sup>6</sup>

## PMP41, PMP45, PMP46, PMP48 with metallic measuring diaphragm for negative gauge pressure

Nominal value	Measurement limits		Minimum span	OPL <sup>1</sup>	MWP <sup>2</sup>	Vacuum resistance <sup>3</sup>	Version in the order code <sup>4</sup>
	lower (LRL) [bar]	upper (URL) [bar]					
1 bar	-1	1	0.2	4	2.7	0.01	7H
4 bar	-1	4	0.5	16	10.7	0.01	7M
10 bar	-1	10	1.1	40	26.7	0.01	7P

## PMP41, PMP45, PMP46, PMP48 with metallic measuring diaphragm for absolute pressure

Nominal value	Measurement limits		Minimum span	OPL <sup>1</sup>	MWP <sup>2</sup>	Vacuum resistance <sup>3</sup>	Version in the order code <sup>4</sup>
	lower (LRL) [bar <sub>abs</sub> ]	upper (URL) [bar <sub>abs</sub> ]					
1 bar	0	1	0.1	4	2.7	0.01	4H
4 bar	0	4	0.4	16	10.7	0.01	4M
10 bar	0	10	1	40	26.7	0.01	4P
40 bar	0	40	4	160	106.7	0.01	4S
100 bar	0	100	10	400	100	0.01	4U <sup>6</sup>
400 bar	0	400	40	600	400	0.01	4Z <sup>6</sup>

- 1) OPL: Over pressure limit
- 2) The MWP (maximum working pressure) for the measuring device depends on the weakest element of the components selected with regard to pressure, i.e. the process connection (→ see Page 26 ff) has to be taken into consideration in addition to the measuring cell (→ see Table above). Also observe pressure-temperature dependency. For the appropriate standards and further information, see Page 25, "Pressure specifications" section.
- 3) Observe the pressure and temperature operating limits of the filling oil selected. → See Page 53, "Diaphragm seal filling oils" section.
- 4) Version in the order code → see also Page 60 ff, feature 30 "Sensor range; MWP, OPL"
- 5) Absolute pressure sensors
- 6) Not for PMP46

**Explanation of terms**

**Explanation of terms: turn down (TD), set span and span based on zero point**

Case 1:

- Lower range value (LRV)  $\leq$  Upper range value (URV) |

Example:

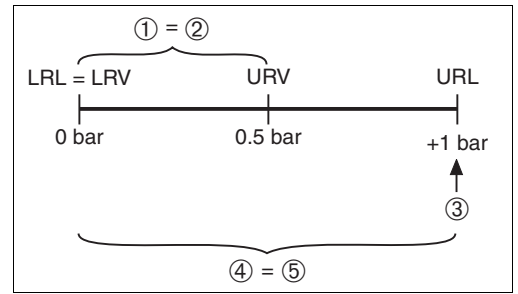
- Lower range value (LRV) = 0 bar
- Upper range value (URV) = 0.5 bar
- Nominal value (URL) = 1 bar

Turn down:

- Nominal value / Upper range value (URV) = 1 bar / 0.5 bar  
TD = 2:1

Set span:

- Upper range value (URV) – Lower range value (LRV) = 0.5 bar – 0 bar  
Set span = 0.5 bar  
This span is based on the zero point.



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Example: 1 bar measuring cell

Case 2:

- Lower range value (LRV)  $\leq$  Upper range value (URV) |

Example:

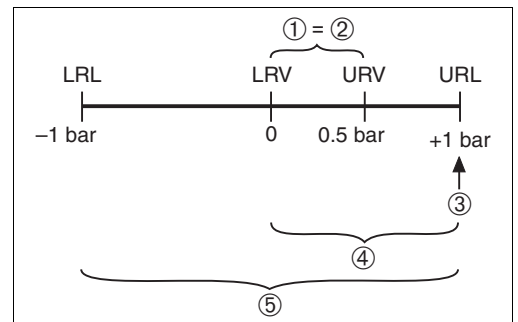
- Lower range value (LRV) = 0 bar
- Upper range value (URV) = 0.5 bar
- Nominal value (URL) = 1 bar

Turn down:

- Nominal value / Upper range value (URV) = 1 bar / 0.5 bar  
TD = 2:1

Set span:

- Upper range value (URV) – Lower range value (LRV) = 0.5 bar – 0 bar  
Set span = 0.5 bar  
This span is based on the zero point.



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Example: 1 bar measuring cell

Case 3:

- Lower range value (LRV)  $\geq$  Upper range value (URV) |

Example:

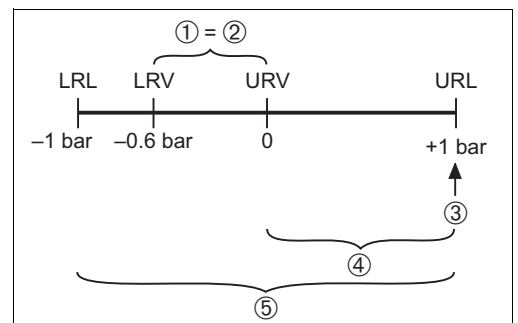
- Lower range value (LRV) = -0.6 bar
- Upper range value (URV) = 0 bar
- Nominal value (URL) = 1 bar

Turn down:

- Nominal value / Lower range value (LRV) = 1 bar / 0.6 bar  
TD 1.67:1

Set span:

- Upper range value (URV) – Lower range value (LRV) = 0 bar – (-0.6 bar)  
Set span = 0.6 bar  
This span is based on the zero point.



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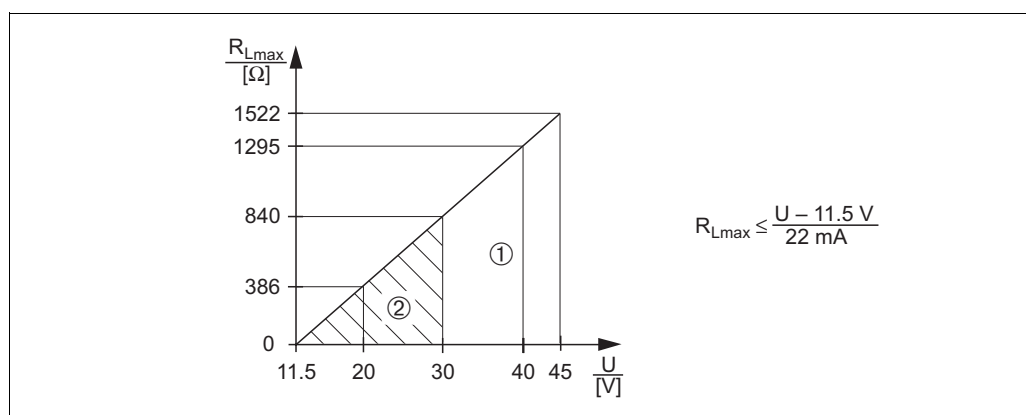
Example: 1 bar measuring cell

- Set span
  - Span based on zero point
  - Nominal value  $\cong$  upper range limit (URL)
  - Nominal measuring range
  - Sensor measuring range
- LRL Lower range limit  
URL Upper range limit  
LRV Lower range value  
URV Upper range value

## Output

<b>Output signal</b>	<ul style="list-style-type: none"> <li>■ 4 to 20 mA, 2-wire</li> <li>■ 4 to 20 mA with superimposed communication protocol HART, 2-wire</li> <li>■ Digital communication signal PROFIBUS PA (Profile 3.0), 2-wire</li> </ul>
<b>Signal range</b>	4 to 20 mA, 4 to 20 mA HART: <ul style="list-style-type: none"> <li>■ 3.8 to 20.5 mA</li> </ul>
<b>Signal on alarm</b>	<ul style="list-style-type: none"> <li>■ 4 to 20 mA:             <ul style="list-style-type: none"> <li>– Signal overshoot: &gt; 20.5 mA</li> <li>– Signal undershoot: &lt; 3.8 mA</li> </ul> </li> <li>■ 4 to 20 mA HART:             <ul style="list-style-type: none"> <li>Options:                 <ul style="list-style-type: none"> <li>– MIN: 3.6 mA</li> <li>– MAX: 22 mA (factory setting)</li> <li>– Continue: last measured value is kept</li> </ul> </li> </ul> </li> <li>■ PROFIBUS PA: can be set in the Analog Input block, Options: Last Good Value (factory setting), FSAFE Value, Wrong Value</li> </ul>

### Load – 4 to 20 mA and 4 to 20 mA HART



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Load diagram, observe explosion protection.

- 1 Power supply 11.5 to 45 V DC for devices for non-hazardous areas, 1/3 D, EEx d, EEx nA, FM XP, FM DIP, CSA XP and CSA Dust-Ex
- 2 Power supply 11.5 to 30 V DC for EEx ia, 1 D, 1/2 D 1/2G, FM IS and CSA IS
- $R_{Lmax}$  Maximum load resistance
- $U$  Supply voltage

#### Note!

When operating via a handheld terminal or via PC with an operating program, a minimum communication resistance of 250  $\Omega$  must exist within the loop.

<b>Resolution</b>	<ul style="list-style-type: none"> <li>■ 4 to 20 mA:             <ul style="list-style-type: none"> <li>– Current output: &lt; 1 <math>\mu</math>A</li> <li>– Onsite display: 30 segments</li> </ul> </li> <li>■ 4 to 20 mA HART:             <ul style="list-style-type: none"> <li>– Current output:                 <ul style="list-style-type: none"> <li>– Typical value: 1 <math>\mu</math>A</li> <li>– Max.: 6 <math>\mu</math>A</li> </ul> </li> <li>– Onsite display: 28 segments, display value with resolution 1 per thousand</li> </ul> </li> <li>■ PROFIBUS PA:             <ul style="list-style-type: none"> <li>– Onsite display: 28 segments, display value with resolution 1 per thousand</li> </ul> </li> </ul>
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<b>Reading cycle</b>	<ul style="list-style-type: none"> <li>■ HART commands: on average 3 to 4 per second</li> <li>■ PROFIBUS PA:             <ul style="list-style-type: none"> <li>– Cyclic: on average 100/s</li> <li>– Acyclic: on average 20/s</li> </ul> </li> </ul>
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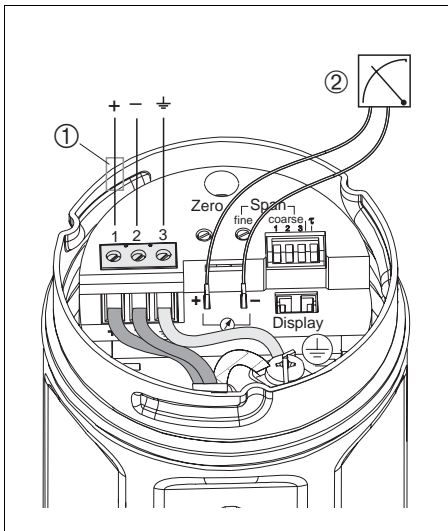
<b>Cycle time (update time)</b>	<p>PROFIBUS PA</p> <ul style="list-style-type: none"> <li>■ The cycle time in a bus segment in cyclic data communication depends on the number of devices, the segment coupler used and the internal PLC cycle time.</li> <li>■ The minimum cycle time is approx. 20 ms per device.</li> </ul>
<b>Response time</b>	<p>PROFIBUS PA</p> <ul style="list-style-type: none"> <li>■ Cyclic: approx. 10 ms per request</li> <li>■ Acyclic: &lt; 50 ms</li> </ul>
<b>Damping</b>	<p><b>4 to 20 mA</b></p> <ul style="list-style-type: none"> <li>■ Via DIP switch on the electronic insert, switch position "On" = 2 s, switch position "Off" = 0 s</li> </ul> <p><b>4 to 20 mA HART</b></p> <ul style="list-style-type: none"> <li>■ Via DIP switch on the electronic insert, switch position "On" = set value, switch position "Off" = 0 s</li> <li>■ Via handheld terminal or PC with operating program, continuous 0 to 40 s</li> <li>■ Factory setting: 2 s</li> </ul> <p><b>PROFIBUS PA</b></p> <ul style="list-style-type: none"> <li>■ Via handheld terminal or PC with operating program, continuous 0 to 40 s</li> <li>■ Factory setting: 0.0 s</li> </ul>

## Power supply

### Electrical connection

Note!

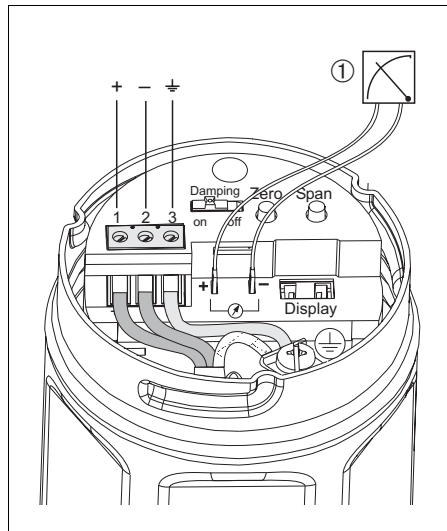
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety instructions or Installation or Control drawings. → See also Page 75, "Safety Instructions" and "Installation/Control Drawings" sections.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- The shield or grounding (if present) must always be connected to the internal ground terminal in the housing.



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Analog electronic insert

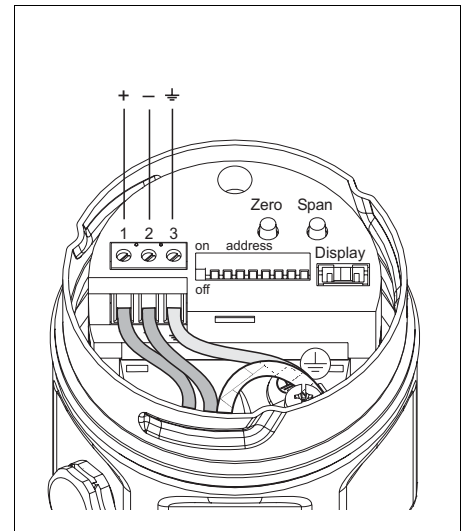
- 1 Devices with ATEX II 1/3 D certificate (non-Ex-powered) must be protected with a 50 mA fuse (slow-blow).
- 2 4 to 20 mA test signal: you can take a 4 to 20 mA test signal via the terminal lugs without interrupting the measurement.



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4 to 20 mA HART electronic insert

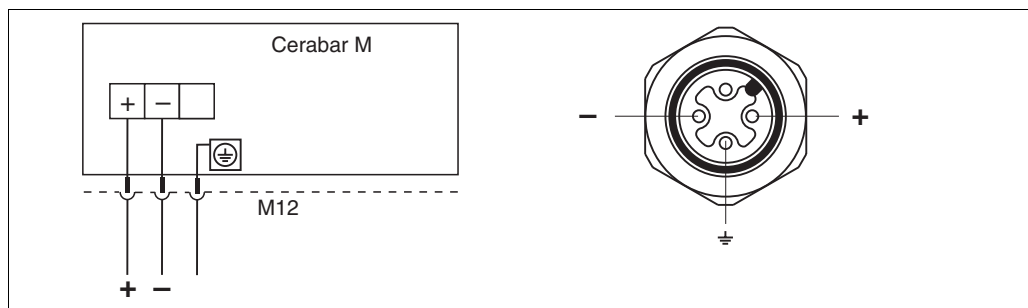
- 1 4 to 20 mA test signal: you can take a 4 to 20 mA test signal via the terminal lugs without interrupting the measurement.



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PROFIBUS PA electronic insert

**Devices with M12 plug**



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Left: electrical connection for devices with M12 plug  
 Right: view of the plug at the device

Endress+Hauser offers for devices with M12 plug the following accessories:

Plug-in jack M 12x1, straight

- Material: Body PA; coupling nut CuZn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 52006263

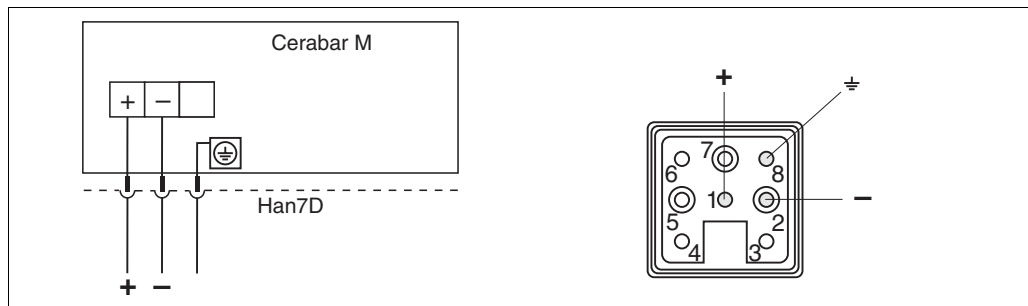
Plug-in jack M 12x1, elbowed

- Material: Body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 51006327

Cable 4x0.34 mm<sup>2</sup> with M12 socket, elbowed, screw plug, 5 m length

- Material: Body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP67
- Order number: 52010285

**Devices with Harting plug Han7D**



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Left: electrical connection for devices with Harting plug Han7D  
 Right: view of the plug at the device



<b>Supply voltage</b>	<p>Note!</p> <ul style="list-style-type: none"> <li>■ When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety instructions or Installation or Control drawings.</li> <li>■ All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas. → See also Page 75, "Safety Instructions" and "Installation/Control Drawings" sections.</li> </ul> <p><b>4 to 20 mA</b></p> <p>For non-hazardous areas: 11.5 to 45 V DC</p> <p><b>4 to 20 mA HART</b></p> <p>For non-hazardous areas: 11.5 to 45 V DC</p> <p><b>PROFIBUS PA</b></p> <p>For non-hazardous areas: 9 to 32 V DC</p>
<b>Current consumption</b>	PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
<b>Cable entry</b>	→ See also Page 60 ff, feature 20 "Housing; Electrical connection".
<b>Cable specification</b>	<ul style="list-style-type: none"> <li>■ Endress+Hauser recommends using shielded, twisted pair two-wire cables.</li> <li>■ Terminals for wire cross-sections 0.14 to 2.5 mm<sup>2</sup></li> <li>■ Cable outer diameter: 5 to 9 mm</li> </ul>
<b>Residual ripple</b>	<p><b>4 to 20 mA and 4 to 20 mA HART</b></p> <ul style="list-style-type: none"> <li>■ Without influence on 4 to 20 mA signal up to ±5% residual ripple within the permitted voltage range (according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1))</li> <li>■ With HART Communicator or Commubox:        Max. ripple (measured at 500 Ω) 47 to 125 Hz: <math>U_{ss} = 200</math> mV        Max. noise (measured at 500 Ω) 500 Hz to 10 kHz: <math>U_{eff} = 2.2</math> mV</li> </ul>

## Performance characteristics

<b>Reference operating conditions</b>	<ul style="list-style-type: none"> <li>■ As per IEC 60770</li> <li>■ Ambient temperature range <math>T_A = \text{constant}</math>, in range: +21 to +33°C (+69.8 to +91.4°F)</li> <li>■ Humidity <math>\phi = \text{constant}</math>, in range: 20 to 80% RH</li> <li>■ Ambient pressure <math>p_A = \text{constant}</math>, in range: 860 to 1060 mbar</li> <li>■ Position of measuring cell = constant, in range: horizontal ±1°</li> <li>■ Input of LOW SENSOR CALIBRATION and HIGH SENSOR CALIBRATION for lower range value and upper range value</li> <li>■ Span based on zero point</li> <li>■ Membrane material PMC41 and PMC45: Al<sub>2</sub>O<sub>3</sub> (aluminum oxide ceramic)</li> <li>■ Membrane material PMP41, PMP45, PMP46 and PMP48: AISI 316L/1.4435</li> <li>■ Filling oil: mineral oil</li> <li>■ Supply voltage: 24 V DC ± 3 V DC</li> <li>■ Load for HART: 250 Ω</li> <li>■ Turn down: 1:1 to 10:1</li> </ul>
<b>Uncertainty of measurement for small absolute pressure measuring ranges</b>	The smallest expanded uncertainty of measurement that can be returned by our calibration standards is 0.4% of the set span in the range 1 to 30 mbar.
<b>Long-term stability</b>	<ul style="list-style-type: none"> <li>■ ±0.1% of URL/year</li> <li>■ ±0.25% of URL/3 years</li> </ul>

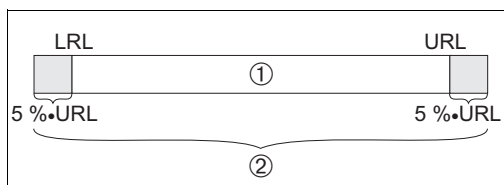
**Influence of the installation position**

A position-dependent zero point shift can be corrected within the (extended) measuring range. → See also the following section "Raising and lowering the zero point", Page 20, "General installation instructions" section and Page 57 ff, "Installation instructions, diaphragm seal systems" section.

**Raising and lowering the zero point**

- 4 to 20 mA: ±10% within the extended measuring range
- 4 to 20 mA HART: as required within the extended measuring range
- PROFIBUS PA: as required within the extended measuring range

**Examples for extended measuring limits and raising and lowering the zero point**



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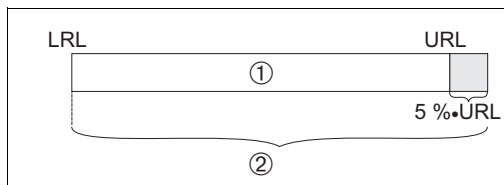
Case 1

*Case 1:*

- 4 to 20 mA HART or PROFIBUS PA
- And gauge pressure sensors with a lower range limit (LRL) > -1 bar

*Example 1:*

- Sensor measuring range: 0 to 10 bar
- Extended measuring range: -0.5 to 10.5 bar (the zero point can be adjusted in this range)



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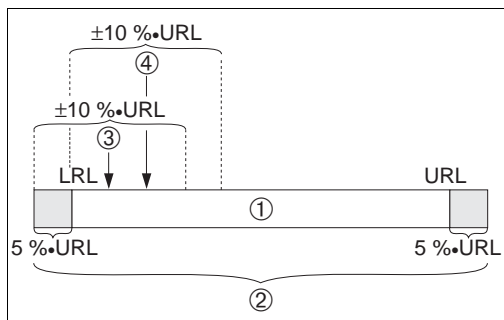
Case 2

*Case 2:*

- 4 to 20 mA HART or PROFIBUS PA
- Absolute pressure sensors and gauge pressure sensors with a lower range limit (LRL) = -1 bar

*Example 2:*

- Sensor measuring range: -1 to 10 bar
- Extended measuring range: -1 to 10.5 bar (the zero point can be adjusted in this range)



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Case 3, example 3 and 4

*Case 3:*

- 4 to 20 mA

*Example 3:*

- Sensor measuring range: 0 to 10 bar
- Extended measuring range: -0.5 to 10.5 bar
- A pressure of 0.5 bar is applied at the device. The zero point can be adjusted in the range -0.5 to 1.5 bar.

*Example 4:*

- Sensor measuring range: 0 to 10 bar
- Extended measuring range: -0.5 to 10.5 bar
- A pressure of 1 bar is applied at the device. The zero point can be adjusted in the range 0 to 2 bar.

- 1 Sensor measuring range
- 2 Extended measuring range
- 3 Pressure applied at the device, see Case 3, Example 3
- 4 Pressure applied at the device, see Case 3, Example 4
- LRL Lower range limit
- URL Upper range limit

<b>Maximum measured error</b>	The measured error comprises the non-linearity including hysteresis and non-reproducibility in accordance with the limit point method as per IEC 60770.
	<b>PMC41, PMC45:</b>
	<ul style="list-style-type: none"> <li>■ <math>\pm 0.2\%</math> of set span</li> <li>■ Optional<sup>1)</sup>: <math>\pm 0.1\%</math> non-linearity of set span</li> </ul>
	100 mbar and 400 mbar measuring cell: ("1C", "1F", "5C", "5F" and "2F" version for feature 30 "Sensor range; MWP; OPL)
	<ul style="list-style-type: none"> <li>■ <math>\pm 0.2\%</math> of set span x TD</li> <li>■ Optional<sup>1)</sup>: <math>\pm 0.1\%</math> non-linearity of set span x TD</li> </ul>
	<b>PMP41, PMP45:</b>
	<ul style="list-style-type: none"> <li>■ <math>\pm 0.2\%</math> of set span</li> <li>■ Optional<sup>1)</sup>: <math>\pm 0.1\%</math> non-linearity of set span</li> </ul>
	<b>PMP46, PMP48:</b>
	<ul style="list-style-type: none"> <li>■ <math>\pm 0.2\%</math> of set span</li> </ul>
	Note! In the case of gauge pressure measurement using absolute pressure sensors with measuring ranges $\leq 10$ bar, the accuracy can be affected by fluctuating ambient air pressure.
<b>Vibrations effects</b>	Without any effects up to 5 to 15 Hz: $\pm 4$ mm 15 to 150 Hz: 2 g 150 to 2000 Hz: 1 g
<b>Warm-up period</b>	<ul style="list-style-type: none"> <li>■ 4 to 20 mA: 200 ms</li> <li>■ 4 to 20 mA HART: 1 s</li> <li>■ PROFIBUS PA: 1 s</li> </ul>
<b>Rise time (T90)</b>	<ul style="list-style-type: none"> <li>■ 4...20 mA: 60 ms</li> <li>■ 4...20 mA HART: 220 ms</li> <li>■ PROFIBUS PA: 220 ms</li> </ul>
<b>Settling time</b>	<ul style="list-style-type: none"> <li>■ 4...20 mA: 180 ms</li> <li>■ 4...20 mA HART: 600 ms</li> <li>■ PROFIBUS PA: 600 ms</li> </ul>
<b>Thermal change of the zero output and the output span</b>	<p><b>4 to 20 mA</b></p> <p>–10 to +60°C (+14 to +140°F):</p> <ul style="list-style-type: none"> <li>■ <math>\pm(0.3 \times \text{TD} + 0.3)\%</math> of set span</li> </ul> <p>–40 to –10°C, +60 to +85°C (–40 to +14°F, +140 to +185°F):</p> <ul style="list-style-type: none"> <li>■ <math>\pm(0.5 \times \text{TD} + 0.5)\%</math> of set span</li> </ul> <p>+85 to +125°C (+185 to +257°F) (only PMC45/PMP45):</p> <ul style="list-style-type: none"> <li>■ <math>\pm(0.8 \times \text{TD} + 0.8)\%</math> of set span</li> </ul> <p><b>4 to 20 mA HART, PROFIBUS PA</b></p> <p>–10 to +60°C (+14 to +140°F):</p> <ul style="list-style-type: none"> <li>■ <math>\pm(0.2 \times \text{TD} + 0.2)\%</math> of set span</li> </ul> <p>–40 to –10°C, +60 to +85°C (–40 to +14°F, +140 to +185°F):</p> <ul style="list-style-type: none"> <li>■ <math>\pm(0.4 \times \text{TD} + 0.4)\%</math> of set span</li> </ul> <p>+85 to +125°C (+185 to +257°F) (only PMC45/PMP45):</p> <ul style="list-style-type: none"> <li>■ <math>\pm(0.6 \times \text{TD} + 0.6)\%</math> of set span</li> </ul> <p>PMP46, PMP48: the data apply to the transmitter without diaphragm seals and capillary line.</p>

1) → See also Page 61 ff, "Ordering information" section, feature 40 "Calibration; Unit", version "C"

**Temperature coefficient ( $T_K$ ) for zero output and output span**

If the value for the temperature coefficient exceeds the value for the thermal change, the thermal change automatically applies.

**4 to 20 mA**

–10 to +60°C (+14 to +140°F):

- $\pm 0.15\%$  of URL/10 K

–40 to –10°C, +60 to +85°C (–40 to +14°F, +140 to +185°F):

- $\pm 0.2\%$  of URL/10 K

+85 to +125°C (+185 to +257°F) (only PMC45/PMP45):

- $\pm 0.25\%$  of URL/10 K

**4 to 20 mA HART, PROFIBUS PA**

–10 to +60°C (+14 to +140°F):

- $\pm 0.08\%$  of URL/10 K

–40 to –10°C, +60 to +85°C (–40 to +14°F, +140 to +185°F):

- $\pm 0.1\%$  of URL/10 K

+85 to +125°C (+185 to +257°F) (only PMC45/PMP45):

- $\pm 0.12\%$  of URL/10 K

PMP46, PMP48: the data apply to the transmitter without diaphragm seals and capillary line.

## Operating conditions (installation)

**General installation instructions**

- The position-dependent zero shift can be corrected directly at the device by means of a key or a potentiometer. Diaphragm seals also shift the zero point, depending on the installation position (→ see also Page 57, "Installation instructions, diaphragm seal systems" section).
- Endress+Hauser offers a mounting bracket for installing on pipes. → See also Page 21, "Wall and pipe-mounting" section.
- The onsite display can be rotated in 90° stages.
- Devices with EHEDG approval: these devices must be installed in accordance with the Hygienic Equipment Design Criteria to meet the requirements of EHEDG.
- For PMP46, PMP48: see Page 57, "Installation instructions, diaphragm seal system" section.

**Measuring arrangement for devices without diaphragm seals – PMC41, PMC45, PMP41, PMP45**

Cerabar M devices without diaphragm seals are mounted as per the norms for a manometer (DIN EN 839-2). We recommend the use of shutoff devices and siphons. The orientation depends on the measuring application.

**Pressure measurement in gases**

- Mount Cerabar M with shutoff device above the tapping point so that the condensate can flow into the process.

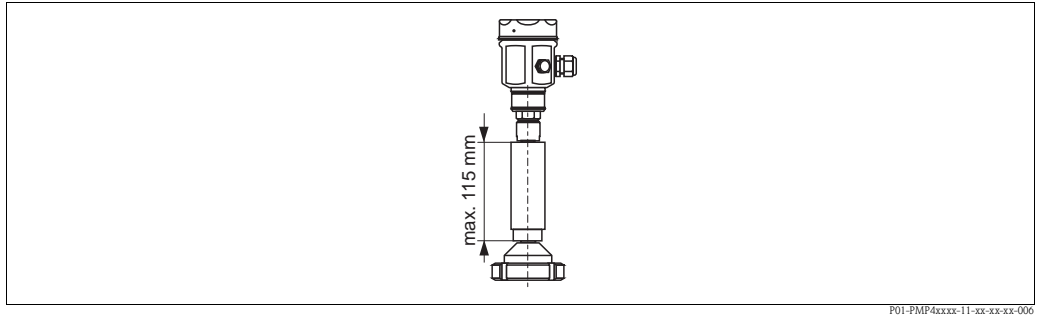
**Pressure measurement in steams**

- Mount Cerabar M with siphon below the tapping point.  
The siphon reduces the temperature to almost ambient temperature.
- Fill the siphon with fill fluid before commissioning.

**Pressure measurement in liquids**

- Mount Cerabar M with shutoff device below or at the same level as the tapping point.

**Mounting with temperature isolator**



P01-PMP4xxxx-11-xx-xx-xx-000

Endress+Hauser recommends the use of temperature isolators in the event of constant extreme fluid temperatures which lead to the maximum permissible electronics temperature of +85°C (+185°F) being exceeded.

Depending on the filling oil used, Cerabar M devices with temperature isolators can be used for maximum temperatures of up to 260°C (+500°F). → For the temperature application limits of filling oils, see page 53, "Diaphragm seal filling oil" section.

To minimize the influence of rising heat, Endress+Hauser recommends the device be mounted horizontally or with the housing pointing downwards.

The additional installation height also brings about a zero point shift of max. 21 mbar due to the hydrostatic column in the temperature isolator. The position-dependent zero shift can be corrected.

**Wall and pipe-mounting**

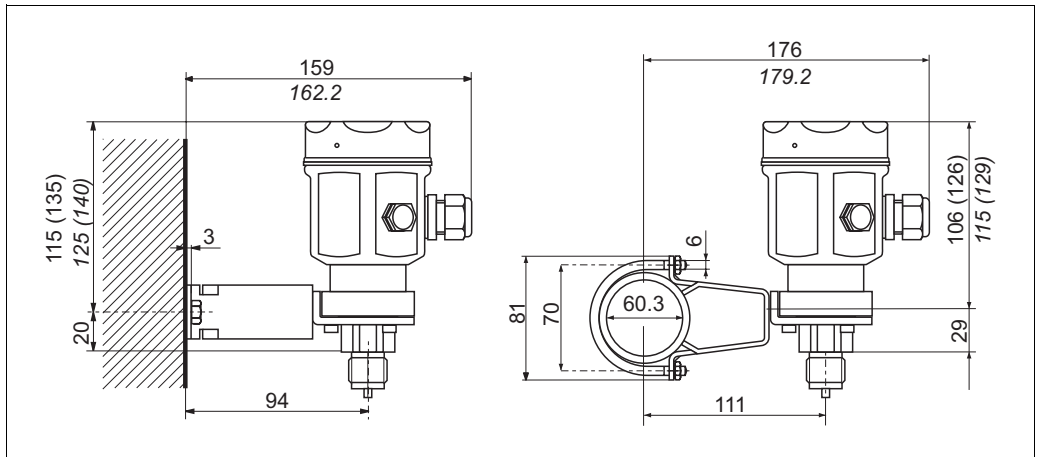
Endress+Hauser offers a mounting bracket for installing on pipes or walls for PMC41, PMP41, PMP46 and PMP48. You can order the mounting bracket either via the order code (→ see Page 61 ff, feature 60, "Additional option") or separately as an accessory.

**PMC41**

- Order number: 919806-0000
- Material: AISI 304 (1.4301)

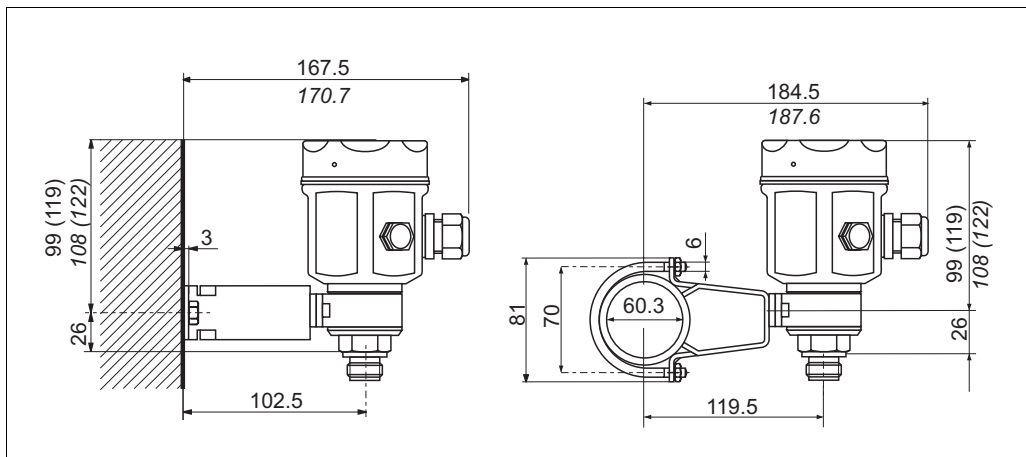
**PMP41, PMP46 and PMP48**

- Order number: 52001402
- Material: AISI 304 (1.4301)



P01-PMC41xxx-17-xx-xx-xx-000

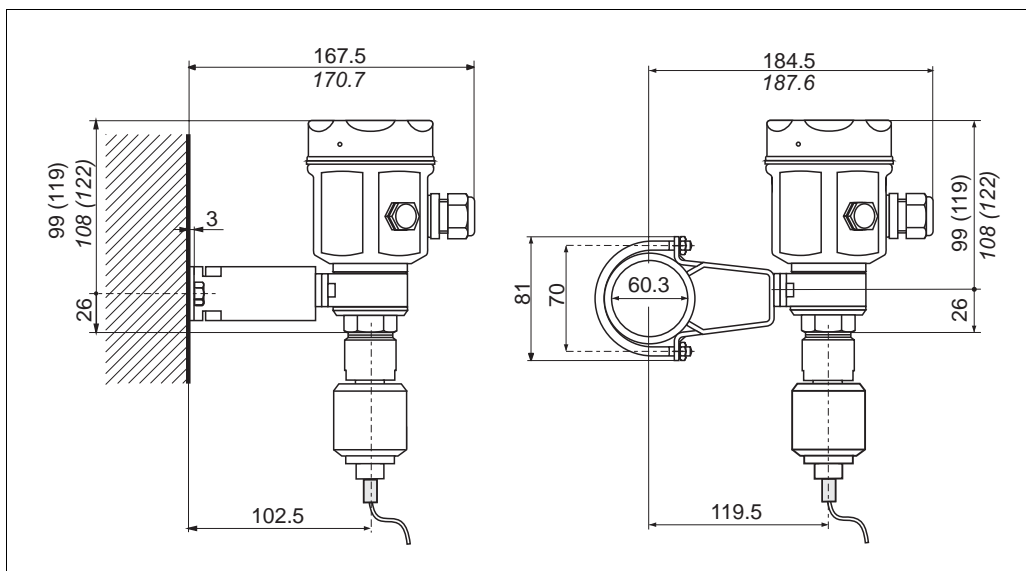
Wall and pipe-mounting PMC41



P01-PMP41xxx-17-xx-xx-xx-000

Wall and pipe-mounting PMP41

The dimensions in brackets apply to housings with a high cover (for optional display). Dimensions written in italics apply to devices with an aluminum housing.



P01-PMP4xxxx-17-xx-xx-xx-000

Wall and pipe mounting PMP46/PMP48

The dimensions in brackets apply to housings with a high cover (for optional display). Dimensions written in italics apply to devices with an aluminum housing.

**Oxygen applications**

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:

- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded in oxygen applications. The maximum temperature  $T_{max}$  for oxygen applications is 60°C (+140°F).

The devices suitable for gaseous oxygen applications are listed in the following table, indicated by  $p_{max}$ .

Order code for devices cleaned for oxygen applications	$p_{max}$ for oxygen applications
PMC41 – * * * * * 6, for devices with sensors, nominal value < 10 bar	Over pressure limit (OPL) of sensor <sup>1</sup>
PMC41 – * * * * * 6, for devices with sensors, nominal value ≥ 10 bar	30 bar
PMP41 – * * * * * C, for devices with sensors, nominal value < 40 bar	Over pressure limit (OPL) of sensor <sup>1</sup>
PMP41 – * * * * * C, for devices with sensors, nominal value ≥ 40 bar	160 bar
PMP46 – * * * * * N	Depends on the weakest link in terms of pressure of the selected components: over pressure limit (OPL) of sensor <sup>1</sup> or process connection (1.5 x PN)
PMP48 – * * * * * N *	Depends on the weakest link in terms of pressure of the selected components: over pressure limit (OPL) of sensor <sup>1</sup> , process connection (1.5 x PN) or Halocarbon 6.3 fill fluid (160 bar)

1) → See Page 60 ff "Ordering information", feature 30 "Sensor range; MWP; OPL".

**Ultrapure gas applications**

Endress+Hauser also offers degreased devices for special applications, such as ultrapure gas. No special restrictions regarding the process conditions apply to these devices.

- See also Page 61, PMC41: feature 80 "Sensor seal".
- See also Page 66, PMP41: feature 80 "Seal; Fill fluid".

## Operating conditions (environment)

**Ambient temperature range**

- –40 to +85°C (–40 to +185°F)
- Onsite display 4 to 20 mA: –30 to +80°C (–22 to +176°F)
- Onsite display 4 to 20 mA HART, PROFIBUS PA: –25 to +70°C (–13 to +158°F)  
Lower temperatures minimize the display speed.

For devices for use in hazardous areas, see Safety Instruction, Installation or Control Drawing. (→ See also Page 75, "Safety Instructions" and "Installation/Control Drawing" sections)

**Storage temperature range**

- –40 to +100°C (–40 to +212°F)
- Onsite display: –40 to +80°C (–40 to +176°F)

**Degree of protection**

- → See Page 60 ff, feature 20 "Housing; Electrical connection".
- Degree of protection IP 68 for housing versions "K1" and "K2": 1 mH<sub>2</sub>O for 1 h

**Climate class**

Class 4K4H (air temperature: –20 to 55°C (–4 to 131°F), relative humidity: 4 to 100%) fulfilled as per DIN EN 60721-3-4 (condensation possible)

- Electromagnetic compatibility**
- Interference emission as per EN 61326 electrical device B, Interference immunity as per EN 61326 appendix A (industrial use) and NAMUR EMC recommendation (NE 21).
  - Maximum deviation: < 0.5% of span
  - Maximum deviation for 100 mbar sensors: < 1.25% of span
  - In the event of surge influence (EN 61000-4-5), deviations greater than the specified measured error can occur briefly.
  - All measurements were performed with a turn down (TD) = 1:1.

## Operating conditions (process)

### Process temperature limits

Note!

- For oxygen applications, see Page 23, "Oxygen applications" section.
- PMC41 and PMC45: extreme jumps in temperature can result in temporary measuring errors. Temperature compensation takes effect after several minutes. Internal temperature compensation is faster the smaller the temperature jump and the longer the time interval.

#### PMC41 (with ceramic measuring diaphragm)

- -40 to +100°C (-40 to +212°F)
- Observe temperature operating range of the seal. → See also the following section "Temperature operating range, seals".

#### PMC45 (with ceramic measuring diaphragm)

- -40 to +125°C (-40 to +257°F) (+150°C (+302°F) for max. 1 hour)
- Observe temperature operating range of the seal. → See also the following section "Temperature operating range, seals".

#### PMP41 (with metallic measuring diaphragm)

- -40 to +100°C (-40 to +212°F)
- Observe temperature operating range of the seal. → See also the following section "Temperature operating range, seals".

#### PMP45 (with metallic measuring diaphragm)

- -40 to +125°C (-40 to +257°F) (+150°C (+302°F) for max. 1 hour)

#### PMP46 and PMP48 (with metallic measuring diaphragm)

- Depends on diaphragm seal and filling oil up to 350°C (662°F)  
Observe the temperature application limits of the diaphragm seal oil. → See also Page 53, "Diaphragm seal filling oils" section.
- PMP48 with PTFE foil: -50 to +205°C (-58 to 401°F)

### Temperature operating range, seals

#### PMC41 (with ceramic measuring diaphragm)

Version for feature 80 in the order code	Seal	Temperature operating range
1	FKM Viton	-20 to +100°C (+4 to +212°F)
2	NBR	-20 to +80°C (+4 to +176°F)
4	EPDM	-20 to +100°C (+4 to +212°F)
C	Chemraz, Compound 505	-10 to +100°C (+14 to 212°F)
7	Kalrez, Compound 4079	+5 to +100°C (+41 to +212°F)
A	FKM Viton, oil + grease free	-10 to +100°C (+14 to +212°F)
6	FKM Viton, cleaned for oxygen service	-10 to +60°C (+14 to 140°F)
9	Silicone to be ordered as special version	-40 to +100°C (-40 to +212°F)



**PMC45 (with ceramic measuring diaphragm)**

Version for feature 80 in the order code	Seal	Temperature operating range
1	FKM Viton	-20 to +125°C (-4 to +257°F)
2 <sup>1</sup>	HNBR (FDA 21CFR177.2600); 3A Class II; KTW; AFNOR; BAM; USP Class VI	-20 to +125°C (-4 to +257°F)
2	NBR	-20 to +80°C (-4 to +176°F)
4 <sup>1</sup>	EPDM (FDA 21CFR177.2600); 3A Class I; USP Class VI	-20 to +125°C (-4 to +257°F)
4	EPDM	-20 to +125°C (-4 to +257°F)
C	Chemraz, Compound 505	-10 to +125°C (+14 to +257°F)
7	Kalrez, Compound 4079	+5 to +125°C (+41 to 257°F)
A	FKM Viton, oil + grease free	-10 to +125°C (+14 to 257°F)
9	Silicone to be ordered as special version	-40 to +125°C (-40 to 257°F)

- 1) These seals are used for devices with 3A-approved process connections. → See also Page 63 "Ordering information", feature 70 "Process connections".

**PMP41 (with metallic measuring diaphragm)**

Version in the order code	Seal	Temperature operating range
1	FKM Viton	-20 to +100°C (-4 to +212°F)
4	FKM Viton, oil + grease free	-20 to +100°C (-4 to +212°F)
H	FKM Viton	-20 to +100°C (-4 to +212°F)
P	PTFE + Alloy C	-40 to +100°C (-40 to +212°F)
F	NBR	-20 to +80°C (-4 to +176°F)

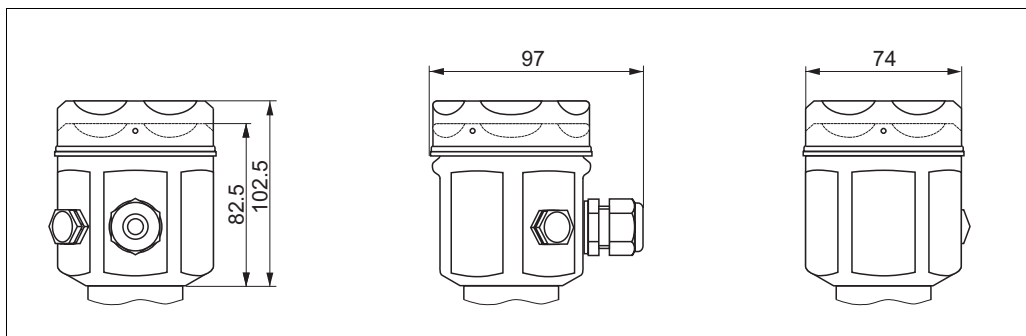
**Pressure specifications**

- The MWP (maximum working pressure) of the device is specified on the nameplate. It depends on the lowest-rated element, with regard to pressure, of the selected components. See the following sections:
  - → Page 60 ff, "Ordering information" section, feature 30 "Sensor range; MWP; OPL"
  - → Page 26 ff, "Mechanical construction" section.
 The MWP information on the nameplate refers to a reference temperature of 20°C (68°F), or to 100 °F for ANSI flanges. Observe the pressure-temperature dependencies.
- The pressure values permitted at higher temperatures can be found in the following standards:
  - EN 1092-1: 2001 Tab. 18<sup>1</sup>
  - ASME B 16.5a – 1998 Tab. 2-2.2 F316
  - ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  - JIS B 2220.
- The test pressure corresponds to the over pressure limit (OPL) of the device = MWP x 1.5<sup>2</sup>.
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- In the case of sensor range and process connection combinations where the OPL of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value (1.5 x PN; PN = MWP).
- In oxygen applications, the values for "p<sub>max</sub> and T<sub>max</sub> for oxygen applications" as per Page 23, "Oxygen applications" may not be exceeded.

- 1) With regard to its stability-temperature property, the material 1.4435 is identical to 1.4404 which is grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.
- 2) The equation does not apply for PMP41, PMP45 and PMP48 with a 100 bar measuring cell.

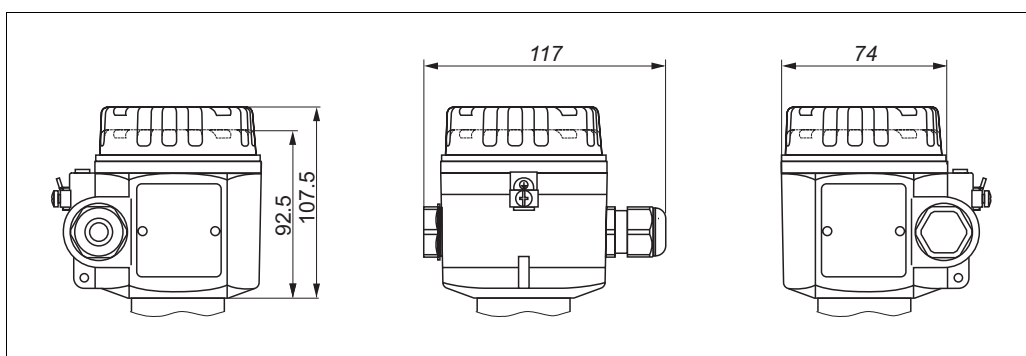
## Mechanical construction

### Dimensions of stainless steel housing



P01-PMx4xxxx-06-xx-xx-xx-000

### Dimensions of aluminum housing



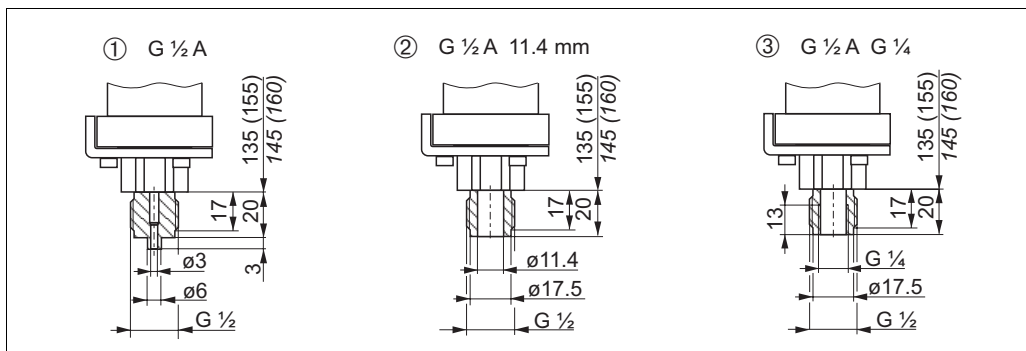
P01-PMx4xxxx-06-xx-xx-xx-001

### Process connections PMC41 (with ceramic measuring diaphragm)

Note!

- The installation heights in brackets apply to housings with a high cover (for optional display). Installation heights written in italics apply to devices with an aluminum housing.

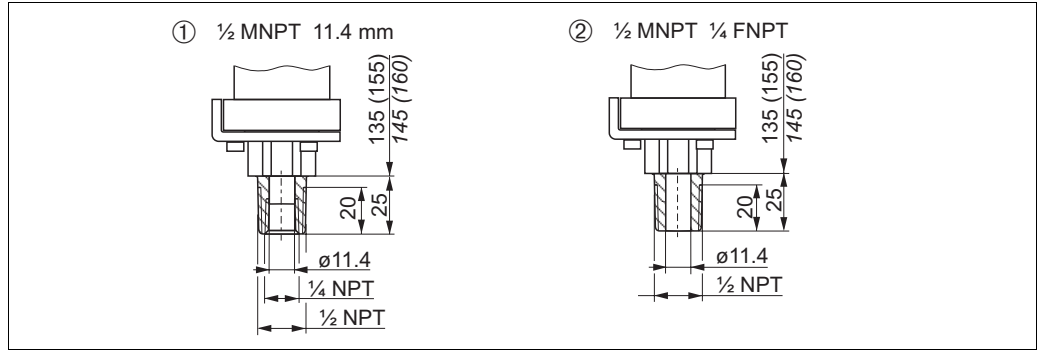
### Thread, inner diaphragm



P01-PMC41xxx-06-09-xx-xx-000

Process connections PMC41, thread ISO 228

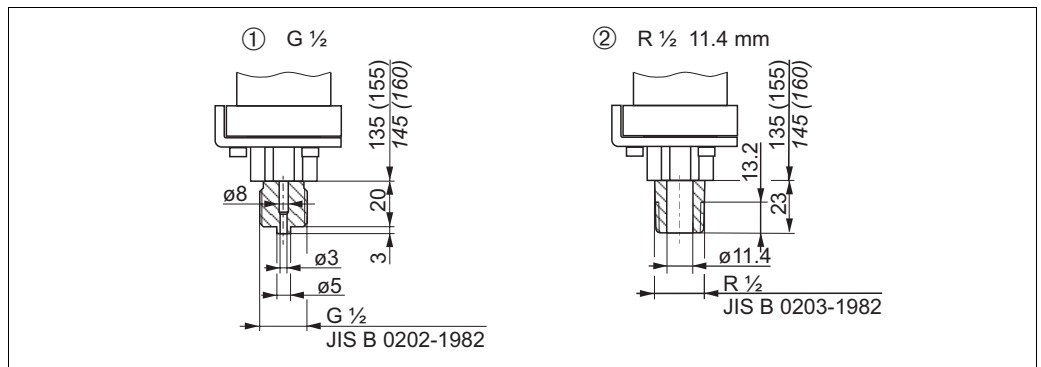
- 1 Thread ISO 228 G 1/2 A, version 1M: AISI 316L/1.4435, version 2M: Alloy C276 (2.4819)
- 2 Thread ISO 228 G 1/2 A bore 11.4 mm, version 1R: AISI 316L/1.4435
- 3 Thread ISO 228 G 1/2 A G 1/4 (female), version 1P: AISI 316L/1.4435



P01-PMC41.xxx-06-09-xx-xx-001

Process connections PMC41, thread ANSI

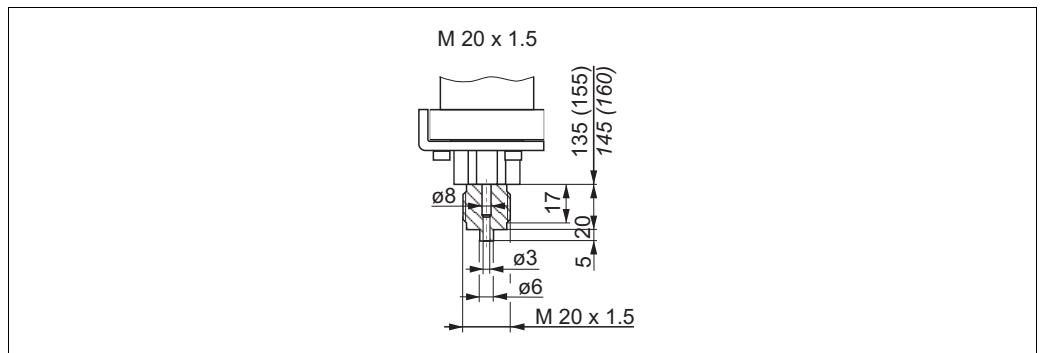
- 1 Thread ANSI 1/2 MNPT bore 11.4 mm, version 1A: AISI 316L/1.4435
- 2 Thread ANSI 1/2 MNPT 1/4 FNPT, version 1N: AISI 316L/1.4435, version 2N: Alloy C276 (2.4819)



P01-PMC41.xxx-06-09-xx-xx-002

Process connections PMC41, thread JIS

- 1 Version 1S: thread JIS B0202 G 1/2 (male), material: AISI 316L/1.4435
- 2 Version 1K: thread JIS B0203 R 1/2 (male) bore 11.4 mm, material: AISI 316L/1.4435



P01-PMC41.xxx-06-09-xx-xx-003

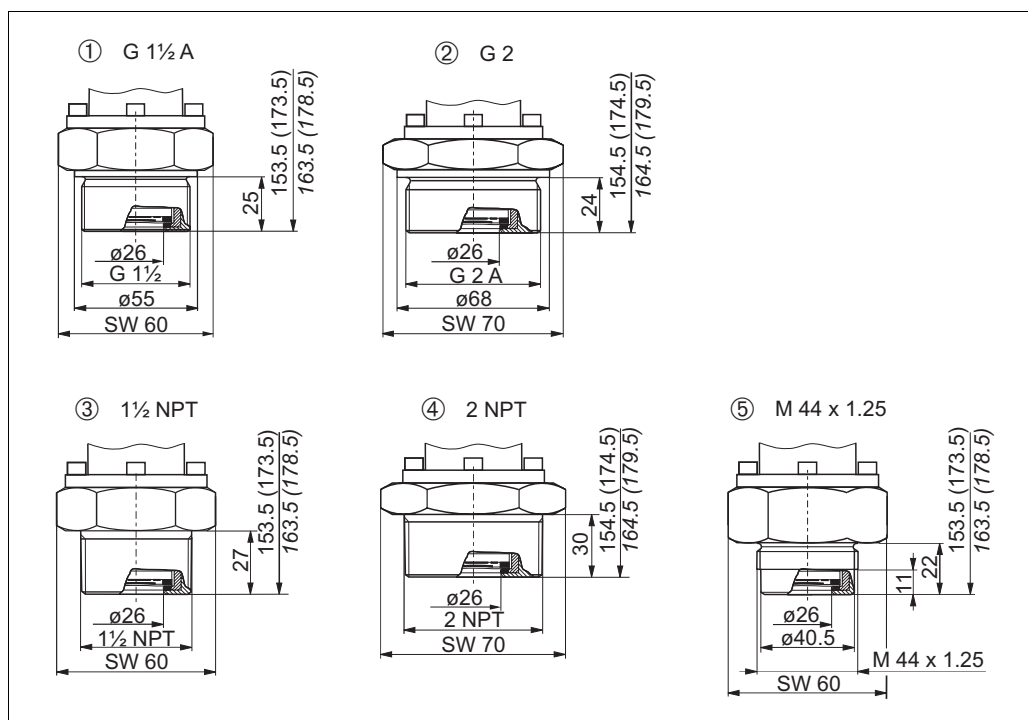
Process connection PMC41, version 1T: thread DIN 13 M20 x 1.5 bore 3 mm, material AISI 316L /1.4435

**Process connections PMC45  
(with ceramic measuring  
diaphragm)**

Note!

- The installation heights in brackets apply to housings with a high cover (for optional display). Installation heights written in italics apply to devices with an aluminum housing.
- Devices with an aluminum housing, high cover, threaded connection or hygienic connection weigh approx. 2.1 kg. The weights for devices with an aluminum housing, high cover and flange are indicated in the tables as of Page 32 ff. Devices with a stainless steel housing weigh approx. 300 g less.
- Many process connections with an EPDM or HNBR seal are 3A-approved for PMC45. This means that a 3A-approved process connection with an EPDM or HNBR seal must be selected when ordering for the 3A approval for the PMC45 version to be valid. → For ordering information on EPDM or HNBR seals, see Page 64 "Ordering information PMC45", feature 80 "Sensor seal", version 2 or 4.

**Thread, flush-mounted diaphragm**

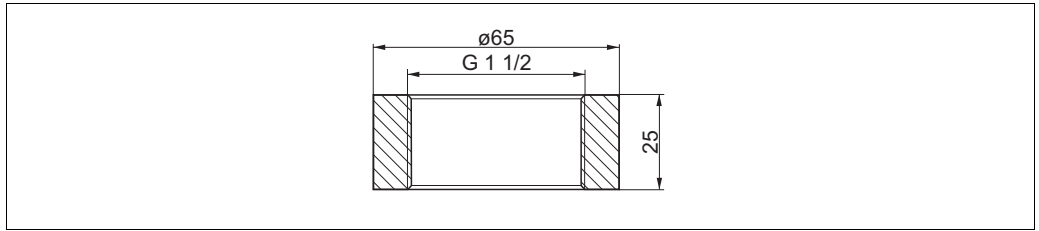


P01-PMC45xxx-06-09-xx-xx-000

Process connections PMC45, threaded connection, material AISI 316L/1.4435

- 1 Version AG: thread ISO 228 G1 1/2 A  
Endress+Hauser also offers welding necks for this process connection. See the following section.
- 2 Version AR: thread ISO 228 G 2 A
- 3 Version BF: thread ANSI 1 1/2 MNPT
- 4 Version BR: thread ANSI 2 MNPT
- 5 Version XK: thread DIN 13 M 44x1.25

**Welding neck G 1 1/2**



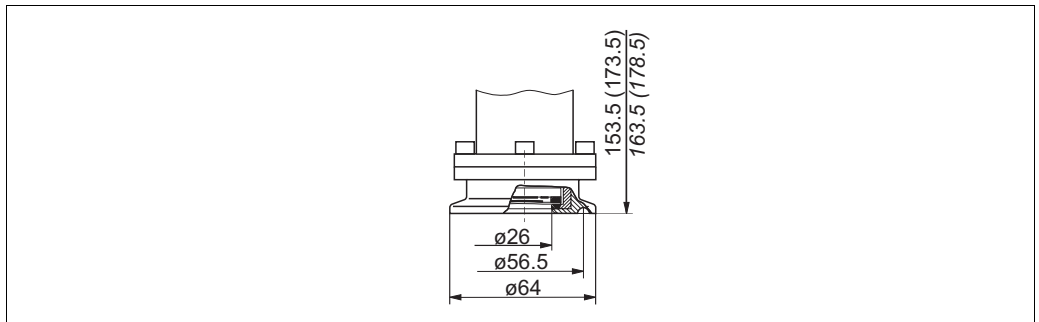
P01-PMx4xxxx-06-09-xx-xx-000

Welding neck for process connection thread ISO 228 G 1 1/2 A (version AG)  
 order no.: 52024469, order no. with 3.1 inspection certificate: 52024470

**Note!**

Endress+Hauser offers a pressure sensor dummy for the welding necks with order numbers 52024469 and 52024470. Order number for pressure sensor dummy: 52024471

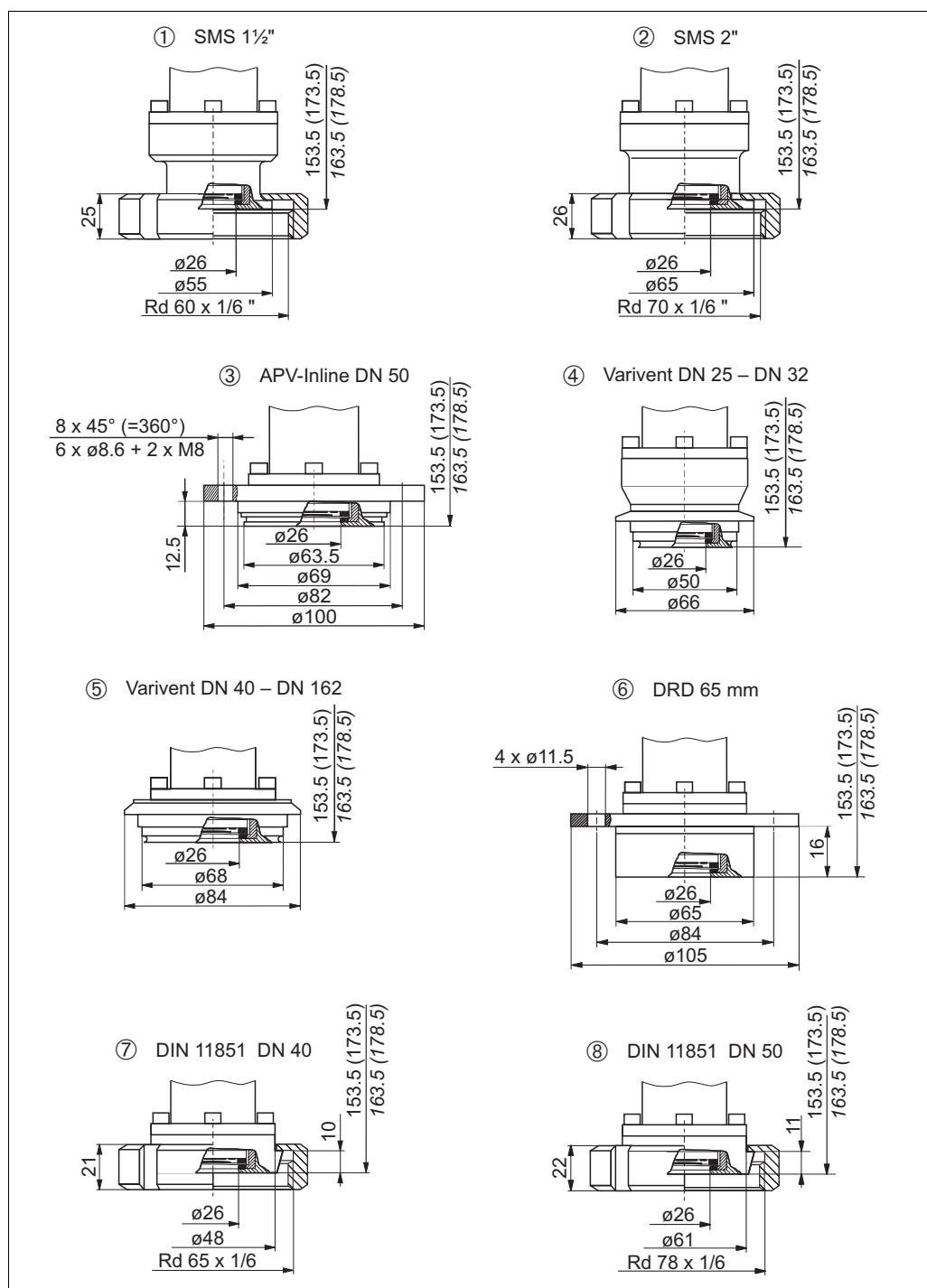
**Tri-Clamp, flush-mounted diaphragm**



P01-PMC45xxxx-06-09-xx-xx-001

Process connection PMC45, version DL: Tri-Clamp, ISO 2852 DN 51 (2")/DIN 32676 DN 50, material AISI 316L/1.4435, 3A with HNBR or EPDM seal

## Hygienic connections, flush-mounted diaphragm

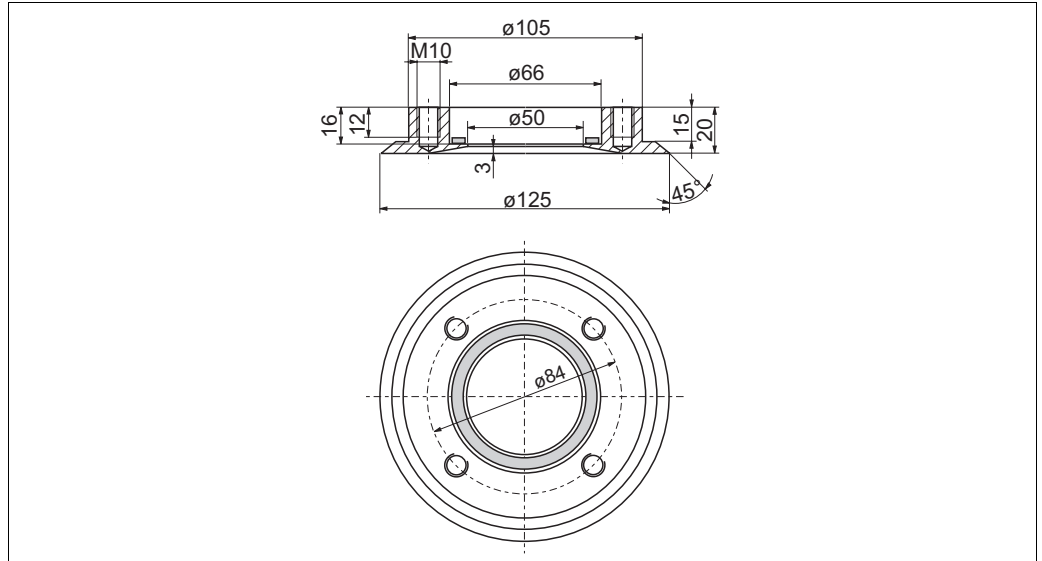


P01-PMC45xxx-06-09-xx-xx-004

Process connections PMC45, hygienic connections, material AISI 316L/1.4435

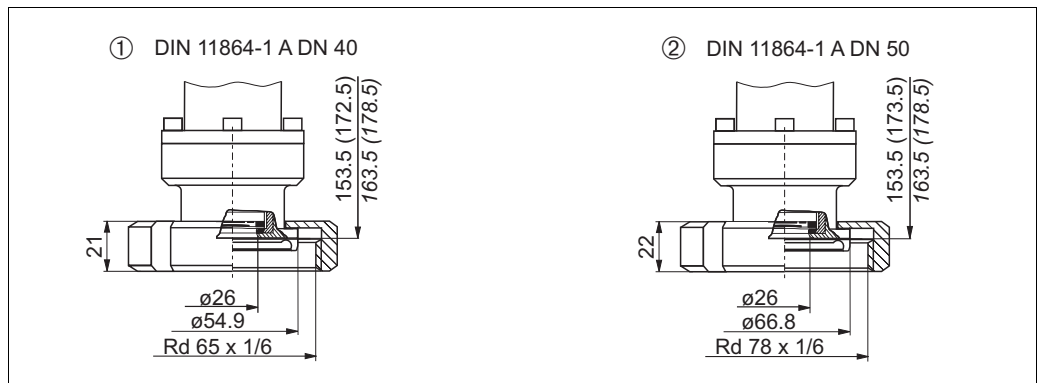
surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

- 1 Version EG: SMS 1 1/2" PN 25, 3A with HNBR or EPDM seal
- 2 Version EL: SMS 2" PN 25, 3A with HNBR or EPDM seal
- 3 Version HL: APV-Inline DN 50 PN 40, 3A with HNBR or EPDM seal
- 4 Version LB: Varivent type F for pipes DN 25 – DN 32 PN 40, EHEDG, 3A with HNBR or EPDM seal
- 5 Version LL: Varivent type N for pipes DN 40 – DN 162 PN 40, EHEDG, 3A with HNBR or EPDM seal
- 6 Version KL: DRD 65 mm PN25, 3A with HNBR or EPDM seal; Endress+Hauser offers a welding flange with PTFE seals for flush-mounted installation of a device with a DRD flange. See the following page.
- 7 Version AH: DIN 11851 DN 40 PN 40, 3A with HNBR or EPDM seal
- 8 Version AL: DIN 11851 DN 50 PN 25, 3A with HNBR or EPDM seal



Welding flange for flush-mounted installation for devices with a DRD flange.  
 Order number: 52002041, material: AISI 316L/1.4435;  
 Order number with 3.1: 52011899, material: AISI 316L/1.4435;  
 Only PTFE sealing ring: order number: 916783-0000;

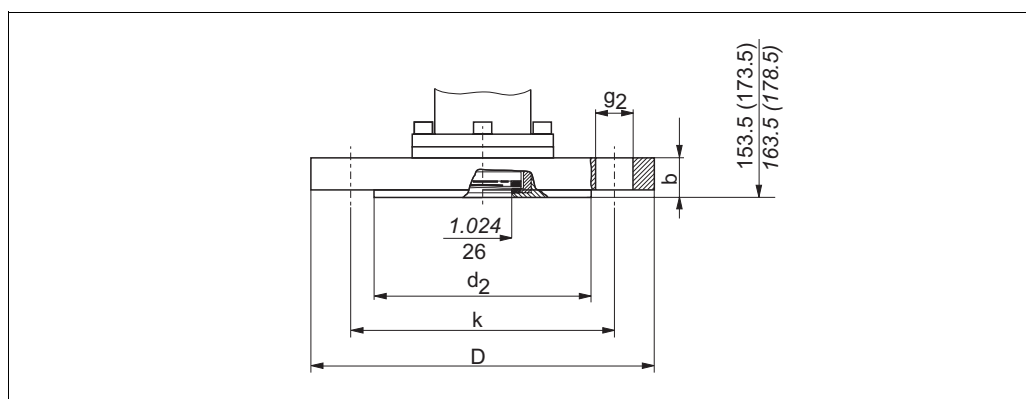
**Aseptic couplings**



Process connections PMC45, Aseptic couplings, material AISI 316L/1.4435  
 Surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

- 1 Version AS: aseptic DIN 11864-1 form A DN 40 for pipes to DIN 11850, EHEDG, 3A with HNBR or EPDM seal
- 2 Version AT: aseptic DIN 11864-1 form A DN 50 for pipes to DIN 11850, EHEDG, 3A with HNBR or EPDM seal

## EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527



P01-PMC45xxx-06-09-xx-xx-007

Process connection PMC45, EN/DIN flange

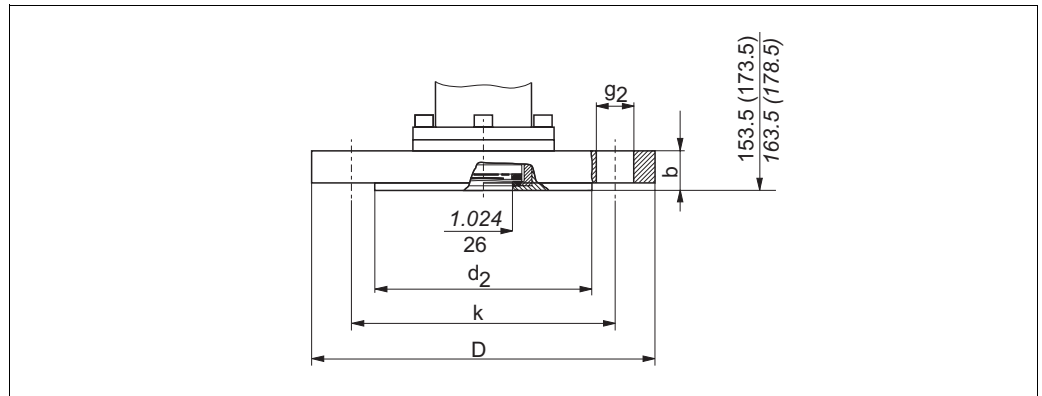
Version	Flange							Boltholes			
	Material	Nominal diameter	Nominal pressure	Shape <sup>1</sup>	Diameter D [mm]	Raised face	Thickness b [mm]	Quantity	Diameter g <sub>2</sub> [mm]	Hole circle k [mm]	Max. total weight [kg]
EK	AISI 316L	DN 50	PN 10-40	B1 (D)	165	102	20	4	18	125	3.3
WK	AISI 316L <sup>2</sup>			–		–					
EU	AISI 316L	DN 80	PN 10-40	B1 (D)	200	138	24	8	18	160	5.8
WU	AISI 316L <sup>2</sup>			–		–					

1) Designations as per DIN 2527 in brackets

2) ECTFE coating on AISI 316L. Avoid electrostatic charge at the plastic surfaces when installing in hazardous areas.



ANSI flanges, connection dimensions as per ANSI B 16.5, raised face RF



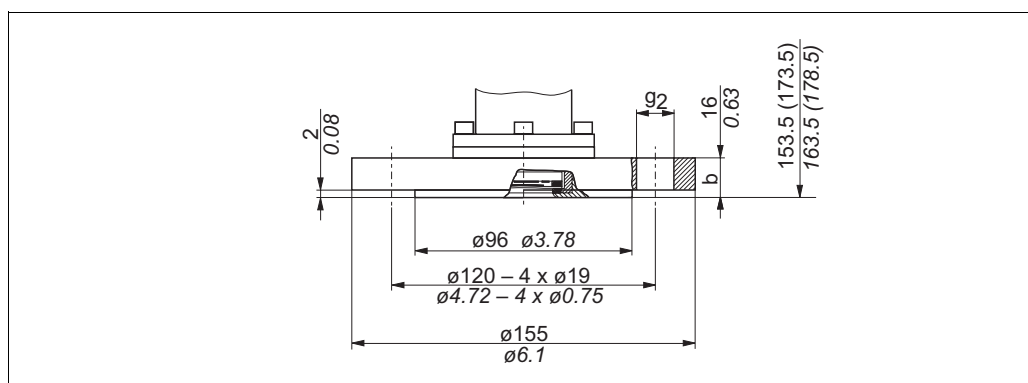
P01-PMC45xxx-06-09-xx-xx-007

Process connection PMC45, ANSI flange with raised face RF

Version	Flange						Boltholes			Max. total weight [kg]
	Material	Nominal diameter [in]	Class [lb./sq.in]	Diameter D [in] [mm]	Thickness b [in] [mm]	Raised face g [in] [mm]	Quantity	Diameter g <sub>2</sub> [in] [mm]	Hole circle k [in] [mm]	
K1	AISI 316/ 316L <sup>1</sup>	1 1/2	150	5 127	0.69 17.5	2.88 73.2	4	0.62 15.7	3.88 98.6	3.3
K2	AISI 316/ 316L <sup>1</sup>	1 1/2	300	6.12 155.4	0.81 20.6	2.88 73.2	4	0.88 22.4	4.5 114.3	3.3
KJ	AISI 316/ 316L <sup>1</sup>	2	150	6 152.4	0.75 19.1	3.62 91.9	4	0.75 19.1	4.75 120.7	3.3
KK	AISI 316/ 316L <sup>1</sup>	2	300	6.5 165.1	0.88 22.4	3.62 91.9	8	0.75 19.1	5 127	4.1
KU	AISI 316/ 316L <sup>1</sup>	3	150	7.5 190.5	0.94 23.9	5 127	4	0.75 19.1	6 152.4	5.8
KV	AISI 316/ 316L <sup>1</sup>	3	300	8.25 209.5	1.12 28.4	5 127	8	0.88 22.4	6.62 168.1	7.9
KW	AISI 316/ 316L <sup>1</sup>	4	150	9 228.6	0.94 23.9	6.19 157.2	8	0.75 19.1	7.5 190.5	7.9
KX	AISI 316/ 316L <sup>1</sup>	4	300	10 254	1.25 31.8	6.19 157.2	8	0.88 22.4	7.88 200.2	7.9
VJ	ECTFE <sup>2</sup>	2	150	6 152.4	0.75 19.1	3.62 91.9	4	0.75 19.1	4.75 120.7	3.3
VU	ECTFE <sup>2</sup>	3	150	7.5 190.5	0.94 23.9	5 127	4	0.75 19.1	6 152.4	5.5
VN	ECTFE <sup>2</sup>	4	150	9 228.6	0.94 23.9	6.19 157.2	8	0.75 19.1	7.5 190.5	7.9
ZJ	<sup>3</sup>	2	150	6 152.4	0.75 19.1	3.62 91.9	4	0.75 19.1	4.75 120.7	3.3
ZU	PVDF <sup>3</sup>	3	150	7.5 190.5	0.94 23.9	5 127	4	0.75 19.1	6 152.4	5.5

- 1) Combination of AISI 316 for required pressure resistance and AISI 316L/1.4435 for required chemical resistance (dual rated)
- 2) ECTFE coating on AISI 316L/1.4435. Avoid electrostatic charge at the plastic surfaces when installing in hazardous areas.
- 3) Max.: 15 bar (225 psi), max.: -10 to +60 °C (+14 to +140 °F)

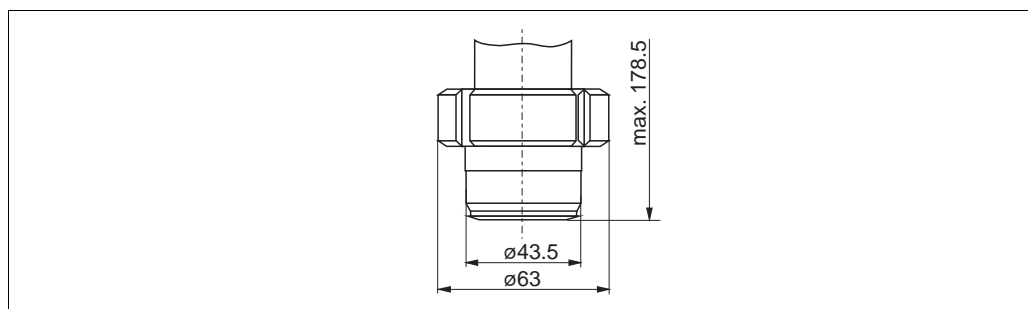
**JIS flange, connection dimensions as per JIS B 2220, raised face RF**



P01-PMC45xxx-06-09-xx-xx-008

Process connection PMC45, version RI: JIS flange 10 K 50 A, raised face RF, material AISI 316L/1.4435, max. total weight: 3.5 kg

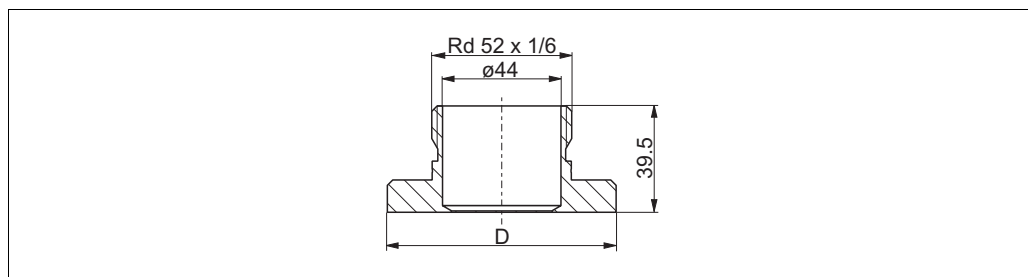
**Universal process adapter**



P01-PMC45xxx-06-09-xx-xx-009

Process connection PMC45, version HA: universal process adapter, PN 10, material AISI 316L/1.4435. A silicone molded seal is enclosed with the process connection.

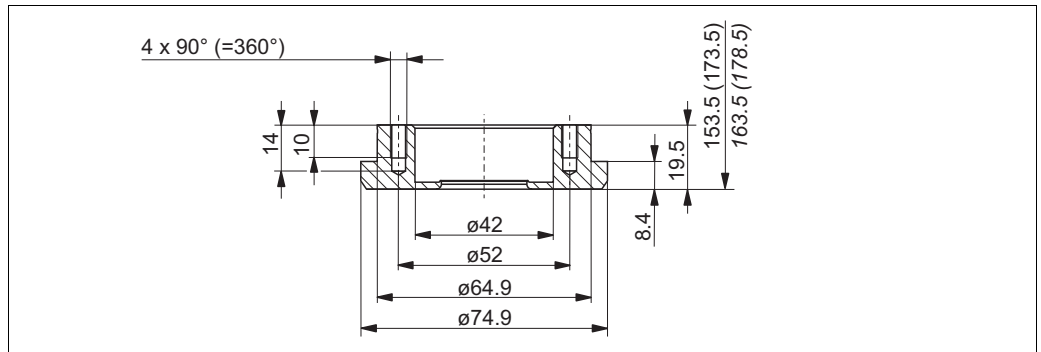
**Welding neck for universal process adapter**



P01-PMC45xxx-06-xx-xx-xx-000

Diameter D	Material	Order number
65 mm	AISI 316L	214880-0002
65 mm	AISI 316L with inspection certificate EN 10204 3.1 material	52010174
85 mm	AISI 316L	52006262
85 mm	AISI 316L with inspection certificate EN 10204 3.1 material	52010173

**Weld spud**



P01-PMC45xxx-06-09-xx-xx-002

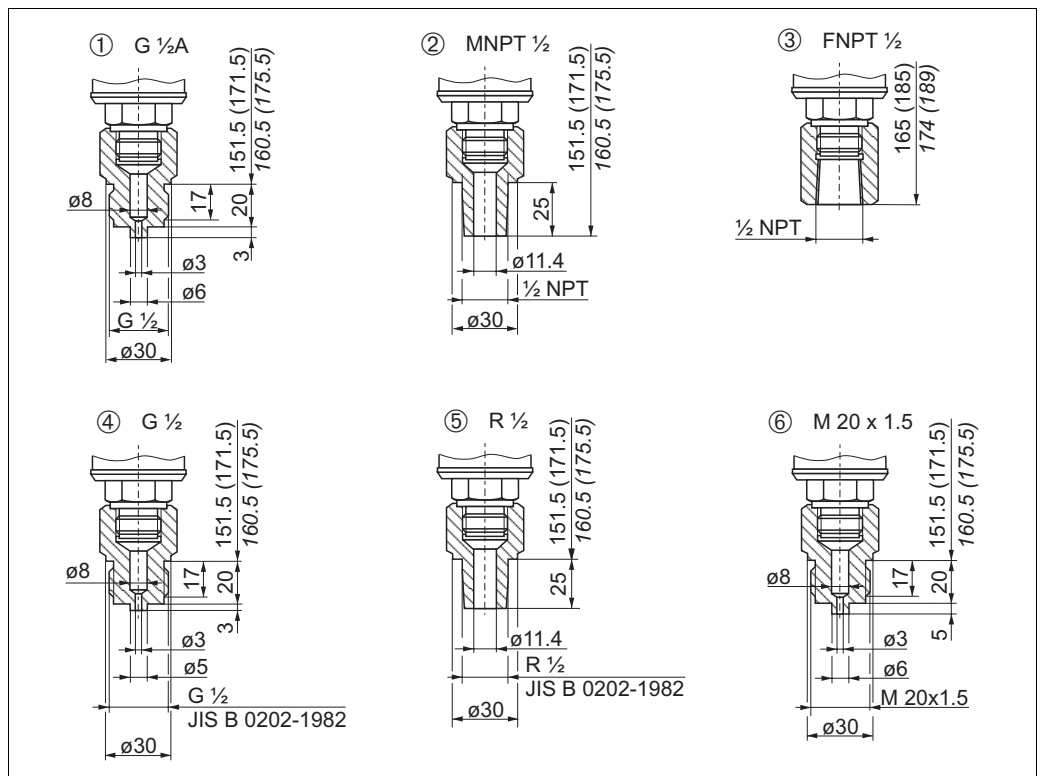
Version XU: weld spud 75 mm, material AISI 316L/1.4435

**Process connections PMP41 (with metallic measuring diaphragm)**

Note!

- The installation heights in brackets apply to housings with a high cover (for optional display). Installation heights written in italics apply to devices with an aluminum housing.

**Thread, inner diaphragm**



P01-PMP41xxx-06-09-xx-xx-000

Process connections PMP41, material: AISI 316L/1.4435

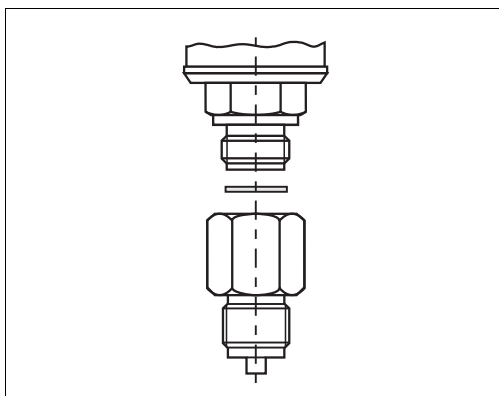
- 1 Version 1M: thread ISO 228 G 1/2 A
- 2 Version 1G: thread ANSI MNPT 1/2 bore 11.4 mm
- 3 Version 1X: thread ANSI FNPT 1/2
- 4 Version 1S: thread JIS B0202 G 1/2 (male)
- 5 Version 1K: thread JIS B0203 R 1/2 (male) bore 11.4 mm
- 6 Version 1T: thread DIN 13 M 20x1.5

Note!

The 1M, 1G, 1X, 1S, 1K and 1T versions listed above are available as threaded or welded versions. Using feature 80 "Seal; Fill fluid" in the order code, select the version in conjunction with the seal and the filling oil. → See the following page also.

**Threaded versions**

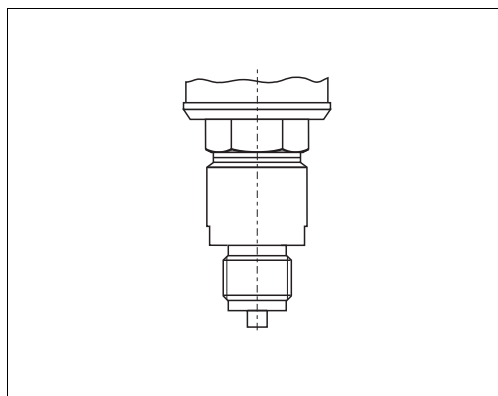
Can be selected in conjunction with versions 1, H, P for feature 80 "Seal; Fill fluid" in the order code (→ see Page 64)



P01-PMP41xxx-06-09-xx-xx-004

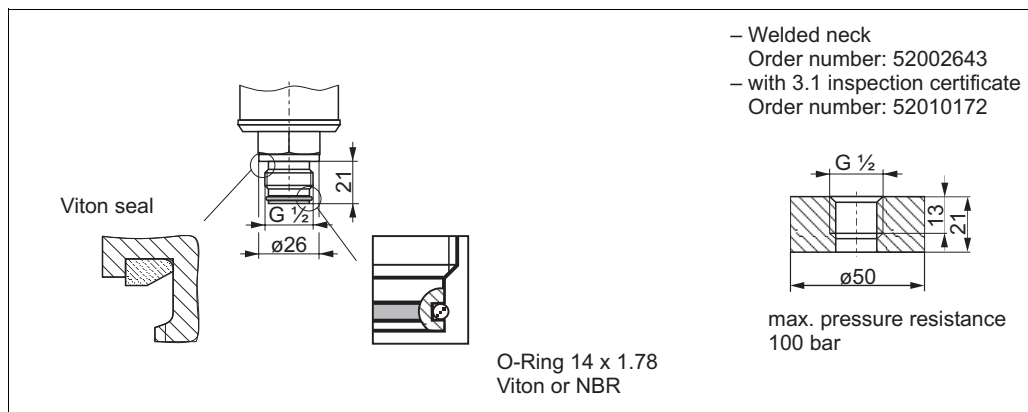
**Welded versions**

Can be selected in conjunction with versions A, C, D for feature 80 "Seal; Fill fluid" in the order code (→ see Page 64)



P01-PMP41xxx-06-09-xx-xx-005

**Threaded connection, flush-mounted diaphragm**



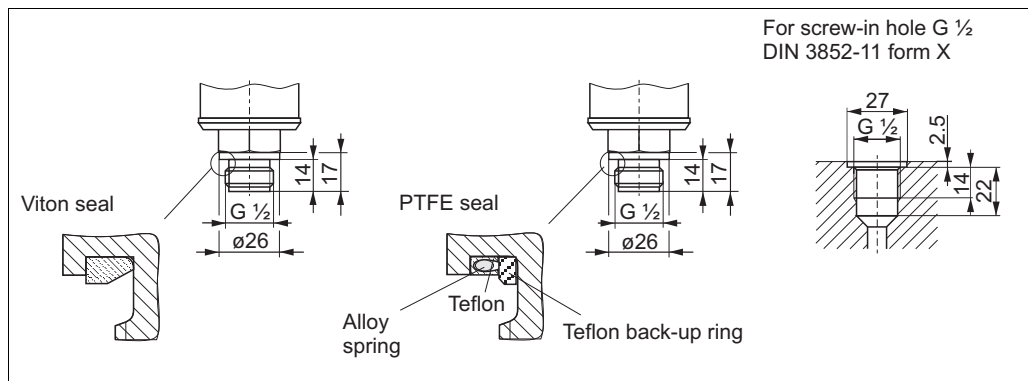
P01-PMP41xxx-06-09-xx-xx-001

Process connection PMP41, version 1D: thread ISO 228 G 1/2 with O-ring for welding neck, material AISI 316L/1.4435

This process connection can be selected with versions 1, 4 or P for feature 80 "Seal; Fill fluid" (→ see Page 64).

**Note!**

Endress+Hauser offers a pressure sensor dummy for the welding necks with order numbers 52002643 and 52010172. Order number for pressure sensor dummy: 52005082



P01-PMP41xxx-06-09-xx-xx-005

Process connection PMP41, version 1F: thread G 1/2 A; screw-in adapter to DIN 3852-11 form E with seal, material AISI 316L/1.4435

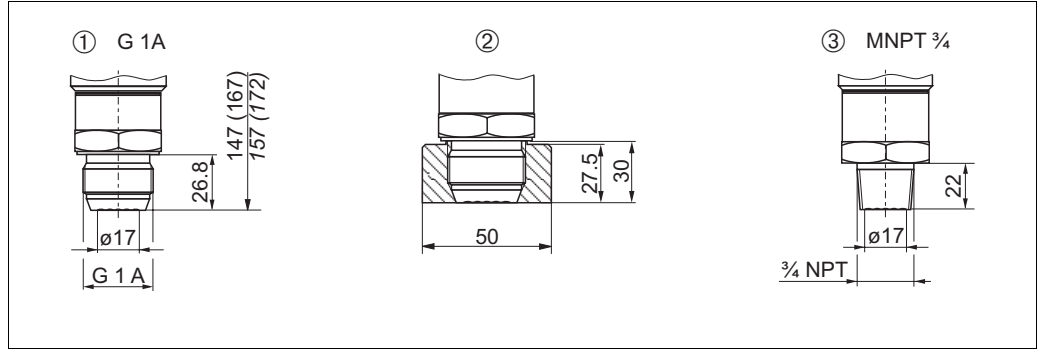
This process connection can be selected with versions F or H for feature 80 "Seal; Fill fluid" (→ see Page 64).

**Process connections PMP45  
(with metallic measuring  
diaphragm)**

Note!

- The installation heights in brackets apply to housings with a high cover (for optional display). Installation heights written in italics apply to devices with an aluminum housing.

**Threaded connection, flush-mounted diaphragm**



P01-PMP45xxx-06-09-xx-xx-000

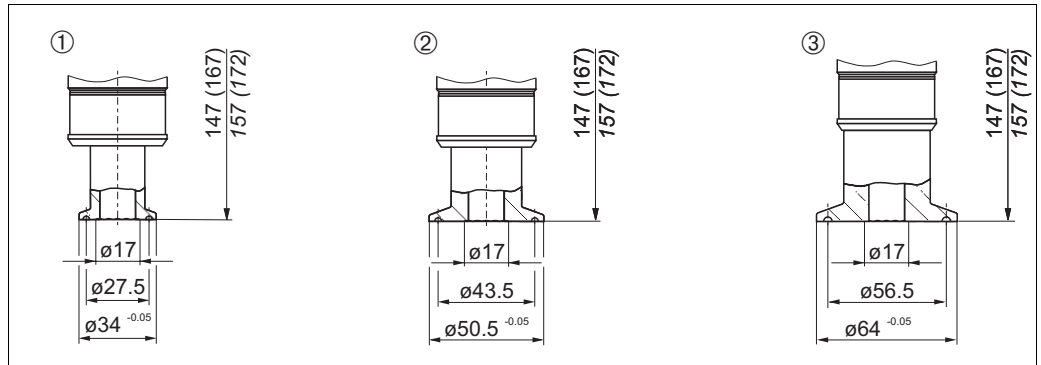
Process connections PMP45, flush-mounted threaded connection, material: AISI 316L/1.4435

- 1 Version CD: thread ISO 228 G 1 A, seal metal taper AISI 316L/1.4435 for welding neck see 2.
- 2 Welding neck for process connection thread ISO 228 G 1 A (version CD) order number: 52005087; order number with 3.1 inspection certificate: 52010171 max. pressure resistance: 100 bar
- 3 Version BB: thread ANSI 3/4 MNPT

Note!

Endress+Hauser offers a pressure sensor dummy for the welding necks with order numbers 52005087 and 52010171. Order number for pressure sensor dummy: 52005272

**Clamp connections**



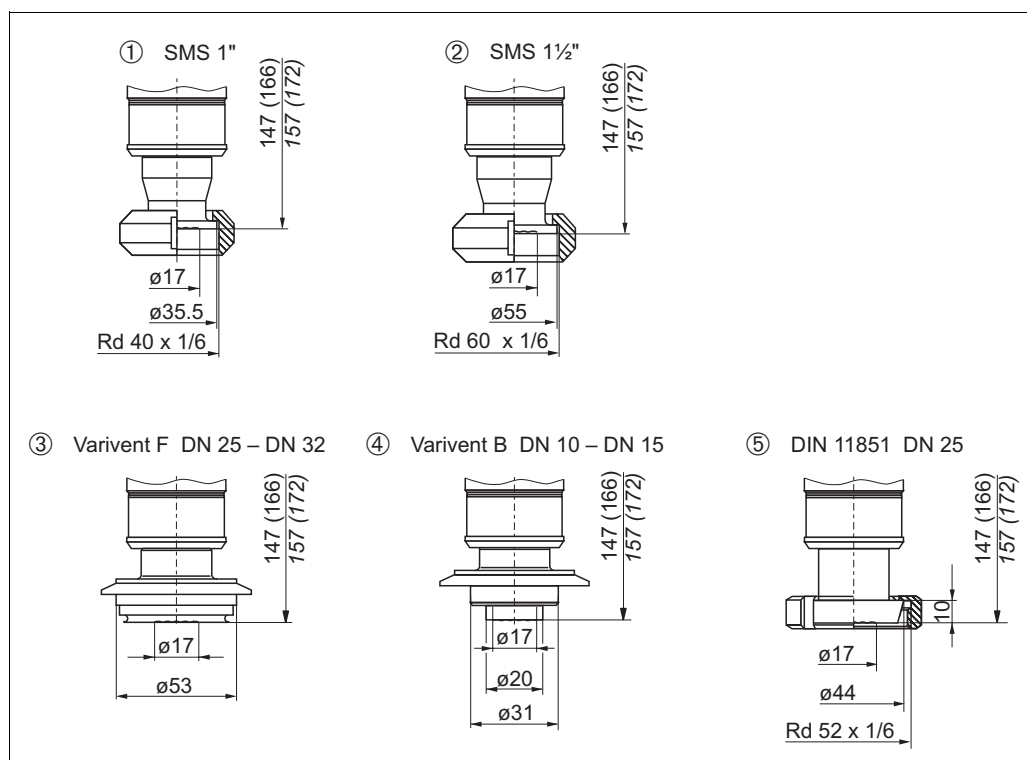
P01-PMP45xxx-06-09-xx-xx-001

Process connections PMP45, clamp connections, material AISI 316L/1.4435

Surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

- 1 Version DA: Clamp ISO 2852 DN 22 ( 3/4"), 3A, DIN 32676 DN 20
- 2 Version DB: Tri-Clamp ISO 2852 DN 25 – DN 38 (1" – 1 1/2"), 3A, DIN 32676 DN 25 – DN 40
- 3 Version DL: Tri-Clamp ISO 2852 DN 40 – DN 51 (2"), 3A, DIN 32676 DN 50

## Hygienic connections



P01-PMP45xxx-06-09-xx-xx-002

Process connections PMP45, hygienic connections, material AISI 316L/1.4435

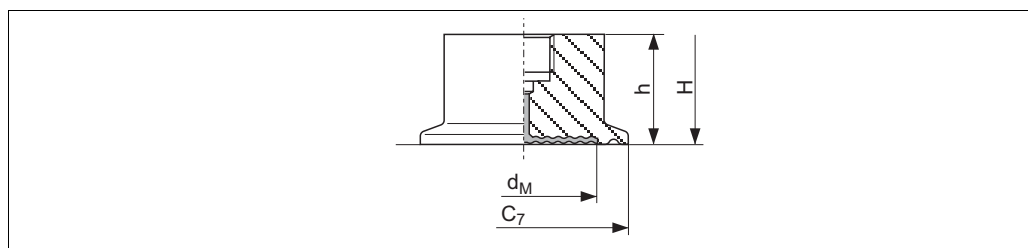
- 1 Version EB: SMS 1" PN 25, 3A
- 2 Version EG: SMS 1 1/2" PN 25, 3A
- 3 Version LB: Varivent type F for pipes DN 25 – DN 32 PN 40, 3A
- 4 Version LG: Varivent type B for pipes DN 10 – DN 15 PN 40, 3A
- 5 Version AB: DIN 11851 DN 25 PN 40, 3A

**Process connections PMP46 (with metallic measuring diaphragm)**

Note!

- The following tables contain information on the temperature coefficients "T<sub>K</sub> Process" and "T<sub>K</sub> Ambient". The values given are typical values. These temperature coefficients apply to silicone oil and the membrane material AISI 316L/1.4435. For other filling oils, these temperature coefficients must be multiplied by the T<sub>K</sub> correction factor of the corresponding filling oil. For the T<sub>K</sub> correction factors, see Page 53, "Diaphragm seal filling oils" section.
- With regard to the temperature coefficient "T<sub>K</sub> Ambient", devices with temperature isolator behave like devices with the same process connection with 1 m capillary.
- In addition, the temperature coefficient "T<sub>K</sub> Ambient" is listed in relation to the capillary length for the diaphragm seal versions which can be supplied with capillaries as standard. This information can be found on Page 53 ff, "Influence of the temperature on the zero point" section.
- The tables and drawings always give the maximum installation height for the device version, i.e. this installation height applies to a device with an aluminum housing and a high cover and without any capillaries. The installation heights for devices with a stainless steel housing and a high cover are approx. 5 mm less.
- The tables always give the maximum total weight for the device version, i.e. this total weight applies to a device with an aluminum housing and a high cover. Devices with a stainless steel housing weigh approx. 300 g less.
- The following drawings are schematic drawings. This means that the dimensions of a diaphragm seal supplied can deviate from the dimensions indicated in this document.

**Tri-Clamp ISO 2852**



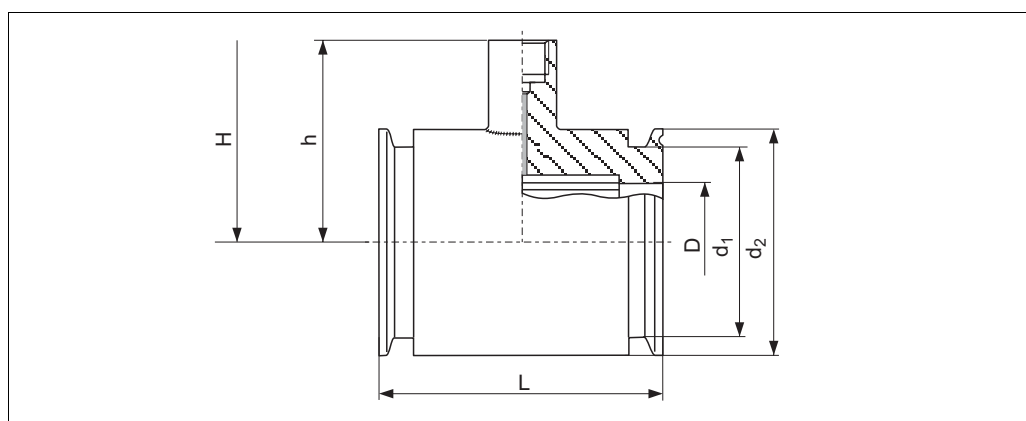
P01-PMP46xxx-06-09-xx-xx-000

Process connection PMP46, material: AISI 316L/1.4435, 3A, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

Version	Nominal diameter ISO 2852	Nominal diameter DIN 32676	Nominal diameter	Diameter	Max. diaphragm diameter	Height	T <sub>K</sub> Ambient	T <sub>K</sub> Process	Max. installation height	Max. total weight
			[in]	C <sub>7</sub> [mm]	d <sub>M</sub> [mm]	h [mm]	[mbar/10 K]		H [mm]	[kg]
DF	DN 25	DN 25	1	50.5	24	37	+15.33	+2.85	227	1.6
DG <sup>1</sup>	DN 38	DN 40	1 1/2	50.5	34	37	+8.14	+1.91	227	1.6
DL <sup>1</sup>	DN 51	DN 50	2	64	48	45	+3.45	+1.28	235	1.9
DU	DN 76.1	–	3	91	73	45	+0.3	+0.18	235	2.4

1) Diaphragm seal versions in conformity with ASME-BPE for use in biochemical processes, wetted surfaces  $R_a \leq 0.4 \mu\text{m}$  (15.75  $\mu\text{in}$ ; 180 grit), electropolished; to be ordered using feature 60 "Additional option", version "P" in the order code

## Tri-Clamp pipe diaphragm seal (RDM)



P01-PMP40xxx-06-09-xx-xx-001

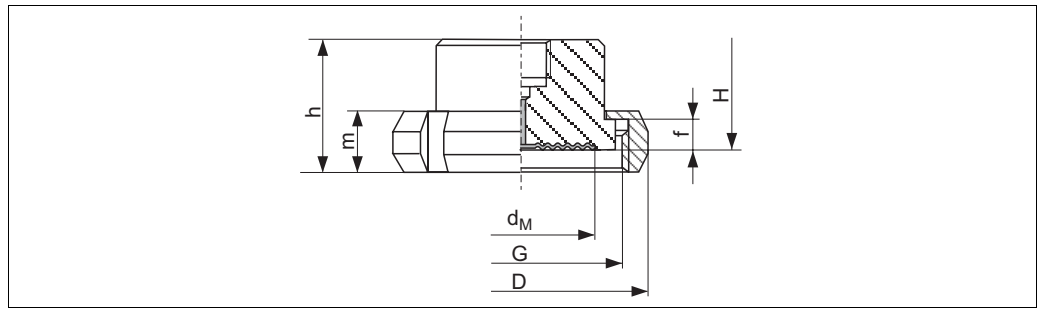
Process connection PMP46, material AISI 316L/1.4435, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

Version	Nominal diameter ISO 2852	Nominal diameter [inch]	Diameter	Diameter	Diameter	Height h [mm]	Face-to-face length L [mm]	$T_K$ Ambient	$T_K$ Process	Max. installa- tion height H [mm]	Max. total weight [kg]
			D [mm]	d <sub>1</sub> [mm]	d <sub>2</sub> [mm]						
SA <sup>1</sup>	DN 10	3/4	10.5	18	25	60	140	+5.4	+3.1	255	2.9
SB <sup>1</sup>	DN 25	1	22.5	43.5	50.5	67	126	+7.75	+4.49	262	2.9
SG <sup>1,2</sup>	DN 38	1 1/2	35.5	43.5	50.5	67	126	+5.17	+3.46	262	2.2
SL <sup>1,2</sup>	DN 51	2	48.6	56.5	64	79	100	+3.56	+2.69	274	2.9

- 1) With 3A approval
- 2) Including 3.1 and pressure test as per Pressure Equipment Directive, Category II



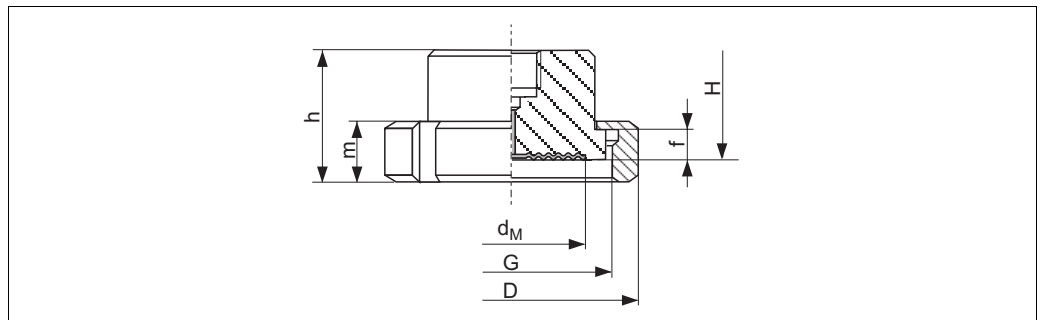
SMS nozzles with coupling nut



Process connection PMP46, material AISI 316L/1.4435, 3A, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu m$  as standard. Lower surface roughness on request.

Version	Nominal diameter	Nominal pressure	Dia- meter	Adapter height	Thread	Height	Height	Max. dia- phragm diameter	$T_K$ Ambient	$T_K$ Process	Max. installa- tion height	Max. total weight
	[inch]	[bar]	<b>D</b> [mm]	<b>f</b> [mm]	<b>G</b>	<b>m</b> [mm]	<b>h</b> [mm]	<b>d<sub>M</sub></b> [mm]	[mbar/10 K]		<b>H</b> [mm]	[kg]
EG	1 1/2	PN 25	74	4	Rd 60 – 1/6	25	57	36	+8.18	+2.59	252	1.8
EL	2	PN 25	84	4	Rd 70 – 1/6	26	62	48	+5.4	+1.76	257	2.2

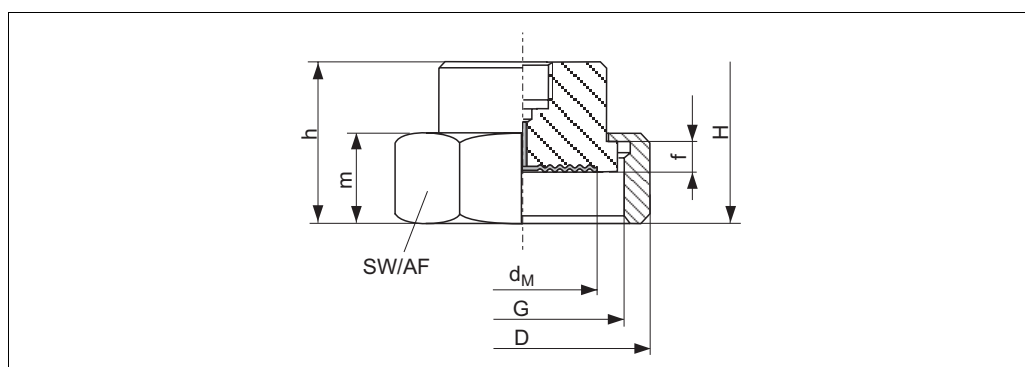
APV-RJT nozzles with coupling nut



Process connection PMP46, material AISI 316L/1.4435, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu m$  as standard. Lower surface roughness on request.

Version	Nomi- nal dia- meter	Nomi- nal press- ure	Dia- meter	Adapter height	Thread	Height	Height	Max. dia- phragm diameter	$T_K$ Ambient	$T_K$ Process	Max. installa- tion height	Max. total weight
	[inch]	<b>PN</b> [bar]	<b>D</b> [mm]	<b>f</b> [mm]	<b>G</b>	<b>m</b> [mm]	<b>h</b> [mm]	<b>d<sub>M</sub></b> [mm]	[mbar/10 K]		<b>H</b> [mm]	[kg]
FG	1 1/2	PN 40	72	6.4	2 5/16 – 1/8"	21	60	28	+8.18	+2.59	255	2.0
FL	2	PN 40	86	6.4	2 7/8 – 1/8"	22	61	38	+5.4	+1.76	256	2.2

## APV-ISS nozzles with coupling nut

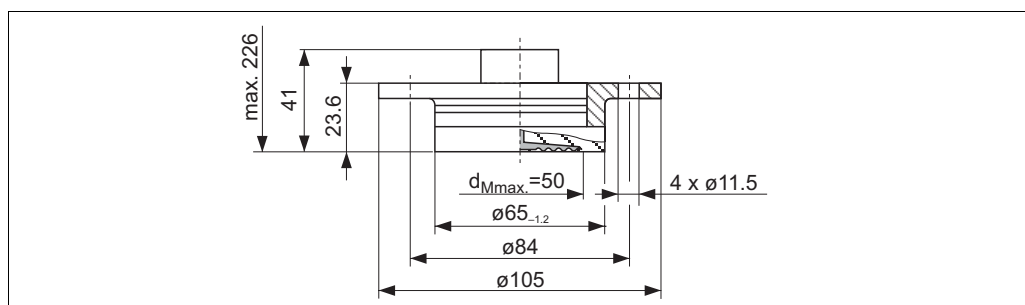


P01-PMP46xxx-06-09-xx-xx-004

Process connection PMP46, material AISI 316L/1.4435, 3A, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

Version	Nominal diameter	Nominal pressure	Diameter	Adapter height	Thread	Height	Across flats	Height	Max. diaphragm diameter	$T_K$ Ambient	$T_K$ Process	Max. installation height	Max. total weight
GG	1 1/2	PN 40	72	4	2" - 1/8"	30	62	70	34	+8.14	+2.59	265	1.9
GL	2	PN 40	89	4	2 1/2" - 1/8"	30	77	70	45	+5.4	+1.76	265	2.2

## DRD 65 mm

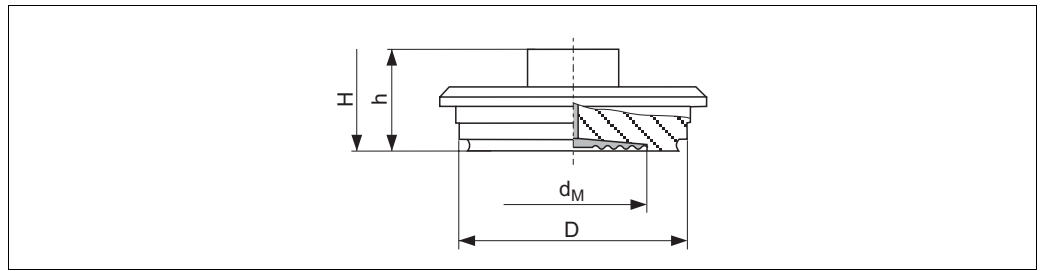


P01-PMP46xxx-06-09-xx-xx-005

Process connection PMP46, version KL: material AISI 316L/1.4435, 3A, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

Version	Nominal pressure	$T_K$ Ambient	$T_K$ Process	Max. total weight
KL	PN 25	+2.26	+0.89	2.0

**Varivent**



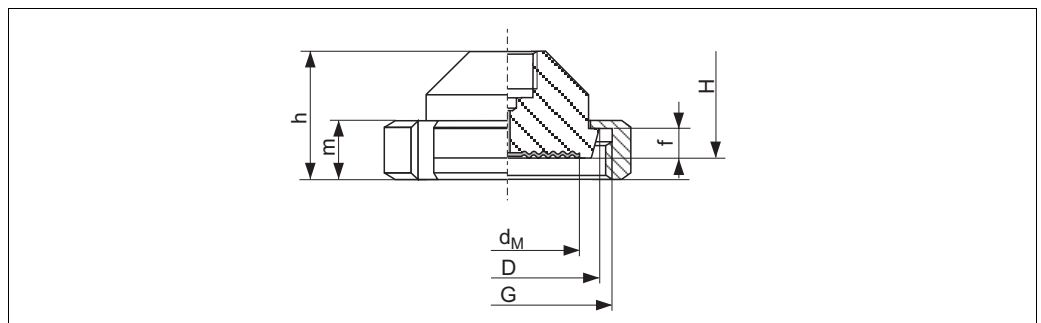
P01-PMP46xxx-06-09-xx-xx-006

Process connection PMP46, material AISI 316/1.4435, 3A, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu m$  as standard. Lower surface roughness on request.

Version	Description	Nominal pressure	Diameter	Height	Max. diaphragm diameter	$T_K$ Ambient	$T_K$ Process	Max. installation height	Max. total weight
		[bar]	D [mm]	h [mm]	$d_M$ [mm]	[mbar/10 K]		H [mm]	[kg]
LB	Type F for pipes DN 25 – DN 32	PN 40	50	55	30	+7.75	+4.49	250	1.8
LL <sup>1</sup>	Type N for pipes DN 40 – DN 162	PN 40	68	55	50	+2.26	+0.89	250	2.1

1) Diaphragm seal versions in conformity with ASME-BPE for use in biochemical processes, wetted surfaces  $R_a \leq 0.4 \mu m$  (15.75  $\mu in$ ; 240 grit), electropolished; to be ordered using feature 60 "Additional option", version "P" in the order code

**Taper adapter with coupling nut, DIN 11851 (dairy fitting)**

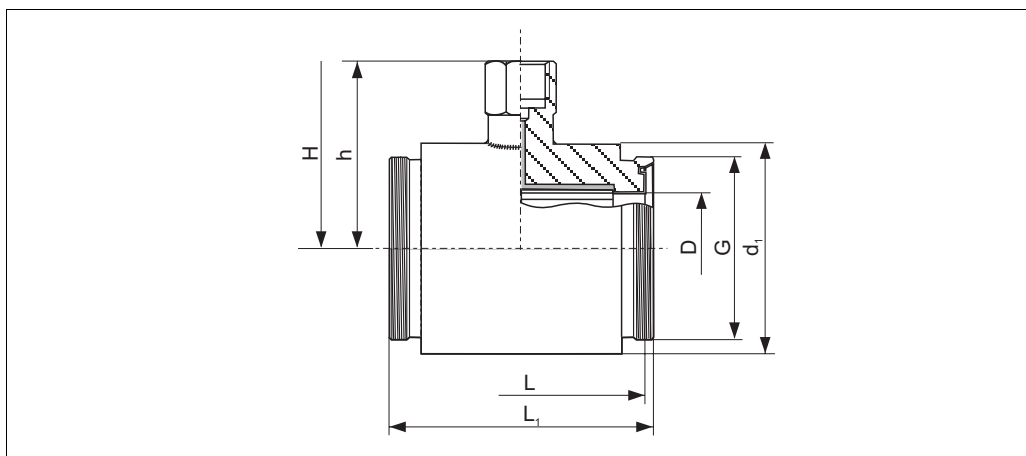


P01-PMP46xxx-06-09-xx-xx-007

Process connection PMP46, material AISI 316L/1.4435, 3A, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu m$  as standard. Lower surface roughness on request.

Version	Nominal diameter	Taper adapter			Slotted nut			Diaphragm seal				
		Nominal pressure	Diameter	Adapter height	Thread	Height	Height	Max. diaphragm diameter	$T_K$ Ambient	$T_K$ Process	Max. installation height	Max. total weight
	[mm]	[bar]	D [mm]	f [mm]	G	m [mm]	h [mm]	$d_M$ [mm]	[mbar/10 K]		H [mm]	[kg]
AG	DN 32	PN 40	50	10	Rd 58 x 1/6	21	54	32	+8.14	+2.59	249	1.9
AH	DN 40	PN 40	56	10	Rd 65 x 1/6	21	53	38	+5.4	+1.76	248	2.0
AL	DN 50	PN 25	68.5	11	Rd 78 x 1/6	22	48	46	+2.21	+0.88	243	2.3

## Pipe diaphragm seal, threaded adapter DIN11851 (dairy fitting)



P01-PMP46xxx-06-09-xx-xx-008

Process connection PMP46, material AISI 316L/1.4435, 3A, surface roughness of the surfaces in contact with the medium  $R_a \leq 0.8 \mu\text{m}$  as standard. Lower surface roughness on request.

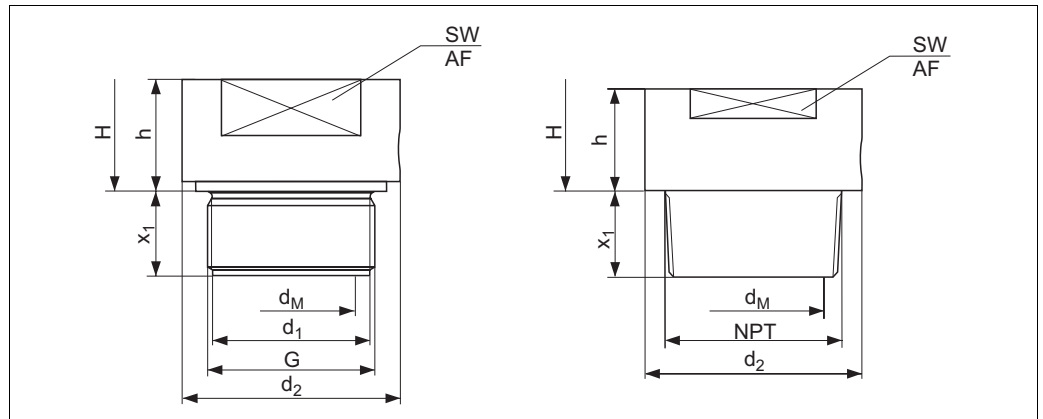
Version	Nominal diameter	Nominal pressure	Diameter	Diameter	Thread	Face-to-face length	Total length	Height	$T_K$ Ambient	$T_K$ Process	Max. installation height	Max. total weight
	[mm]	[bar]	D	$d_1$	G	L	$L_1$	h	[mbar/10 K]		H	[kg]
			[mm]	[mm]		[mm]	[mm]	[mm]			[mm]	
PB	DN 25	PN 40	26.2	58	Rd 52 x 1/6	126	140	76	+16.03	+5.17	271	3.0
PH	DN 40	PN 40	38	78	Rd 65 x 1/6	126	140	86	+5.4	+1.76	281	4.4
PL	DN 50	PN 40	50.7	88	Rd 78 x 1/6	100	114	91	+2.21	+0.88	286	3.8

**Process connections PMP48  
(with metallic measuring  
diaphragm)**

Note!

- The following tables contain information on the temperature coefficients "T<sub>K</sub> Process" and "T<sub>K</sub> Ambient". The values given are typical values. These temperature coefficients apply to silicone oil and the membrane material AISI 316L/1.4435. For other filling oils, these temperature coefficients must be multiplied by the T<sub>K</sub> correction factor of the corresponding filling oil. For the T<sub>K</sub> correction factors, see Page 53, "Diaphragm seal filling oils" section.
- The following drawings are schematic drawings. This means that the dimensions of a diaphragm seal supplied can deviate from the dimensions indicated in this document.
- The tables and drawings always give the maximum installation height for the device version, i.e. this installation height applies to a device with an aluminum housing and a high cover and without any capillaries. The installation heights for devices with a stainless steel housing and a high cover are approx. 5 mm less.
- The tables always give the maximum total weight for the device version, i.e. this total weight applies to a device with an aluminum housing and a high cover. Devices with a stainless steel housing weigh approx. 300 g less.

**Threaded connection, flush-mounted diaphragm**



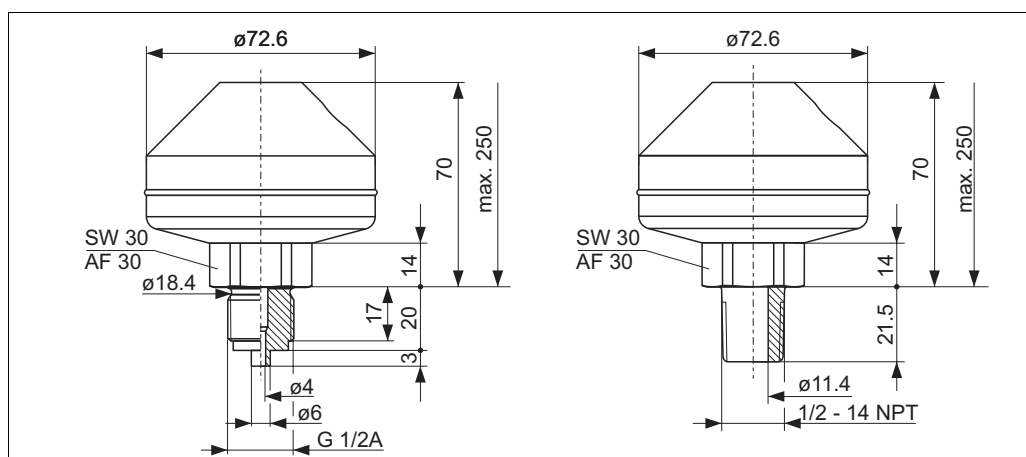
P01-PMP48xxx-06-09-xx.xx-000

Process connections PMP48, left: thread ISO 228, right: thread ANSI, material AISI 316L/1.4435

Version	Thread	Nominal pressure	Dia-meter	Dia-meter	Screw-in length	Across flats	Height	Max. diaphragm diameter	T <sub>K</sub> Ambient	T <sub>K</sub> Process	Max. installation height	Max. total weight
		PN	d <sub>1</sub> [mm]	d <sub>2</sub> [mm]	x <sub>1</sub> [mm]	SW/AF	h [mm]	d <sub>M</sub> [mm]	[mbar/10 K]		H [mm]	[kg]
AF	G 1 A	400	30	39	21	32	19	30	+16.03	+5.17	199	1.6
AG <sup>1)</sup>	G 1 1/2 A	400	43	55	30	41	20	42	+5.4	+1.76	200	2.1
AR	G 2	400	56	68	30	60	20	50	+1.76	+0.56	200	3.1
BF	1 MNPT	400	–	48	28	41	37	24	+15.66	+4.21	217	1.8
BG	1 1/2 MNPT	400	–	50	30	41	20	36	+8.14	+2.59	200	2.1
BR	2 MNPT	400	–	78	30	65	35	38	+5.4	+2.59	235	3.0

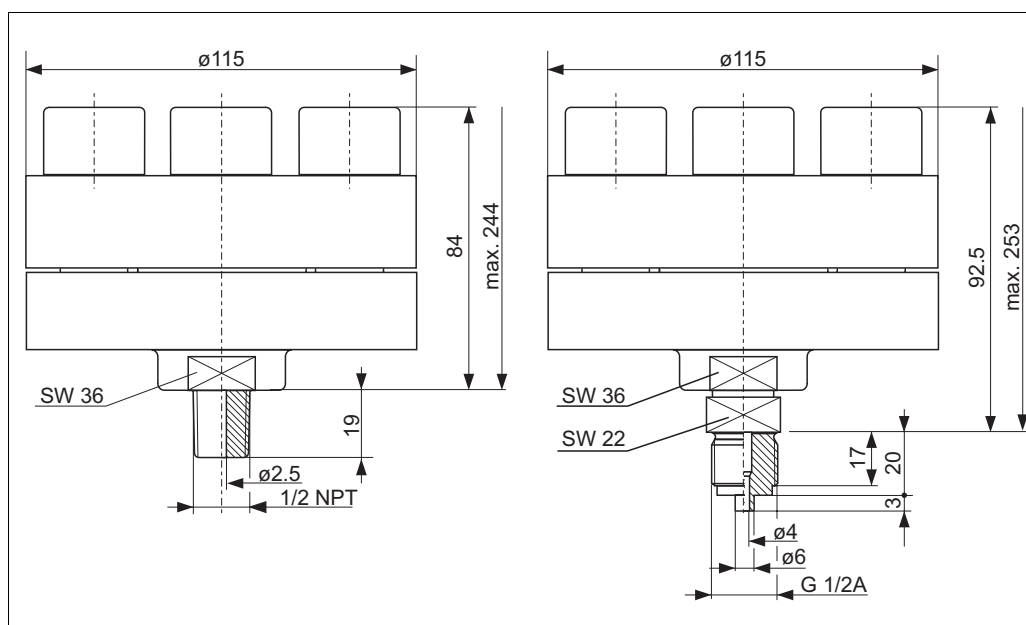
1) Endress+Hauser also offers welding necks for this Process connection. → See Page 29.

Separator ISO 228 G 1/2 A and ANSI 1/2 MNPT



P01-PMP48xxx-06-09-xx-xx-003

Process connection PMP48, welded, for sensors with a nominal pressure ≤ 40 bar, material AISI 316L

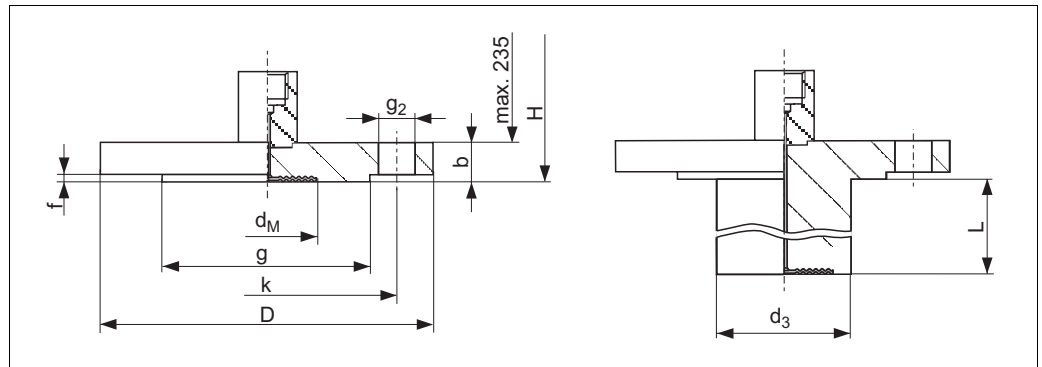


P01-PMP48xxx-06-09-xx-xx-004

Process connection PMP48, threaded, for sensors with a nominal pressure > 40 bar, material AISI 316L

Version	Description	Nominal pressure	T <sub>K</sub>		Max. total weight [kg]
			Ambient	Process	
			[mbar/10 K]		
CA	ISO 228 G 1/2 A	PN 160	+0.9	+0.3	2.7
DA	ANSI 1/2 MNPT	PN 160	+0.9	+0.3	6.0
CA	ISO 228 G 1/2 B	PN 400	+0.9	+0.3	6.0
DA	ANSI 1/2 MNPT	PN 400	+0.9	+0.3	2.7

EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527 and DIN 2501-1



P01-PMP48xxx-06-09-xx-xx-001

Process connection PMP48, EN/DIN flange with flush-mounted diaphragm, material AISI 316L

H Max. installation height = 235 mm + flange thickness b (→ see Table)

Version	Flanges							Boltholes			Diaphragm seal			Max. total weight [kg]
	Nominal diameter	Nominal pressure	Shape <sup>1</sup>	Dia- meter D [mm]	Thick- ness b [mm]	Raised face		Quan- tity	Dia- meter g <sub>2</sub> [mm]	Hole circle k [mm]	Max. diaphragm diameter [mm]	T <sub>K</sub> Ambient [mbar/10 K]	T <sub>K</sub> Process [mbar/10 K]	
						g [mm]	f [mm]							
EB	DN 25	PN 10-40	B1 (D)	115	18	66	3	4	14	85	32	+16.03	+5.17	2.1
EC	DN 25	PN 63-160	E	140	24	68	2	4	18	100	28	+16.03	+5.17	2.5
ED	DN 25	PN 250	E	150	28	68	2	4	22	105	28	+16.03	+5.17	3.7
EF	DN 25	PN 400	E	180	38	68	2	4	26	130	28	+16.03	+5.17	7.0
EK	DN 50	PN 10-40	B1 (D)	165	20	102	3	4	18	125	59	+2.21	+1.15	3.0
EM	DN 50	PN 63	B2 (E)	180	26	102	3	4	22	135	59	+2.21	+1.15	4.6
EN	DN 50	PN 100-160	E	195	30	102	3	4	26	145	59	+2.21	+1.15	6.2
EP	DN 50	PN 250	E	200	38	102	3	8	26	150	59	+2.21	+1.15	7.7
ER	DN 50	PN 400	E	235	52	102	3	8	30	180	59	+2.21	+1.15	14.7
EU	DN 80	PN 10-40	B1 (D)	200	24	138	3.5	8	18	160	89	+0.19	+0.11	5.3
FK <sup>2</sup>	DN 50	PN 10-40	B1 (D)	165	20	102	3	4	18	125	47	+3.45	+1.67	<sup>2</sup>
GK <sup>2</sup>														
JK <sup>2</sup>														
FU <sup>2</sup>	DN 80	PN 10-40	B1 (D)	200	24	138	3.5	4	18	160	72	+0.19	+0.7	<sup>2</sup>
GU <sup>2</sup>														
JU <sup>2</sup>														

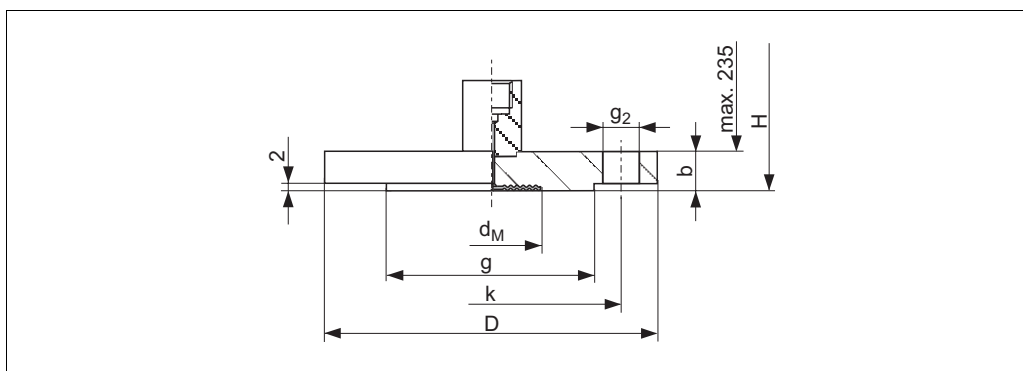
1) Designation as per DIN 2527 in brackets

2) Alternatively with 50 mm, 100 mm and 200 mm extended diaphragm seal, for extended diaphragm seal diameter and weight, see the following table

**EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527 and DIN 2501 (additional technical data)**

Version	Nominal diameter	Nominal pressure	Extension length	Extension diameter	Max. total weight
			L [mm]	d <sub>3</sub> [mm]	
FK	DN 50	PN 10-40	50	48.3	4.4
GK	DN 50	PN 10-40	100	48.3	5.0
JK	DN 50	PN 10-40	200	48.3	5.6
FU	DN 80	PN 10-40	50	76	7.4
GU	DN 80	PN 10-40	100	76	7.9
JU	DN 80	PN 10-40	200	76	9.0

**JIS flanges, connection dimensions as per B 2220, raised face RF**



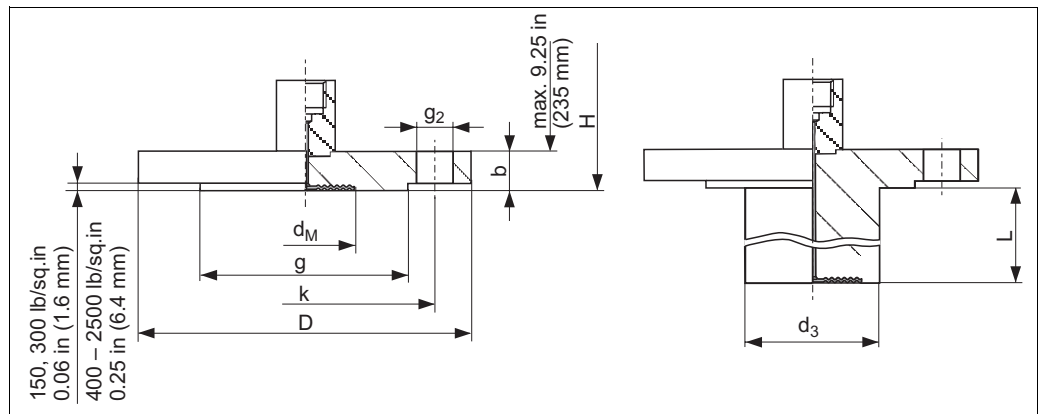
Process connection PMP48, JIS flange, material AISI 316L

H Max. installation height = 235 mm + flange thickness b (→ see Table)

Version	Flange						Boltholes			Diaphragm seal			Max. total weight
	Nominal diameter	Nominal pressure	Diameter	Thickness	Raised face diameter	Raised face height	Quantity	Diameter	Hole circle	Max. diaphragm diameter	T <sub>K</sub> Ambient	T <sub>K</sub> Process	
			D [mm]	b [mm]	g [mm]	f [mm]		g <sub>2</sub> [mm]	k [mm]	d <sub>M</sub> [mm]	[mbar/10 K]		[kg]
RB	25 A	10 K	125	14	67	1	4	19	90	32	+16.03	+5.17	2.7
RJ	50 A	10 K	155	16	96	2	4	19	120	59	+2.21	+1.15	2.5
RU	80 A	10 K	185	18	127	2	8	19	150	89	+0.19	+0.11	5.5



ANSI flanges B 16.5 RF



Process connection PMP48, ANSI flange B 16.5 RF with and without extended diaphragm seal

H Max. installation height = 235 mm + flange thickness b (→ see Table)

Version	Flange						Boltholes			Diaphragm seal			Max. total weight [kg]
	Material <sup>1</sup>	Nominal diameter [in]	Class [lb./sq.in]	Diameter D [in] [mm]	Thick-ness b [in] [mm]	Raised face g [in] [mm]	Quan- tity	Dia- meter g <sub>2</sub> [in] [mm]	Hole circle k [in] [mm]	Max. diaphragm diameter [in] [mm]	T <sub>K</sub> Ambient [mbar/10 K]	T <sub>K</sub> Process	
KB	AISI 316/316L <sup>1</sup>	1	150	4.25 108	0.56 14.2	2 50.8	4	0.62 15.7	3.12 79.2	1.26 32	+16.03	+5.17	2.4
KC	AISI 316/316L1	1	300	4.88 124	0.69 17.5	2 50.8	4	0.75 19.1	3.5 88.9	1.26 32	+16.03	+5.17	2.5
KD	AISI 316/316L1	1	400/ 600	4.88 124	0.69 17.5	2 50.8	4	0.75 19.1	3.5 88.9	1.26 32	+16.03	+5.17	2.6
KE	AISI 316/316L1	1	900/ 1500	5.88 149.4	1.12 28.4	2 50.8	4	1 25.4	4 101.6	1.26 32	+16.03	+5.17	5.0
KF	AISI 316/316L1	1	2500	6.25 158.8	1.38 35.1	2 50.8	4	1 25.4	4.25 108	1.26 32	+16.03	+5.17	5.8
KJ	AISI 316/316L1	2	150	6 152.4	0.75 19.1	3.62 91.9	4	0.75 19.1	4.75 120.7	2.32 59	+2.21	+1.15	3.4
KK	AISI 316/316L1	2	300	6.5 165.1	0.88 22.4	3.62 91.9	8	0.75 19.1	5 127	2.32 59	+2.21	+1.15	4.6
KL	AISI 316/316L1	2	400/ 600	6.5 165.1	1 25.4	3.62 91.9	8	0.75 19.1	5 127	2.32 59	+2.21	+1.15	5.3
KM	AISI 316/316L1	2	900/ 1500	8.5 215.9	1.5 38.1	3.62 91.9	8	1 25.4	6.5 165.1	2.32 59	+2.21	+1.15	11.5
KN	AISI 316/316L1	2	2500	9.25 235	2 50.8	3.62 91.9	8	1.12 28.4	6.75 171.5	2.32 59	+2.21	+1.15	17.0
KU	AISI 316/316L1	3	150	7.5 190.5	0.94 23.9	5 127	4	0.75 19.1	6 152.4	3.50 89	+0.19	+0.11	6.3
KV	AISI 316/316L1	3	300	8.25 209.5	1.12 28.4	5 127	8	0.75 19.1	6 152.4	3.50 89	+0.19	+0.11	8.2
KW	AISI 316/316L1	4	150	9 228.6	0.94 23.9	6.19 157.2	8	0.75 19.1	7.5 190.5	3.50 89	+0.19	+0.11	8.4
KX	AISI 316/316L1	4	300	10 254	1.25 31.8	6.19 157.2	8	0.88 22.4	7.88 200.2	3.50 89	+0.19	+0.11	12.9

Version	Flange						Boltholes			Diaphragm seal			Total weight [kg]
	Material	Nominal diameter [in]	Class [lb./sq.in]	Dia- meter D [in] [mm]	Thick- ness b [in] [mm]	Raised face g [in] [mm]	Quan- tity	Dia- meter g <sub>2</sub> [in] [mm]	Hole circle k [in] [mm]	Max. diaphragm diameter [in] [mm]	T <sub>K</sub> Ambient	T <sub>K</sub> Process	
				[mbar/10 K]									
LJ <sup>2</sup>	AISI 316/ 316L <sup>1</sup>	2	150	6 152.4	0.75 19.1	3.62 91.9	4	0.75 19.1	4.75 120.7	1.85 47	+3.45	+1.67	<sup>2</sup>
MJ <sup>2</sup>													
NJ <sup>2</sup>													
LU <sup>2</sup>	AISI 316/ 316L <sup>1</sup>	3	150	7.5 190.5	0.94 23.9	5 127	4	0.75 19.1	6 152.4	2.83 72	+0.19	+0.7	<sup>2</sup>
MU <sup>2</sup>													
NU <sup>2</sup>													
LW <sup>2</sup>	AISI 316/ 316L <sup>1</sup>	4	150	9 228.6	0.94 23.9	6.19 157.2	8	0.75 19.1	7.5 190.5	3.50 89	+0.19	+0.11	<sup>2</sup>
MW <sup>2</sup>													
NW <sup>2</sup>													

- 1) Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated).  
2) Alternatively with 2", 4" and 6" extended diaphragm seal, for extended diaphragm seal diameter and weight, see the following table

#### ANSI flanges B 16.5 RF (additional technical data)

Version	Nominal diameter [in]	Class [lb./sq.in]	Extension length L [in] [[mm]]	Extension diameter d <sub>3</sub> [in] [[mm]]	Max. total weight [kg]
LJ	2	150	2 (50.8)	1.9 (48.3)	4.2
MJ			4 (101.6)		4.6
NJ			6 (152.4)		5.1
LU	3	150	2 (50.8)	2.99 (75.9)	7.2
MU			4 (101.6)		7.8
NU			6 (152.4)		8.3
LW	4	150	2 (50.8)	3.7 (94)	9.8
MW			4 (101.6)		11.1
NW			6 (152.4)		12.4

---

**Weight**

- PMC41
  - Stainless steel housing with a high cover: approx. 1.4 kg
  - Aluminum housing with a high cover: approx. 1.6 kg
- PMC45
  - Stainless steel housing with a high cover, threaded connection or hygienic connection: approx. 1.8 kg
  - Aluminum housing with a high cover, threaded connection or hygienic connection: approx. 2.1 kg
  - → For devices with a flange, see Page 32 ff.
- PMP41
  - Stainless steel housing with a high cover: approx. 0.9 kg
  - Aluminum housing with a high cover: approx. 1.2 kg
- PMP45
  - Stainless steel housing with a high cover: approx. 1.5 kg
  - Aluminum housing with a high cover: approx. 1.8 kg
- PMP46
  - → See Page 39 ff, "Process connections PMP46".
- PMP48
  - → See Page 45 ff, "Process connections PMP48".

---

**Material**

- Housing:
  - Stainless steel: AISI 316L (1.4404) with surface roughness  $\leq 0,8 \mu\text{m}$
  - Die-cast aluminum with powder protective coating on polyester base
- Process diaphragm:
  - PMC41 and PMC45: Ceraphire®:  $\text{Al}_2\text{O}_3$  aluminum oxide ceramic (FDA 21CFR186.1256, USP Class VI), ultrapure 99.9%  
(→ See also [www.endress.com/ceraphire](http://www.endress.com/ceraphire))
- O-ring for cover sealing:
  - Stainless steel housing: silicone covered in Teflon
  - Aluminum housing: NBR
- Nameplates:
  - Stainless steel housing: lasered onto the housing
  - Aluminum housing: AISI 304 (1.4301)
- Securing accessories: mounting bracket for pipe and wall mounting AISI 304 (1.4301)
- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 304 (1.4301)

→ For seals, see Page 24, "Temperature operating range, seals" section.

→ For process connections, see Page 26 ff, "Mechanical construction".

→ For process membranes and filling oils, see ordering information, Page 60 ff.

Note!

No animal fats are used in the production of Cerabar M.

## Planning instructions for diaphragm seal systems

### Applications

Diaphragm seal systems should be used if the process media and the device should be separated. Diaphragm seal systems offer clear advantages in the following instances:

- In the event of high process temperatures (→ see also Page 24, "Process temperature limits" section.)
- For aggressive media
- If good and rapid measuring point cleaning is necessary
- If the measuring point is exposed to vibrations
- For mounting locations that are difficult to access
- For very humid mounting locations

### Planning instructions

Diaphragm seals are separating equipment between the measuring system and the process medium.

A diaphragm seal system consists of:

- A diaphragm seal
- Capillary tube
- Fill fluid and
- A pressure transmitter.

The process pressure acts via the diaphragm seal membrane on the liquid-filled system, which transfers the process pressure via the capillary tube onto the sensor of the pressure transmitter.

Note!

The correlations between the individual diaphragm seal components are presented in the following section. For further information and comprehensive diaphragm seal system designs, please contact your local Endress+Hauser Sales Center.

#### Diaphragm seal

The diaphragm seal determines the application range of the system by

- The diaphragm diameter
- The diaphragms: stiffness and material
- The design (oil volume).

##### *Diaphragm diameter*

The larger the diaphragm diameter (less stiffness), the smaller the temperature effect on the measurement result.

Note: To keep the temperature effect in practice-oriented limits, you should select diaphragm seals with a nominal diameter  $\geq$  DN 80, in as far as the process connection allows for it.

##### *Diaphragm stiffness*

The stiffness is dependent on the diaphragm diameter, the material, any available coating and on the diaphragm thickness and shape. The diaphragm thickness and the shape are defined constructively. The stiffness of a diaphragm seal membrane influences the temperature operating range and the measuring error caused by temperature effects.

#### Capillary

Capillaries with an internal diameter of 1 mm are used as standard.

The capillary tube influences the  $T_K$  zero point, the ambient temperature operating range and the response time of a diaphragm seal system as a result of its length and internal diameter.

→ See also Page 53 ff, "Influence of the temperature on the zero point" and "Ambient temperature range" sections.

→ Observe the installation instructions regarding capillary tubes. See Page 57, "Installation instructions" section.

### Filling oil

When selecting the filling oil, fluid and ambient temperature as well as the operating pressure are of crucial importance. Observe the temperatures and pressures during commissioning and cleaning. A further selection criterion is the compatibility of the filling oil with the requirements of the process medium. For this reason, only filling oils that are harmless to health are used in the food industry, such as vegetable oil.  
→ See also the following section "Diaphragm seal filling oils".

The filling oil used influences the  $T_K$  zero point, the temperature operating range of a diaphragm seal system and the response time. → See also Page 53 ff, "Influence of the temperature on the zero point" section.

### Pressure transmitter

The pressure transmitter influences the temperature operating range, the  $T_K$  zero point and the response time as a result of its volume change. The volume change is the volume that has to be shifted to pass through the complete measuring range.

Pressure transmitters from Endress+Hauser are optimized with regard to minimum volume change.

### Diaphragm seal filling oils

Version <sup>1</sup>	Filling oil	Permitted temperature range at $0.05 \text{ bar} \leq p_{\text{abs}} \leq 1 \text{ bar}$	Permitted temperature range at $p_{\text{abs}} \geq 1 \text{ bar}$	Density [g/cm <sup>3</sup> ]	Viscosity [cSt at 25°C/ 77°F]	Expansion coefficient [1/K]	$T_K$ correction factor	Notes
A, J or O	Silicone oil	-40 to +180°C (-40 to +356°F)	-40 to +250°C (-40 to +482°F)	0.96	100	0.00096	1	Suitable for foods
G, H or K	High-temperature oil	-10 to +200°C (+14 to +392°F)	-10 to +350°C (+14 to +662°F)	1.07	37	0.0007	0.72	High temperatures
N	Inert oil	-40 to +80°C (-40 to +176°F)	-40 to +175°C (-40 to +347°F)	1.87	27	0.000876	0.91	Oil for ultrapure gas and oxygen applications
D, F, L <sup>2</sup> or P	Vegetable oil	-10 to +120°C (+14 to +248°F)	-10 to +200°C (+14 to +392°F)	0.94	9.5	0.00101	1.05	Suitable for foods FDA 21 CFR 172.856
E	Glycerine	—	+15 to +200°C (+59 to +392°F)	1.26	1118	0.000615	0.64	Suitable for foods
M, U	Low temperature oil	-90...+80°C <sup>3</sup> (-130...176°F)	-90...+180°C <sup>3</sup> (-130...+356°F)	0.92	4.4	—	—	low temperatures

- 1) Version for feature 80 in the order code
- 2) Version "L" only for PMP46
- 3) Observe temperature limits of the device (→ page 23 and page 24)

### Influence of the temperature on the zero point

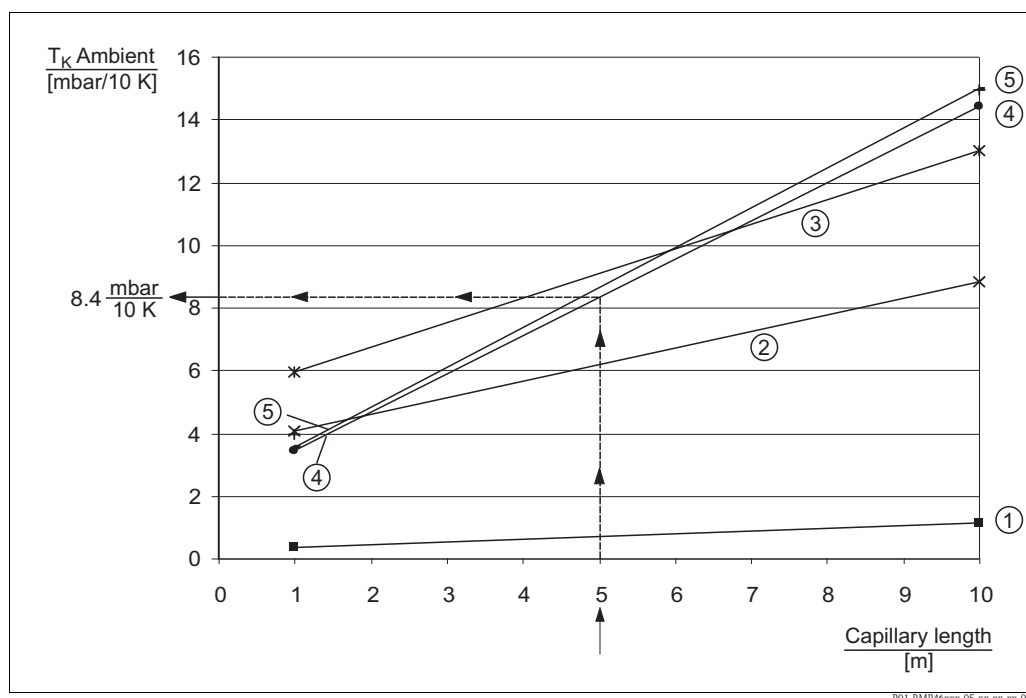
A temperature change results in a volume change of the filling oil. The volume change is dependent on the coefficient of thermal expansion of the filling oil at calibration temperature (constant in the range: +21 to +33°C (+69.8 to 91.4°F)). → See also Page 53, "Diaphragm seal filling oils" section.

For example, the filling oil expands in the event of a temperature increase. The additional volume presses against the diaphragm seal membrane. The stiffer a diaphragm is, the greater its return force, which counteracts a volume change and acts on the measuring cell together with the operating pressure, thus shifting the zero point. For the temperature coefficients " $T_K$  Process" and " $T_K$  Ambient (for devices without capillaries)" see Page 39 ff, "Process connections PMP46 and PMP48" section.

The following diagrams illustrate the temperature coefficient " $T_K$  Ambient" dependent on the capillary length. The following situation is illustrated: capillary and transmitter temperature (ambient temperature) change, the process temperature corresponds to the calibration temperature.

The temperature coefficients obtained from the diagrams apply to silicone oil and the membrane material AISI 316L/1.4435. For other filling oils, these temperature coefficients must be multiplied by the  $T_K$  correction factor of the corresponding filling oil. For the  $T_K$  correction factors, see this Page, "Diaphragm seal filling oils" section. With regard to the temperature coefficient " $T_K$  Ambient", devices with temperature isolator behave like devices with the same process connection with 1 m capillary.

## Diagrams for diaphragm seal PMP46 with sample calculation

Diagram  $T_K$  Ambient as a function of the capillary length for PMP46**Example for:**

- Diaphragm seal version "AL, DIN 11851 DN 50 PN 25, AISI 316L/1.4435"
- Capillary length: 5 m
- Ambient temperature capillary/transmitter: 45 °C
- Filling oil: silicone oil

1. Select characteristic type for diaphragm seal version "AL" in accordance with the following table.  
Result: characteristic type 4
2. Determine value for  $T_K$  Ambient from the diagram.  
Result: 8.4 mbar/10 K
3.  $T_{\text{Ambient}} - T_{\text{Calibration}} = 45 \text{ °C} - 25 \text{ °C} = 20 \text{ °C} \Rightarrow 8.4 \text{ mbar}/10 \text{ K} \times 20 \text{ K} = 16.8 \text{ mbar}$

**Result:** In this example, the zero point is shifted 16.8 mbar.

## Note!

- The influence of temperature on the zero point can be corrected with position calibration.
- The temperature influence can be minimized by using a filling oil with a smaller coefficient of thermal expansion, shorter capillary, diaphragm seal with larger diaphragm diameter or by using a smaller capillary internal diameter.

Characteristic type	Version <sup>1)</sup>	Diaphragm seal
1	DU	Tri-Clamp, ISO 2852 DN 76.1 (3"), AISI 316L/1.4435
2	SL	Pipe diaphragm seal Tri-Clamp, ISO 2852 DN 51 (2"), AISI 316L
3	SG	Pipe diaphragm seal Tri-Clamp, ISO 2852 DN 38 (1 1/2"), AISI 316L
4	AL	DIN 11851 DN 50 PN 25, AISI 316L/1.4435
	PL	Pipe diaphragm seal DIN 11581 DN 50 PN 40, AISI 316L
5	LL	Varivent type N for pipes DN 40 – DN 162, PN 40, AISI 316L/1.4435
	KL	DRD 65 mm PN 25, AISI 316L/1.4435

1) Version for feature 70 "Process connection" in the order code

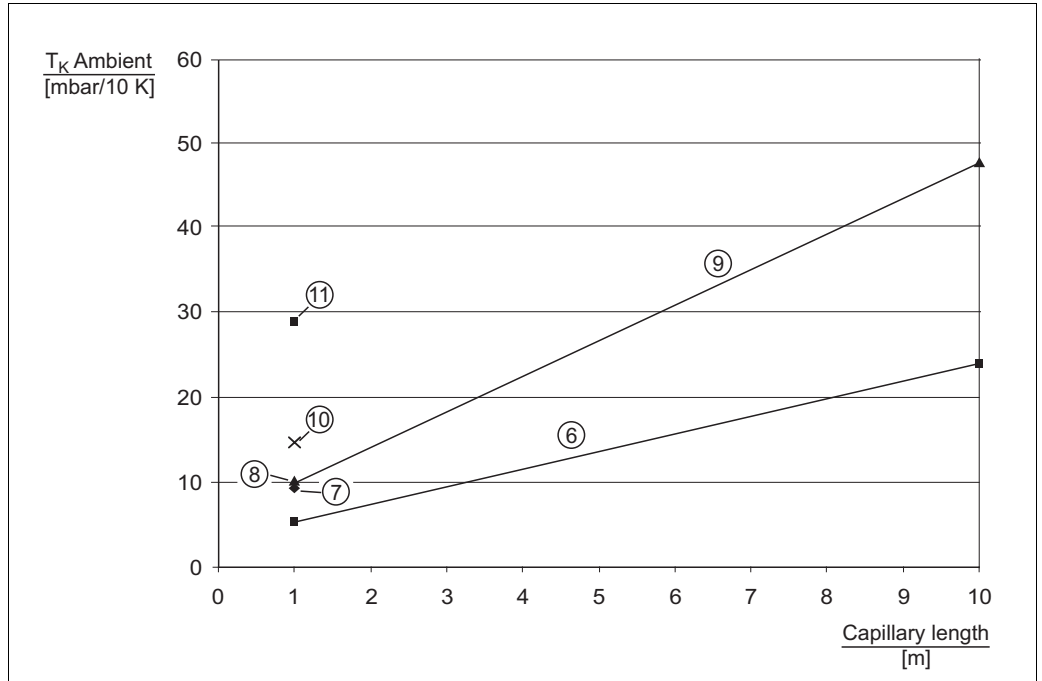
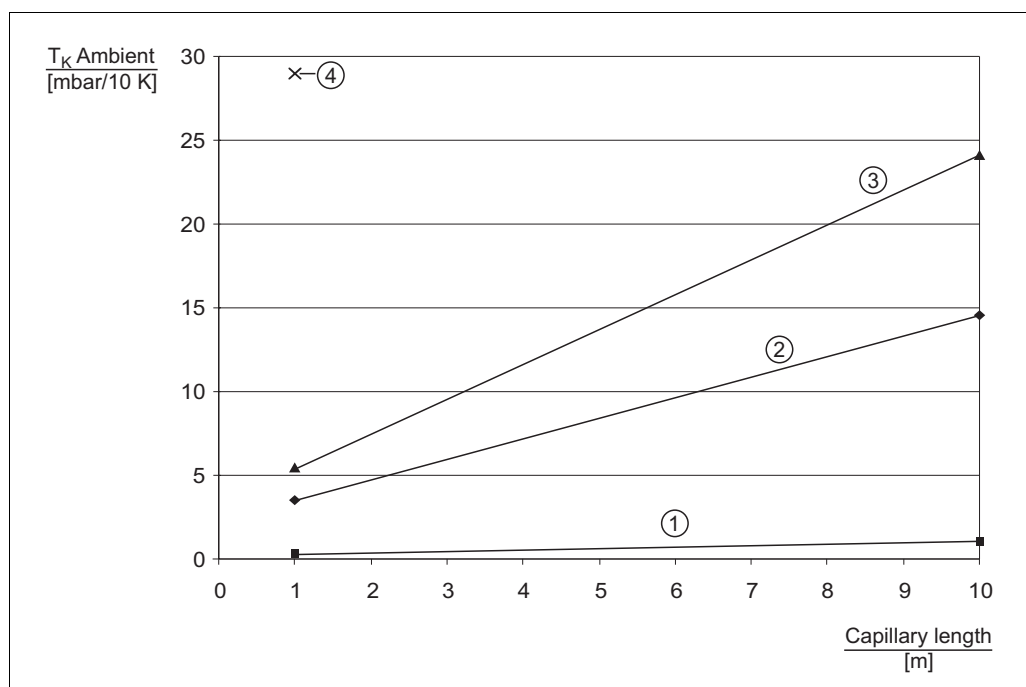


Diagram TK Ambient as a function of the capillary length for PMP46

Characteristic type	Version <sup>1</sup>	Diaphragm seal
6	DL	Tri-Clamp, ISO 2852 DN 51 (2"), DIN 32676 DN 50, AISI 316L/1.4435
7 <sup>2</sup>	SB	Pipe diaphragm seal Tri-Clamp, ISO 2852 DN 25 (1"), AISI 316L
	LB	Varivent type F for pipes DN 25 – DN 32 PN40, AISI 316L/1.4435
8 <sup>2</sup>	AH	DIN 11851 DN 40, AISI 316L/1.4435
	PH	Pipe diaphragm seal DIN 11851 DN 40 PN 40, AISI 316L
9	EL	SMS 2" PN 25, AISI 316L/1.4435
	FL	APV-RJT 2" PN 40, AISI316L/1.4435
	GL	APV-ISS 2" PN 40, AISI316L/1.4435
10 <sup>2</sup>	AG	DIN 11851 DN 32 PN 40, AISI 316L/1.4435
	EG	SMS 1 1/2" PN 25, AISI 316L/1.4435
	FG	APV-RJT 1 1/2" PN 40, AISI 316L/1.4435
	GG	APV-ISS 1 1/2" PN 40, AISI 316L/1.4435
	DG	Tri-Clamp, ISO 2852 DN 38 (1 1/2"), DIN 32676 DN 40, AISI 316L/1.4435
11 <sup>2</sup>	PB	Pipe diaphragm seal DIN 11851 DN 25 PN 40, AISI 316L
	DF	Tri-Clamp, ISO 2852 (1"), DIN 32676 DN 25, AISI 316L/1.435

- 1) Version for feature 70 "Process connections" in the order code
- 2) Versions with 1 m (3 ft) capillary, see also feature 80 "Transmitter mounting; fill fluid"

Diagrams for diaphragm seal PMP48



F01-PMP48xxx-05-xx-xx-xx-004

Diagram  $T_K$  Ambient as a function of the capillary length for PMP48

Characteristic type	Version <sup>1</sup>	Diaphragm seal
1	EU	EN/DIN flange DN 80 PN 10-40 B1, AISI 316L
	RU	JIS flange 10K 80A RF, AISI 316L
	FU	EN flange DN 80 PN 10-40 B1, extended diaphragm seal: 50 mm, AISI 316L
	GU	EN flange DN 80 PN 10-40 B1, extended diaphragm seal: 100 mm, AISI 316L
	JU	EN flange DN 80 PN 10-40 B1, extended diaphragm seal: 200 mm, AISI 316L
	KU	ANSI flange 3" 150 lbs RF, AISI 316/316L
	KV	ANSI flange 3" 300 lbs RF, AISI 316/316L
	LU	ANSI flange 3" 150 lbs RF, extended diaphragm seal: 2", AISI 316/316L
	MU	ANSI flange 3" 150 lbs RF, extended diaphragm seal: 4", AISI 316/316L
	NU	ANSI flange 3" 150 lbs RF, extended diaphragm seal: 6", AISI 316/316L
	KW	ANSI flange 4" 150 lbs RF, AISI 316/316L
	KX	ANSI flange 4" 300 lbs RF, AISI 316/316L
	LW	ANSI flange 4" 150 lbs RF, extended diaphragm seal: 2", AISI 316L
	MW	ANSI flange 4" 150 lbs RF, extended diaphragm seal: 4", AISI 316L
NW	ANSI flange 4" 150 lbs RF, extended diaphragm seal: 6", AISI 316L	
2	EK	EN/DIN flange DN 50 PN 10-40 B1, AISI 316L
	EM	EN/DIN flange DN 50 PN 63 B2, AISI 316L
	EN	EN/DIN flange DN 50 PN 100/160 E, AISI 316L
	EP	EN/DIN flange DN 50 PN 250 E, AISI 316L
	ER	EN/DIN flange DN 50 PN 400 E, AISI 316L
	KJ	ANSI flange 2" 150 lbs RF, AISI 316/316L
	KK	ANSI flange 2" 300 lbs RF, AISI 316/316L
	KL	ANSI flange 2" 400/600 lbs RF, AISI 316/316L
	KM	ANSI flange 2" 900/1500 lbs RF, AISI 316/316L
	KN	ANSI flange 2" 2500 lbs RF, AISI 316/316L
	RJ	JIS flange 10K 50A RF, AISI 316L
3	FK	EN flange DN 50 PN10-40 B1, extended diaphragm seal: 50 mm, AISI 316L
	GK	EN flange DN 50 PN10-40 B1, extended diaphragm seal: 100 mm, AISI 316L
	JK	EN flange DN 50 PN10-40 B1, extended diaphragm seal: 200 mm, AISI 316L
	LJ	ANSI flange 2" 150 lbs, extended diaphragm seal: 2", AISI 316L
	MJ	ANSI flange 2" 150 lbs, extended diaphragm seal: 4", AISI 316L
	NJ	ANSI flange 2" 150 lbs, extended diaphragm seal: 6", AISI 316L

1) Version for feature 70 "Process connection" in the order code



Characteristic type	Version <sup>1</sup>	Diaphragm seal
4 <sup>2</sup>	EB	EN/DIN flange DN 25 PN 10-40 B1, AISI 316L
	EC	EN/DIN flange DN 25 PN 64-160 E, AISI 316L
	ED	EN/DIN flange DN 25 PN 250 E, AISI 316L
	EF	EN/DIN flange DN 25 PN 400 E, AISI 316L
	KB	ANSI flange 1" 150 lbs RF, AISI 316/316L
	KC	ANSI flange 1" 300 lbs RF, AISI 316/316L
	KD	ANSI flange 1" 400/600 lbs RF, AISI 316/316L
	KE	ANSI flange 1" 900/1500 lbs RF, AISI 316/316L
	KF	ANSI flange 1" 2500 lbs RF, AISI 316/316L
	RB	JIS flange 10K 25A RF, AISI 316L

- 1) Version for feature 70 "Process connections" in the order code
- 2) Versions with 1 m (3 ft) capillary, see also feature 80 "Transmitter mounting; fill fluid"

### Ambient temperature range

The filling oil, capillary length, capillary internal diameter, process temperature and the oil volume of the diaphragm seal determine the ambient temperature operating range of the diaphragm seal system. The operating range can be extended by using a filling oil with a smaller coefficient of expansion and by using shorter capillaries.

### Installation instructions

#### Instructions for diaphragm seal systems

- The diaphragm seal together with the transmitter form a closed, calibrated system, which is filled through ports in the diaphragm seal and in the measurement system of the transmitter. These ports are sealed and must not be opened.
- In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling liquid column in the capillaries must be taken into account when selecting the measuring cell. If a measuring cell with a small measuring range is selected, the sensor nominal range can be overdriven as a result of position adjustment.
- When using a mounting bracket, sufficient strain relief must be allowed for in order to prevent the capillary bending down (capillary bending radius  $\geq 100$  mm).

#### Installation instructions

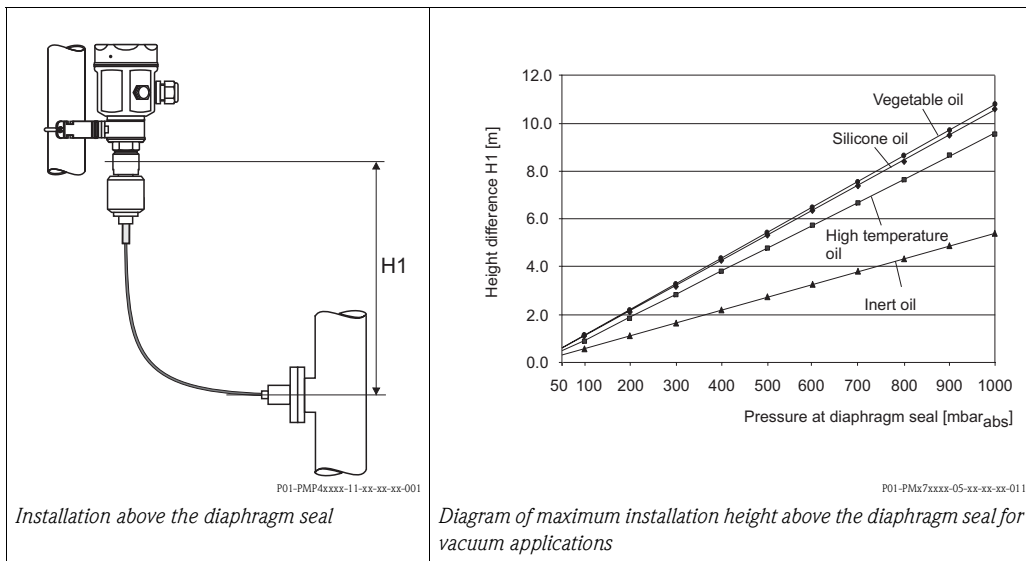
In order to obtain more precise measurement results and to avoid a defect in the device, mount the capillaries as follows:

- Vibration-free (in order to avoid additional pressure fluctuations)
- Not in the vicinity of heating or cooling lines
- Insulate at colder or warmer ambient temperatures
- With a bending radius of  $\geq 100$  mm.

#### Vacuum applications

For applications under vacuum, Endress+Hauser recommends mounting the pressure transmitter below the diaphragm seal. A vacuum load of the diaphragm seal caused by the presence of fill fluid in the capillary is hereby prevented.

When the pressure transmitter is mounted above the diaphragm seal, the maximum height difference H1 in accordance with the following illustration must not be exceeded. The maximum height difference is dependent on the density of the filling oil and the smallest ever pressure that is permitted to occur at the diaphragm seal (empty tank), see the following illustration on the right. Glycerine is not suitable for vacuum applications.



## Certificates and approvals

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<b>CE mark</b>	The device meets the legal requirements of the relevant EC directive. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.
<b>Ex approvals</b>	All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas. →See also Page 75 ff, "Safety Instructions" and "Installation/Control Drawings" sections.
<b>Pressure Equipment Directive (PED)</b>	<ul style="list-style-type: none"><li>– This measuring device corresponds to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.</li><li>– PMP41 with threaded connection, PN &gt; 200: suitable for stable gases in Group 1, Category I</li><li>– PMP46 with pipe diaphragm seal <math>\geq 1.5</math>"/PN40 or DN40/PN40: Suitable for stable gases in Group 1, Category II</li></ul>
<b>Functional safety SIL 2/ IEC 61508/IEC 61511-1</b>	The Cerabar M pressure transmitters with 4 to 20 mA HART electronics have been assessed by an independent body according to the standards IEC 61508/IEC 61511-1. These devices can be used for monitoring process pressure up to SIL 2. → For a detailed description of safety functions with Cerabar M, settings and characteristic quantities for functional safety, see the "Functional Safety Manual – Cerabar M SD172P".
<b>Standards and guidelines</b>	DIN EN 60770 (IEC 60770): Transmitters for controlling in systems used in industrial process technology Part 1: Methods for evaluating the operating behavior  DIN 16086: Electrical pressure measuring devices, pressure sensors, transmitters, pressure measuring devices Terms, specifications in data sheets  EN 61326: Electrical equipment for control technology and laboratory application – EMC requirements

## Ordering information

PMC41

10		Approval:		
R		For non-hazardous areas		
G		ATEX II 1/2 G EEx ia IIC T6		
F		ATEX II 1 G EEx ia IIC T6		
H		ATEX II 2 G EEx ia IIC T6		
N		ATEX II 3 G EEx nA II T5		
J		ATEX II 1/2 G 1/2 D EEx ia IIC T6		
K		ATEX II 1/2 D EEx ia IIC T6		
L		ATEX II 1/3 D		
C		CSA General Purpose		
S		CSA IS, Class I, II, III Division 1, Groups A – G		
T		CSA XP, Class II, III, Division 1, Groups E – G (dust Ex), Class I, Division 2, Groups A – D		
P		FM IS, Class I, II, III, Division 1, Groups A – G		
M		FM DIP, Class II, III Division 1, Groups E – G		
D		IECEx Zone 0/1 Ex ia IIC T6		
V		TIIS IS, Ex ia IIC T6		
20		Housing; Electrical connection:		
E1		AISI 316L; gland M20, IP 66		
C1		AISI 316L; thread NPT 1/2, IP 66		
G1		AISI 316L; thread G 1/2, IP 66		
H1		AISI 316L; plug Han7D, IP 65		
L1		AISI 316L; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
K1		AISI 316L; cable 5 m, IP 68 + atmospheric pressure compensation		
E2		Aluminum; gland M20, IP 66		
C2		Aluminum; thread NPT 1/2, IP 66		
G2		Aluminum; thread G 1/2, IP 66		
H2		Aluminum; plug Han7D, IP 65		
L2		Aluminum; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
K2		Aluminum; cable 5 m, IP 68 + atmospheric pressure compensation		
30		Sensor range; MWP; OPL:		
		<b>Sensor range</b>	<b>MWP (maximum working pressure)</b>	<b>OPL (over pressure limit)</b>
		<b>Sensors for gauge pressure</b>		
1C		0 to 100 mbar/10 kPa/1.5 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
1F		0 to 400 mbar/40 kPa/6 psi g	5.3 bar/530 kPa/80 psi	8 bar/800 kPa/120 psi
1H		0 to 1 bar/100 kPa/15 psi g	6.7 bar/670 kPa/100 psi	10 bar/1 MPa/150 psi
1M		0 to 4 bar/400 kPa/60 psi g	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/375 psi
1P		0 to 10 bar/1 MPa/150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
1S		0 to 40 bar/4 MPa/600 psi g	40 bar/4 MPa/600 psi	60 bar/6 MPa/900 psi
		<b>Sensors for negative gauge pressure</b>		
5C		-100 to 100 mbar/-10 to 10 kPa/ -1.5 to 1.5 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
5F		-400 to 400 mbar/-40 to 40 kPa/-6 to 6 psi g	5.3 bar/530 kPa/80 psi	8 bar/800 kPa/120 psi
5H		-1 to 1 bar/-100 to 100 kPa/-15 to 15 psi g	6.7 bar/670 kPa/100 psi	10 bar/1 MPa/150 psi
5M		-1 to 4 bar/-100 to 400 kPa/-15 to 60 psi g	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/600 psi
5P		-1 to 10 bar/-0.1 to 1 MPa/-15 to 150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
		<b>Sensors for absolute pressure</b>		
2F		0 to 400 mbar/40 kPa/6 psi abs.	5.3 bar/530 kPa/40 psi	8 bar/800 kPa/120 psi
2H		0 to 1 bar/100 kPa/15 psi abs.	6.7 bar/670 kPa/80 psi	10 bar/1 MPa/150 psi
2M		0 to 4 bar/400 kPa/60 psi abs.	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/375 psi
2P		0 to 10 bar/1 MPa/150 psi abs.	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
2S		0 to 40 bar/4 MPa/600 psi abs.	40 bar/4 MPa/600 psi	60 bar/6 MPa/900 psi
PMC41				Order code

→ For continuation of ordering information of PMC41, see the following page.

PMC41 (continued)

40					<b>Calibration; Unit:</b>	
	1				0.2% sensor range; mbar/bar	
	2				0.2% sensor range; kPa/MPa	
	3				0.2% sensor range; mm/mH <sub>2</sub> O	
	4				0.2% sensor range; inH <sub>2</sub> O/ftH <sub>2</sub> O	
	5				0.2% sensor range; kgf/cm <sup>2</sup>	
	6				0.2% sensor range; psi	
	B				0.2% see additional specification	
	C				0.1% see additional specification	
	D				DKD certificate; see additional specification	
50					<b>Output; Operation:</b>	
	A				4 to 20 mA analog; without display	
	C				4 to 20 mA analog; bar graph	
	H				4 to 20 mA HART; without display	
	J				4 to 20 mA HART; 4-digit pressure display + bar graph	
	P				PROFIBUS PA; without display	
	R				PROFIBUS PA; 4-digit pressure display + bar graph	
W				Without electronics; without display		
60					<b>Additional option:</b>	
	1				Basic version	
	2				Mounting bracket, wall/pipe	
	C				EN10204 3.1 (process connection) inspection certificate	
	F				Cleaned for silicone-free service	
	S				GL (German Lloyd) marine certificate	
U				SIL 2/IEC61508/IEC61511 Declaration of conformity		
70					<b>Process connection:</b>	
					Threaded connection	
	1M				Thread ISO228 G1/2, AISI 316L	
	2M				Thread ISO228 G1/2, Alloy C	
	1R				Thread ISO228 G1/2 bore 11.4 mm, AISI 316L	
	1P				Thread ISO228 G1/2 G1/4 (female), AISI 316L	
	1 A				Thread ANSI 1/2 MNPT bore 11.4 mm, AISI 316L	
	1N				Thread ANSI 1/2 MNPT FNPT1/4, AISI 316L	
	2N				Thread ANSI 1/2 MNPT 1/4 FNPT, Alloy C	
	1S				Thread JIS B0202 G1/2 (male), AISI 316L	
	1 K				Thread JIS B0203 R1/2 (male) bore 11.4 mm, AISI 316L	
1T				Thread DIN 13 M20x1.5, AISI 316L		
80					<b>Sensor seal:</b>	
	1				FKM Viton	
	2				NBR	
	4				EPDM	
	C				Chemraz	
	7				Kalrez	
	A				FKM Viton, oil + grease free	
	6				FKM Viton, oxygen service	
PMC41					Complete order code	

## PMC45

10	<b>Approval:</b>			
	R	For non-hazardous areas		
	G	ATEX II 1/2 G EEx ia IIC T6		
	F	ATEX II 1 G EEx ia IIC T6		
	H	ATEX II 2 G EEx ia IIC T6		
	N	ATEX II 3 G EEx nA II T5		
	C	CSA General Purpose		
	S	CSA IS, Class I, II, III Division 1, Groups A – D, G + coal dust		
	P	FM IS, Class I, II, III, Division 1, Groups A – G		
	D	IECEX Zone 0/1 Ex ia IIC T6		
	V	TIS IS, Ex ia IIC T6		
	20	<b>Housing; electrical connection:</b>		
		E1	AISI 316L; gland M20, IP 66	
C1		AISI 316L; thread NPT 1/2, IP 66		
G1		AISI 316L; thread G 1/2, IP 66		
H1		AISI 316L; plug Han7D, IP 65		
L1		AISI 316L; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
K1		AISI 316L; cable 5 m, IP 68 + atmospheric pressure compensation		
E2		Aluminum; gland M20, IP 66		
C2		Aluminum; thread NPT 1/2, IP 66		
G2		Aluminum; thread G 1/2, IP 66		
H2		Aluminum; plug Han7D, IP 65		
L2		Aluminum; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
K2		Aluminum; cable 5 m, IP 68 + atmospheric pressure compensation		
30	<b>Sensor range; MWP; OPL:</b>			
		<b>Sensor range</b>	<b>MWP (maximum working pressure)</b>	<b>OPL (over pressure limit)</b>
		<b>Sensors for gauge pressure</b>		
	1C	0 to 100 mbar/10 kPa/1.5 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	1F	0 to 400 mbar/40 kPa/6 psi g	5.3 bar/530 kPa/80 psi	8 bar/800 kPa/120 psi
	1H	0 to 1 bar/100 kPa/15 psi g	6.7 bar/670 kPa/100 psi	10 bar/1 MPa/150 psi
	1M	0 to 4 bar/400 kPa/60 psi g	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/375 psi
	1P	0 to 10 bar/1 MPa/150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
	1S	0 to 40 bar/4 MPa/600 psi g	40 bar/4 MPa/600 psi	60 bar/6 MPa/900 psi
		<b>Sensors for negative gauge pressure</b>		
	5C	-100 to 100 mbar/-10 to 10 kPa/-1.5 to 1.5 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	5F	-400 to 400 mbar/-40 to 40 kPa/-6 to 6 psi g	5.3 bar/530 kPa/80 psi	8 bar/800 kPa/120 psi
	5H	-1 to 1 bar/-100 to 100 kPa/-15 to 15 psi g	6.7 bar/670 kPa/100 psi	10 bar/1 MPa/150 psi
	5M	-1 to 4 bar/-100 to 400 kPa/-15 to 60 psi g	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/600 psi
	5P	-1 to 10 bar/-0.1 to 1 MPa/-15 to 150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
		<b>Sensors for absolute pressure</b>		
	2F	0 to 400 mbar/40 kPa/6 psi abs.	5.3 bar/530 kPa/40 psi	8 bar/800 kPa/120 psi
	2H	0 to 1 bar/100 kPa/15 psi abs.	6.7 bar/670 kPa/80 psi	10 bar/1 MPa/150 psi
	2M	0 to 4 bar/400 kPa/60 psi abs.	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/375 psi
	2P	0 to 10 bar/1 MPa/150 psi abs.	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
2S	0 to 40 bar/4 MPa/600 psi abs.	40 bar/4 MPa/600 psi	60 bar/6 MPa/900 psi	
40	<b>Calibration; Unit:</b>			
	1	0.2% sensor range; mbar/bar		
	2	0.2% sensor range; kPa/MPa		
	3	0.2% sensor range; mm/mH <sub>2</sub> O		
	4	0.2% sensor range; inH <sub>2</sub> O/ftH <sub>2</sub> O		
	5	0.2% sensor range; kgf/cm <sup>2</sup>		
	6	0.2% sensor range; psi		
	B	0.2% see additional specification		
	C	0.1% see additional specification		
	D	DKD certificate; see additional specification		
PMC45			Order code	

→ For continuation of ordering information of PMC45, see the following page.

PMC45 (continued)

<b>50</b>									<b>Output; Operation:</b> A 4 to 20 mA analog; without display C 4 to 20 mA analog; bar graph H 4 to 20 mA HART; without display J 4 to 20 mA HART; 4-digit pressure display + bar graph P PROFIBUS PA; without display R PROFIBUS PA; 4-digit pressure display + bar graph W Without electronics; without display
<b>60</b>									<b>Additional option:</b> 1 Basic version C EN10204 3.1 (process connection) inspection certificate S GL (German Lloyd) marine certificate U SIL 2/IEC61508/IEC61511 Declaration of conformity
<b>70</b>									<b>Process connection:</b> <b>Threaded connection</b> AG Thread ISO 228 G 1 1/2 , AISI 316L AR Thread ISO 228 G 2, AISI 316L BF Thread ANSI 1 1/2 MNPT, AISI 316L BR Thread ANSI 2 MNPT, AISI 316L XK Thread DIN 13 M44x1.25, AISI 316L <b>Clamp connections</b> DL Tri-Clamp, ISO 2852 DN 51 (2"), DIN 32676 DN 50, AISI 316L, 3A with HNBR/NBR seal <b>Hygienic connections</b> EG SMS 1 1/2" PN 25, AISI 316L, 3A with HNBR/EPDM seal EL SMS 2" PN 25, AISI 316L, 3A with HNBR/EPDM seal HL APV-Inline DN 50 PN 40, AISI 316L, 3A with HNBR/EPDM seal LB Varivent F for pipes DN 25 – 32 PN 40, AISI 316L, EHEDG, 3A with HNBR/EPDM seal LL Varivent N for pipes DN 40 – 162 PN 40, AISI 316L, EHEDG, 3A with HNBR/EPDM seal KL DRD 65 mm PN 25, AISI 316L, 3A with HNBR/EPDM seal AH DIN 11851 DN 40 PN 40, AISI 316L, 3A with HNBR/EPDM seal AL DIN 11851 DN 50 PN 25, AISI 316L, 3A with HNBR/EPDM seal <b>Aseptic couplings</b> AS DIN 11864-1 form A DN 40 for pipes to DIN 11850, AISI 316L, EHEDG, 3A with HNBR/EPDM seal AT DIN 11864-1 form A DN 50 for pipes to DIN 11850, AISI 316L, EHEDG, 3A with HNBR/EPDM seal <b>EN flanges</b> EK DN 50 PN 10-40 B1, AISI 316L EU DN 80 PN 10-40 B1, AISI 316L WK DN 50 PN 10-40, AISI 316L with ECTFE coating WU DN 80 PN 10-40, AISI 316L with ECTFE coating <b>ANSI flanges</b> K1 1 1/2" 150 lbs RF, AISI 316/316L K2 1 1/2" 300 lbs RF, AISI 316/316L KJ 2" 150 lbs RF, AISI 316/316L KK 2" 300 lbs RF, AISI 316/316L KU 3" 150 lbs RF, AISI 316/316L KV 3" 300 lbs RF, AISI 316/316L KW 4" 150 lbs RF, AISI 316/316L KX 4" 300 lbs RF, AISI 316/316L VJ 2" 150 lbs, AISI 316/316L with ECTFE coating VU 3" 150 lbs, AISI 316/316L with ECTFE coating VN 4" 150 lbs, AISI 316/316L with ECTFE coating ZJ 2" 150 lbs RF, PVDF ZU 3" 150 lbs RF, PVDF <b>JIS flange</b> RI 10K 50A RF, AISI 316L <b>Other</b> HA Universal process adapter 44 mm incl. silicone molded seal XU Weld spud 75 mm, AISI 316L
PMC45									Order code

→ For continuation of ordering information of PMC45, see the following page.

PMC45 (continued)

80								Sensor seal:	
								1	FKM Viton
								2	HNBR (FDA)
								4	EPDM (FDA)
								C	Chemraz
								7	Kalrez
								A	FKM Viton, oil + grease free
PMC45								Complete order code	



**PMP41**

<b>10</b>	<b>Approval:</b>				
	R	For non-hazardous areas			
	G	ATEX II 1/2 G EEx ia IIC T6			
	F	ATEX II 1 G EEx ia IIC T6			
	H	ATEX II 2 G EEx ia IIC T6			
	N	ATEX II 3 G EEx nA II T5			
	J	ATEX II 1/2 D1/2G EEx ia IIC T6			
	K	ATEX II 1/2 D EEx ia II T6			
	L	ATEX II 1/3 D			
	C	CSA General Purpose			
	S	CSA IS, Class I, II, III Division 1, Groups A - G			
	T	CSA XP, Class I, II, III Division 1, Groups E - G (dust Ex); Class I Division 2, Groups A - D			
	P	FM IS, Class I, II, III Division 1, Groups A - G			
	M	FM DIP, Class I, II, III Division 1, Groups E - G			
	D	IECEx Zone 0/1 Ex ia IIC T6			
	V	TIS IS Ex ia IIC T6			
	<b>20</b>	<b>Housing; Electrical connection:</b>			
		E1	AISI 316L; gland M20, IP 66		
		C1	AISI 316L; thread NPT 1/2, IP 66		
		G1	AISI 316L; thread G 1/2, IP 66		
H1		AISI 316L; plug Han7D, IP 65			
L1		AISI 316L; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)			
K1		AISI 316L; cable 5 m, IP 68 + atmospheric pressure compensation			
E2		Aluminum; gland M20, IP 66			
C2		Aluminum; thread NPT 1/2, IP 66			
G2		Aluminum; thread G 1/2, IP 66			
H2		Aluminum; plug Han7D, IP 65			
L2		Aluminum; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)			
K2		Aluminum; cable 5 m, IP 68 + atmospheric pressure compensation			
<b>30</b>		<b>Sensor range; MWP; OPL:</b>			
		<b>Sensor range</b>	<b>MWP (maximum working pressure)</b>	<b>OPL (over pressure limit)</b>	
		<b>Sensors for gauge pressure</b>			
	3H	0 to 1 bar/100 kPa/15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi	
	3M	0 to 4 bar/400 kPa/60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi	
	3P	0 to 10 bar/1 MPa/150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi	
	3S	0 to 40 bar/4 MPa/600 psi g	106.7 bar/10.67 MPa/1600 psi	160 bar/16 MPa/24000 psi	
	3U	0 to 100 bar/10 MPa/1500 psi g	100 bar/10 MPa/1500 psi	400 bar/40 MPa/6000 psi	
	3Z	0 to 400 bar/40 MPa/6000 psi g	400 bar/40 MPa/6000 psi	600 bar/60 MPa/9000 psi	
		<b>Sensors for negative gauge pressure</b>			
	7H	-1 to 1 bar/-100 to 100 kPa/-15 to 15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi	
	7M	-1 to 4 bar/-100 to 400 kPa/-15 to 60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi	
	7P	-1 to 10 bar/-0.1 to 1 MPa/-15 to 150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi	
		<b>Sensors for absolute pressure</b>			
	4H	0 to 1 bar/100 kPa/15 psi abs.	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi	
	4M	0 to 4 bar/400 kPa/60 psi abs.	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi	
	4P	0 to 10 bar/1 MPa/150 psi abs.	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi g	
	4S	0 to 40 bar/4 MPa/600 psi abs.	106.7 bar/10.67 MPa/ 1600 psi	160 bar/16 MPa/24000 psi	
	4U	0 to 100 bar/10 MPa/1500 psi abs.	100 bar/10 MPa/ 1500 psi	400 bar/40 MPa/6000 psi	
	4Z	0 to 400 bar/40 MPa/6000 psi abs.	400 bar/40 MPa/6000 psi	600 bar/60 MPa/9000 psi	
	<b>40</b>	<b>Calibration; Unit:</b>			
		1	0.2% sensor range; mbar/bar		
2		0.2% sensor range; kPa/MPa			
3		0.2% sensor range; mm/mH <sub>2</sub> O			
4		0.2% sensor range; inH <sub>2</sub> O/ftH <sub>2</sub> O			
5		0.2% sensor range; kgf/cm <sup>2</sup>			
6		0.2% sensor range; psi			
B		0.2% see additional specification			
C	0.1% see additional specification				
D	DKD certificate; see additional specification				
PMP41				Order code	

→ For continuation of ordering information of PMP41, see the following page.

## PMP41 (continued)

50									<b>Output; Operation:</b>	
									A	4 to 20 mA analog; without display
									C	4 to 20 mA analog; bar graph
									H	4 to 20 mA HART; without display
									J	4 to 20 mA HART; 4-digit pressure display + bar graph
									P	PROFIBUS PA; without display
									R	PROFIBUS PA; display 4-digit pressure display + bar graph
									W	Without electronics; without display
60									<b>Additional option:</b>	
									1	Basic version
									2	Mounting bracket, wall/pipe
									F	Cleaned for silicone-free service
									C	EN10204 3.1 (wetted) inspection certificate
									S	GL/RINA marine approval
									U	SIL 2/IEC61508/IEC61511 Declaration of conformity
70									<b>Process connection:</b>	
									<b>Threaded connection</b>	
									1M	Thread ISO 228 G1/2, AISI 316L
									1D	Thread ISO 228 G1/2 seal O-ring, AISI 316L, flush-mounted, for adapter with order number: 52002643
									1F	Thread ISO 228 G1/2 seal DIN 3852, AISI 316L, flush-mounted
									1G	Thread ANSI 1/2 MNPT bore 11.4 mm, AISI 316L
									1X	Thread ANSI 1/2 FNPT, AISI 316L
									1S	Thread JIS B0202 G1/2 (male), AISI 316L
									1K	Thread JIS B0203 R1/2 (male) bore 11.4 mm, AISI 316L
									1T	Thread DIN13 M 20x1.5, AISI 316L
80									<b>Seal; Fill fluid:</b>	
									1	FKM Viton; mineral oil
									4	FKM Viton, inert oil, oil + grease free
									F	NBR; mineral oil (FDA)
									H	FKM Viton; mineral oil (FDA)
									P	FTFE; mineral oil
									A	Welded; mineral oil
									C	Welded; inert oil, oxygen service
									D	Welded, inert oil, oil + grease free
PMP41										Complete order code

**PMP45**

<b>10</b>		<b>Approval:</b>			
	R	For non-hazardous areas			
	G	ATEX II 1/2 G EEx ia IIC T6			
	F	ATEX II 1 G EEx ia IIC T6			
	H	ATEX II 2 G EEx ia IIC T6			
	N	ATEX II 3 G EEx nA II T5			
	J	ATEX II 1/2 D 1/2G EEx ia IIC T6			
	K	ATEX II 1/2 D EEx ia IIC T6			
	L	ATEX II 1/3 D			
	C	CSA General Purpose			
	S	CSA IS, Class I, II, III Division 1, Groups A - G			
	T	CSA XP, Class II, III, Division 1, Groups E - G (dust Ex), Class I, Division 2, Groups A- D			
	P	FM IS, Class I, II, III, Division 1, Groups A - G			
	M	FM DIP, Class II, III Division 1, Groups E - G			
	D	IECEx Zone 0/1 Exia IIC T6			
	V	TIS IS, Ex ia IIC T6			
<b>20</b>		<b>Housing; Electrical connection:</b>			
	E1	AISI 316L; gland M20, IP 66			
	C1	AISI 316L; thread NPT 1/2, IP 66			
	G1	AISI 316L; thread G 1/2, IP 66			
	H1	AISI 316L; plug Han7D, IP 65			
	L1	AISI 316L; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)			
	K1	AISI 316L; cable 5 m, IP 68 + atmospheric pressure compensation			
	E2	Aluminum; gland M20, IP 66			
	C2	Aluminum; thread NPT 1/2, IP 66			
	G2	Aluminum; thread G 1/2, IP 66			
	H2	Aluminum; plug Han7D, IP 65			
	L2	Aluminum; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)			
	K2	Aluminum; cable 5 m, IP 68 + atmospheric pressure compensation			
<b>30</b>		<b>Sensor range; MWP; OPL:</b>			
		<b>Sensor range</b>	<b>MWP (maximum working pressure)</b>	<b>OPL (over pressure limit)</b>	
		<b>Sensors for gauge pressure</b>			
	3H	0 to 1 bar/100 kPa/15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi	
	3M	0 to 4 bar/400 kPa/60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi	
	3P	0 to 10 bar/1 MPa/150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi	
	3S	0 to 40 bar/4 MPa/600 psi g	106.7 bar/10.67 MPa/1600 psi	160 bar/16 MPa/24000 psi	
	3U	0 to 100 bar/10 MPa/1500 psi g	100 bar/10 MPa/1500 psi	400 bar/40 MPa/6000 psi	
	3Z	0 to 400 bar/40 MPa/6000 psi g	400 bar/40 MPa/6000 psi	600 bar/60 MPa/9000 psi	
		<b>Sensors for negative gauge pressure</b>			
	7H	-1 to 1 bar/-100 to 100 kPa/-15 to 15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi	
	7M	-1 to 4 bar/-100 to 400 kPa/-15 to 60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi	
	7P	-1 to 10 bar/-0.1 to 1 MPa/-15 to 150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi	
		<b>Sensors for absolute pressure</b>			
	4H	0 to 1 bar/100 kPa/15 psi abs.	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi	
	4M	0 to 4 bar/400 kPa/60 psi abs.	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi	
	4P	0 to 10 bar/1 MPa/150 psi abs.	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi g	
	4S	0 to 40 bar/4 MPa/600 psi abs.	106.7 bar/10.67 MPa/1600 psi	160 bar/16 MPa/24000 psi	
	4U	0 to 100 bar/10 MPa/1500 psi abs.	100 bar/10 MPa/1500 psi	400 bar/40 MPa/6000 psi	
	4Z	0 to 400 bar/40 MPa/6000 psi abs.	400 bar/40 MPa/6000 psi	600 bar/60 MPa/9000 psi	
<b>40</b>		<b>Calibration; Unit:</b>			
	1	0.2% sensor range; mbar/bar			
	2	0.2% sensor range; kPa/MPa			
	3	0.2% sensor range; mm/mH <sub>2</sub> O			
	4	0.2% sensor range; inH <sub>2</sub> O/ftH <sub>2</sub> O			
	5	0.2% sensor range; kgf/cm <sup>2</sup>			
	6	0.2% sensor range; psi			
	B	0.2% see additional specification			
	C	0.1% see additional specification			
	D	DKD certificate; see additional specification			
PMP45					Order code

→ For continuation of ordering information of PMP45, see the following page.

## PMP45 (continued)

50					<b>Output; operation:</b>
	A				4 to 20 mA analog; without display
	C				4 to 20 mA analog; bar graph
	H				4 to 20 mA HART; without display
	J				4 to 20 mA HART; 4-digit pressure display + bar graph
	P				PROFIBUS PA; without display
	R				PROFIBUS PA; 4-digit pressure display + bar graph
W				Without electronics; without display	
60					<b>Additional option:</b>
	1				Basic version
	C				EN10204-3.1 (wetted) inspection certificate
	S				GL (German Lloyd) marine certificate
	U				SIL 2/IEC61508/IEC61511 Declaration of conformity
70					<b>Process connection:</b>
					Threaded connection
	CD				Thread ISO 228 G1 metal taper seal, AISI 316L, 3A, flush-mounted, for adapter with order number: 52005087
	BB				Thread ANSI MNPT 3/4, AISI 316L, flush-mounted
					Clamp connections
	DA				Clamp ISO 2852 DN 22 (3/4"), DIN 32676 DN 20, AISI 316L, 3A
	DB				Tri-Clamp, ISO 2852 DN 25 – 38 (1 – 1 1/2"), DIN 32676 DN 25 – 40, AISI 316L, 3A,
	DL				Tri-Clamp, ISO 2852 DN 40 – 51 (2"), DIN 32676 DN 50, AISI 316L, 3A
					Hygienic connections
	EB				SMS 1" PN 25, AISI 316L, 3A
	EG				SMS 1 1/2" PN 25, AISI 316L, 3A
	LB				Varivent F for pipes DN 25 – 32 PN 40, AISI 316L, 3A
	LG				Varivent B for pipes DN 10 – 15 PN 40, AISI 316L, 3A
	AB				DIN 11851 DN 25 PN 40, AISI 316L, 3A
80					<b>Diaphragm, Fill fluid:</b>
	A				AISI 316L, mineral oil (only for process connection BB)
	F				AISI 316L, mineral oil (FDA)
PMP45					Complete order code

**PMP46**

<b>10</b>	<b>Approval:</b>			
	R	For non-hazardous areas		
	G	ATEX II 1/2 G EEx ia IIC T6		
	F	ATEX II 1 G EEx ia IIC T6		
	H	ATEX II 2 G EEx ia IIC T6		
	N	ATEX II 3 G EEx nA II T5		
	J	ATEX II 1/2 D 1/2G EEx ia IIC T6		
	K	ATEX II 1/2 D EEx ia IIC T6		
	L	ATEX II 1/3 D		
	C	CSA General Purpose		
	S	CSA IS, Class I, II, III Division 1, Groups A – G		
	T	CSA XP, Class II, III, Division 1, Groups E – G (dust Ex), Class I, Division 2, Groups A – D		
	P	FM IS, Class I, II, III, Division 1, Groups A – G		
	M	FM DIP, Class II, III Division 1, Groups E – G		
	D	IECEx Zone 0/1 Ex ia IIC T6		
	V	TIS IS, Ex ia IIC T6		
<b>20</b>	<b>Housing; Electrical connection:</b>			
	E1	AISI 316L; gland M20, IP 66		
	C1	AISI 316L; thread NPT 1/2, IP 66		
	G1	AISI 316L; thread G 1/2, IP 66		
	H1	AISI 316L; plug Han7D, IP 65		
	L1	AISI 316L; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
	K1	AISI 316L; cable 5 m, IP 68 + atmospheric pressure compensation		
	E2	Aluminum; gland M20, IP 66		
	C2	Aluminum; thread NPT 1/2, IP 66		
	G2	Aluminum; thread G 1/2, IP 66		
	H2	Aluminum; plug Han7D, IP 65		
	L2	Aluminum; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
	K2	Aluminum; cable 5 m, IP 68 + atmospheric pressure compensation		
<b>30</b>	<b>Sensor range; MWP; OPL:</b>			
		<b>Sensor range</b>	<b>MWP (maximum working pressure)</b>	<b>OPL (over pressure limit)</b>
		<b>Sensors for gauge pressure</b>		
	3H	0 to 1 bar/100 kPa/15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	3M	0 to 4 bar/400 kPa/60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi
	3P	0 to 10 bar/1 MPa/150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
	3S	0 to 40 bar/4 MPa/600 psi g	106.7 bar/10.67 MPa/1600 psi	160 bar/16 MPa/24000 psi
		<b>Sensors for negative gauge pressure</b>		
	7H	-1 to 1 bar/-100 to 100 kPa/-15 to 15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	7M	-1 to 4 bar/-100 to 400 kPa/-15 to 60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi
	7P	-1 to 10 bar/-0.1 to 1 MPa/-15 to 150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
		<b>Sensors for absolute pressure</b>		
	4H	0 to 1 bar/100 kPa/15 psi abs.	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	4M	0 to 4 bar/400 kPa/60 psi abs.	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi
	4P	0 to 10 bar/1 MPa/150 psi abs.	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi g
	4S	0 to 40 bar/4 MPa/600 psi abs.	106.7 bar/10.67 MPa/ 1600 psi	160 bar/16 MPa/24000 psi
<b>40</b>	<b>Calibration; Unit:</b>			
	1	0.2% sensor range; mbar/bar		
	2	0.2% sensor range; kPa/MPa		
	3	0.2% sensor range; mm/mH <sub>2</sub> O		
	4	0.2% sensor range; inH <sub>2</sub> O/ftH <sub>2</sub> O		
	5	0.2% sensor range; kgf/cm <sup>2</sup>		
	6	0.2% sensor range; psi		
	B	0.2% see additional specification		
	D	DKD certificate; see additional specification		
PMP46				Order code

→ For continuation of ordering information of PMP46, see the following page.

## PMP46 (continued)

50					<b>Output; Operation:</b>
	A				4 to 20 mA analog; without display
	C				4 to 20 mA analog; bar graph
	H				4 to 20 mA HART; without display
	J				4 to 20 mA HART; 4-digit pressure display + bar graph
	P				PROFIBUS PA; without display
	W				Without electronics; without display
60					<b>Additional option:</b>
	1				Basic version
	2				Mounting bracket, wall/pipe
	C				EN10204-3.1 material (wetted) inspection certificate
	P				Ra < 0.4 µm/15.75 µin (240 grit), electropolished + EN10204-3.1 material (wetted) inspection certificate; in conjunction with process connection versions "DG", "DL" and "LL"; please order roughness confirmation separately
	S				GL (German Lloyd) marine certificate
	U				SIL 2/IEC61508/IEC61511 Declaration of conformity
70					<b>Process connection:</b>
	<b>Clamp connections</b>				
	DF				Tri-Clamp, ISO 2852 DN 25 (1"), DIN 32676 DN 25, AISI 316L, 3A
	DG				Tri-Clamp, ISO 2852 DN 38 (1 1/2"), DIN 32676 DN 40, AISI 316L, 3A
	DL				Tri-Clamp, ISO 2852 DN 51 (2"), DIN 32676 DN 50, AISI 316L, 3A
	DU				Tri-Clamp, ISO 2852 DN 76.1 (3"), AISI 316L, 3A
	<b>Clamp pipe diaphragm seal (RDM)</b>				
	SA				Tri-Clamp DN 10 (3/4") RDM, AISI 316L, 3A
	SB				Tri-Clamp ISO 2852 DN 25 (1") RDM, AISI 316L, 3A
	SG				Tri-Clamp, ISO 2852 DN 38 (1 1/2") RDM, AISI 316L, 3A, 3.1 + pressure test PED
	SL				Tri-Clamp, ISO 2852 DN 51 (2 ") RDM, AISI 316L, 3A, 3.1 + pressure test PED Cat. II
	<b>Hygienic connections</b>				
	EG				SMS 1 1/2" PN 25, AISI 316L, 3A
	EL				SMS 2" PN 25, AISI 316L, 3A
	FG				APV-RJT 1 1/2" PN 40, AISI 316L, 3A
	FL				APV-RJT 2" PN 40, AISI 316L, 3A
	GG				APV-ISS 1 1/2" PN 40, AISI 316L, 3A
	GL				APV-ISS 2" PN 40, AISI 316L, 3A
	KL				DRD 65 mm PN 25, AISI 316L, 3A
	LB				Varivent F for pipes DN 25 – 32 PN 40, AISI 316L, 3A
	LL				Varivent N for pipes DN 40 – 162 PN 40, AISI 316L, 3A
	AG				DIN 11851 DN 32 PN 40, AISI 316L, 3A
	AH				DIN 11851 DN 40 PN 40, AISI 316L, 3A
	AL				DIN 11851 DN 50 PN 25, AISI 316L, 3A
	<b>Hygienic pipe diaphragm seal (RDM)</b>				
	PB				DIN 11851 DN 25 PN 40 RDM, AISI 316L, 3A
	PH				DIN 11851 DN 40 PN 40 RDM, AISI 316L, 3A
PL				DIN 11851 DN 50 PN 40 RDM, AISI 316L, 3A	
PMP46					Order code

→ For continuation of ordering information of PMP46, see the following page.

PMP46 (continued)

80	Transmitter mounting; fill fluid:
A	Direct; silicone oil
D	Direct; vegetable oil (FDA)
E	Direct; glycerine
N	Oxygen service; inert oil
L	Temperature isolator; vegetable oil (FDA)
G	Temperature isolator; high-temperature oil
K	1 m capillary; high-temperature oil
O	1 m capillary; silicone oil
P	1 m capillary; vegetable oil (FDA)
H	..... m capillary; high-temperature oil (capillary > 1 m, only as of DN 50/2"; capillary length: 1 – 10 m, price independent of length)
M	..... m capillary; low-temperature oil (capillary > 1 m, only as of DN 50/2"; capillary length: 1 – 10 m, price independent of length)
F	..... m capillary; vegetable oil (FDA) (capillary > 1 m, only as of DN 50/2"; capillary length: 1 – 10 m, price independent of length)
J	..... m capillary; silicone oil (capillary > 1 m, only as of DN 50/2"; capillary length: 1 – 10 m, price independent of length)
R	..... ft capillary; high-temperature oil (capillary > 3 ft, only as of DN 50/2"; capillary length: 3 – 33 ft, price independent of length)
U	..... ft capillary; low-temperature oil (capillary > 3 ft, only as of DN 50/2"; capillary length: 3 – 33 ft, price independent of length)
S	..... ft capillary; vegetable oil (FDA) (capillary > 3 ft, only as of DN 50/2"; capillary length: 3 – 33 ft, price independent of length)
T	..... ft capillary; silicone oil (capillary > 3 ft, only as of DN 50/2"; capillary length: 3 – 33 ft, price independent of length)
PMP46	Complete order code

PMP48

10	<b>Approval:</b>			
	R	For non-hazardous areas		
	G	ATEX II 1/2 G EEx ia IIC T6		
	F	ATEX II 1 G EEx ia IIC T6		
	H	ATEX II 2 G EEx ia IIC T6		
	N	ATEX II 3 G EEx nA II T5		
	J	ATEX II 1/2 D 1/2G EEx ia IIC T6		
	K	ATEX II 1/2 D EEx ia IIC T6		
	L	ATEX II 1/3 D		
	C	CSA General Purpose		
	S	CSA IS, Class I, II, III Division 1, Groups A - G		
	T	CSA XP, Class II, III, Division 1, Groups E - G (dust Ex), Class I, Division 2, Groups A - D		
	P	FM IS, Class I, II, III, Division 1, Groups A - G		
	M	FM DIP, Class II, III Division 1, Groups E - G		
	D	IECEX Zone 0/1 Ex ia IIC T6		
	V	TIS IS, Ex ia IIC T6		
	20	<b>Housing; Electrical connection:</b>		
		E1	AISI 316L; gland M20, IP 66	
		C1	AISI 316L; thread NPT 1/2, IP 66	
		G1	AISI 316L; thread G 1/2, IP 66	
H1		AISI 316L; plug Han7D, IP 65		
L1		AISI 316L; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
K1		AISI 316L; cable 5 m, IP 68 + atmospheric pressure compensation		
E2		Aluminum; gland M20, IP 66		
C2		Aluminum; thread NPT 1/2, IP 66		
G2		Aluminum; thread G 1/2, IP 66		
H2		Aluminum; plug Han7D, IP 65		
L2		Aluminum; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)		
K2		Aluminum; cable 5 m, IP 68 + atmospheric pressure compensation		
30		<b>Sensor range; MWP; OPL:</b>		
		<b>Sensor range</b>	<b>MWP (maximum working pressure)</b>	<b>OPL (over pressure limit)</b>
	<b>Sensors for gauge pressure</b>			
	3H	0 to 1 bar/100 kPa/15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	3M	0 to 4 bar/400 kPa/60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi
	3P	0 to 10 bar/1 MPa/150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
	3S	0 to 40 bar/4 MPa/600 psi g	106.7 bar/10.67 MPa/1600 psi	160 bar/16 MPa/24000 psi
	3U	0 to 100 bar/10 MPa/1500 psi g	100 bar/10 MPa/1500 psi	400 bar/40 MPa/6000 psi
	3Z	0 to 400 bar/40 MPa/6000 psi g	400 bar/40 MPa/6000 psi	600 bar/60 MPa/9000 psi
	<b>Sensors for negative gauge pressure</b>			
	7H	-1 to 1 bar/-100 to 100 kPa/-15 to 15 psi g	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	7M	-1 to 4 bar/-100 to 400 kPa/-15 to 60 psi g	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi
	7P	-1 to 10 bar/-0.1 to 1 MPa/-15 to 150 psi g	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
	<b>Sensors for absolute pressure</b>			
	4H	0 to 1 bar/100 kPa/15 psi abs.	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
	4M	0 to 4 bar/400 kPa/60 psi abs.	10.7 bar/1.07 MPa/160 psi	16 bar/1.6 MPa/240 psi
	4P	0 to 10 bar/1 MPa/150 psi abs.	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi g
	4S	0 to 40 bar/4 MPa/600 psi abs.	106.7 bar/10.67 MPa/1600 psi	160 bar/16 MPa/24000 psi
	4U	0 to 100 bar/10 MPa/1500 psi abs.	100 bar/10 MPa/1500 psi	400 bar/40 MPa/6000 psi
	4Z	0 to 400 bar/40 MPa/6000 psi abs.	400 bar/40 MPa/6000 psi	600 bar/60 MPa/9000 psi
40	<b>Calibration; Unit:</b>			
	1	0.2% sensor range; mbar/bar		
	2	0.2% sensor range; kPa/MPa		
	3	0.2% sensor range; mm/mH <sub>2</sub> O		
	4	0.2% sensor range; inH <sub>2</sub> O/ftH <sub>2</sub> O		
	5	0.2% sensor range; kgf/cm <sup>2</sup>		
	6	0.2% sensor range; psi		
	B	0.2% see additional specification		
D	DKD certificate; see additional specification			
PMP48			Order code	

→ For continuation of ordering information of PMP48, see the following page.



PMP48 (continued)

<b>50</b>									<b>Output; Operation:</b> A 4 to 20 mA analog; without display C 4 to 20 mA analog; bar graph H 4 to 20 mA HART; without display J 4 to 20 mA HART; 4-digit pressure display + bar graph P PROFIBUS PA; without display R PROFIBUS PA; 4-digit display + bar graph W Without electronics; without display
<b>60</b>									<b>Additional option:</b> 1 Basic version 2 Mounting bracket, wall/pipe C EN10204 3.1 (wetted) inspection certificate S GL (German Lloyd) marine certificate U SIL 2/IEC61508/IEC61511 Declaration of conformity
<b>70</b>									<b>Process connection:</b> <b>Threaded connections</b> CA Thread ISO 228 G 1/2, AISI 316L, separator AF Thread ISO 228 G 1, AISI 316L AG Thread ISO 228 G 1 1/2, AISI 316L AR Thread ISO 228 G 2, AISI 316L DA Thread ANSI 1/2 NPT, AISI 316L, separator BF Thread ANSI 1 NPT, AISI 316L BG Thread ANSI 1 1/2 NPT, AISI 316L BR Thread ANSI 2 NPT, AISI 316L <b>EN flanges</b> EB DN 25 PN 10 – 40 B1, AISI 316L EC DN 25 PN 64 – 160 E, AISI 316L ED DN 25 PN 250 E, AISI 316L EF DN 25 PN 400 E, AISI 316L EK DN 50 PN 10-40 B1, AISI 316L EM DN 50 PN 63 B2, AISI 316L EN DN 50 PN 100-160 E, AISI 316L EP DN 50 PN 250 E, AISI 316L ER DN 50 PN 400 E, AISI 316L EU DN 80 PN 10 – 40 B1, AISI 316L <b>EN flanges with extended diaphragm seal</b> FK DN 50 PN 10 – 40 B1, AISI 316L, extended diaphragm seal 50 mm GK DN 50 PN 10 – 40 B1, AISI 316L, extended diaphragm seal 100 mm JK DN 50 PN 10 – 40 B1, AISI 316L, extended diaphragm seal 200 mm FU DN 80 PN 10 – 40 B1, AISI 316L, extended diaphragm seal 50 mm GU DN 80 PN 10 – 40 B1, AISI 316L, extended diaphragm seal 100 mm JU DN 80 PN 10 – 40 B1, AISI 316L, extended diaphragm seal 200 mm <b>ANSI flanges</b> KB 1" 150 lbs RF, AISI 316/316L KC 1" 300 lbs RF, AISI 316/316L KD 1" 400/600 lbs RF, AISI 316/316L KE 1" 900/1500 lbs RF, AISI 316/316L KF 1" 2500 lbs RF, AISI 316/316L KJ 2" 150 lbs RF, AISI 316/316L KK 2" 300 lbs RF, AISI 316/316L KL 2" 400/600 lbs RF, AISI 316/316L KM 2" 900/1500 lbs RF, AISI 316/316L KN 2" 2500 lbs RF, AISI 316/316L KU 3" 150 lbs RF, AISI 316/316L KV 3" 300 lbs RF, AISI 316/316L KW 4" 150 lbs RF, AISI 316/316L KX 4" 300 lbs RF, AISI 316/316L For continuation of "Process connection," see next page.
PMP48									Order code

PMP48 (continued)

70	<b>Process connection (continued):</b>
	<p><b>ANSI flanges with extended diaphragm seal</b></p> <p>LJ 2" 150 lbs RF, AISI 316/316L, extended diaphragm seal 2"                  MJ 2" 150 lbs RF, AISI 316/316L, extended diaphragm seal 4"                  NJ 2" 150 lbs RF, AISI 316/316L, extended diaphragm seal 6"                  LU 3" 150 lbs RF, AISI 316/316L, extended diaphragm seal 2"                  MU 3" 150 lbs RF, AISI 316/316L, extended diaphragm seal 4"                  NU 3" 150 lbs RF, AISI 316/316L, extended diaphragm seal 6"                  LW 4" 150 lbs RF, AISI 316/316L, extended diaphragm seal 2"                  MW 4" 150 lbs RF, AISI 316/316L, extended diaphragm seal 4"                  NW 4" 150 lbs RF, AISI 316/316L, extended diaphragm seal 6"</p> <p><b>JIS flanges</b></p> <p>RB 10K 25A RF, AISI 316L                  RJ 10K 50A RF, AISI 316L                  RU 10K 80A RF, AISI 316L</p>
80	<b>Transmitter mounting; Fill fluid:</b>
	<p>A Direct; silicone oil                  D Direct; vegetable oil (FDA)                  E Direct; glycerine                  N O<sub>2</sub> application; inert oil                  G Temperature isolator; high-temperature oil                  K 1 m capillary; high-temperature oil                  P 1 m capillary; vegetable oil (FDA)                  O 1 m capillary; silicone oil                  H ..... m capillary; high-temperature oil (capillary &gt; 1 m, only as of DN 50/2";                  Capillary length: 1 – 10 m, price independent of length)                  M ..... m capillary; low-temperature oil (capillary &gt; 1 m, only as of DN 50/2";                  Capillary length: 1 – 10 m, price independent of length)                  F ..... m capillary; vegetable oil (FDA) (capillary &gt; 1 m, only as of DN 50/2";                  Capillary length: 1 – 10 m, price independent of length)                  J ..... m capillary; silicone oil (capillary &gt; 1 m, only as of DN 50/2";                  Capillary length: 1 – 10 m, price independent of length)                  R ..... ft capillary; high-temperature oil (capillary &gt; 3 ft, only as of DN 50/2";                  Capillary length: 3 – 33 ft, price independent of length)                  U ..... ft capillary; low-temperature oil (capillary &gt; 3 ft, only as of DN 50/2";                  Capillary length: 3 – 33 ft, price independent of length)                  S ..... ft capillary; vegetable oil (FDA) (capillary &gt; 3 ft, only as of DN 50/2";                  Capillary length: 3 – 33 ft, price independent of length)                  T ..... m capillary; silicone oil (capillary &gt; 3 ft m, only as of DN 50/2";                  Capillary length: 3 – 33 ft, price independent of length)</p>
90	<b>Diaphragm material:</b>
	<p>Extended diaphragm seal versions only as 316L</p> <p>1 AISI 316L                  2 Alloy C276                  5 Tantalum                  7 AISI 316L with 0.09 PTFE foil (not for vacuum applications)                  8 AISI 316L with 0.25 PTFE foil (not for vacuum applications)</p>
PMP48	Complete order code

## Documentation

<b>Field of Activities</b>	<ul style="list-style-type: none"> <li>■ Pressure measurement, powerful measuring instruments for process pressure, differential pressure, level and flow: FA004P/00/en</li> </ul>
<b>Technical Information</b>	<ul style="list-style-type: none"> <li>■ EMC test procedures TI241F/00/en</li> </ul>
<b>Operating Instructions</b>	<ul style="list-style-type: none"> <li>■ Cerabar M (4 to 20 mA analog): BA200P/00/en</li> <li>■ Cerabar M (4 to 20 mA HART): BA201P/00/en</li> <li>■ Cerabar M (PROFIBUS PA): BA222P/00/en</li> </ul>
<b>Functional Safety Manual (SIL)</b>	<ul style="list-style-type: none"> <li>■ Cerabar M (4 to 20 mA HART): SD172P/00/en</li> </ul>

### Safety Instructions

Certificate/explosion protection	Device	Electronics	Documentation
ATEX II 1 G EEx ia IIC T6	PMC41, PMC45, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– XA297P</li> <li>– XA311P</li> </ul>
ATEX II 1/2 G EEx ia IIC T6 or ATEX II 2 G EEx ia IIC T6	PMC41, PMC45, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA</li> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– XA039P</li> <li>– XA039P</li> <li>– XA096P</li> </ul>
ATEX II 1/2 G 1/2 D EEx ia IIC T6	PMC41, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– XA309P</li> <li>– XA310P</li> </ul>
ATEX II 1/3 D	PMC41, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA</li> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– XA040P</li> <li>– XA040P</li> <li>– XA098P</li> </ul>
ATEX II 3 G EEx nA T5	PMC41, PMC45, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA</li> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– XA052P</li> <li>– XA052P</li> <li>– XA052P</li> </ul>
ATEX II 1/2 D EEx ia T6	PMC41, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– XA038P</li> <li>– XA097P</li> </ul>

Certificate/explosion protection	Device	Electronics	Documentation
IECEx Zone 0/1 Ex ia IIC T6	PMC41, PMC45, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4...20 mA HART</li> </ul>	<ul style="list-style-type: none"> <li>– XB013P</li> </ul>

### Installation/Control Drawings

Certificate/explosion protection	Device	Electronics	Documentation
FM IS Class I, II, III, Division 1, Groups A – G	PMC41, PMC45, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA</li> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– ZD039P</li> <li>– ZD039P</li> <li>– ZD052P</li> </ul>
CSA IS Class I, II, III, Division 1, Groups A – G	PMC41, PMC45, PMP41, PMP45, PMP46, PMP48	<ul style="list-style-type: none"> <li>– 4 to 20 mA</li> <li>– 4 to 20 mA HART</li> <li>– PROFIBUS PA</li> </ul>	<ul style="list-style-type: none"> <li>– ZD040P</li> <li>– ZD040P</li> <li>– ZD051P</li> </ul>

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