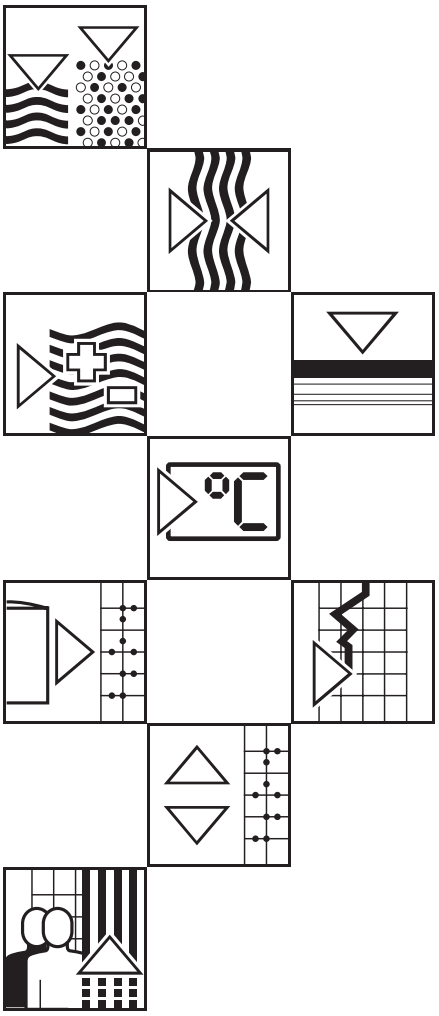
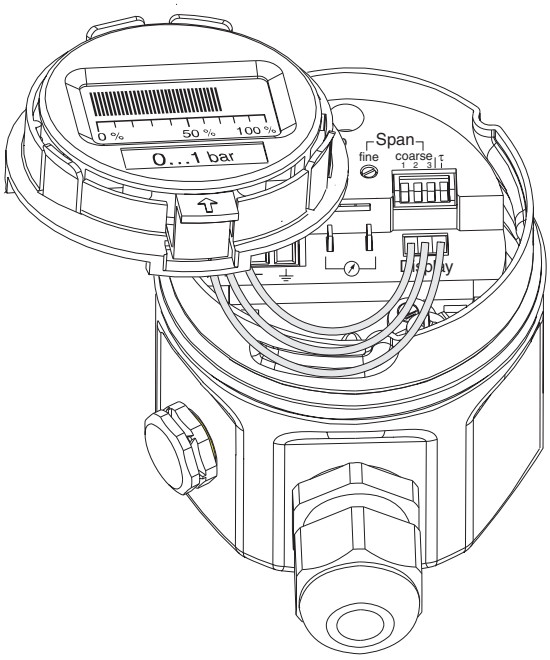
BA 200P/00/en/12.03
52022181

cerabar M
Pressure Transmitter

Operating instructions
Cerabar M with analogue electronics

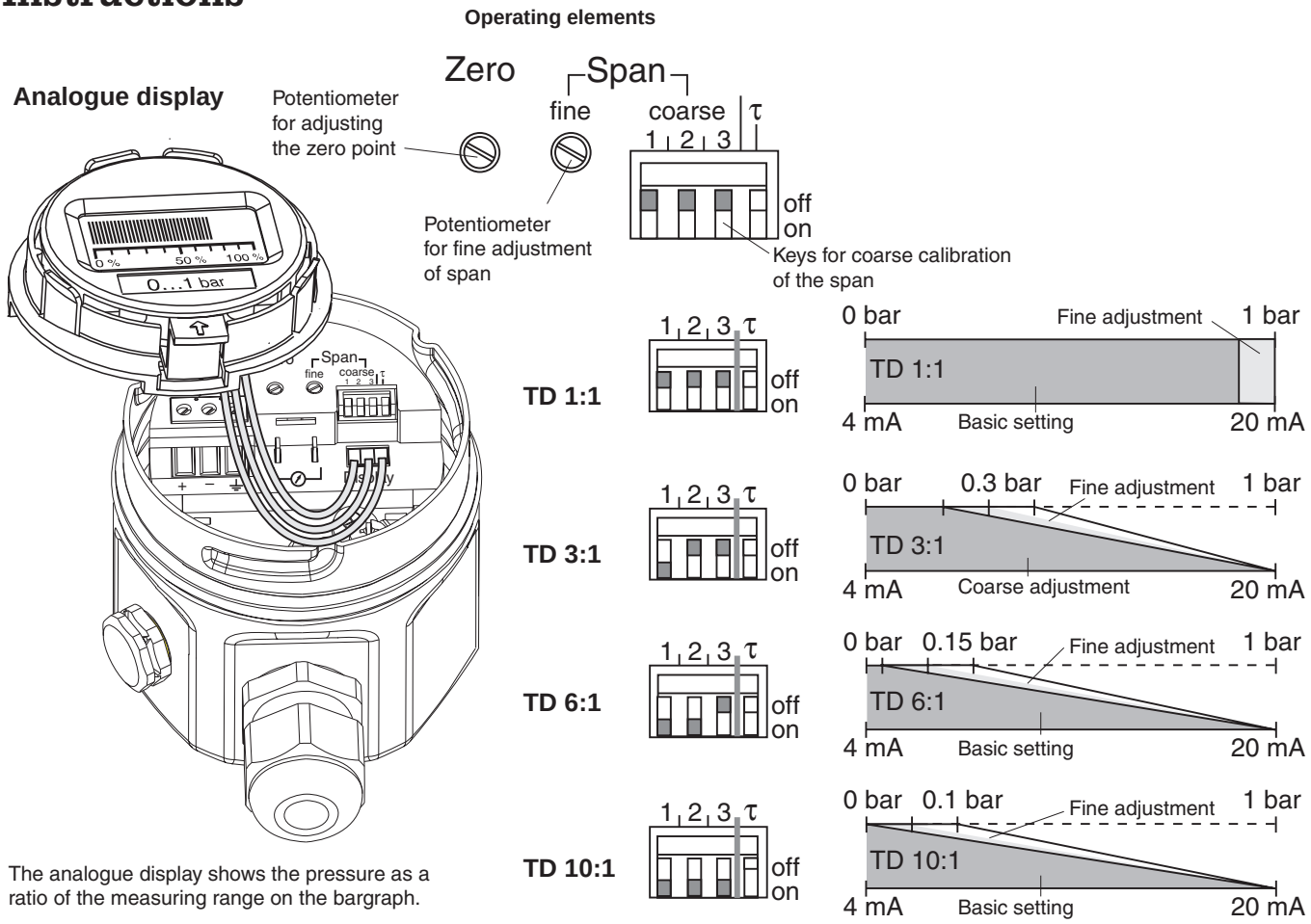




Endress+Hauser

The Power of Know How

Short Operating Instructions



The analogue display shows the pressure as a ratio of the measuring range on the bargraph.

Table of Contents

Notes on Safety

Approved usage

The Cerabar M is a pressure transmitter for measuring gauge or absolute pressure depending on the version.

Mounting, commissioning, operation

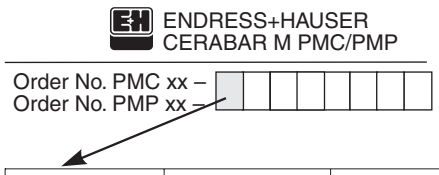
The Cerabar M has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise, e. g. product overspill by incorrect installation or adjustment. For this reason, the instrument must be installed, connected, operated and maintained by personnel that are authorised by the user of the facility and who are suitably qualified. The manual is to be read and understood, and the instructions followed. Modifications and repairs to the device are permissible only when they are expressly approved in the manual.

Please pay particular attention to the technical data on the nameplate. The MWP (maximum working pressure) is specified on the nameplate. The value refers to a reference temperature of 20°C (68°F) or 100°F for ANSI flanges.
- Test pressure (over pressure limit OPL) = MWP (nameplate) x 1.5
- The pressure values permitted at higher temperatures can be found in the following standards:
  – EN 1092-1: 2001 Tab. 18
  – ASME B 16.5a – 1998 Tab. 2-2.2 F316
  – ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  – JIS B2201

Explosion-hazardous area

The measuring system used in the explosion-hazardous area must comply with all existing national standards. The instrument can be supplied with the following certificates as listed in the table. The certificates are designated by the first letter of the order code on the nameplate (see table below).

Ensure that technical personnel are sufficiently trained.
All measurement and safety regulations which apply to the measuring points are to be observed.



Certificates for applications in explosion hazardous areas

Code	Certificate	Protection
R	Standard	None
G	ATEX 100	ATEX II 1/2 G EEX ia IIC T6
K	ATEX 100	ATEX II 1/2 D EEX ia IIC T6
L	ATEX 100	ATEX II 1/3 D (non- Ex power supply)
N	ATEX 100	ATEX II 3 G EEx nV IIC T5 (Zone 2)
C	CSA	General Purpose
S	CSA	CSA IS (suitable for Div. 2) Cl. I, II, III, Div. 1, Groups A…G
T	CSA	CSA Cl. I
P	FM	FM IS (non incendive) Cl. I, II, III, Div. 1, Groups A…G
M	FM	FM DIP, Cl. II, III, Div. 1, Groups A…G
V	TIIS	TIIS Ex ia IIC T6

Notes on Safety

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Notes on safety

Symbol	Meaning
 Note!	**Note!** Notes draw attention to activities or procedures that can have a direct influence on operation or trigger an unforeseen device reaction if they are not carried out properly.
 Caution!	**Caution!** Cautions draw attention to activities or procedures that can lead to persons being injured or to incorrect device operation if they are not carried out properly.
 Warning!	**Warning!** Warnings draw attention to activities or procedures that can lead to persons being seriously injured, to safety risks or to the destruction of the device if they are not carried out properly.

Explosion protection

	**Explosion protected, type examined operating equipment** If this icon is on the device's nameplate, the device can be used in hazardous areas.
	**Hazardous area** This symbol identifies the hazardous area in the diagrams in these Operating Instructions. – Devices that are used in hazardous areas or cables for such devices must have the corresponding type of protection.
	**Safe area (non-hazardous areas)** This symbol identifies the non-hazardous area in the diagrams in these Operating Instructions. – Devices in non-hazardous areas must also be certified if connection cables run through a hazardous area.

Electrical symbols

	**Direct current** A terminal at which direct current voltage is present or through which direct current flows.
	**Alternating current** A terminal at which (sinusoidal) alternating voltage is present or through which alternating current flows.
	**Ground connection** A grounded terminal that, from the user's viewpoint, is already grounded via a grounding system.
	**Protective earth connection** A terminal that has to be grounded before other connections can be made.
	**Equipotential connection** A connection that has to be connected to the machine's grounding system: This can be, for example, a potential matching line or a star-shaped grounding system, depending on national or company practice.

1 Introduction

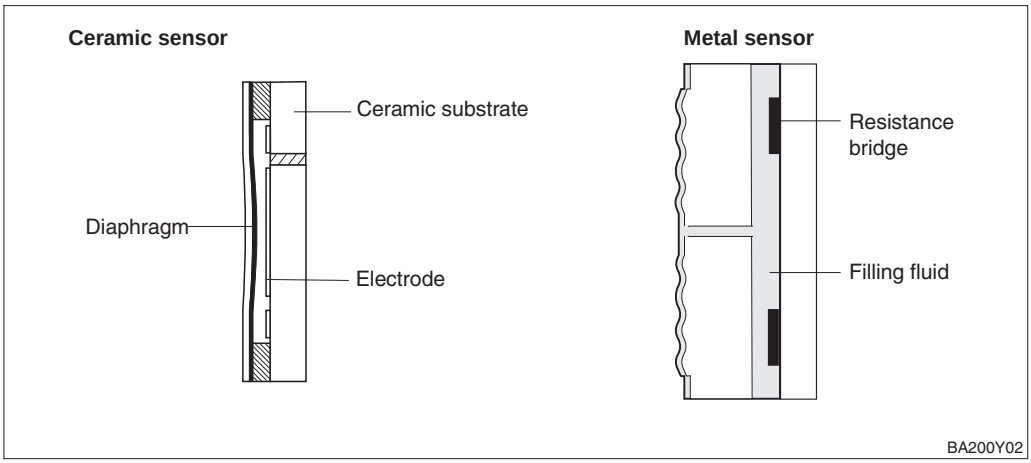
Application

The Cerabar M pressure transmitter measures the pressure of gases, vapours and liquids and is used in all areas of chemical and process engineering.

Operating principle

Ceramic sensor
The system pressure acts directly on the rugged ceramic diaphragm of the pressure sensor deflecting it by a maximum of 0.025 mm (0.0098 in). A pressure-proportional change in the capacitance is measured by the electrodes on the ceramic substrate and diaphragm. The measuring range is determined by the thickness of the ceramic diaphragm.

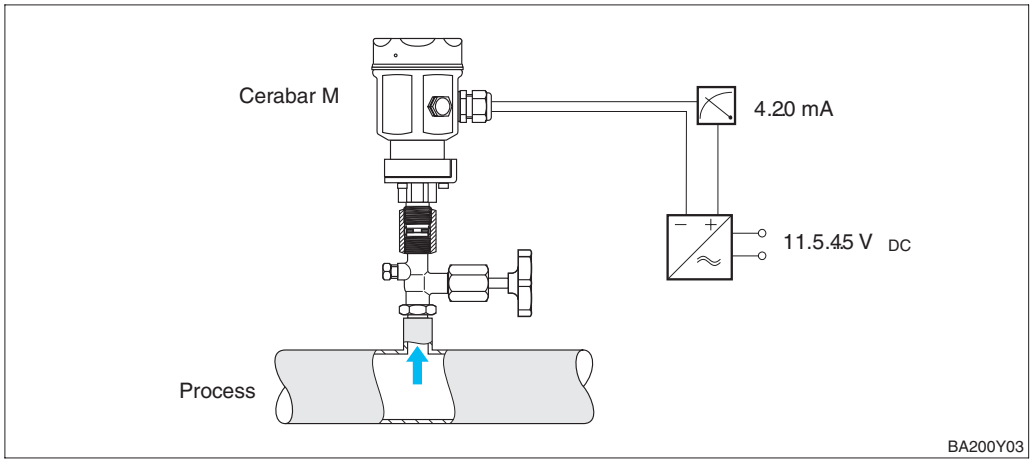
Metal sensor
The process pressure deflects the separating diaphragm with a filling liquid transmitting the pressure to a resistance bridge. The bridge output voltage, which is proportional to pressure, is then measured and processed.



Measuring system

The complete measuring system in a simple application consists of
- a Cerabar M pressure transmitter with 4…20 mA signal output and
- a power supply of 11.5…45 V_{DC}.

An optional analogue display can be directly plugged onto the electronic insert using a holder. It shows the pressure on a bargraph as a ratio of the measuring range.



2 Installation

Contents

This section describes:
- the mechanical installation of Cerabar M with and without diaphragm seal,
- the electrical connection.

2.1 Mounting instructions without diaphragm seal

Cerabar M without diaphragm seal
– PMC 41, 45
– PMP 41, 45

The Cerabar M without diaphragm seal is mounted in the same way as a manometer. The use of shut-off valves and pigtails is recommended. The position depends upon the application.

- Measurement in gases:
  Mount on the shut-off valve above the tapping point so that condensate can run back into the process.

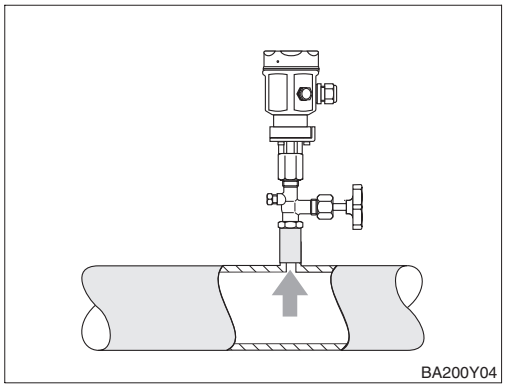
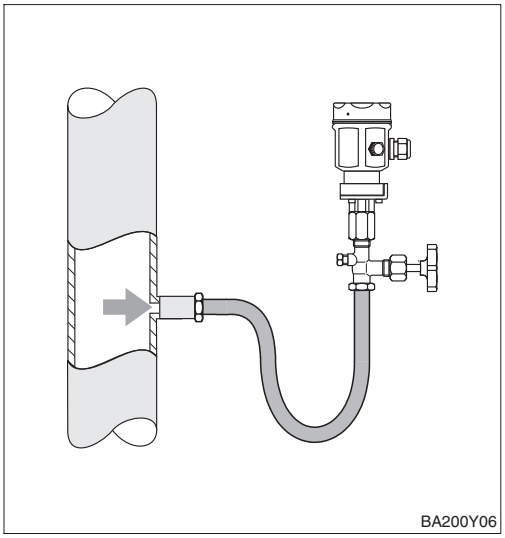


Figure 2.1
Mounting on a shut-off valve for measuring gases

- Measurement in steam:
  Mount with a pigtail above the tapping point.
  The pigtail reduces the temperature in front of the diaphragm to almost ambient temperature. Before start-up, the pigtail must be filled with water.



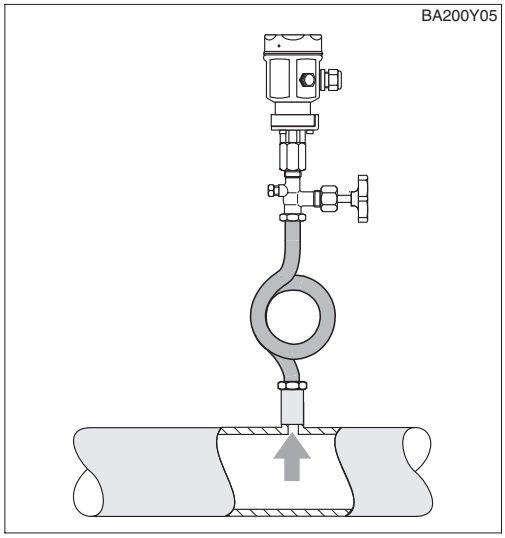


Figure 2.2
left:
Mounting with a U-shaped pigtail for measuring steam
right:
Mounting with a circular pigtail for measuring steam

• Measurement in liquids:
Mount on the shut-off valve below the tapping point or at the same height.

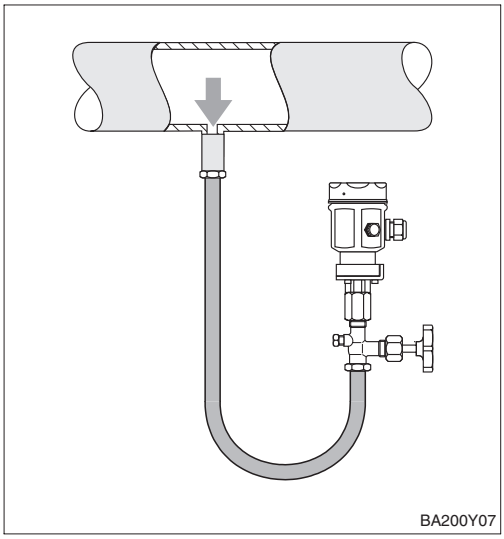
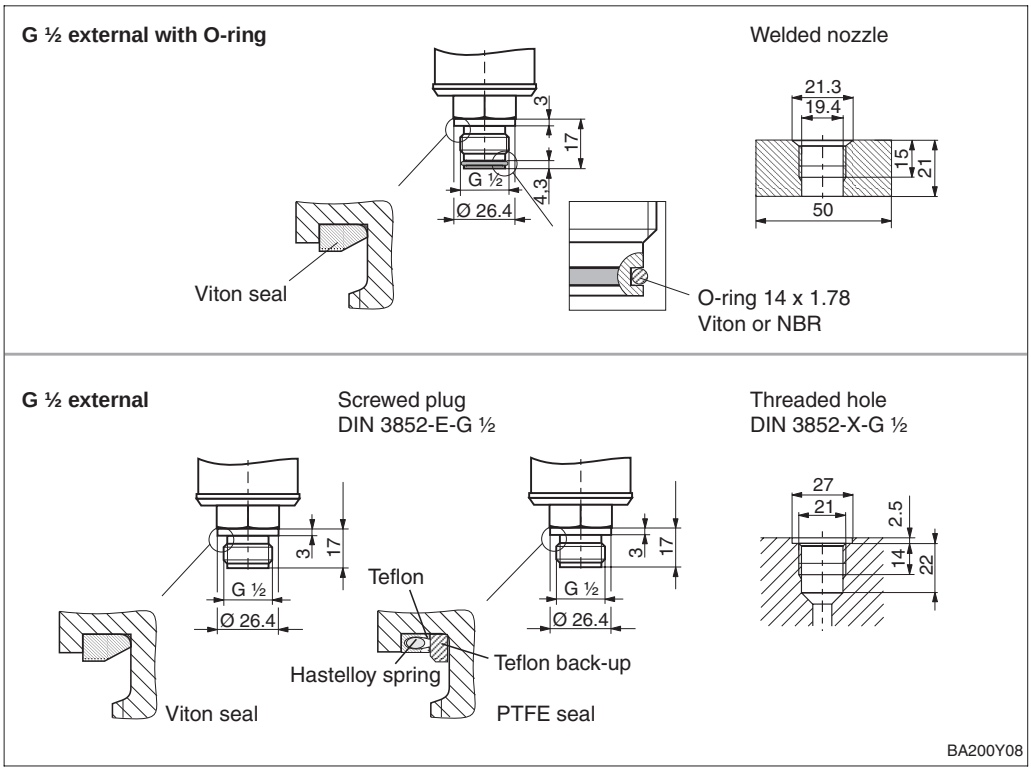


Figure 2.3
Mounting on a shut-off valve for measuring liquids

Mounting the PMP 41

The PMP 41 with metal sensor is available in the following versions:
• with flush-mounted diaphragm or
• with adapter and internal diaphragm.
The adapter can be screwed on or welded in.
A gasket is enclosed according to the material used and version.



Dimensions
1 in = 25.4 mm
1 mm = 0.039 in

Figure 2.4
PMP 41 with flush-mounted diaphragm
above:
G ½ external with O-ring
below:
G ½ external

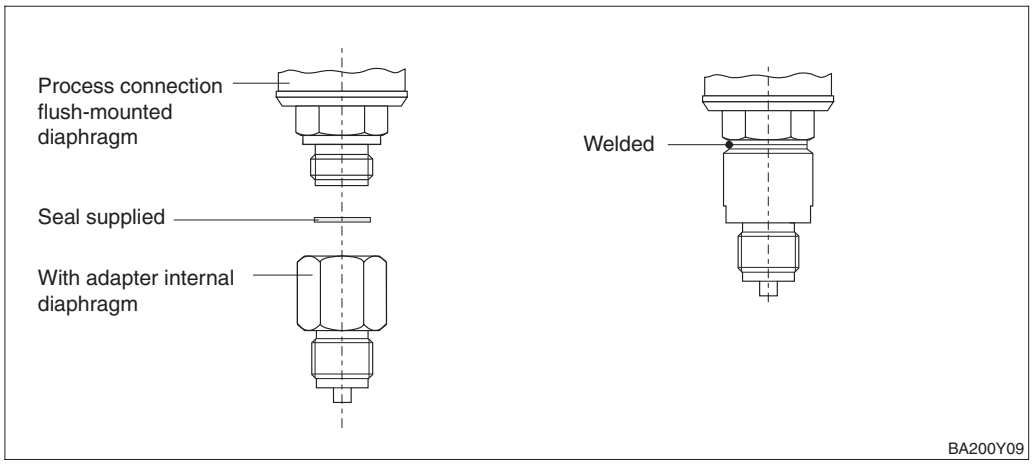


Figure 2.5
Cerabar M PMP 41
with screwed or welded adapter.
With welded adapter max. torque
80 Nm

2.2 Mounting instructions with diaphragm seal

Cerabar M
with diaphragm seal
– PMP 46
– PMP 48

The Cerabar M with diaphragm seal is screwed in, flanged or clamped, depending on the type of diaphragm seal.

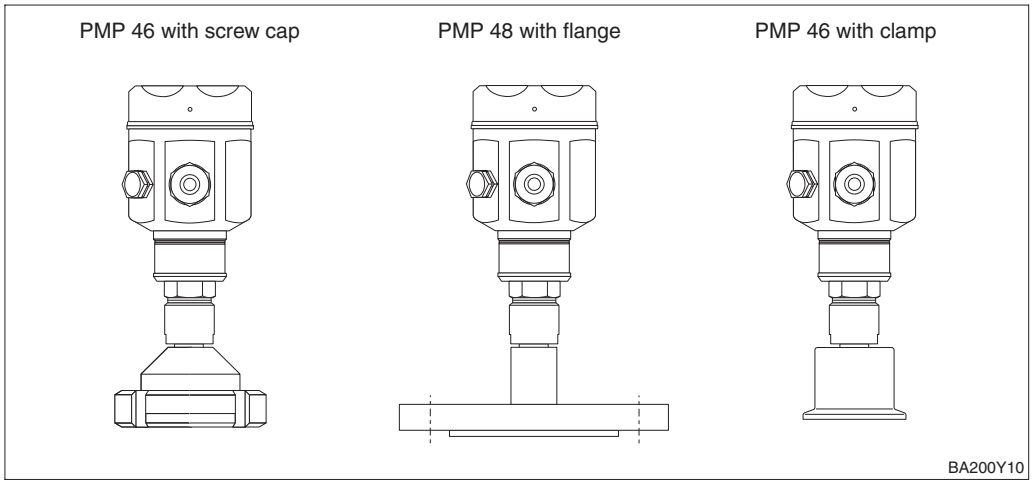


Figure 2.6
Diaphragm seal versions

- The protective cap of the diaphragm seal should only be removed just before mounting in order to protect the diaphragm.
- The diaphragm of the diaphragm seal of the Cerabar M must not be dented or cleaned with pointed or hard objects.
- The diaphragm seal and the pressure sensor together form a closed and calibrated system which is filled with filling fluid through a hole in the upper part of the sensor. The following rules should be observed:
  – This hole is sealed and is not to be opened.
  – The instrument should only be turned by the diaphragm seal at the point provided and not by the housing.

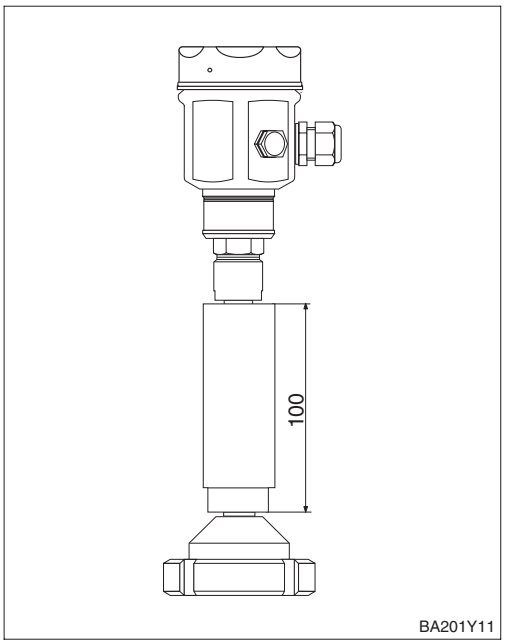


Figure 2.7
Mounting with temperature spacers

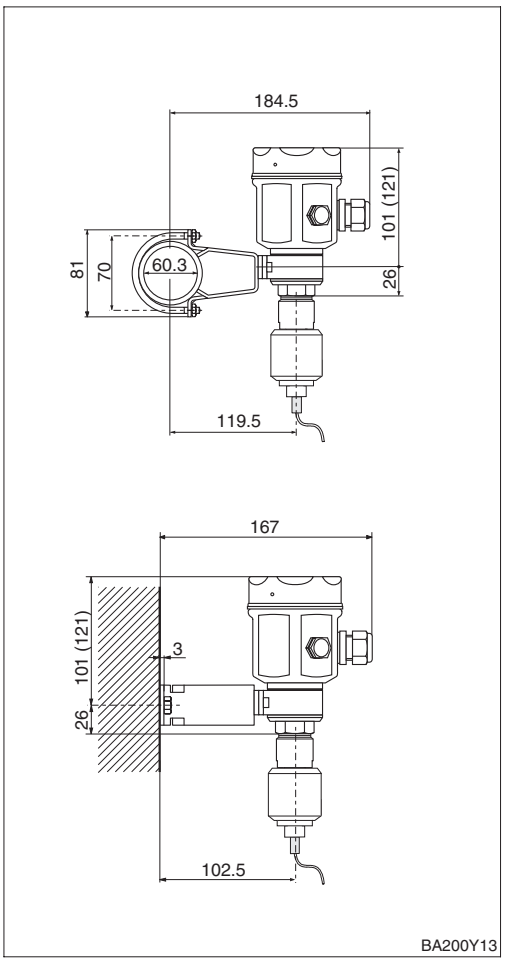
Mounting with temperature spacers

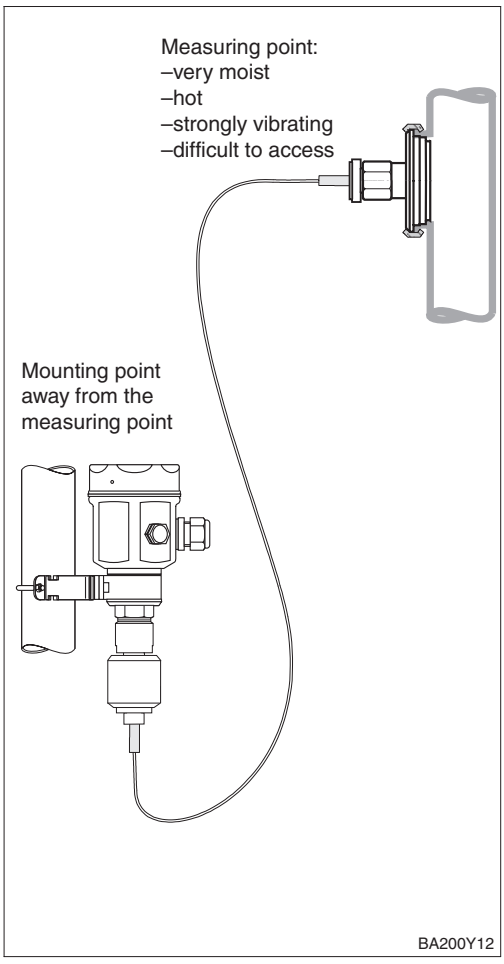
The use of temperature spacers is recommended for constant extreme product temperatures that can cause the maximum permissible ambient temperature of +85°C (+185°F) to be exceeded.

- Note when mounting that the temperature spacer increases the maximum height by 100 mm (3.94 in).
- Due to the water column in the temperature spacer, the increased height also causes a zero point shift of approx. 10 mbar (0.15 psi).

Mounting with capillary tubing

To protect from high temperature, moisture or vibration, or where the mounting point is not easily accessible, the housing of the Cerabar M can be mounted with a capillary tube to one side of the measuring point.
A bracket for mounting on a wall or pipe is available for this.





Dimensions
1 in = 25.4 mm
1 mm = 0.039 in

Figure 2.8
Mounting with capillary tubing and bracket away from the measuring point.
Values in brackets apply to instruments with a raised cover.

2.3 Mounting accessories

PMC 41
Wall and pipe mounting with bracket

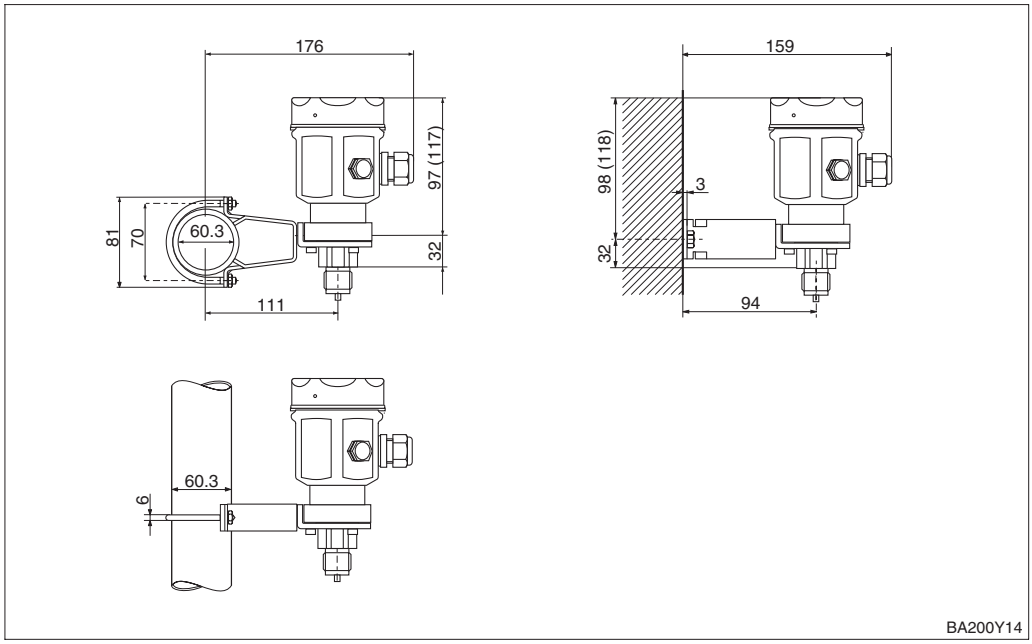


Figure 2.9
Mounting with bracket
left: on a vertical pipe
right: on a wall.
Values in brackets apply to instruments with a raised cover.

PMP 41
wall and pipe mounting with bracket

Dimensions
1 in = 25.4 mm
1 mm = 0.039 in

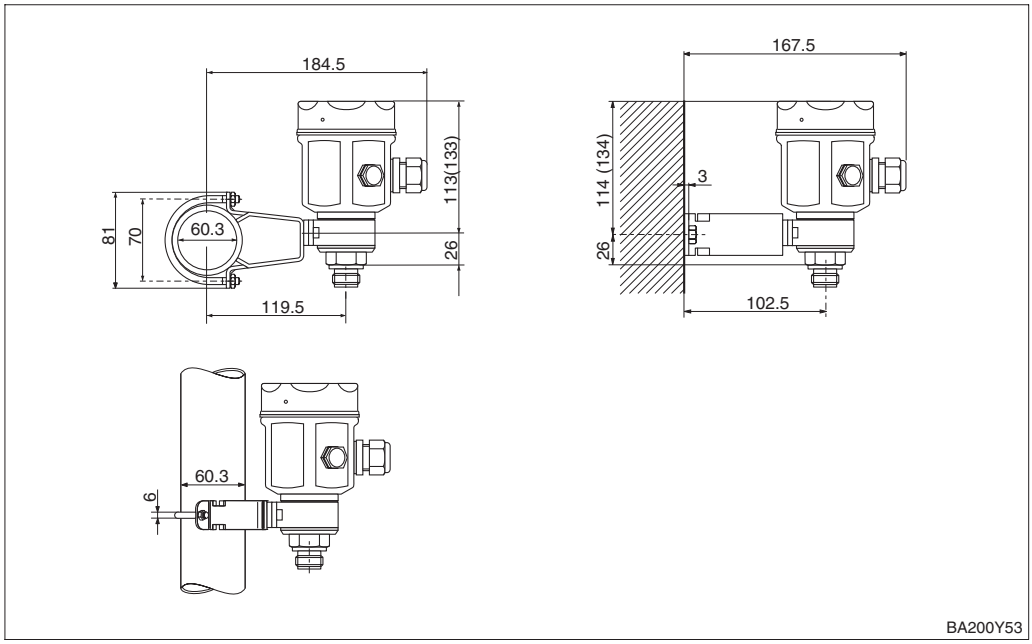


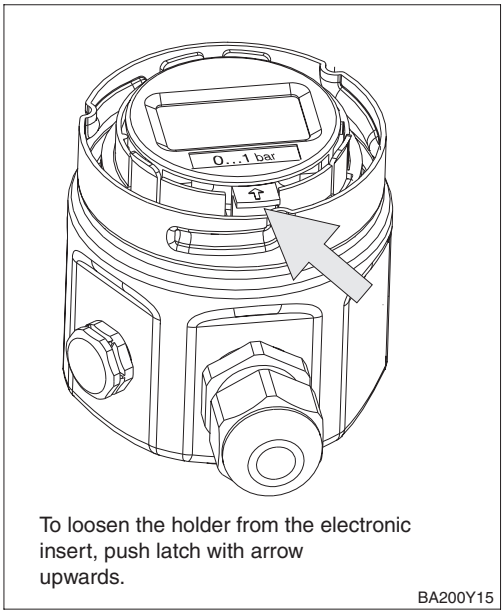
Figure 2.10
Mounting with bracket
left: on a vertical pipe
right: on a wall.
Values in brackets apply to instruments with a raised cover

2.4 Electrical connection

Transposed, screened two-wire cabling is recommended for the connecting cable.
Max. wire diameter: 2.5 mm^2 solid conductor
The power supply voltage is:
• 11.5…45 V_{DC}
Internal protection circuits against reverse polarity, HF interference and overvoltage peaks (see TI 241F "EMC Guidelines").
A test signal can be measured using the terminal plugs for this purpose without interrupting measurement.

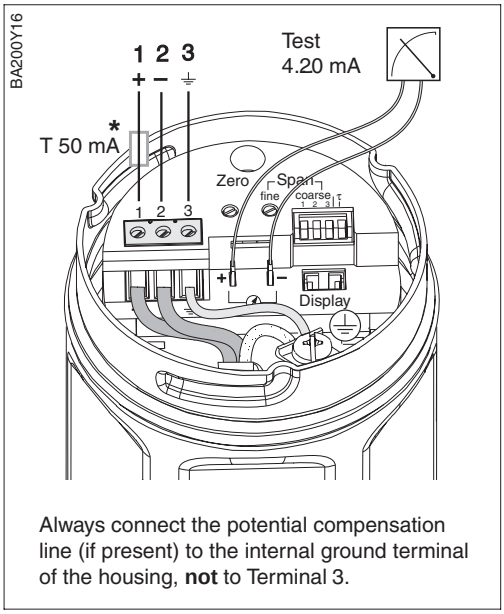
Cable connection

- Unscrew the cover
- If present, remove the retainer ring with analogue display.
  In addition:
  – Push up the catch with the arrow until the grip of the retaining ring is audibly released.
  – Loosen the retainer ring carefully to prevent the display cable from breaking. The plug of the display can remain plugged in.
- Insert the cable through the cable entry
- Connect the cable wires as shown in the connection diagram.
- Where appropriate, replace the retainer ring with an analogue display. The grip of the retainer right clips in with an audible click.
- Screw down the cover



To loosen the holder from the electronic insert, push latch with arrow upwards.

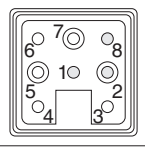
BA200Y15



Always connect the potential compensation line (if present) to the internal ground terminal of the housing, **not** to Terminal 3.

Figure 2.11
Electrical connection
Analogue electronics
***** For versions with certificate ATEX 100, II1/3D (not Ex power supply) the instrument must always be protected by a 50 mA (slow-blow) fuse.

Terminal 3 on the electronic insert is for grounding and is already wired internally. If the connecting cable also has a screening or ground cable within it, then this may only be connected to the internal ground terminal of the housing, not to Terminal 3 (see circuit diagram).

Plug	**Plug assignment**			
	Terminal	Function	Wire colour code	
Harting plug	1 2 8	+ – PE	Blue (BL) Brown (BN) Green-Yellow (GNYE)	
Plug M 12x1		+ – PE	Green (GN) Black (BK) Red (RD)	

3 Operation and Start-Up

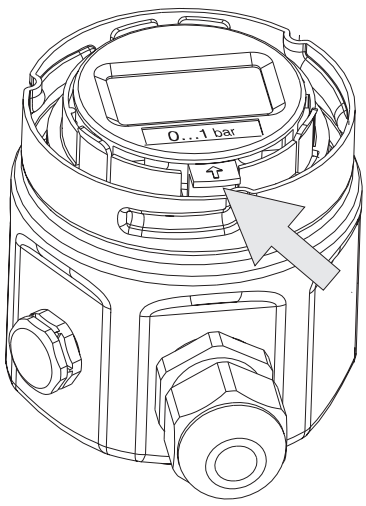
This section describes:
- Access to the operating elements and the function of the analogue display
- Position and function of the operating elements on the electronic insert
- Calibration and start-up of the Cerabar M

3.1 Access to the operating elements and the function of the analogue display

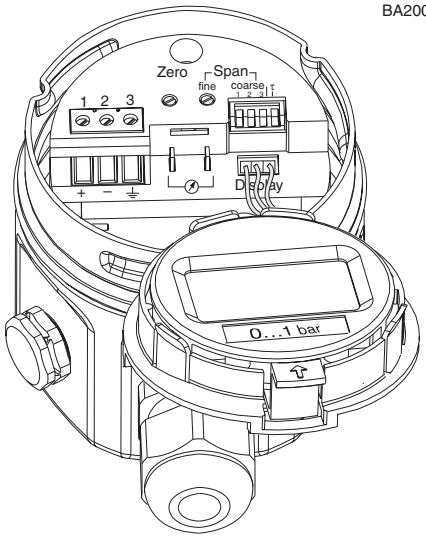
Lifting display for operation

The analogue display is delivered already mounted when it is ordered with the instrument. The analogue display with the retaining ring must therefore be removed before operating.
If you want to order an analogue display at a later date, then please observe the instructions in Section 4.3 "Mounting the analogue display".

Removing the display:
- Push up the catch with the arrow until the grip of the retaining ring on the electronic insert clicks.
- Loosen the retainer ring and lift off carefully to prevent the display cable from breaking.
- For reading the display during operation, plug the display onto the edge of the housing or let it hang down loosely by its cable next to the housing.



To loosen the holder from the electronic insert, push catch with arrow upwards.



Lifting off the display with retaining ring for operation.

Figure 3.1
left:
Loosening the retaining ring
right:
Lifting off the display with retaining ring for operation

Function of the display

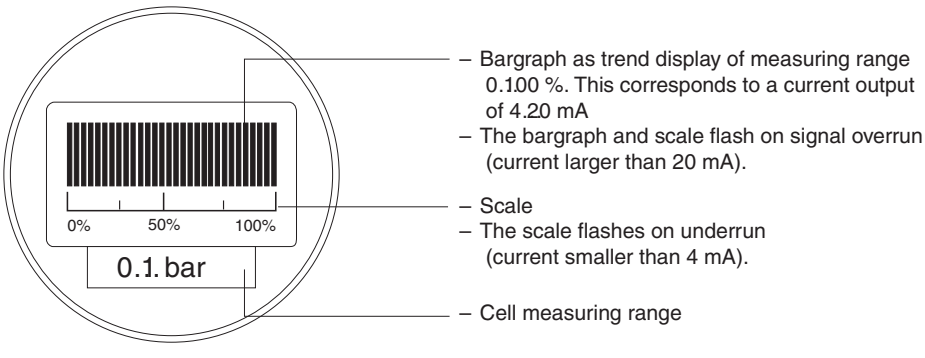
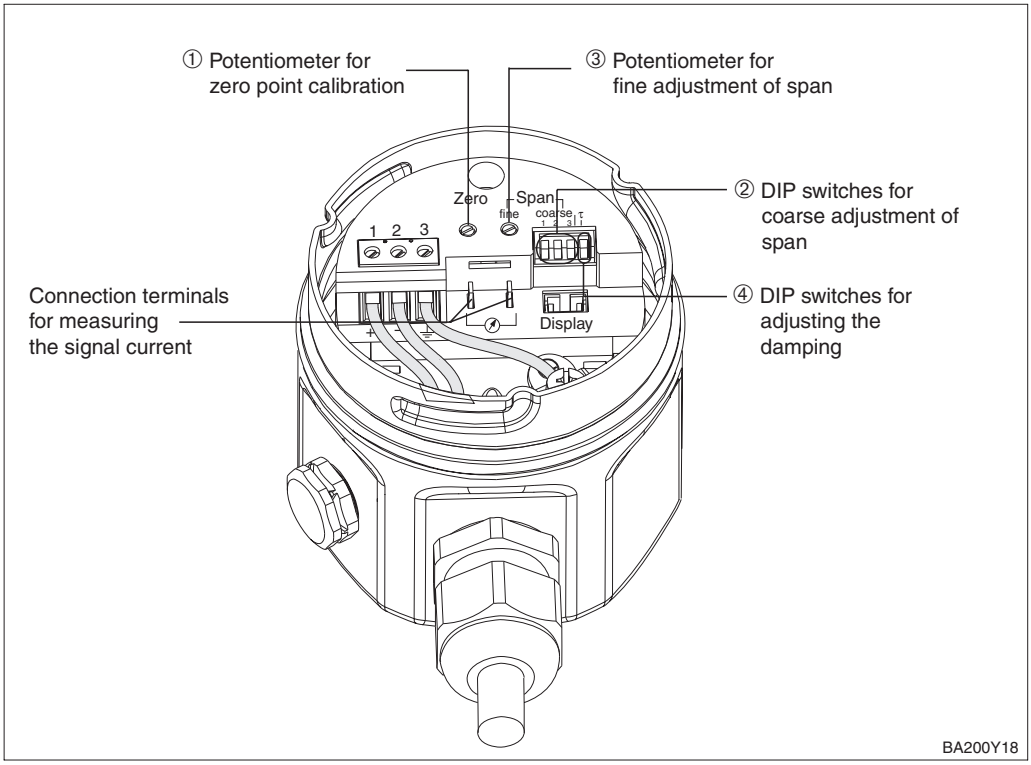


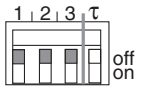
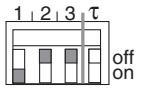
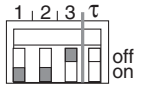
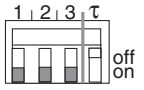
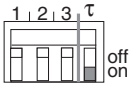
Figure 3.2
Function of the display

3.2 Position and function of the operating elements on the electronic insert

Position of the operating elements



Function of the operating elements

No.	Operating element	Function
①	Potentiometer for zero point calibration	Calibration of zero point ±10 %
②	DIP switches for coarse calibration of the measuring span	For coarse calibration of the measuring span a spread between 1:1 and 10:1 can be selected Switch positions: 1:1  3:1  6:1  10:1 
③	Potentiometer for fine calibration of the measuring span	Fine adjustment of the measuring span
④	DIP switches for calibrating damping	 **off:** Damping 0 s **on:** Damping 2 s

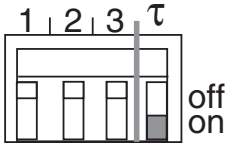
3.3 Calibration and start-up

Preparatory work

- Connect up electrically the Cerabar M (see sect. 2.4 "Electrical connection")
- Connect a multimeter (4…20 mA) to the connection terminals provided.
- Ensure that a pressure can be generated within the required measuring range.

Damping

The damping τ affects the speed with which the output signal and the analogue display react to changes in pressure.
A DIP switch unit is available for calibrating the damping:



- Switch position **off**: Damping 0 s
- Switch position **on**: Damping 2 s

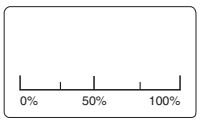
Example

The example used here is for calibrating a 0…1 bar measuring cell.

Zero point adjustment

Zero point calibration is carried out using the potentiometer for zero point adjustment.
Carry out the zero point adjustment as follows:

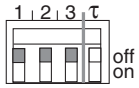
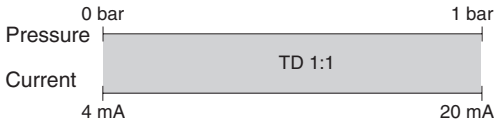
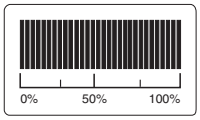
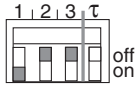
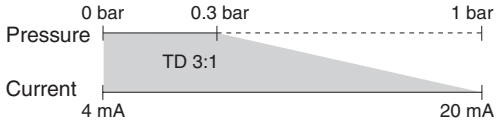
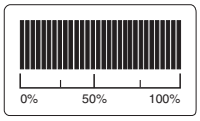
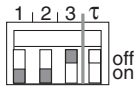
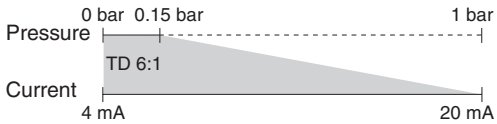
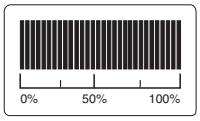
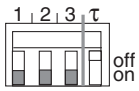
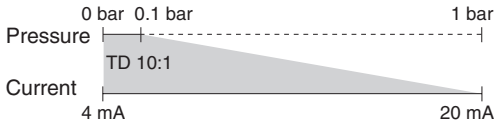
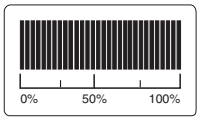
- Enter exactly 0 bar for the zero point (ambient pressure for gauge measurements or vacuum for absolute measurements).
- Adjust the multimeter to exactly 4 mA.

Pressure	Current	Response of analogue display
0 bar	Set to exactly 4 mA	Display of 0 %  The scale does not flash. (The scale begins to flash immediately a point is set which is below the cell measuring range. In this case readjust the value until the scale stops flashing.)

Adjusting the measuring span

Three DIP switches are available for course adjustment of the measuring span. Depending on the switch position, a measuring range spread (also known as turndown or TD) can be selected for 1:1 (to 2:1), 3:1, 6:1 or 10:1. Fine adjustment is carried out using the fine adjustment potentiometer of the measuring span.

Carry out the measuring span adjustment as follows:
- Enter exactly the pressure required for the measuring span.
- Adjust the multimeter to exactly 20 mA.
  Proceed as follows:
  – Limit the measuring span by selecting one of the measurement range spreads using the DIP switches for coarse adjustment.
  – Adjust exactly the measuring span required using the potentiometer for fine adjustment of the measuring span.

DIP switch positions	Pressure	Response of the analogue display
TD 1:1 	Cell measuring range: 0…1 bar Measuring range set: 0…1 bar 	Display of 100 %  The bargraph does not flash.*
TD 3:1 	Cell measuring range: 0…1 bar Coarse measuring range set: 0…0.3 bar (TD 3:1) 	Display of 100 %  The bargraph does not flash.*
TD 6:1 	Cell measuring range: 0…1 bar Coarse measuring range set: 0…0.15 bar (TD 6:1) 	Display of 100 %  The bargraph does not flash.*
TD 10:1 	Cell measuring range: 0…1 bar Coarse measuring range set: 0…0.1 bar (TD 10:1) 	Display of 100 %  The bargraph does not flash.*

* Bargraph and scale begin to flash immediately a full scale value is set which exceeds the cell measuring range. In this case read just the value until the bargraph and scale stop flashing.

4 Maintenance and Repair

4.1 Repair

If the Cerabar M must be sent to Endress+Hauser for repair, then a note should be enclosed containing the following information:
- An exact description of the application
- The chemical and physical characteristics of the product.
- A brief description of the error.

Before sending in the Cerabar M to Endress+Hauser for repair, please take the following protective measures:

- Remove all traces of the product.
  This is particularly important if the product is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.
- We do request that no instrument should be returned to us without all dangerous material being completely removed as it can, e.g. penetrate into fissures or diffuse through plastic.


Caution!

Caution!
Instruments with certificates of conformity or design approval must be sent in for repair as complete units only.

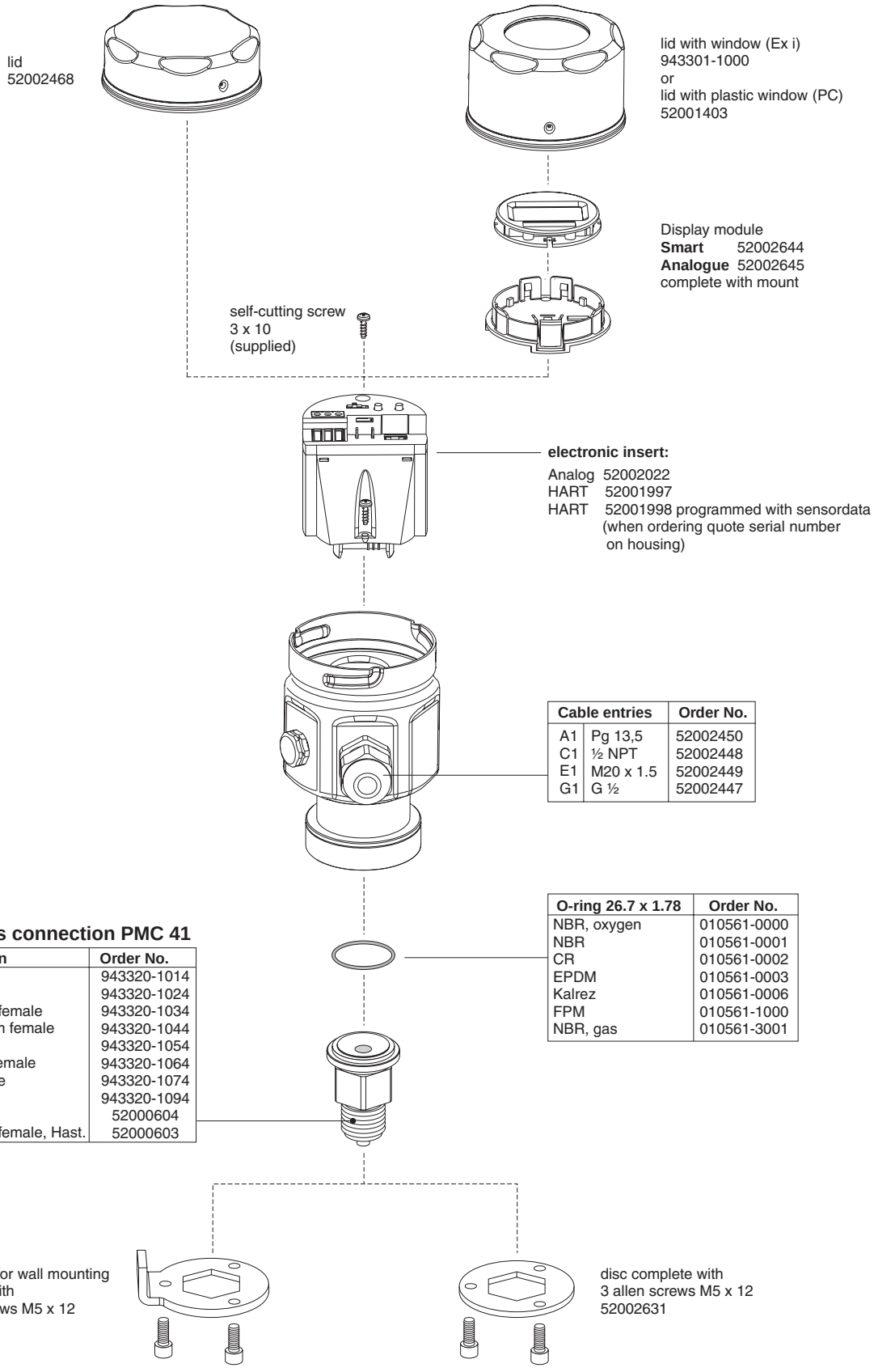

Note!

Note!
More detailed information on maintenance and repair can be found in the Service Manual SM 005P/00/en which is available on request.

4.2 Replacement parts

The diagram below shows all replacement parts together with their order numbers which can be ordered from Endress+Hauser.
When ordering replacement parts, please note the following:
- If parts given in the order code are to be replaced, then ensure that the order code (instrument designation) on the nameplate is still applicable.
- If the instrument designation on the nameplate has changed then a modified nameplate must also be ordered. The information about the new instrument must then be entered on the modified nameplate. This must then be attached to the housing of the Cerabar M.
- If a new sensor is ordered as a spare part, it is usually supplied as the complete mounted device with housing and process connection, but without the electronic insert.
- Only the process connection on the PMC 41 can be exchanged by the customer. For all other versions, the process connection ordered is supplied with the complete housing, but without the electronic insert.
- It is not possible to convert a standard instrument into an Ex instrument by replacing its parts. The appropriate regulations are to be observed when certified instruments are to be repaired.

Spare parts



Cable entries		Order No.
A1	Pg 13,5	52002450
C1	½ NPT	52002448
E1	M20 x 1.5	52002449
G1	G ½	52002447

O-ring 26.7 x 1.78	Order No.
NBR, oxygen	010561-0000
NBR	010561-0001
CR	010561-0002
EPDM	010561-0003
Kalrez	010561-0006
FPM	010561-1000
NBR, gas	010561-3001

Replaceable process connection PMC 41

Vers.	Threaded connection	Order No.
1M	G ½ male	943320-1014
1T	M 20x1.5 male	943320-1024
1N	½ NPT male, ¼ NPT female	943320-1034
1A	½ NPT male, 11.4 mm female	943320-1044
1K	PT ½ male	943320-1054
1R	G ½ male, 11.4 mm female	943320-1064
1P	G ½ male, G ¼ female	943320-1074
1S	PF ½ male	943320-1094
	G ½ male, Hastelloy	52000604
	½ NPT male, ¼ NPT female, Hast.	52000603

4.3 Mounting the analogue display

The analogue display is delivered already mounted when it is ordered with the instrument. In cases of damage, accessories can be ordered.

Removing the display

- Push up the latch with the arrow until the grip of the retaining ring on the electronic insert is heard to click.
- Loosen the retainer ring and lift off carefully to prevent the display cable from breaking.
- Remove the plug of the display from the electronic insert.

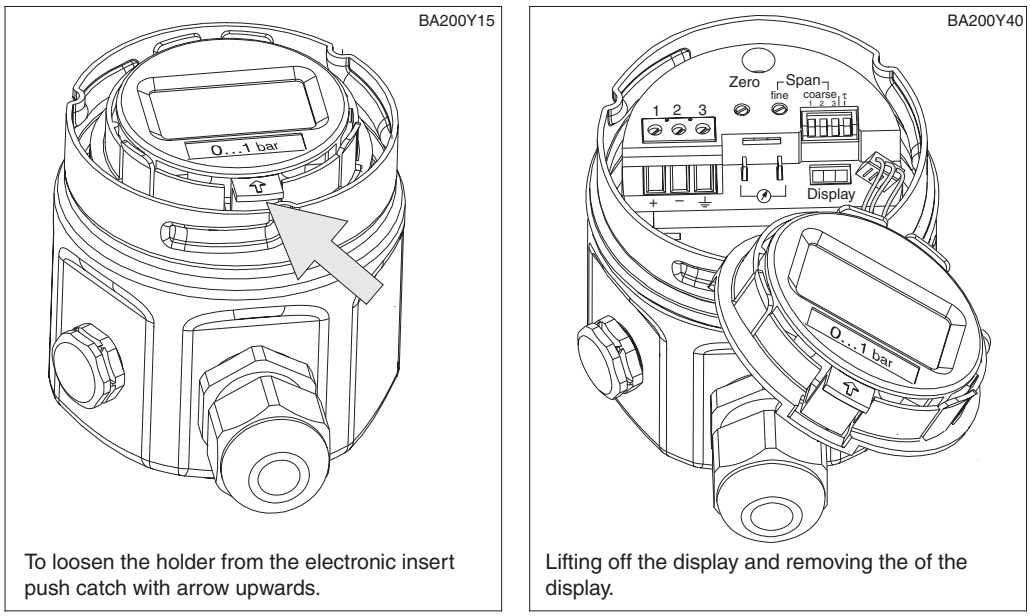


Figure 4.1
left:
Loosening the retaining ring
right:
Removing the display

Mounting the display

- Insert the plug of the display in the jack in the electronic insert provided for this purpose and clip in ①.
- Insert the pin on the retaining ring into the hole in the electronic insert provided for this purpose ②.
- Firmly press down the retaining ring with the display onto the electronic insert. The stop makes an audible click.

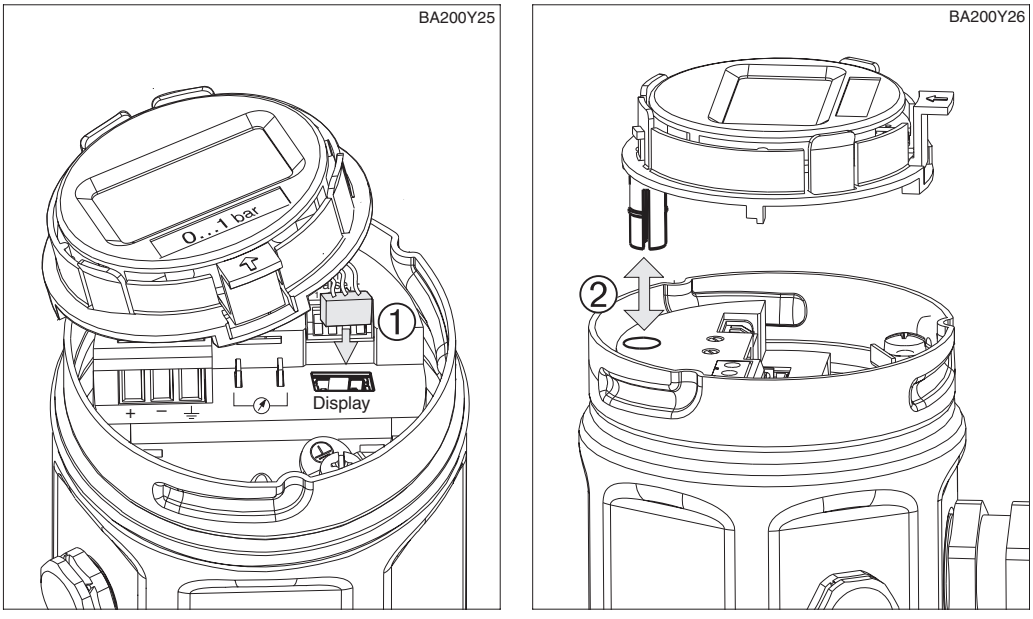


Figure 4.2
Mounting the display

4.4 Replacing the electronic insert

- If the existing analogue electronic insert is to be replaced with another analogue electronic insert, then it can be ordered under the following order No.:
  – **52002022**: Electronics Cerabar M, 4…20 mA, analogue
  After replacing the electronic insert the instrument must be recalibrated. Information on adjustment is given in Section 3 "Operation".
- If the existing analogue electronic insert is to be replaced with a digital electronic insert, then the information contained in BA 201P, supplied with the digital electronic insert, applies.

Removing the electronic insert

- If appropriate, loosen the retaining ring and lift off and remove the plug of the display from the electronic insert.
- Remove the cable from the electronic insert.
- Loosen screws ① and ② on the electronic insert.
- Lift out the electronic insert.

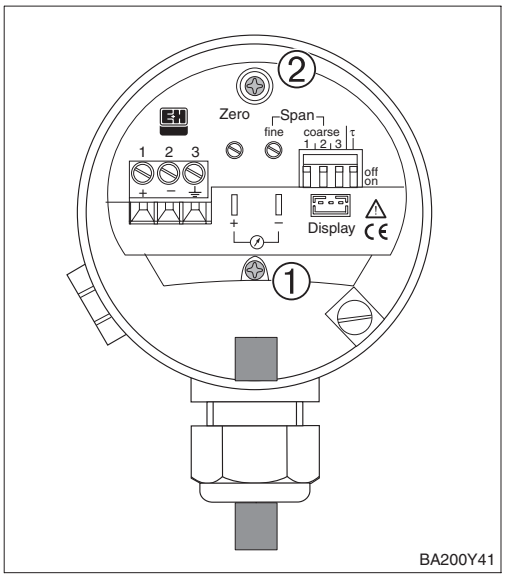


Figure 4.3
Position of screws ① and ② for removing the electronic insert

Mounting the electronic insert

- Plug in the new electronic insert and tighten screws ① and ②.

- Connect the connecting cable as shown in connection diagram in Section 2.4 "Electrical Connection".
- Carry out a calibration as shown in Section 3 "Operation".
- If appropriate, mount the display.

4.5 Changing the measuring cell

If the measuring cell is to be changed then Endress+Hauser offers a complete housing with the new measuring cell and process connection required but without an electronic insert. Therefore, when changing the measuring cell, simply remove the electronic insert from the old housing and install it in the new one. After changing the measuring cell. the Cerabar M must be recalibrated.

- Ordering a housing with measuring cell and process connection:
  PM* 4* – ❒ ❒❒ ❒❒ ❒ W ❒ ❒❒ ❒ ❒
- For instructions on mounting the electronic insert see Sect. 4.4. "Replacing the electronic insert"
- For instructions on calibration see Section 3 "Operation and Start-Up".

4.6 Changing the gasket

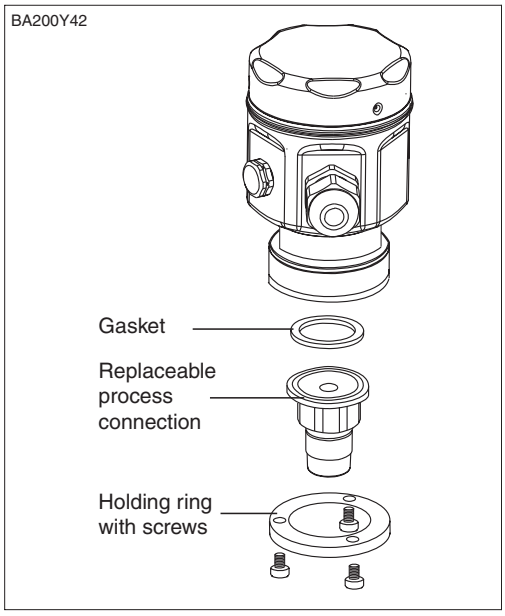
The gasket in contact with the medium and inside the spigot of the Cerabar M PMC 41 can be replaced. Except for the PTFE gasket (Structure D), all gaskets can thus be interchanged as required. The different temperature limits should be observed for individual materials.

Gasket		Temperature limits
1	FPM, Viton	–20°C* (–4°F)
6	FPM, Viton grease-free	–10°C* (+14°F)
A	FPM, Viton oil and grease-free for oxygen	–10°C…+60°C (+14°F…+140°F)
8	NBR (DVGW)	–20°C…+80°C (–4°F…+176°F)
2	NBR	–20°C* (–4°F)
7	FFKM, Kalrez compound 4079	+5°C* (+41°F)
4	EPDM	–40°C* (–40°F)

* Upper temperature limit according to specifications of standard instrument

Changing the gasket

- Loosen the screws on the retaining ring of the process connection.
- Remove the retaining ring and the process connection
- Replace gasket.
  The surfaces on each side of the gasket and the gasket itself must be free from dirt fibre and dirt.
- Secure the process connection with the retaining ring and screws



5 Technical Data

General information

Manufacturer	Endress+Hauser
Instrument	Pressure transmitter
Designation	PMC 41, PMC 45, PMC 46, PMC 48
Technical documentation Version Technical data	BA 200P/00/en 12.03 according to DIN 19 259

Application

Measurement of absolute and gauge pressure in gases, vapours, liquids

Operation and system design

Measuring principle

PMC 41, PMC 45 with ceramic sensor	The pressure causes a slight deflection of the ceramic diaphragm of the sensor. The change in the capacitance is proportional to the pressure and is measured by the electrodes of the ceramic sensor. Volume of chamber: approx. 2 mm^3 (0.078 in^3)
PMP 41, PMP 45, PMP 46, PMP 48 with metal sensor	The process pressure acting on the metallic separating diaphragm of the sensor is transmitted via a filling fluid to a resistance bridge. The change in the output voltage of the bridge is proportional to the pressure and is then measured. Volume of chamber: smaller than 1 mm^3 (0.039 in^3)
Measuring system	– Cerabar M and power supply e.g. via RN 221 transmitter power pack – Calibration via potentiometers for zero point and span – Plug-in analogue display for showing measured values
Construction	Standard SS housing, for process connections see page 25
Signal transmission	4…20 mA, 2-wire

Input

Measured variables	Absolute or gauge pressure

Measuring ranges

PMC 41, PMC 45				**PMP 41, PMP 45, PMP 46, PMP 48**			
Type of pressure	**Measure-ment limits**	**Min. span (TD 10:1)**	**Overload**	**Type of pressure**	**Measure-ment limits**	**Min. span (TD 10:1)**	**Overload**
	bar	**bar**	**bar**		**bar**	**bar**	**bar**
gauge	0…0.1	0.01	4	**gauge**	0…1	0.1	4
gauge	0…0.4	0.04	7	**gauge**	0…4	0.4	16
gauge	0…1	0.1	10	**gauge**	0…10	1	40
gauge	0…4	0.4	25	**gauge**	0…40	4	160
gauge	0…10	1	40	**gauge**	0…100	10	400
gauge	0…40	4	60	**gauge**	0…400	40	600
gauge	–0.1…0.1	0.02	4	**gauge**	–1…+1	0.2	4
gauge	–0.4…0.4	0.08	7	**gauge**	–1…+4	0.5	16
gauge	–1…+1	0.2	10	**gauge**	–1…+10	1.0	40
gauge	–1…+4	0.5	25				
gauge	–1…+10	1.0	40				
absolute	0…0.4	0.04	6	**absolute**	0…1	0.1	4
absolute	0…1	0.1	9	**absolute**	0…4	0.4	16
absolute	0…4	0.4	25	**absolute**	0…10	1	40
absolute	0…10	1	40	**absolute**	0…40	4	160
absolute	0…40	4	60	**absolute**	0…100	10	400
				absolute	0…400	40	600

Conversion factors

1 bar = 14.5 psi
1 psi = 0.069 bar

Resistance to low pressures	PMC PMP	for sensors with nominal values 0.1 bar: to 0.7 $bar_{absolute}$; for all other sensors: to 0 $bar_{absolute}$ to 10 $mbar_{absolute}$
Calibration range (turndown)		via DIP switches to TD 10:1
Zero point increase and decrease		±10 % of cell measuring range

Output

Output signal		Analogue signal 4…20 mA
Signal on alarm	Signal overrun (>20.5 mA) Signal underrun (<3.6 mA)	Bargraph and scale on the display flash Scale flashes
Integration time		Depending on switch position: off: 0 s; on: 2 s

Accuracy

Reference conditions	DIN IEC 770 T_U=25°C (+77°F)
Linearity including hysteresis and reproducibility (based on the limit point method to DIN IEC 770)	PMC: ±0.2 % of set span PMP. ±0.3 % of set span
Linearity at low absolute pressure ranges (due to performance limits of currently available DKD calibration rigs)	Absolute: for ≥40 mbar to <100 mbar: ±0.3 % of set span
Warm-up time	200 ms
Rise time	60 ms
Response time	180 ms
Long-term drift	0.1 % (FS) per year
Thermal effects with reference to the set span TD = nominal value/set span	for –10…+60°C (+14…+140°F): ±(0.3% x TD+0.3%) for –40…–10°C (–40…+14°F); +60…+85°C (+140…+185°F): ±(0.5% x TD+0.5%)
Temperature coefficient (maximum TK) (But not exceeding the error due to thermal effects.)	for zero signal and span: for –10°C…+60°C (+14°F…+140°F): ±0.15% of nominal value/10 K for –40°C…–10°C (–40°F…+14°F); +60°C…+85°C (+140°F…+185°F): ±0.2% of nominal value/10 K
Vibration effects	None (4 mm in path peak-to-peak 5…15 Hz, 2 g: 15…150 Hz, 1g: 150 Hz…2000 Hz)

Process conditions

Mounting conditions	Any position

Ambient conditions

Ambient temperature	–40…+85°C (–40…+185°F)
Ambient temperature range (short-term)	–40…+100°C (–40…+257°F)
Storage temperature	–40…+85°C (–40…+185°F)
Climatic class	4K4H to DIN EN 60721-3
Protection	IP 66/Nema 4x with cable gland IP 68 (1 m water over 24 h) or Nema 6P (1.8 m water over 30 min.) with assembled cable with reference air feed
Electromagnetic compatibility	Interference emission to EN 50081-1, Interference immunity to EN 50082-2 and NAMUR NE 21: influence < 0.5%

Process conditions

Process temperature	PMC/PMP 41: –40…+85°C (–40…+185°F) PMC/PMP 45: –40…+125°C (–40…+257°F) PMP 46/48: –40…+85°C (–40…+185°F)
Process temperature range	Cleaning temperature for Cerabar M flush-mounted +150°C (+302°F) up to 60 minutes, diaphragm seal with temperature spacer and high-temperature oil max. 350°C (+662°F)
Pressure specifications	See nameplate. Observe pressure-temperature derating.

Mechanical construction

Design

Housing	– Type F 15 Optional electrical connection via – cable gland M 20x1.5 – cable entry Pg 13.5, G ½, ½ NPT – Harting plug, M 12x1 plug – assembled cable with reference air feed
Process connections	All common thread versions, flush-mounted connections and diaphragm seals

Materials

Housing		– SS 1.4301 (SS 304) – Housing cover gasket: silicone
Nameplate		Engraved on housing with laser
Process connections	PMP 41 PMC 41 PMP 45, PMC 45, PMP 46, PMP 48	– 1.4435 (SS 316L), adapter 1.4435 (SS 316L) – 1.4435 (SS 316L), Hastelloy 2.4819 (C 276) – 1.4435 (SS 316L)
Process diaphragm	PMC 41, PMC 45 PMP 41, PMP 45, PMP 46 PMP 48	– Al_2O_3 aluminium oxide ceramic – 1.4435 (SS 316L) – 1.4435 (SS 316L), Hastelloy 2.4819 (C 276), tantalum, PTFE film on 1.4435 (SS 316L)
Seals		FPM Viton, FPM Viton grease-free, FPM Viton oil and grease-free for oxygen, EPDM, Kalrez, NBR, DVGW version with NBR seal
Mounting accessories		Bracket for pipe and wall mounting 1.4301 (SS 304)
Filling fluid in diaphragm seals		Silicone oil, vegetable oil, glycerine, high-temperature oil, FLUOROLOBE grease-free for oxygen

Gasket		Lower temperature limit
1	FPM, Viton	–20°C (–4°F)
6	FPM, Viton grease-free	–10°C (+14°F)
A	FPM, Viton oil and grease-free for oxygen	–10°C…+60°C (+14°F… +140°F)
8	NBR (DVGW)	–20°C…+80°C (–4°F…+176°F)
2	NBR	–20°C (–4°F)
7	FFKM, Kalrez Compound 4079	+5°C (+41°F)
4	EPDM	–40°C (–40°F)

Measuring cell

Filling fluid	PMC 41, PMC 45 PMP 41, PMP 45, PMP 46, PMP 48	– None, dry cell sensor – optional silicone oil or inert oil (Voltalef) for oxygen

Display and operating interface

Display	Plug-in display with bargraph of pressure (30 segments)
Operation	– Calibration of zero point and span via two potentiometers and DIP switches on the instrument – Calibrating the damping via DIP switches on the instrument

Power supply

Power supply	11.5…45 V_{DC},
Overvoltage category	II to DIN EN 61 010-1
Ripple	No effect for 4…20 mA signal up to ±5 % residual ripple within permissible voltage range

Certificates and approvals

Ignition protection	see "Safety Instructions" page 4
CE Mark	By attaching the CE Mark, Endress+Hauser confirms that the instrument fulfils all the requirements of the relevant EC directives.

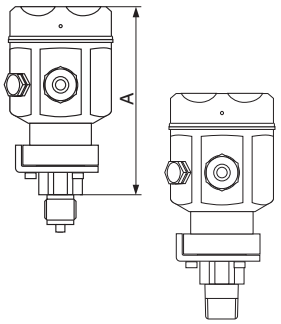
Supplementary documentation

Cerabar M System Information: SI 038P/00/en
Cerabar M pressure transmitter Technical Information: TI 321P/00/en
Cerabar M with diaphragm seal Technical Information: TI 322P/00/de
Cerabar M analogue electronics operating instructions: BA 201P/00/en

5.1 Dimensions

PMC 41

Thread (for detailed information see TI 321P)

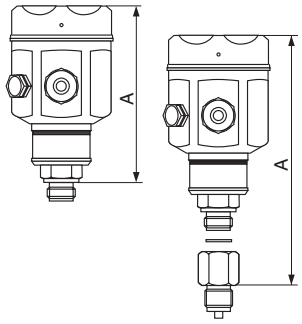


	Max. height
– G ½ external	155.0 mm
– G ½ external, G ¼ internal	155.0 mm
– G ½ external, 11.4 mm internal	155.0 mm
– ½ NPT external, ¼ NPT internal	155.0 mm
– ½ NPT external, Ø 11.4 mm internal	155.0 mm
– PF ½ external	155.0 mm
– PT ½ external	155.0 mm
– M 20x1.5 external	155.0 mm

Dimensions
1 mm = 0.039 in
1 in = 25.4 mm

PMP 41

Thread flush-mounted or with internal adapter (for detailed information see TI 321P)

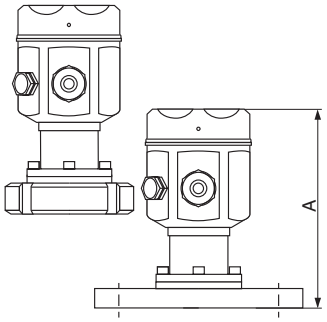


Diaphragm flush-mounted:	*Max. height*
– G ½ external	162.0 mm
– G ½ external with O-ring for welded nozzle	162.0 mm
Diaphragm flush-mounted:	
– G ½ external	197.5 mm
– ½ NPT external	197.5 mm
– ½ NPT internal	184.5 mm
– PF ½ external	195.5 mm
– PT ½ external	197.5 mm
– M 20x1.5 external	197.5 mm

PMC 45

Dairy connections | **Threaded bosses** | **Flanges**

(For detailed information see TI 321P)



	Max. height
– Triclamp 2"	172.5 mm
– SMS 1½"	172.5 mm
– SMS 2"	172.5 mm
– DIN 11851 DN 40, PN 40	172.5 mm
– DIN 11851 DN 50, PN 40	172.5 mm
– Varivent, D=68 mm	172.5 mm
– DRD flange, D=65 mm	172.5 mm

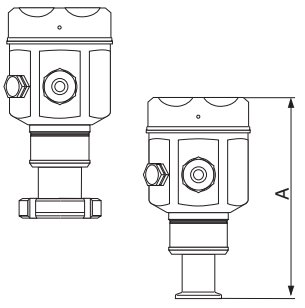
	Max. height
– G 1½	172.5 mm
– G 2	173.5 mm
– 1½ NPT	172.5 mm
– 2 NPT	173.5 mm
– M 44x1.25	172.5 mm

	Max. Height
DIN 2527	
– DN 50, PN 40	172.5 mm
– DN 80, PN 40	172.5 mm
ANSI B16.5 with sealing strip	
– 1½"	172.5 mm
– 2"	172.5 mm
– 3"	172.5 mm
– 4"	172.5 mm
JIS B 2210	
– JIS 10K 50A RF	172.5 mm

PMC 45

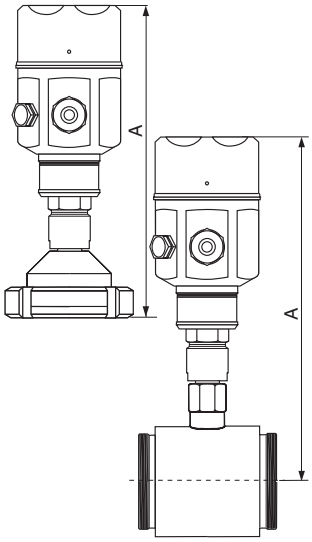
Dairy connections | **Threaded bosses**

(For detailed information see TI 321P)

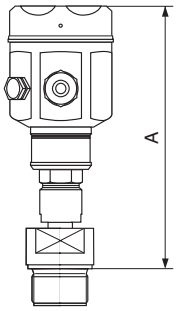


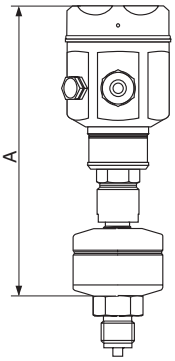
	Max. height
– Miniclamp DN 20, PN 40	166.0 mm
– Triclamp 1"	166.0 mm
– DIN 11851 DN 25, PN 40	166.0 mm
– Varivent D= 50 mm	166.0 mm

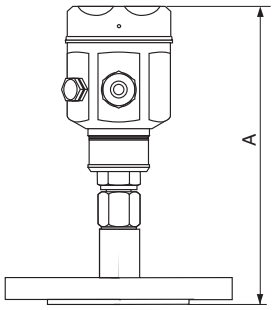
	Max. height
– ¾ NPT external	166.0 mm
– G 1 external with metal plug for welded nozzle	166.0 mm

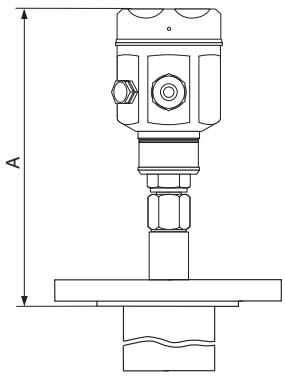
PMP 46	Diaphragm and pipe diaphragm seals for dairy connections (for detailed information see TI 322P)		
	*Diaphragm for diaphragm seal*	*Max. height*	**Dimensions** 1 mm = 0.039 in 1 in = 25.4 mm
	– DIN 11851 DN 32, PN 40	251.5 mm	
	– DIN 11851 DN 40, PN 40	250.5 mm	
	– DIN 11851 DN 50, PN 40	245.5 mm	
	– Triclamp 1½"	234.5 mm	
	– Triclamp 2"	242.5 mm	
	– Triclamp 3"	242.5 mm	
	– SMS 1½"	254.5 mm	
	– SMS 2"	259.5 mm	
	– RJT 1½"	257.0 mm	
	– RJT 2"	258.0 mm	
	– ISS 1½"	267.5 mm	
	– ISS 2"	267.5 mm	
	– DRD flange D= 65 mm	258.5 mm	
	– Varivent D=68 mm	252.5 mm	
	Pipe diaphragm seal		
	– DIN 11851 DN 25, PN 40	273.5 mm	
	– DIN 11851 DN 40, PN 40	283.5 mm	
	– DIN 11851 DN 50, PN 40	288.5 mm	
	– Triclamp ¾", PN 40	220.0 mm	
	– Triclamp 1", PN 40	220.0 mm	
	– Triclamp 1½", PN 40	257.0 mm	
	– Triclamp 2", PN 40	268.0 mm	

PMP 48	Diaphragm seal, flange (for detailed information see TI 322P)









Threaded bosses	*Max. height*
– G 1½, DIN ISO 228/1, from 0.4 bar span	232.5 mm
– G 2, DIN ISO 228/1from 0.1 bar span	237.5 mm
– 1½ NPT, ANSI B 1.201, from 0.4 bar span	233.5 mm
– 2 NPT, ANSI B 1.201, from 0.1 bar span	233.5 mm
– Spacer with G ½, EN 16 288, Form 6kt	237.5 mm
– Spacer with ½ NPT, ANSI B 1.201	237.5 mm
Flanges, dimensions to DIN 2527	
– DN 25, PN 64/160	255.0 mm
– DN 25, PN 250	255.0 mm
– DN 25, PN 400	255.0 mm
– DN 50, PN 10/40	255.0 mm
– DN 50, PN 64	261.0 mmh
– DN 50, PN 100/160	265.0 mm
– DN 50, PN 250	273.0 mm
– DN 50, PN 400	287.0 mm
– DN 80, PN 10/40	259.0 mm
Flanges with extension, dimensions to DIN 2527	
– DN 50, PN 10/40, Extension 50 mm	255.0 mm
– DN 80, PN 10/40, Extension 50 mm	259.0 mm
– DN 100, PN 10/40, Extension 50 mm	255.0 mm
– DN 80, PN 10/40, Extension 100 mm	259.0 mm
– DN 50, PN 10/40, Extension 200 mm	255.0 mm
– DN 80, PN 10/40, Extension 200 mm	259.0 mm
Flanges, dimensions to ANSI B16.5 with sealing strip Form RF	
– 1", 400/600 lbs	250.5 mm
– 1", 900/1500 lbs	254.5 mm
– 1", 2500 lbs	254.5 mm
– 2", 150 lbs	254.5 mm
– 2", 300 lbs	257.5 mm
– 2", 400/600 lbs	267.0 mm
– 2", 900/1500 lbs	280.0 mm
– 2", 2500 lbs	295.0 mm
– 3", 150 lbs	254.5 mm
– 3", 300 lbs	259.0 mm
– 4", 150 lbs	259.0 mm
– 4", 300 lbs	262.5 mm
Flanges with extension, dimensions to ANSI 16.5	
– 2", 150 lbs, extension 2"	254.5 mm
– 3", 150 lbs, extension 2"	254.5 mm
– 4", 150 lbs, extension 2"	254.5 mm
– 2", 150 lbs, extension 4"	254.5 mm
– 3", 150 lbs, extension 4"	254.5 mm
– 4", 150 lbs, extension 4"	254.5 mm
– 2", 150 lbs, extension 6"	254.5 mm
– 3", 150 lbs, extension 6"	254.5 mm
– 4", 150 lbs, extension 6"	254.5 mm

Dimensions
1 mm = 0.039 in
1 in = 25.4 mm

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