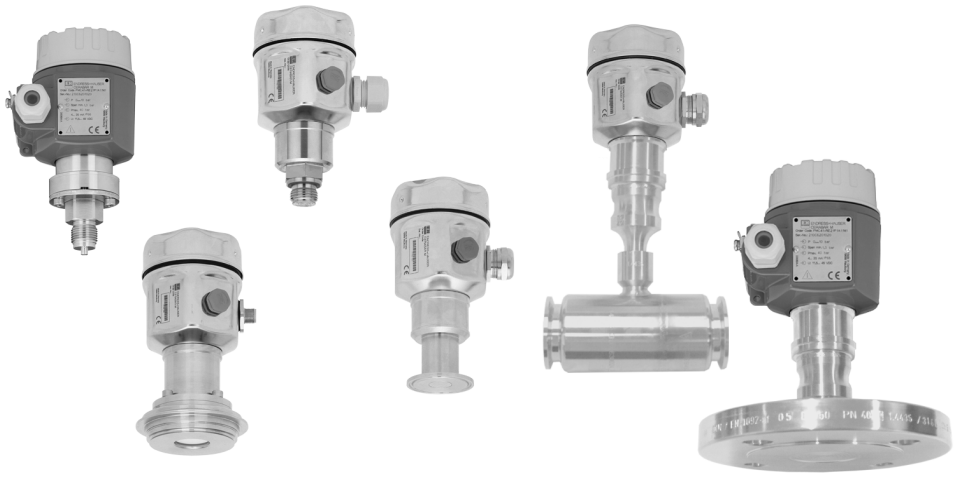
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

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

Process pressure measurement
Pressure transmitter with ceramic and metal sensors
Overload-resistant and function-monitored
With Analog, HART or PROFIBUS PA Electronics



Application

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

Your benefits

- Performance characteristics
  - Reference accuracy better than 0.2% of the set measuring range (optional: non-linearity better than 0.1%)
  - Configurable measuring range up to TD 10:1
  - Long-term stability better than 0.25 % / 3 years
- 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 with no dead space, Cerabar M meets the hygienic requirements of the food and pharmaceutical industries.
  The coated aluminum housing has already stood the test of time in the process industry.
- Device versions compliant with ASME-BPE

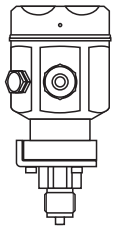
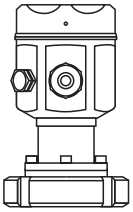
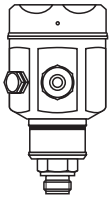
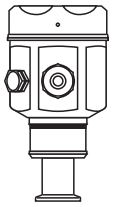
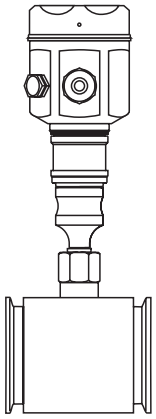
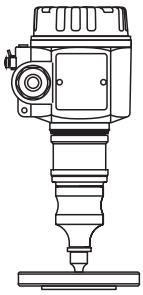
TI399P/00/en/06.08
71064497

Endress+Hauser

People for Process Automation

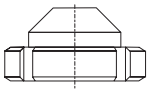
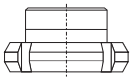
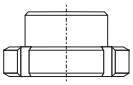
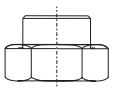
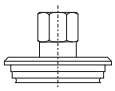
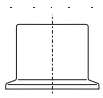
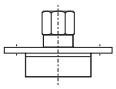
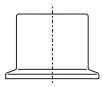
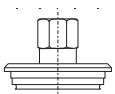
Function and system design

Device selection

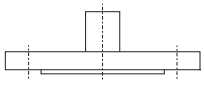
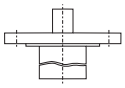
Cerabar M – product family	**PMC41**  P01-PMC41xxx-16-xx-xx-xx-000	**PMC45**  P01-PMC45xxx-16-xx-xx-xx-000	**PMP41**  P01-PMP41xxx-16-xx-xx-xx-000	**PMP45**  P01-PMP45xxx-16-xx-xx-xx-000	**PMP46**  P01-PMP46xxx-16-xx-xx-xx-000	**PMP48**  P01-PMP48xxx-16-xx-xx-xx-000
	With capacitance measuring cell and ceramic measuring diaphragm (Ceraphire®)		**With piezoresistive measuring cell and metal measuring diaphragm**		**With piezoresistive measuring cell, and diaphragm seal**	
Field of application	Absolute pressure and overpressure					
Process connections	Threaded connections	Flush-mounted hygienic connections	Threaded connections	Flush-mounted hygienic connections	Hygiene diaphragm seal, diaphragm seals compliant 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			
Overpressure limit (OPL) [1]	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	-70 to +400°C (–40 to +212°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 superimposed HART protocol, PROFIBUS PA					
Options	– 3.1 Inspection certificate – Materials compliant with FDA – Mounting bracket	– 3.1 Inspection certificate – Materials compliant with FDA	– 3.1 Inspection certificate – Materials compliant with FDA – Mounting bracket	– 3.1 Inspection certificate – Materials compliant with FDA	– 3.1 Inspection certificate – Materials compliant with FDA – Temperature isolator – Electropolished surface – Mounting bracket	
Specialties	– Flexibility thanks to modular design – Large selection of approvals, including ATEX, FM and CSA – Wide range of cable entries, cable glands and connectors – Choice of robust housing made of stainless steel (AISI 316L) or coated aluminum housing for strict hygienic requirements – Electropolished wetted surfaces – Dry ceramic cell (without fill fluid), resistant to abrasion and corrosion, compliant with FDA: Ceraphire® – Special cleaning of the transmitter to remove paint-wetting impairment substances, for use in paint shops					

1) Depends on the element of the selected components which has the lowest pressure rating

Overview of diaphragm seals for PMP46

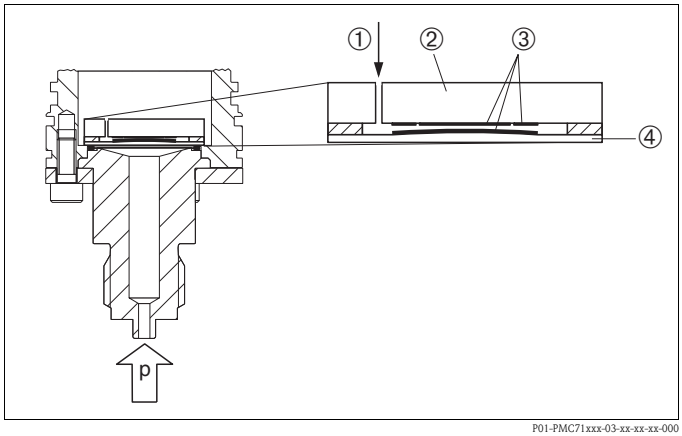
Design	Diaphragm seal	Connection	Version	Standard	Nominal diameter	Nominal pressure/ Class
Hygienic version	Membrane diaphragm seal (MDM)	Nozzle with coupling nut	 P01-PMP46xxx-03-xx-xx-xx-000	DIN 11851	– DN 32 – DN 40 – DN 50	– PN 40 – PN 40 – PN 25
			 P01-PMP46xxx-03-xx-xx-xx-001	SMS	– 1 1/2" – 2"	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		DN50 (65 mm)	PN 25
	Pipe diaphragm seal (RDM)	Threaded adapter	 P01-PMP46xxx-03-xx-xx-xx-007	DIN 11851	– DN 25	PN 40
					– DN 40	PN 40
					– DN 50	PN 25
		Clamp	 P01-PMP46xxx-03-xx-xx-xx-008	ISO 2852	– DN 10 (3/4") – DN 16 (3/4") – DN 25 (1") – DN 38 (1 1/2") – DN 51 (2")	Dependent on the clamp used
Versions compliant with ASME-BPE for use in biotechnical processes; wetted surfaces $R_a \leq 0.4$ *m (15.75 *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

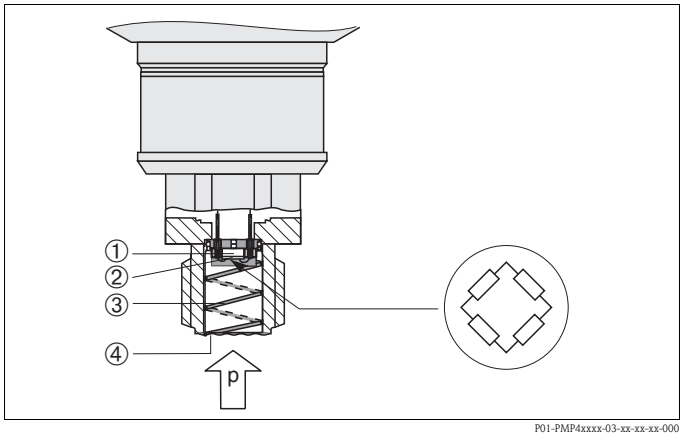
Ceramic measuring diaphragm used for PMC41 and PMC45 (Ceraphire®)



Ceramic sensor

① *Air pressure (overpressure sensors)*
② *Ceramic carrier*
③ *Electrodes*
④ *Ceramic diaphragm*

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



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 99.9% high-purity ceramic (Ceraphire®, → see also 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)

Metal 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 in 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 even 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 in 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 ±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 Guidelines (Profibus User Organization).

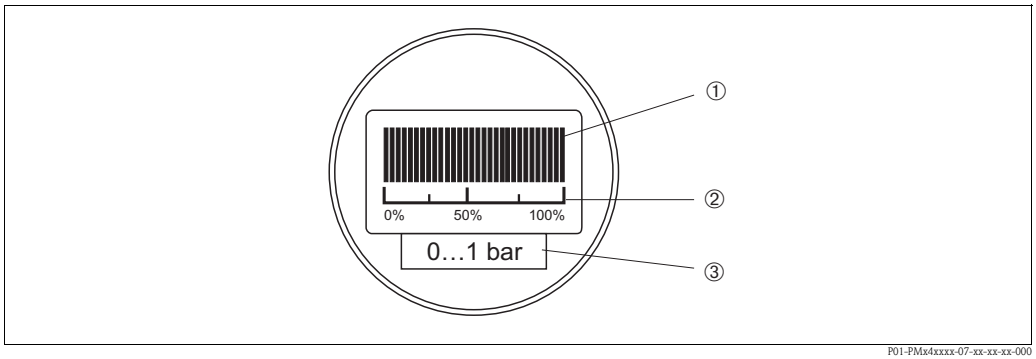
Human interface

Onsite display (optional)

Analog display for devices with analog electronics

A plug-in liquid crystal display (LCD), with a bar graph for showing the current (30 segments), is used as the display unit. The display can be rotated in 90° stages.

Functions:
- Bar graph to indicate the 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).



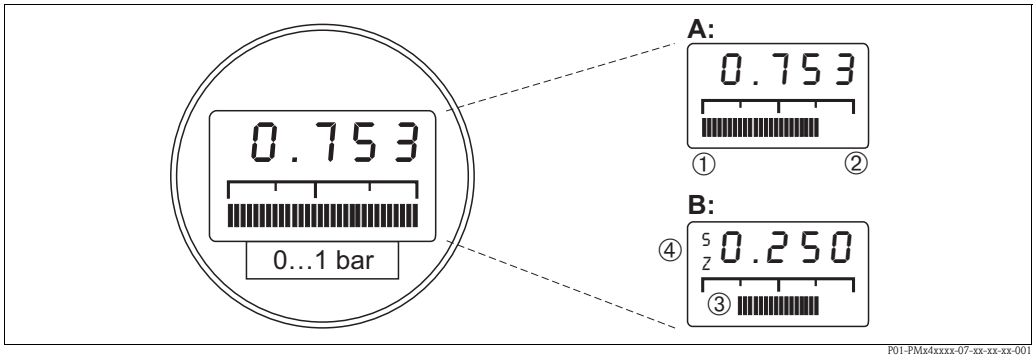
Onsite display for devices with analog electronics

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

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

A plug-in digital display, with a 4-digit pressure display and bar graph (28 segments), is used as the display unit. 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.
- Easy diagnosis by displaying an error code



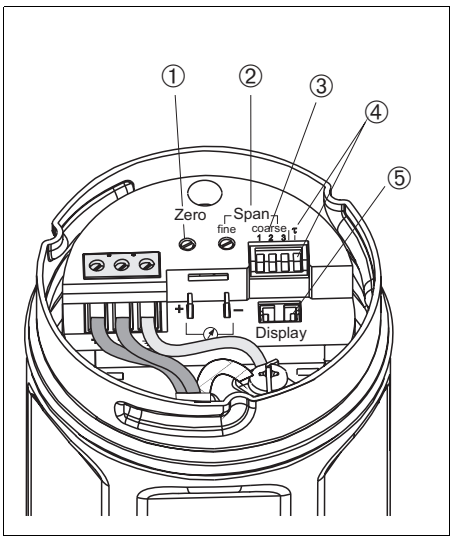
Onsite display for devices with 4 to 20 mA HART or PROFIBUS PA electronics

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 value*
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

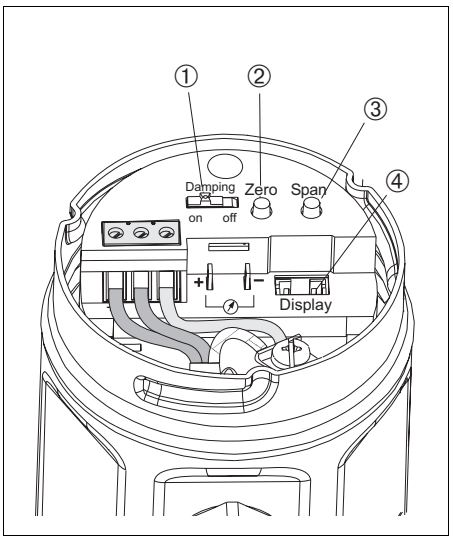
The operating elements are located under the optional onsite display on the electronic insert.



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

Analog electronic insert

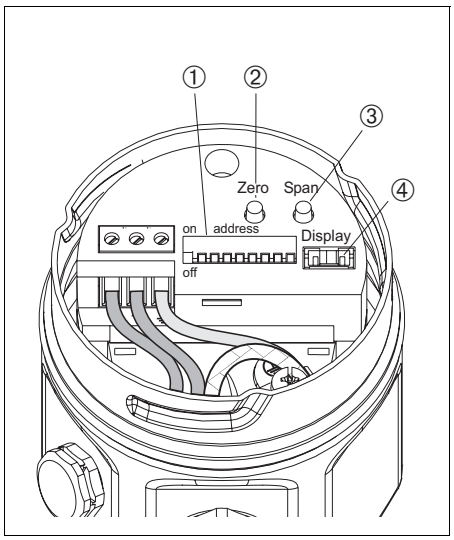
① *Potentiometer for calibrating the lower-range value (Zero)*
② *Potentiometer for fine adjustment of the span*
③ *DIP switches 1 to 3 for coarse adjustment of the span*
④ *DIP switch for damping on/off*
⑤ *Slot for optional onsite display*



P01-PMx4xxxx-19-xx-xx-xx-001

4 to 20 mA HART electronic insert

① *Switch for damping on/off*
② *Key for calibrating the lower-range value (Zero)*[1]
③ *Key for calibrating the upper-range value (Span)*[2]
④ *Slot for optional onsite display*



P01-PMx4xxxx-19-xx-xx-xx-002

PROFIBUS PA electronic insert

① *DIP switches for bus address*
② *Key for calibrating the lower-range value (Zero)*[1]
③ *Key for calibrating the upper-range value (Span)*[2]
④ *Slot for optional onsite display*

1) Lower-range value (LRV) = Zero

2) Upper-range value (URV) = Span

Onsite operation

4 to 20 mA functions

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

4 to 20 mA HART functions

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

PROFIBUS PA functions

- Calibrating the display value on the onsite display to zero
- Setting the 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 Endress+Hauser's plant asset management tool which is based on FDT technology. With FieldCare, you can configure all of Endress+Hauser devices, as well as devices from other manufacturers that support the FDT standard.

FieldCare supports the following functions:
- Configuration of transmitters in offline and online mode
- Loading and saving device data (upload/download)
- Documentation of the measuring point

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

For more information, see → www.endress.com.

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 shows the most important parameters.

Commuwin II supports the following functions:
- Configuration of measuring devices in online mode via matrix operation
- Loading and saving device data (upload/download)
- Visualization of measured values and limit values
- Presentation and recording of measured values with a line recorder

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

Input

Measured variable

Absolute pressure or overpressure

Measuring range

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

Nominal value	Measurement limits		Smallest span that can be calibrated	OPL [1]	MWP [2]	Vacuum resistance	Version in the order code [3]
	lower (LRL)	upper (URL)					
	[bar]	[bar]	[bar]	[bar]	[bar]	[bar_{abs}]	
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 overpressure

Nominal value	Measurement limits		Smallest span that can be calibrated	OPL [1]	MWP [2]	Vacuum resistance	Version in the order code [3]
	lower (LRL)	upper (URL)					
	[bar]	[bar]	[bar]	[bar]	[bar]	[bar_{abs}]	
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		Smallest span that can be calibrated	OPL [1]	MWP [2]	Vacuum resistance	Version in the order code [3]
	lower (LRL)	upper (URL)					
	[bar_{abs}]	[bar_{abs}]	[bar]	[bar_{abs}]	[bar_{abs}]	[bar_{abs}]	
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: overpressure limit

2) The MWP (maximum working pressure) for the measuring device depends on the element of the selected components which has the lowest pressure rating, i.e. the process connection (→ see Page 31 ff) has to be taken into consideration in addition to the measuring cell (→ see Table above). Please also observe the pressure-temperature dependencies. For the appropriate standards and further information, see Page 30, "Pressure specifications" section.

3) Version in the order code → see also Page 67 ff, feature 30 "Sensor range; MWP, OPL"

Explanation of terms

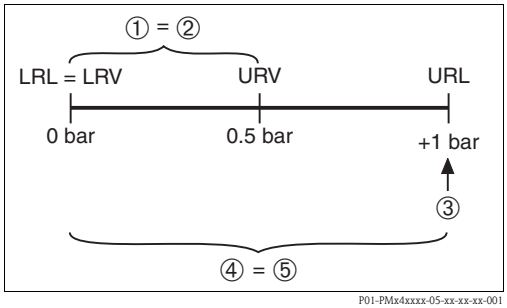
Explanation of terms: turn down (TD), set span and span based on zero point

Case 1:
- |Lower-range value (LRV)| ≤ |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.



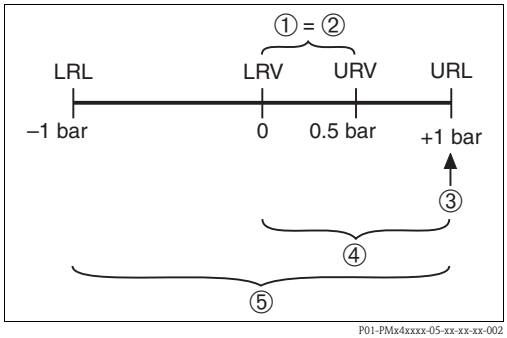
Example: 1 bar measuring cell

Case 2:
- |Lower-range value (LRV)| ≤ |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.



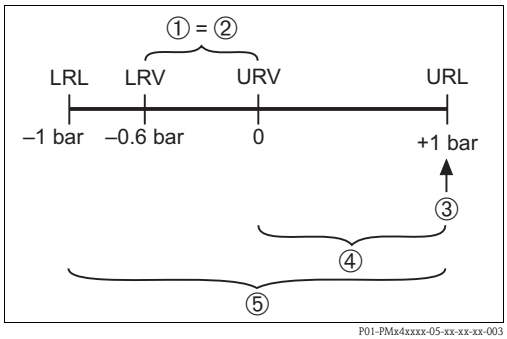
Example: 1 bar measuring cell

Case 3:
- |Lower-range value (LRV)| ≥ |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.



Example: 1 bar measuring cell

① *Set span*
② *Span based on zero point*
③ *Nominal value ≙ upper-range limit (URL)*
④ *Nominal measuring range*
⑤ *Sensor measuring range*
LRL Lower-range limit
URL Upper-range limit
LRV Lower-range value
URV Upper-range value

Output

Output signal

- 4 to 20 mA, 2-wire
- 4 to 20 mA with superimposed communication protocol HART, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.0), 2-wire

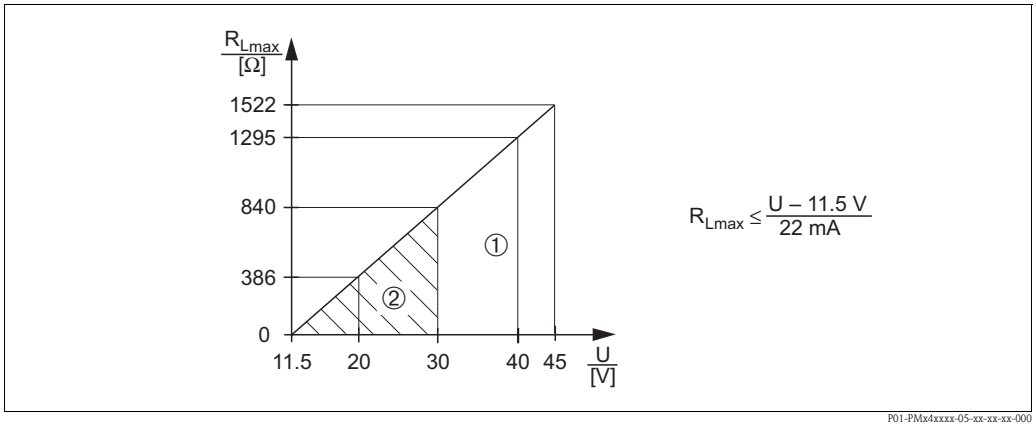
Signal range

4 to 20 mA, 4 to 20 mA HART:
- 3.8 to 20.5 mA

Signal on alarm

- 4 to 20 mA:
  - Signal overshoot: > 20.5 mA
  - Signal undershoot: < 3.8 mA
- 4 to 20 mA HART:
  Options:
  - MIN: 3.6 mA
  - MAX: 22 mA (factory setting)
  - Continue: last measured value is kept
- PROFIBUS PA: can be set in the Analog Input Block, options: last good value (factory setting), FSAFE value, wrong value

Load – 4 to 20 mA and 4 to 20 mA HART



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!
Devices with 4 to 20 mA HART electronics: when operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

Resolution

- 4 to 20 mA:
  - Current output: < 1 µA
  - Onsite display: 30 segments
- 4 to 20 mA HART:
  - Current output:
    - Typical value: 1 µA
    - Max.: 6 µA
  - Onsite display: 28 segments, numerical value display with 1 per thousand resolution
- PROFIBUS PA:
  - Onsite display: 28 segments, display value with resolution 1 per thousand

Dead time, time constant (T63)

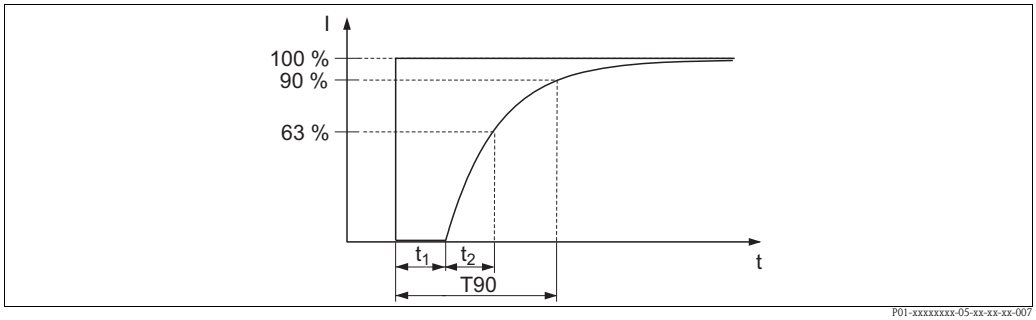


Illustration of dead time and time constant

Dynamic behavior 4...20 mA (Analog electronic)

Dead time, time constant (T63)

Types	Dead time t_1	Time constant (T63), t_2	Step response time (T90)
all	—	40 ms	80 ms
PMP46/PMP48	additional influence from the diaphragm seal		

Dynamic behavior current output (HART electronic)

Types	Dead time t_1	Time constant (T63), t_2
all	290 ms	240 ms
PMP46/PMP48	additional influence from the diaphragm seal	

Dynamic behavior digital output (HART electronic)

Dead time, time constant (T63)

For HART communication, the dead time consists of the internal dead time of the device and the update rate on the bus:

Types	Dead time t_1	Time constant (T63), t_2
all	540 ms	240 ms
PMP46/PMP48	additional influence from the diaphragm seal	

Reading cycle

HART commands: on average 3 to 4 per second on average.

Update rate

On average 250 to 330 ms.

Dynamic behavior PROFIBUS PA

Dead time, time constant (T63)

For PROFIBUS, the dead time consists of the internal dead time of the device, the response time of the AI function block and the cycle time of the communication buffer:

Types	Dead time t_1	Time constant (T63), t_2
all	440 ms	240 ms
PMP46/48	additional influence from the diaphragm seal	

Response time

- Cyclic: approx. 10 ms per request
- Acyclic: < 50 ms

All values are typical values.

Cycle time (update time)

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.

Damping

4 to 20 mA

- Via DIP switch on the electronic insert, switch position "On" = 2 s, switch position "Off" = 0 s

4 to 20 mA HART

- Via switch on the electronic insert, switch position "On" = set value, switch position "Off" = 0 s
- Via handheld terminal or PC with operating program, continuous 0 to 40 s
- Factory setting: 2 s

PROFIBUS PA

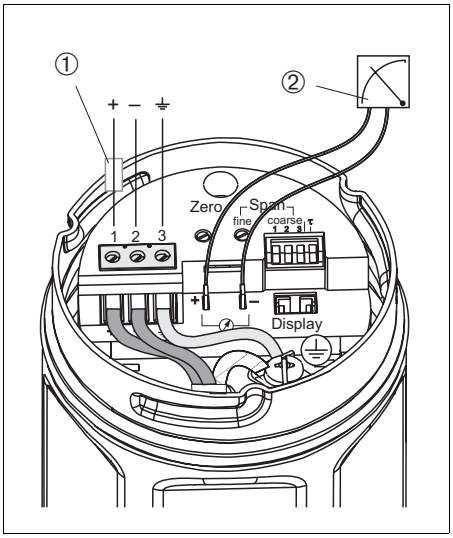
- Via handheld terminal or PC with operating program, continuous 0 to 40 s
- Factory setting: 0.0 s

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 82, "Safety conventions and icons" and "Installation/Control Drawings" sections.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.
- The shield or grounding (if present) must always be connected to the internal ground terminal in the housing.

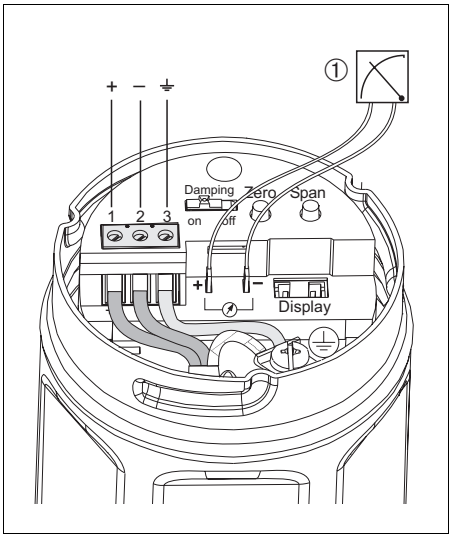


P01-PMx4xxxx-04-xx-xx-xx-000

Analog electronic insert

① *Devices with an ATEX II 1/3 D certificate (non-Ex-powered) must be protected with a 50 mA fuse (slow-blow).*

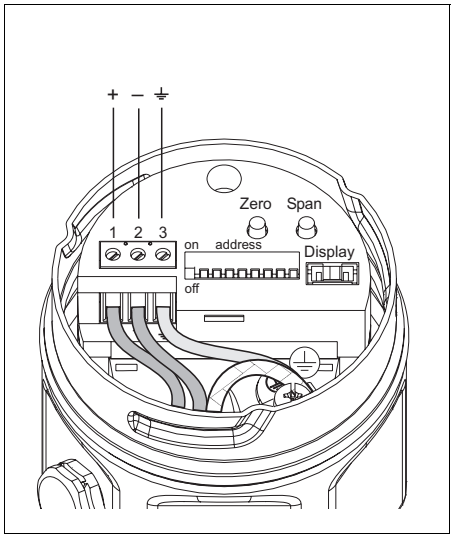
② *4 to 20 mA test signal: you can take a 4 to 20 mA test signal via the terminal lugs without interrupting the measurement.*



P01-PMx4xxxx-04-xx-xx-xx-001

4 to 20 mA HART electronic insert

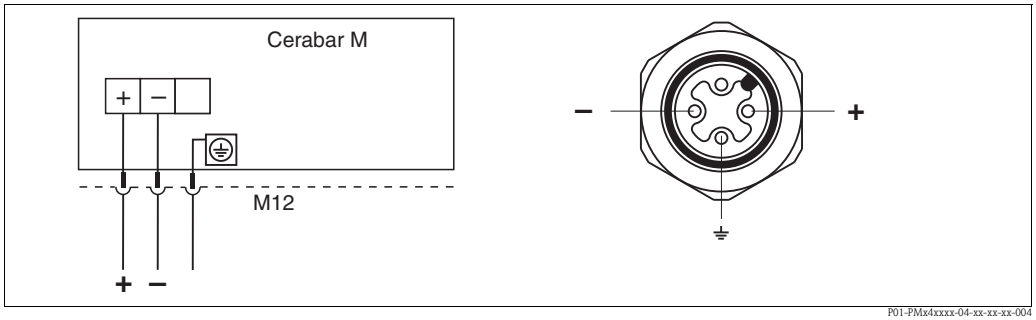
① *4 to 20 mA test signal: you can take a 4 to 20 mA test signal via the terminal lugs without interrupting the measurement.*



P01-PMx4xxxx-04-xx-xx-xx-002

PROFIBUS PA electronic insert

Devices with M12 connector



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

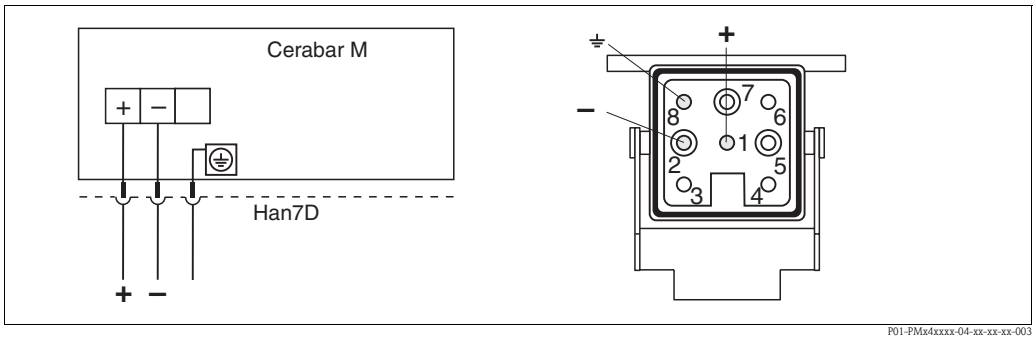
Endress+Hauser offers the following accessories for devices with M12 connectors:

Plug-in jack M 12x1, straight
- Material: body PA; coupling nut CuZn, nickel-plated
- Degree of protection (plugged in): IP67
- Order number: 52006263

Plug-in jack M 12x1, elbowed
- Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (plugged in): IP67
- Order number: 51006327

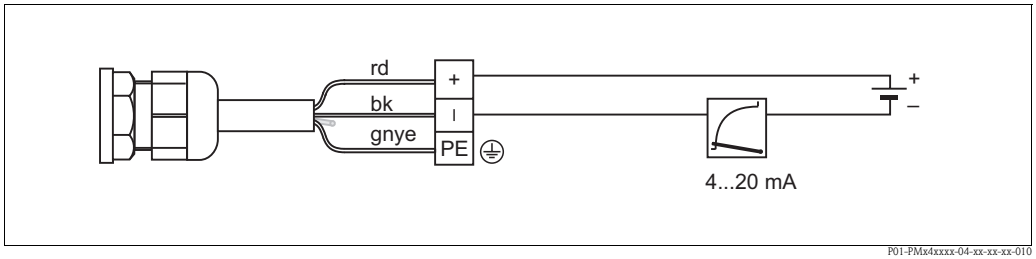
Cable 4x0.34 mm^2 with M12 socket, elbowed, screw plug, 5 m length
- Material: body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (plugged in): IP67
- Order number: 52010285

Devices with Harting connector Han7D



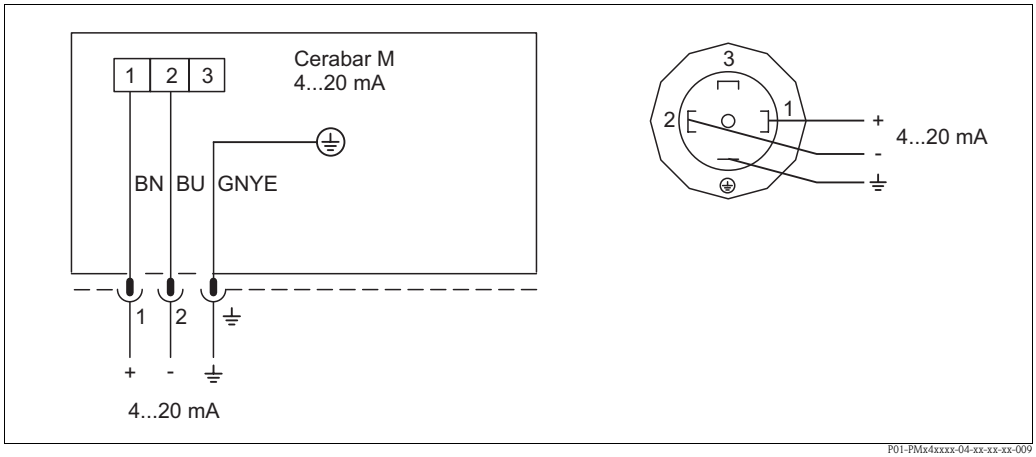
Left: electrical connection for devices with Harting connector Han7D
Right: view of the connector at the device

Connecting the cable version



rd = red, bk = black, gnye = green-yellow

Connecting the valve connector M16, ISO4400



BN = brown, BU = blue, GNYE = green/yellow

Supply voltage

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.
- 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 hazardous areas. → See also Page 82, "Safety conventions and icons" and "Installation/Control Drawings" sections.

4 to 20 mA

For non-hazardous areas: 11.5 to 45 V DC

4 to 20 mA HART

For non-hazardous areas: 11.5 to 45 V DC

PROFIBUS PA

For non-hazardous areas: 9 to 32 V DC

Current consumption

PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Cable entry

→ See also Page 67 ff, feature 20 "Housing; Electrical connection".

Cable specification

- Endress+Hauser recommends using shielded, twisted pair two-wire cables.
- Terminals for wire cross-sections 0.14 to 2.5 mm^2
- Cable outer diameter: 5 to 9 mm

Residual ripple

4 to 20 mA and 4 to 20 mA HART

- Without impact 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))
- With HART Communicator or Commubox:
  Max. ripple (measured at 500 Ω) 47 to 125 Hz: U_{ss} = 200 mV
  Max. noise (measured at 500 Ω) 500 Hz to 10 kHz: U_{eff} = 2.2 mV

Performance characteristics – general

Reference operating conditions

- As per IEC 60770
- Ambient temperature range T_A = constant, in range: +21 to +33°C (+69.8 to +91.4°F)
- Humidity φ = constant, in range: 20 to 80% RH
- Ambient pressure p_U = constant, in range: 860 to 1060 mbar
- Position of measuring cell = constant, in range: horizontal ±1°
- Input of LOW SENSOR CALIBRATION and HIGH SENSOR CALIBRATION for lower-range value and upper-range value
- Membrane material PMC41 and PMC45: Al_2O_3 (aluminum oxide ceramic)
- Membrane material PMP41, PMP45, PMP46 and PMP48: AISI 316L/1.4435
- Filling oil: synthetic oil
- Supply voltage: 24 V DC ± 3 V DC
- Load for HART: 250 Ω
- Turn down: 1:1 to 10:1

Reference accuracy

Note!
In the case of overpressure measurement using absolute pressure sensors, the accuracy can be affected by fluctuating ambient air pressure.

Uncertainty of measurement for small absolute pressure measuring ranges

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.

Long-term stability

- ±0.1% of URL/year
- ±0.25% of URL/3 years

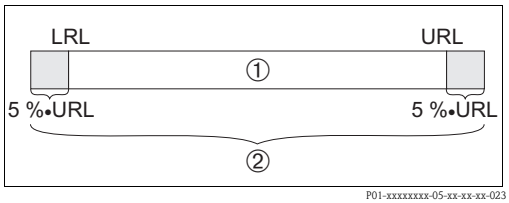
Influence of the orientation

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 25, "General installation instructions" section and Page 65 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

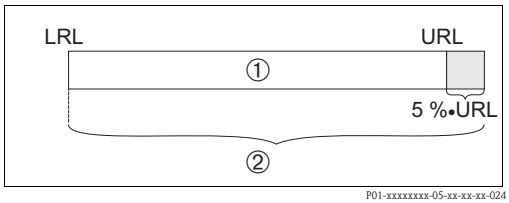
Examples for extended measuring limits and raising and lowering the zero point



Case 1

Case 1:
- 4 to 20 mA HART or PROFIBUS PA
- And overpressure sensors with a lower-range limit (LRL) > −1 bar

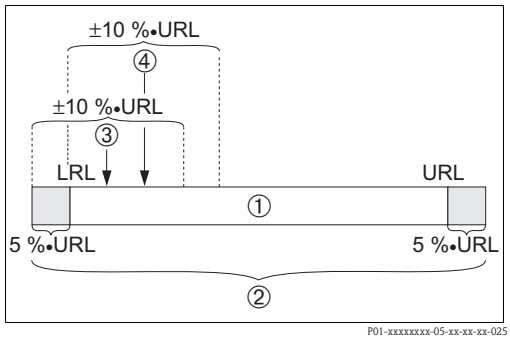
Example 1:
- Sensor measuring range: 0 to 10 bar
- Extended measuring range: −0.5 to 10.5 bar (the zero point can be adjusted in this range)



Case 2

Case 2:
- 4 to 20 mA HART or PROFIBUS PA
- Absolute pressure sensors and overpressure sensors with a lower-range limit (LRL) = −1 bar

Example 2:
- Sensor measuring range: −1 to 10 bar
- Extended measuring rang: −1 to 10.5 bar (the zero point can be adjusted in this range)



Case 3, example 3 and 4

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

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.

Vibrations effects

Within the reference accuracy vor vibration amplitudes below:
0 ... 15 Hz: 4 mm (amplitude of distance)
15 ... 150 Hz: 2 g (amplitude of acceleration)
150 ... 2000 Hz: 1g (amplitude of acceleratrion)

Warm-up period

- 4 to 20 mA: 200 ms
- 4 to 20 mA HART: 1 s
- PROFIBUS PA: 1 s

Rise time (T90)

- 4 to 20 mA: 60 ms
- 4 to 20 mA HART: 220 ms
- PROFIBUS PA: 220 ms

Settling time

- 4 to 20 mA: 180 ms
- 4 to 20 mA HART: 600 ms
- PROFIBUS PA: 600 ms

Performance characteristics – ceramic diaphragm

Reference accuracy

Reference accuracy comprises non-linearity after limit point setting, hysteresis and non-reproducibility as per IEC 60770.

PMC41, PMC45:

Measuring cell	% of the set span
100 mbar, 400 mbar ("1C", "1F", "5C", "5F" and "2F" version for feature 30 "Sensor range"; MWP; OPL)	■ ±0.2 x TD ■ Optional [1]: ±0.1 % non-linearity of set span x TD
1 bar, 4 bar, 10 bar, 40 bar	■ ±0.2 ■ Optional [1]: ±0.1 % non-linearity of set span

1) → See also Page 67 ff, chapter "Ordering information" section, feature 40 "Calibration; Unit", version "C"

Note!
In the case of overpressure measurement using absolute pressure sensors, the accuracy can be affected by fluctuating ambient air pressure.

Thermal change of the zero output and the output span

4...20 mA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMC45)	% of the set span
X	—	—	■ ±(0.3 x TD + 0.3)
—	X	—	■ ±(0.5 x TD + 0.5)
—	—	X	■ ±(0.8 x TD + 0.8)

4...20 mA HART, PROFIBUS PA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMC45)	% of the set span
X	—	—	■ ±(0.2 x TD + 0.2)
—	X	—	■ ±(0.4 x TD + 0.4)
—	—	X	■ ±(0.6 x TD + 0.6)

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...20 mA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMC45)	% of URL/10 K
X	—	—	■ ±0.15
—	X	—	■ ±0.2
—	—	X	■ ±0.25

4...20 mA HART, PROFIBUS PA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMC45)	% of URL/10 K
X	—	—	■ ±0.08
—	X	—	■ ±0.1
—	—	X	■ ±0.12

Performance characteristics – metal diaphragm

Reference accuracy

Reference accuracy comprises non-linearity after limit point setting, hysteresis and non-reproducibility as per IEC 60770.

PMP41, PMP45	PMP46, PMP48	% of the set span
X	—	■ 0.2 ■ Optional[1]: ±0,1 % non-linearity of set span
—	X	■ 0.2

1) → See also Page 67 ff, chapter "Ordering information" section, feature 40 "Calibration; Unit", version "C"

Note!
In the case of overpressure measurement using absolute pressure sensors, the accuracy can be affected by fluctuating ambient air pressure.

Thermal change of the zero output and the output span

4...20 mA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMP45)	% of the set span
X	—	—	■ ±(0.3 x TD + 0.3)
—	X	—	■ ±(0.5 x TD + 0.5)
—	—	X	■ ±(0.8 x TD + 0.8)

4...20 mA HART, PROFIBUS PA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMP45)	% of the set span
X	—	—	■ ±(0.2 x TD + 0.2)
—	X	—	■ ±(0.4 x TD + 0.4)
—	—	X	■ ±(0.6 x TD + 0.6)
PMP46, PMP48: the data apply to the transmitter without a diaphragm seal or capillary line.			

Note!
When using a PMP46/48, the influence of the respective diaphragm seal must also be taken into account. (→ See also Page 59 ff "Planning instructions for diaphragm seal systems", Page 45 ff "Process connections PMP46 (with metal measuring diaphragm)" and Page 51 ff "Process connections PMP48 (with metal measuring diaphragm)").

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...20 mA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMP45)	% of URL/10 K
X	—	—	■ ±0.15
—	X	—	■ ±0.2
—	—	X	■ ±0.25

4...20 mA HART, PROFIBUS PA

–10...+60 °C (+14 to +140°F)	–40...–10 °C, +60...+85 °C (-40 to +14°F, +140 to +185°F)	+85...+125 °C (+185 to +257°F) (only PMP45)	% of URL/10 K
X	—	—	■ ±0.08
—	X	—	■ ±0.1
—	—	X	■ ±0.12
PMP46, PMP48: the data apply to the transmitter without a diaphragm seal or capillary line.			

Operating conditions (installation)

General installation instructions

- The position-dependent zero point 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 65, "Installation instructions, diaphragm seal systems" section).
- Endress+Hauser offers a mounting bracket for installing on pipes. → See also Page 26, "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 65, "Installation instructions, diaphragm seal system" section.

Measuring arrangement for devices without a diaphragm seal – 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 any condensate can flow into the process.

Pressure measurement in steam

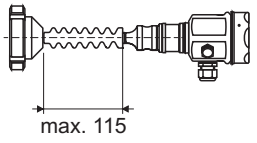
- Mount Cerabar M with siphon above the tapping point.
  The siphon reduces the temperature to almost ambient temperature.
- Fill the siphon with liquid before commissioning.

Pressure measurement in liquids

- Mount Cerabar M with shutoff device below or at the same level as the tapping point.
- Do not mount the device at the following positions:
  In the fill curtain, in the tank outlet or at a point in the container which could be affected by pressure pulses from an agitator or a pump.

Mounting with temperature isolator

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 60, "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 maximum 21 mbar due to the hydrostatic column in the temperature isolator. You can correct this zero point shift.



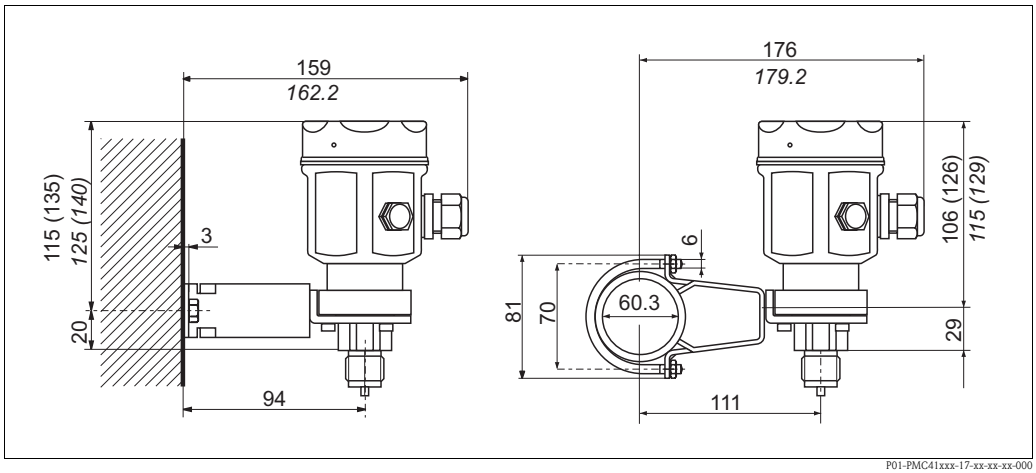
P01-PMP4xxxx-11-xx-xx-xx-006

Wall and pipe-mounting

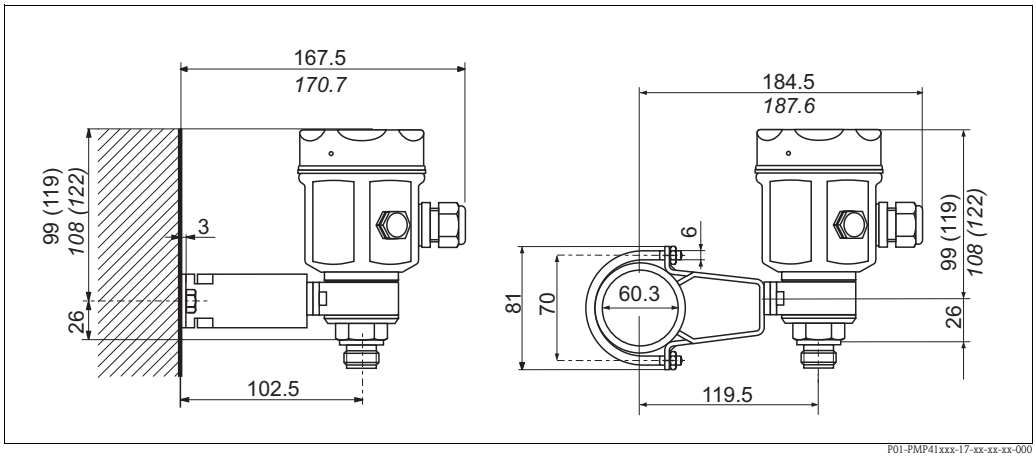
Endress+Hauser offers a mounting bracket for installing on pipes or walls for PMC41, PMP41, PMP46 and PMP48. You can order the mounting bracket either via the order code (→ see Page 68 ff, feature 60, "Additional option") or separately as an accessory.

PMC41
- Order number: 919806-0000
- Material: AISI 304 (1.4301)

PMP41, PMP46 and PMP48
- Order number: 52001402
- Material: AISI 304 (1.4301)

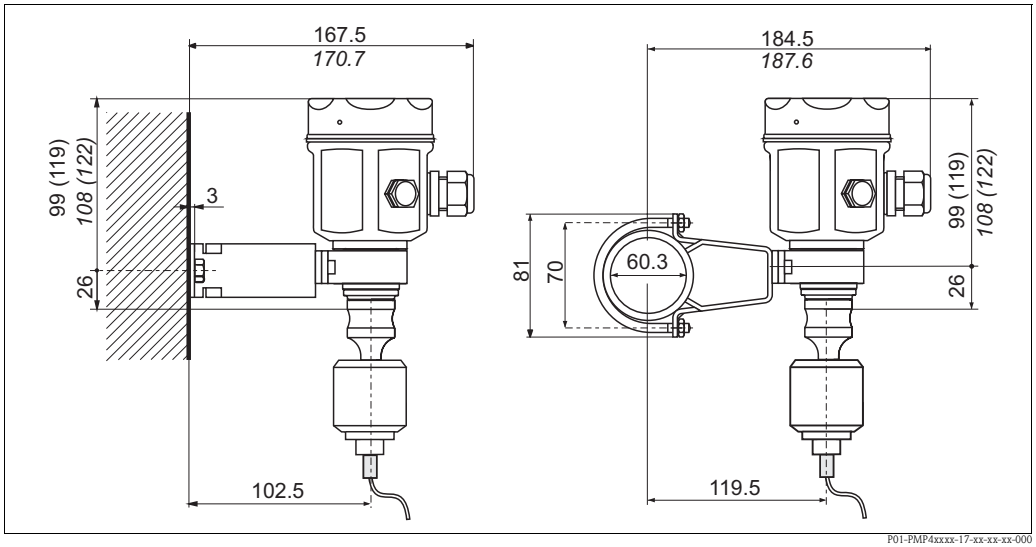


Wall and pipe-mounting PMC41



Wall and pipe-mounting PMP41

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



Wall and pipe-mounting PMP46/PMP48

The dimensions in brackets apply to housings with a raised 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 BAM requirements (DIN 19247). (BAM = Federal Institute for Materials Research and Testing).
- 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	Overpressure limit (OPL) of sensor[1]
PMC41 – * ** ** * * * ** 6, for devices with sensors, nominal value ≥10 bar	30 bar
PMP41 – * ** ** * * * ** C, for devices with sensors, nominal value < 40 bar	Overpressure limit (OPL) of sensor[1]
PMP41 – * ** ** * * * ** C, for devices with sensors, nominal value ≥ 40 bar	160 bar
PMP46 – * ** ** * * * ** N	Depends on the element of the selected components which has the lowest pressure rating: overpressure limit (OPL) of sensor[1] or process connection (1.5 x PN)
PMP48 – * ** ** * * * ** N *	Depends on the element of the selected components which has the lowest pressure rating: overpressure limit (OPL) of sensor [1], process connection (1.5 x PN) or fill fluid (160 bar)

1) → See Page 67 ff "Ordering information", feature 30 "Sensor range; MWP; OPL".

PWIS-free applications

Special cleaning of transmitter to remove paint-wetting impairment substances e.g. for use in paint shops
→ see Page 67 ff "Ordering information", feature 80 "Sensor seal".

Ultrapure gas applications

Endress+Hauser also provides devices which have been cleaned of oil and grease for special applications, such as ultrapure gas. No special restrictions regarding the process conditions apply to these devices.

→ See also Page 68, PMC41: feature 80 "Sensor seal".
→ See also Page 73, PMP41: feature 80 "Seal; Fill fluid".

Operating conditions (environment)

Ambient temperature limits

- 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 speed and contrast of the display.

Note!
For high-temperature applications, either a PMP46/48 with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends you use a PMP46/48 with a capillary.If a PMP46/48 with a temperature isolator or capillary is used, we recommend a suitable bracket for mounting (see "Wall and pipe-mounting" section on Page 26).

For devices for use in hazardous areas, see Safety Instructions, Installation or Control Drawing (ZDs).
(→ See also Page 82, "Safety conventions and icons" 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 67 ff, feature 20 "Housing; Electrical connection".

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 for class B equipment, interference immunity as per EN 61326 appendix A (industrial use) and NAMUR Recommendation on EMC (NE 21).
- Maximum measured error: < 0.5 % of span (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 27, "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 metal 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 metal measuring diaphragm)

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

PMP46 and PMP48 (with metal measuring diaphragm)

- –70 to +400 °C, depends on the diaphragm seal and filling oil
  Observe the temperature application limits of the diaphragm seal oil. → See also Page 60, "Diaphragm seal filling oils" section.
- PMP48 with PTFE coating: –50 to +205 °C

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 257°F)
M	Kalrez, cleaned for PWIS-free applications	+5 to +100°C (+41 to 257°F)
A	FKM Viton, cleaned from oil + grease	–10 to +100°C (+14 to 212°F)
6	FKM Viton, cleaned for oxygen service	–10 to +60°C (+14 to 140°F)
L	FKM Viton, cleaned for PWIS-free applications	–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/150°C [1] (–4 to +257°F/302°F)
4, [2]	EPDM (FDA 21CFR177.2600); 3A Class II; USP Class VI	–20 to +125 °C/150 °C [1]

Version for feature 80 in the order code	Seal	Temperature operating range
4 [3]	EPDM	–20 to +125°C (–4 to +257°F)
7	Kalrez, Compound 4079	+5 to +125 °C/150 °C [1]
C	Chemraz, Compound 505	–10 to +125 °C/150 °C [1]
2 [2] [3]	HNBR (FDA 21CFR177.2600); 3A Class II; KTW; AFNOR; BAM	–20 to +125°C (–4 to +257°F)
2 [3]	NBR	–20 to +80°C (–4 to +176°F)
M	Kalrez, cleaned for PWIS-free applications	+5 to +125°C (+41 to 257°F)
A	FKM Viton, oil and grease removed	–10 to +125°C (+14 to 257°F)
L	FKM Viton, cleaned for PWIS-free applications	–10 to +125°C (+14 to 257°F)
9	Silicone to be ordered as special version	–40 to +125°C (–40 to +212°F)

1) 150 °C for max. 1 hour

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

3) For devices with NBR or HNBR seals, the values for "Thermal change" (→ see Page 23) must be multiplied by a factor of 3.

With applications involving saturated steam, a Cerabar M with a metal diaphragm seal must be used.

PMP41 (with metal 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, cleaned from oil + grease	–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

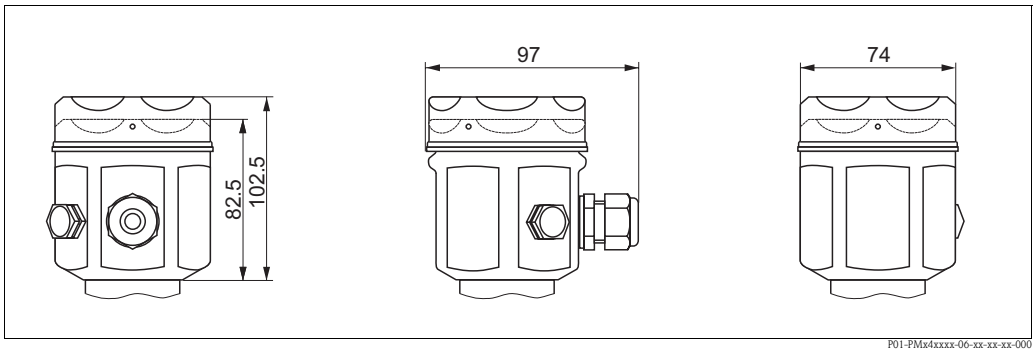
- The maximum pressure for the measuring device depends on the element with the lowest pressure rating, see the following sections:
  – → Page 12 ff, "Measuring range"
  – → "Mechanical construction" section
  The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of 20°C (68°F) or 100°F for ANSI flanges and may be applied to the device for an unlimited time period. Observe temperature dependency.
- The pressure values permitted at higher temperatures can be found in the following standards:
  – EN 1092-1: 2001 Tab. 18 [1]
  – 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 overpressure limit (OPL) of the device = MWP x 1.5 [2].
- 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 to the OPL value of the process connection at the very maximum. 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_{max} and T_{max} for oxygen applications" as per Page 27, "Oxygen applications" may not be exceeded.

1) With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

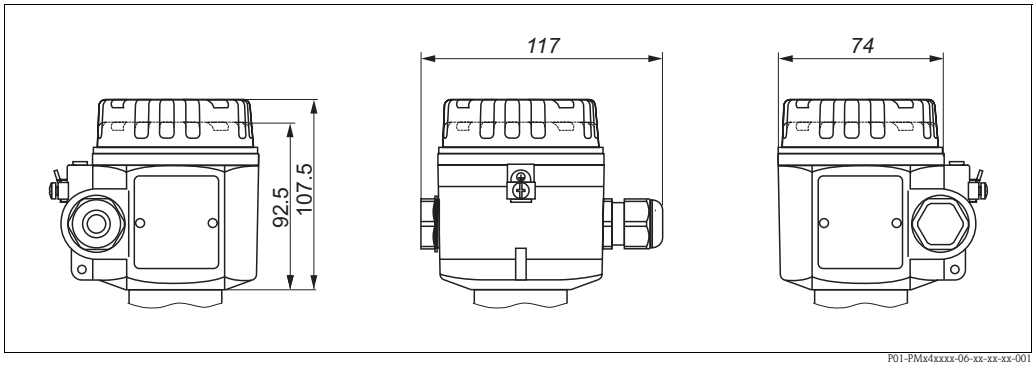
2) The equation does not apply for PMP41, PMP45 and PMP48 with a 100 bar measuring cell.

Mechanical construction

Dimensions of stainless steel housing



Dimensions of aluminum housing



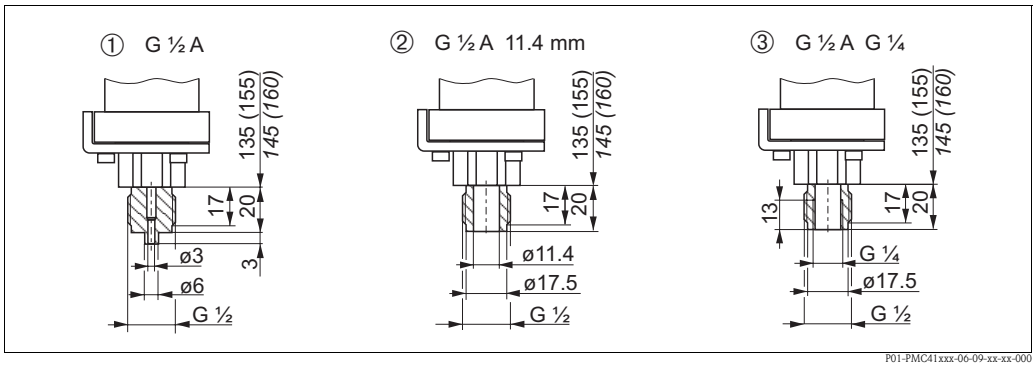
General Note on flanges

The roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards), made of Hastelloy C, Monel or Tantalum is Ra 0.8.
Lower roughnesses are available on request.

Process connections PMC41 (with ceramic measuring diaphragm)

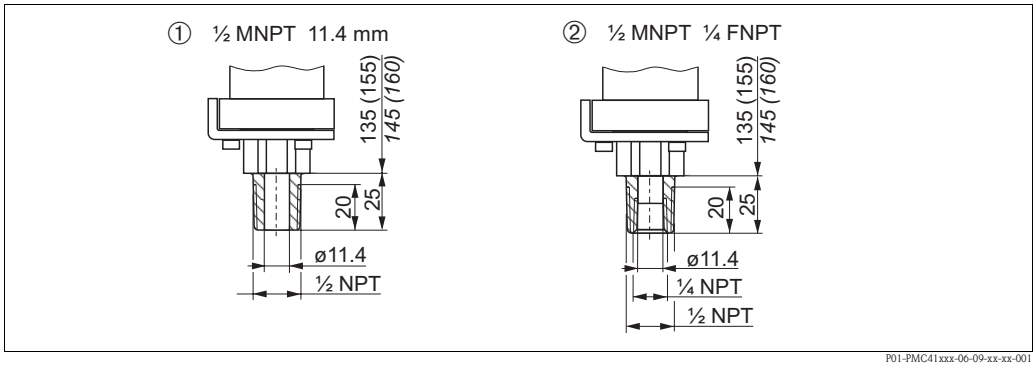
Note!
- The installation heights in brackets apply to housings with a raised cover (for optional display). Installation heights written in italics apply to devices with an aluminum housing.

Thread, inner diaphragm



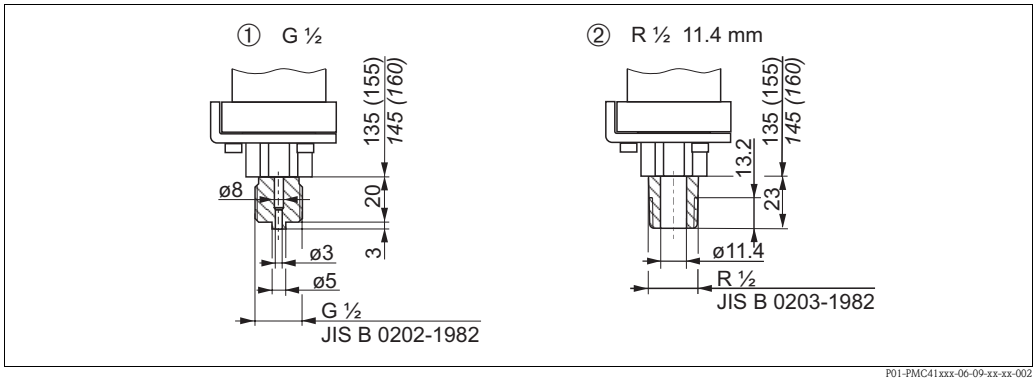
Process connections PMC41, thread ISO 228

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



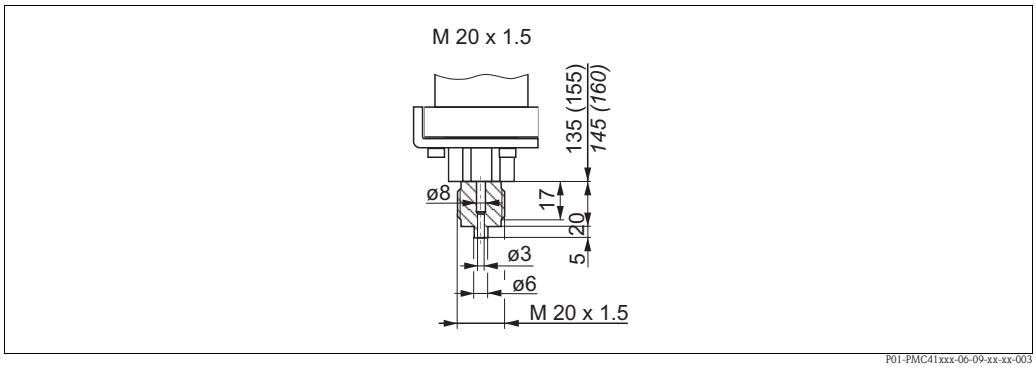
Process connections PMC41, thread ANSI

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



Process connections PMC41, thread JIS

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



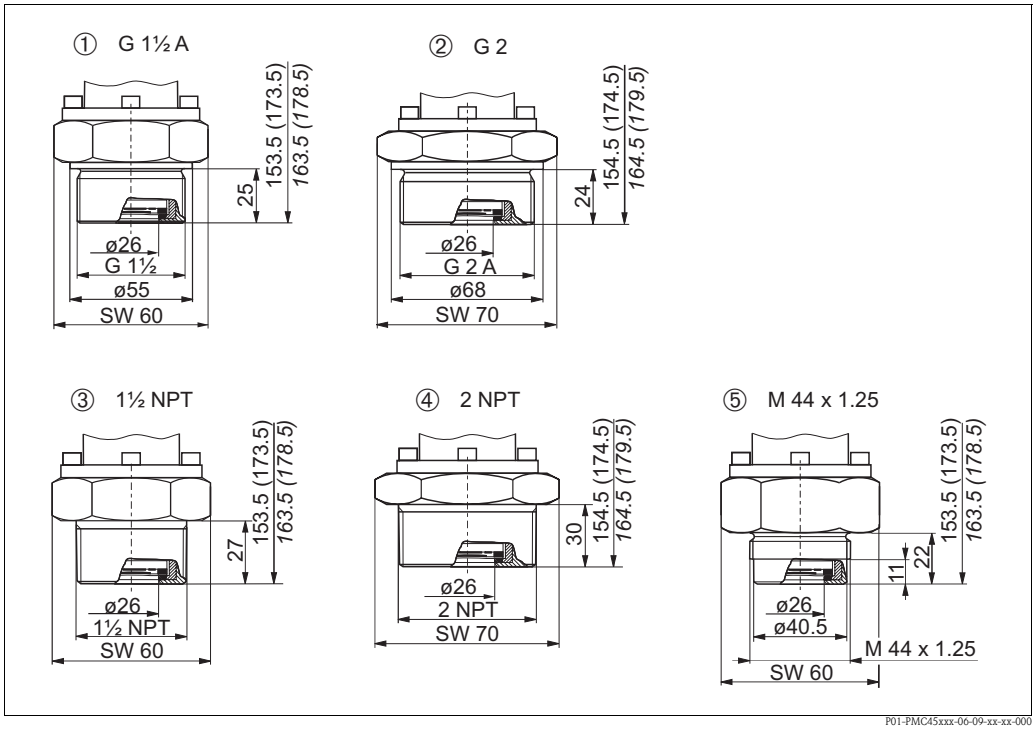
Process connection PMC41, version 1T: thread DIN 13 M20 x 1.5 bore 3 mm, material AISI 316L

Process connections PMC45 (with ceramic measuring diaphragm)

Note!

- The installation heights in brackets apply to housings with a raised cover (for optional display). Installation heights written in italics apply to devices with an aluminum housing.
- Devices with an aluminum housing, raised cover, threaded connection or hygiene connection weigh approx. 2.1 kg. The weights for devices with an aluminum housing, raised cover and flange are given in the tables from Page 37 onwards. 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 70 "Ordering information PMC45", feature 80 "Sensor seal", version 2 or 4.

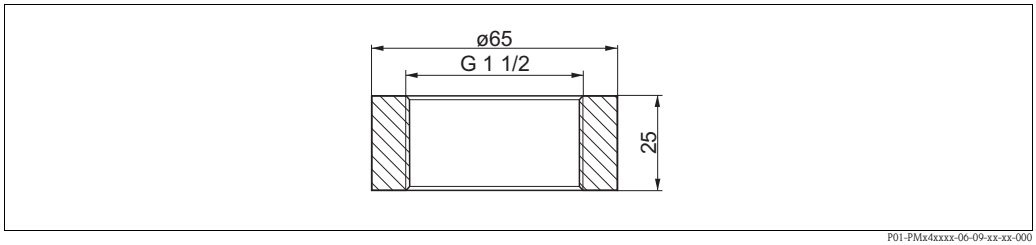
Thread, flush-mounted diaphragm



Process connections PMC45, threaded connection, material AISI 316L

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*

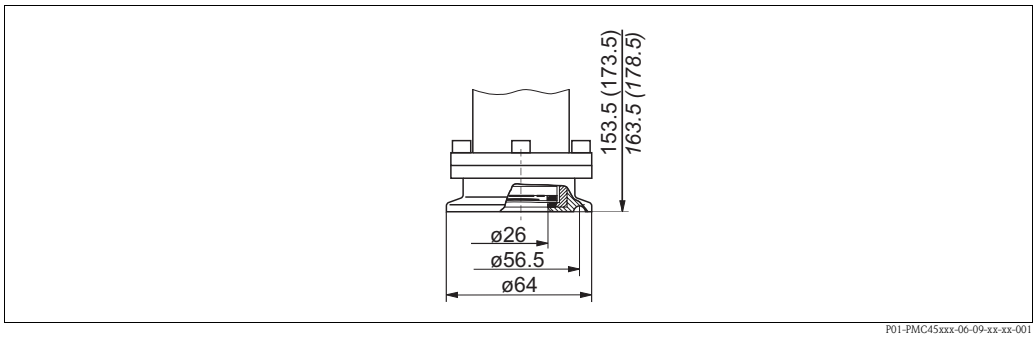
Welding neck G 1 1/2



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

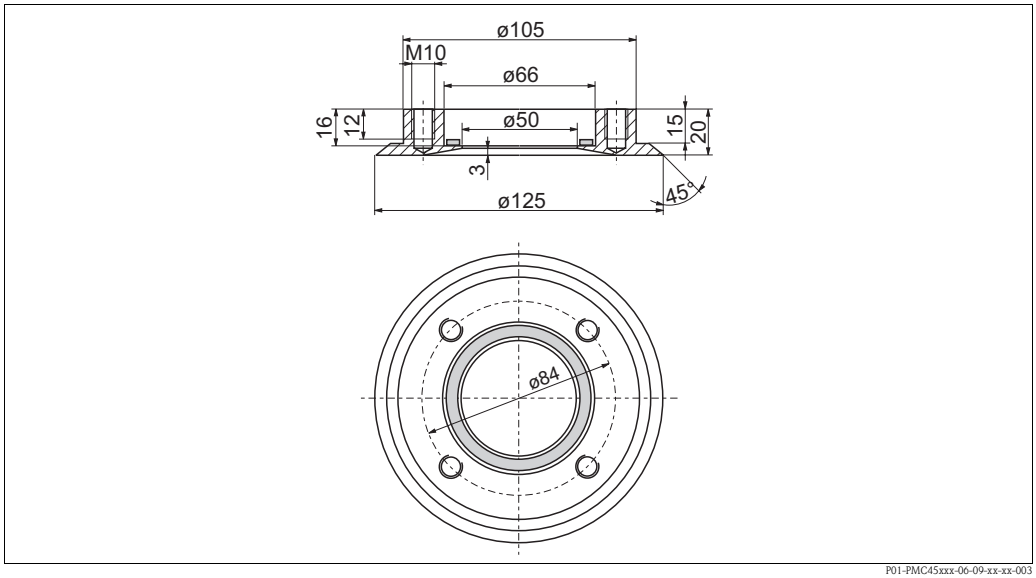
Note!
Endress+Hauser offers a pressure sensor dummy for the welding necks with order numbers 52024469 and 52024470. Order number for pressure sensor dummy: 52024471

Tri-Clamp, flush-mounted diaphragm



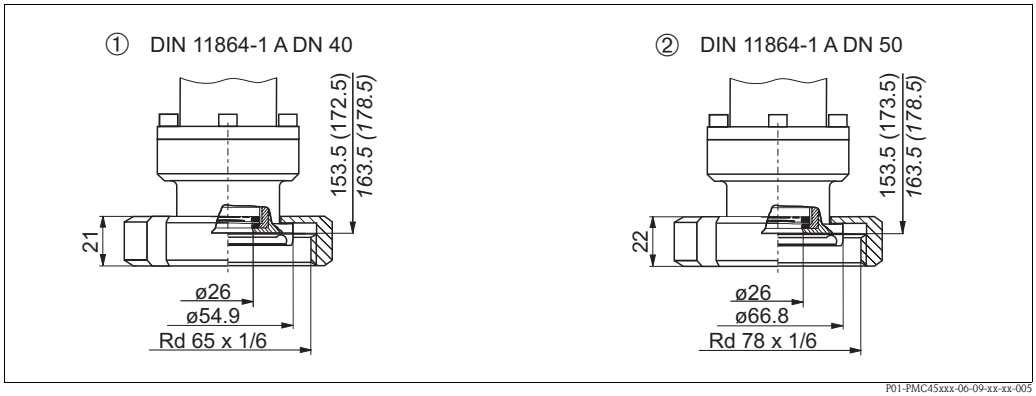
Process connection PMC45, version DL: Tri-Clamp, ISO 2852 DN 51 (2")/DIN 32676 DN 50, material AISI 316L, EHEDG, 3A with HNBR or EPDM seal

⑥ *Version KL: DRD DN50 (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 graphic.*
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: 52024228

Aseptic couplings



Process connections PMC45, aseptic couplings, material AISI 316L
Surface roughness of the surfaces in contact with the medium $R_a \leq 0.8$ µm 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/EPDM seal*
② *Version AT: aseptic DIN 11864–1 form A DN 50 for pipes to DIN 11850, EHEDG, 3A with HNBR/EPDM seal*

Ordering information

PMC41

This overview does not identify options which are mutually exclusive.

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 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 1 Ex ia IIC T6
U	NEPSI Ex ia IIC T6
Y	Special version, to be specified

20	Housing; Electrical connection:
E1	316L; gland M20, IP 66
C1	316L; thread NPT 1/2, IP 66
G1	316L; thread G 1/2, IP 66
H1	316L; plug Han7D, IP 65
L1	316L; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)
K1	316L; cable 5 m, IP 68 + atmospheric pressure compensation
E2	Alu; gland M20, IP 66
C2	Alu; thread NPT 1/2, IP 66
G2	Alu; thread G 1/2, IP 66
H2	Alu; plug Han7D, IP 65
L2	Alu; plug M12, IP 66 (in conjunction with absolute pressure sensors IP 68/NEMA 6P)
K2	Alu; cable 5 m, IP 68 + atmospheric pressure compensation
V2	Alu; valve plug M16 ISO4400, IP64
Y9	Special version, to be specified

30	Sensor range; MWP; OPL:		
	Sensor range	**MWP (maximum working pressure)**	**OPL (overpressure limit)**
	Sensors for overpressure		
1C	0 to 100 mbar/10 kPa/1.5 psi	2.7 bar/270 kPa/40 psi	4 bar/400 kPa/60 psi
1F	0 to 400 mbar/40 kPa/6 psi	5.3 bar/530 kPa/80 psi	8 bar/800 kPa/120 psi
1H	0 to 1 bar/100 kPa/15 psi	6.7 bar/670 kPa/100 psi	10 bar/1 MPa/150 psi
1M	0 to 4 bar/400 kPa/60 psi	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/375 psi
1P	0 to 10 bar/1 MPa/150 psi	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
1S	0 to 40 bar/4 MPa/600 psi	40 bar/4 MPa/600 psi	60 bar/6 MPa/900 psi
	Sensors for negative overpressure		
5C	–100 to 100 mbar/-10 to 10 kPa/ -1.5 to 1.5 psi	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	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	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	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/375 psi
5P	–1 to 10 bar/–0.1 to 1 MPa/–15 to 150 psi	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
	Sensors for absolute pressure		
2F	0 to 400 mbar/40 kPa/6 psi absolute	5.3 bar/530 kPa/40 psi	8 bar/800 kPa/120 psi
2H	0 to 1 bar/100 kPa/15 psi absolute	6.7 bar/670 kPa/80 psi	10 bar/1 MPa/150 psi
2M	0 to 4 bar/400 kPa/60 psi absolute	16.7 bar/1.67 MPa/250 psi	25 bar/2.5 MPa/375 psi
2P	0 to 10 bar/1 MPa/150 psi absolute	26.7 bar/2.67 MPa/400 psi	40 bar/4 MPa/600 psi
2S	0 to 40 bar/4 MPa/600 psi absolute	40 bar/4 MPa/600 psi	60 bar/6 MPa/900 psi
9Y	Special version, to be specified		

40	Calibration; Unit:
1	0.2% sensor range; mbar/bar
2	0.2% sensor range; kPa/MPa
3	0.2 % sensor range; mmmH_2O/mH_2O
4	0.2% sensor range; inH_2O/ftH_2O
5	0.2% sensor range; kgf/cm^2
6	0.2% sensor range; psi

40				**Calibration; Unit:**					
				B	0.2% see additional specification				
				C	0.1% see additional specification				
				D	DKD certificate; see additional specification				
				9	Special version, to be specified				
50					**Output; Operation:**				
					A	4 to 20 mA analog; without display			
					C	4 to 20 mA analog; display bar graph			
					H	4 to 20 mA SIL HART; without display			
					J	4 to 20 mA SIL HART; display 4-digit + bar graph			
					P	PROFIBUS PA; without display			
					R	PROFIBUS PA; display 4-digit + bar graph			
					W	Without electronics; without display			
					Y	Special version, to be specified			
60						**Additional option:**			
						1	Basic version		
						2	Mounting bracket, wall/pipe		
						B	SIL + EN10204-3.1 material (process connection) inspection certificate SIL Declaration of Conformity		
						C	EN10204-3.1 material (process connection) inspection certificate		
						S	GL (German Lloyd) marine certificate		
						U	SIL Declaration of Conformity		
						Y	Special version, to be specified		
70							**Process connection:**		
							Threaded connection		
							1M	Thread ISO228 G1/2, 316L (CRN)	
							2M	Thread ISO228 G1/2, Alloy C (CRN)	
							1R	Thread ISO228 G1/2 hole 11.4 mm, 316L (CRN)	
							1P	Thread ISO228 G1/2 G1/4 (female), 316L (CRN)	
							1A	Thread ANSI MNPT 1/2 hole 11.4 mm, 316L (CRN)	
							1N	Thread ANSI MNPT 1/2 FNPT1/4, 316L (CRN)	
							2N	Thread ANSI MNPT 1/2 FNPT1/4 , Alloy C (CRN)	
							1S	Thread JIS B0202 G1/2 (male), 316L	
							1K	Thread JIS B0203 R1/2 (male) hole 11.4 mm, 316L	
							1T	Thread DIN 13 M20x1.5, AISI 316L	
							9Y	Special version, to be specified	
80								**Sensor seal:**	
								1	FKM Viton
								2	NBR
								4	EPDM
								C	Chemraz
								7	Kalrez
								M	Kalrez, cleaned for silicone-free service
								A	FKM Viton, cleaned from oil + grease
								L	FKM Viton, cleaned for silicone-free service
								6	FKM Viton, oxygen service$_2$ note application limits pressure/temp
								9	Special version, to be specified

PMC41									Complete order code