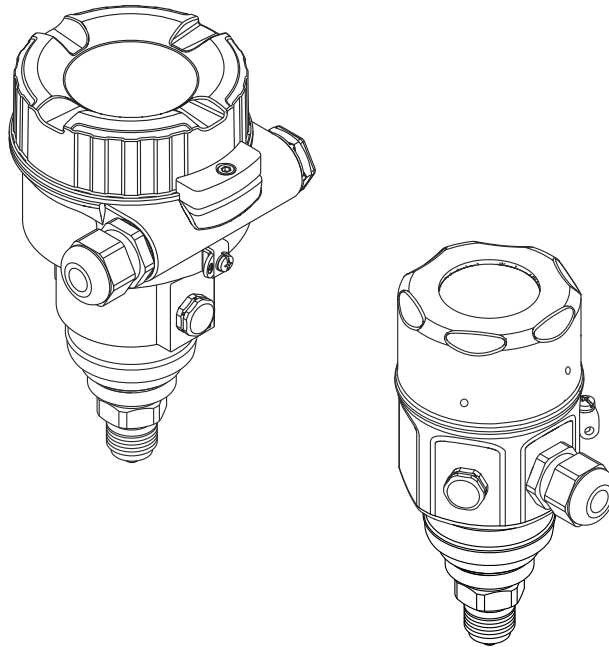


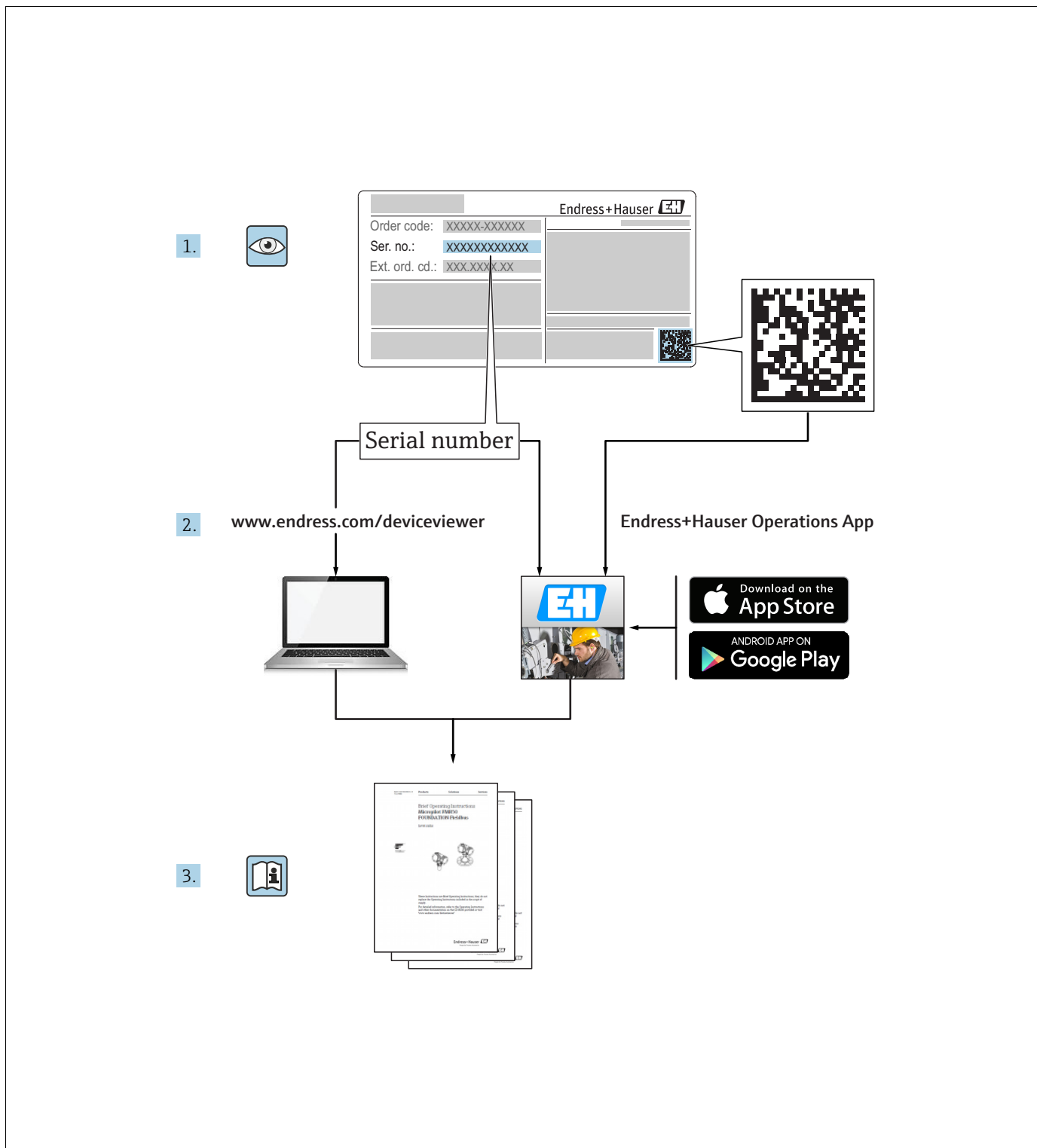
# Operating Instructions

## Cerabar M

### PMC51, PMP51, PMP55

Process pressure measurement





A0023555

Make sure the document is stored in a safe place such that it is always available when working on or with the device.  
 To avoid danger to individuals or the facility, read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures.  
 The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to these Operating Instructions.

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# 1 Document information

## 1.1 Document function







These Operating Instructions contain all the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

## 1.2 Symbols used



### 1.2.1 Safety symbols

Symbol	Meaning
 A0011189-EN	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-EN	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-EN	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 A0011192-EN	<b>NOTE!</b> This symbol contains information on procedures and other facts which do not result in personal injury.









### 1.2.2 Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current		Alternating current
	Direct current and alternating current		<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	<b>Protective ground connection</b> A terminal which must be connected to ground prior to establishing any other connections.		<b>Equipotential connection</b> A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

### 1.2.3 Tool symbols

Symbol	Meaning
 A0011221	Allen screw
 A0011222	Open-ended wrench


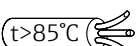
### 1.2.4 Symbols for certain types of information

Symbol	Meaning
 A0011182	<b>Permitted</b> Indicates procedures, processes or actions that are permitted.
 A0011184	<b>Forbidden</b> Indicates procedures, processes or actions that are forbidden.
 A0011193	<b>Tip</b> Indicates additional information.
 A0015482	Reference to documentation
 A0015484	Reference to page.
 A0015487	Reference to graphic
1. , 2. , ...	Series of steps
 A0018343	Result of a sequence of actions
 A0015502	Visual inspection

### 1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3, 4 etc.	Numbering for main items
1. , 2. , ...	Series of steps
A, B, C, D etc.	Views

### 1.2.6 Symbols on the device

Symbol	Meaning
 A0019159	<b>Safety instructions</b> Observe the safety instructions in the associated Operating Instructions.
	<b>Connecting cable immunity to temperature change</b> Indicates that the connecting cables have to withstand a temperature of 85°C at least.

### 1.2.7 Registered trademarks

KALREZ<sup>®</sup>, VITON<sup>®</sup>, TEFLON<sup>®</sup>  
 Trademark of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP<sup>®</sup>  
 Trademark of Ladish & Co., Inc., Kenosha, USA

GORE-TEX<sup>®</sup>  
 Trademark of W.L. Gore & Associates, Inc., USA

## 2 Basic safety instructions

### 2.1 Requirements for personnel

Personnel involved in installation, commissioning, diagnostics and maintenance must meet the following requirements:

- Trained, qualified specialists must have a relevant qualification for this specific function and task
- Are authorized by the plant owner/operator
- Are familiar with national regulations
- Before commencing work, the specialist staff must have read and understood the instructions in the manuals and supplementary documentation as well as in the certificates (depending on the application)
- Follow instructions and comply with basic conditions

Operating personnel must meet the following requirements:

- Are instructed and authorized according to the requirements of the task by the facility's owner-operator
- Follow the instructions in these Operating Instructions

### 2.2 Designated use

The Cerabar M is a pressure transmitter for measuring pressure and level.

#### 2.2.1 Incorrect use

The manufacturer is not liable for damage caused by improper or non-designated use.

Clarification of borderline cases:

In the case of special fluids and fluids used for cleaning, Endress+Hauser is glad to provide assistance in clarifying the corrosion resistance of wetted materials, but does not accept any warranty or liability.

### 2.3 Occupational safety

When working on and with the device:

- Wear the required personal protective equipment according to national regulations.
- Switch off the supply voltage before connecting the device.

### 2.4 Operational safety

Risk of injury!

- ▶ Operate the device in a proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for the trouble-free operation of the device.

#### Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:

- ▶ If modifications are nevertheless required, consult with Endress+Hauser.

#### Repair

To ensure continued operational safety:

- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe national regulations pertaining to the repair of an electrical device.
- ▶ Only use genuine spare parts and accessories from Endress+Hauser.

## 2.5 Hazardous area

To eliminate the risk of danger to persons or the facility when the device is used in the hazardous area (e.g. explosion protection, pressure equipment safety):

- Check the nameplate to determine whether the ordered device can be used for the intended application in the hazardous area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these Operating Instructions.

## 2.6 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

## 3 Identification

### 3.1 Product identification

The following options are available to identify the measuring device:

- Nameplate specifications
- Order code with a breakdown of the device features on the delivery note
- Enter serial number from nameplates in the W@M Device Viewer ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): All information about the measuring device is displayed.

For an overview of the technical documentation provided, enter the serial number from the nameplates in the W@M Device Viewer ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)).

### 3.2 Device designation

#### 3.2.1 Nameplates

- 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 (38 °C) for ANSI flanges.
- The pressure values permitted at higher temperatures can be found in the following standards:
  - EN 1092-1: 2001 Tab. 18 <sup>1)</sup>
  - ASME B 16.5a – 1998 Tab. 2-2.2 F316
  - ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  - JIS B 2220
- The test pressure corresponds to the over pressure limit (OPL) of the device = MWP x 1.5 <sup>2)</sup>.
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.

- 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 PMP51 and PMP55 with a 40 bar (600 psi) or a 100 bar (1500 psi) measuring cell.



**Aluminum housing**

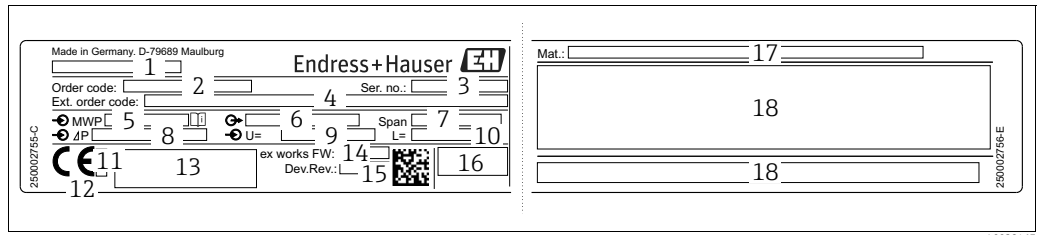


Fig. 1: Nameplate

- 1 Device name
- 2 Order number (shortened for re-ordering)
- 3 Serial number (for identification)
- 4 Extended order number (full)
- 5 MWP (maximum working pressure)
- 6 Electronic version (output signal)
- 7 Min./max. span
- 8 Nominal measuring range
- 9 Supply voltage
- 10 Unit of length
- 11 No entry
- 12 ID number of notified body with regard to Pressure Equipment Directive (optional)
- 13 Approvals
- 14 Software version
- 15 Device version
- 16 Degree of protection
- 17 Wetted materials
- 18 Approval-specific information

Devices suitable for oxygen applications are fitted with an additional nameplate.

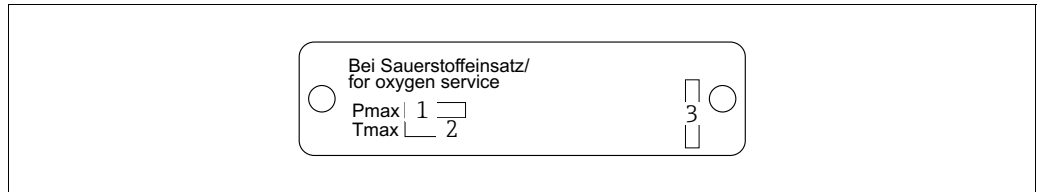


Fig. 2: Additional nameplate for devices suitable for oxygen applications

- 1 Maximum pressure for oxygen applications
- 2 Maximum temperature for oxygen applications
- 3 Layout identification of the nameplate

**Stainless steel housing, hygienic**

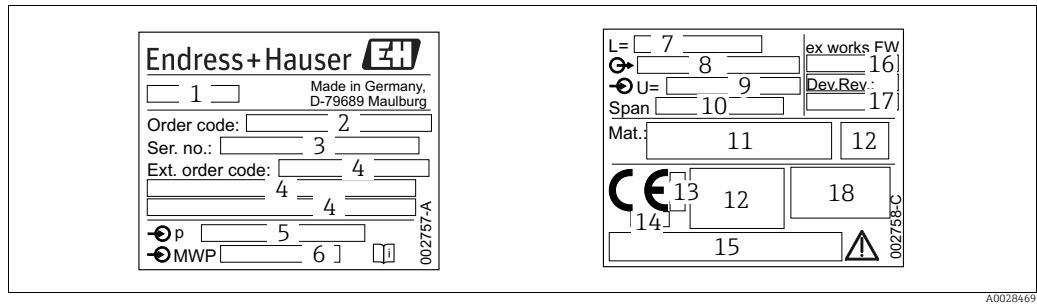


Fig. 3: Nameplate

- 1 Device name
- 2 Order number (shortened for re-ordering)
- 3 Serial number (for identification)
- 4 Extended order number (full)
- 5 Nominal measuring range
- 6 MWP (maximum working pressure)
- 7 Length data
- 8 Electronic version (output signal)
- 9 Supply voltage
- 10 Min./max. span
- 11 Wetted materials
- 12 Approval-specific information
- 13 No entry
- 14 ID number of notified body with regard to Pressure Equipment Directive (optional)
- 15 No entry
- 16 Software version
- 17 Device version
- 18 Degree of protection

Devices with certificates are fitted with an additional nameplate.

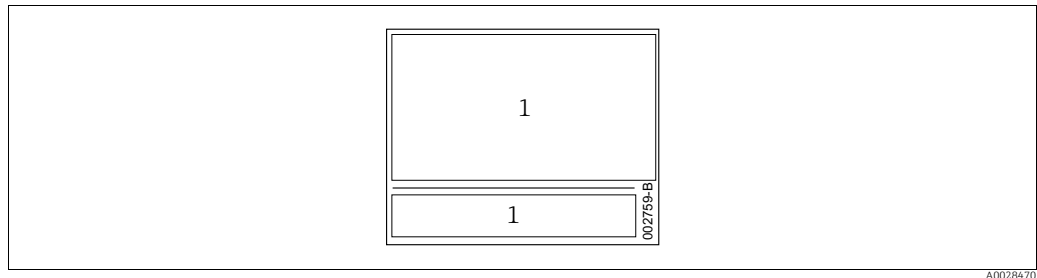


Abb. 4: Additional nameplate for devices with certificates

- 1 Approval-specific information

### 3.3 Scope of delivery

The scope of delivery comprises:

- Device
- Optional accessories

Documentation supplied:

- Operating Instructions BA00385P are available on the Internet.  
→ See: [www.de.endress.com](http://www.de.endress.com) → Download
- Brief Operating Instructions: KA01036P
- Final inspection report
- Optional: factory calibration form, test certificates

### 3.4 CE mark, Declaration of Conformity

The devices are designed to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations as listed in the EC Declaration of Conformity and thus comply with the statutory requirements of the EC Directives.

Endress+Hauser confirms the conformity of the device by affixing to it the CE mark.

## 4 Installation

### 4.1 Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

### 4.2 Storage and transport

#### 4.2.1 Storage

The device must be stored in a dry, clean area and protected against damage from impact (EN 837-2).

Storage temperature range:

See Technical Information for Cerabar M TI00436P.

#### 4.2.2 Transport

##### **▲ WARNING**

##### **Incorrect transportation**

Housing, diaphragm and capillaries may become damaged, and there is a risk of injury!

- ▶ Transport the measuring device to the measuring point in its original packaging or by the process connection.
- ▶ Follow the safety instructions and transport conditions for devices weighing more than 18 kg (39.6 lbs).
- ▶ Do not use capillaries as a carrying aid for the diaphragm seals.

### 4.3 Installation conditions

#### 4.3.1 Dimensions

For dimensions, please refer to the Technical Information for Cerabar M TI00436P, "Mechanical construction" section.

## 4.4 General installation instructions

- Devices with a G 1 1/2 thread:  
When screwing the device into the tank, the flat seal has to be positioned on the sealing surface of the process connection. To avoid additional strain on the process isolating diaphragm, the thread should never be sealed with hemp or similar materials.
- Devices with NPT threads:
  - Wrap Teflon tape around the thread to seal it.
  - Tighten the device at the hexagonal bolt only. Do not turn at the housing.
  - Do not overtighten the thread when screwing. Max. torque: 20 to 30 Nm (14.75 to 22.13 lbf ft)

### 4.4.1 Mounting sensor modules with PVDF thread

**▲ WARNING**

**Risk of damage to process connection!**

Risk of injury!

- ▶ Sensor modules with PVDF process connections with threaded connection must be installed with the mounting bracket provided!

**▲ WARNING**

**Material fatigue from pressure and temperature!**

Risk of injury if parts burst! The thread can become loose if exposed to high pressure and temperatures.

- ▶ The integrity of the thread must be checked regularly and the thread may need to be re-tightened with the maximum tightening torque of 7 Nm (5.16 lbf ft). Teflon tape is recommended for sealing the 1/2" NPT thread.

## 4.5 Installation instructions

- Due to the orientation of the Cerabar M, there may be a shift in the zero point, i.e. when the container is empty or partially full, the measured value does not display zero. You can correct this zero point shift → § 32, → Chap. 6.1.2 "Function of the operating elements".
- For PMP55, please refer to → Chap. 4.5.2 "Installation instructions for devices with diaphragm seals – PMP55", → § 17.
- Endress+Hauser offers a mounting bracket for installing on pipes or walls. → § 21, → Chap. 4.5.5 "Wall and pipe mounting (optional)".

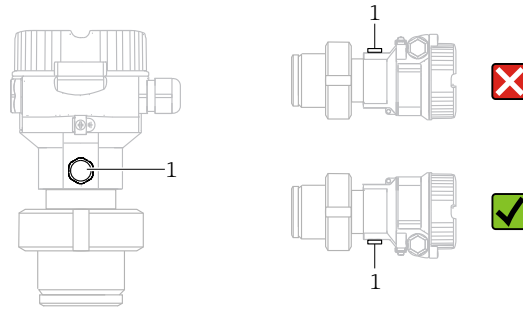
### 4.5.1 Installation instructions for devices without diaphragm seals – PMP51, PMC51

#### NOTICE

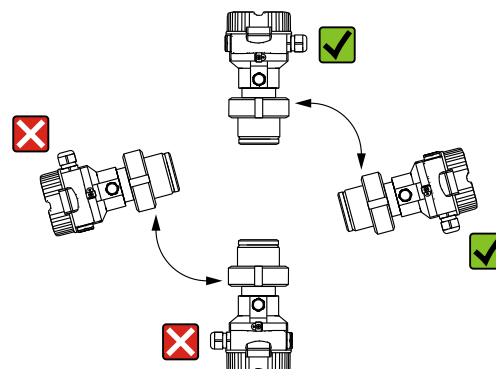
##### Damage to the device!

If a heated Cerabar M is cooled during the cleaning process (e.g. by cold water), a vacuum develops for a short time, whereby moisture can penetrate the sensor through the pressure compensation (1).

- ▶ If this is the case, mount the Cerabar M with the pressure compensation (1) pointing downwards.



- Keep the pressure compensation and GORE-TEX® filter (1) free from contamination.
- Cerabar M transmitters without diaphragm seals are mounted as per the norms for a manometer (DIN EN 837-2). We recommend the use of shutoff devices and siphons. The orientation depends on the measuring application.
- Do not clean or touch process isolating diaphragms with hard or pointed objects.
- The device must be installed as follows in order to comply with the cleanability requirements of the ASME-BPE (Part SD Cleanability):



**Pressure measurement in gases**

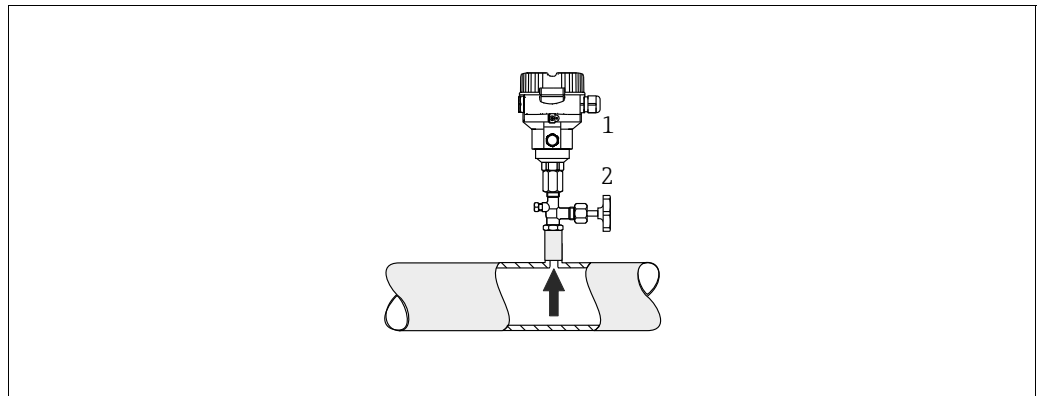


Fig. 5: Measuring arrangement for pressure measurement in gases

- 1 Cerabar M
- 2 Shutoff device

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

**Pressure measurement in steams**

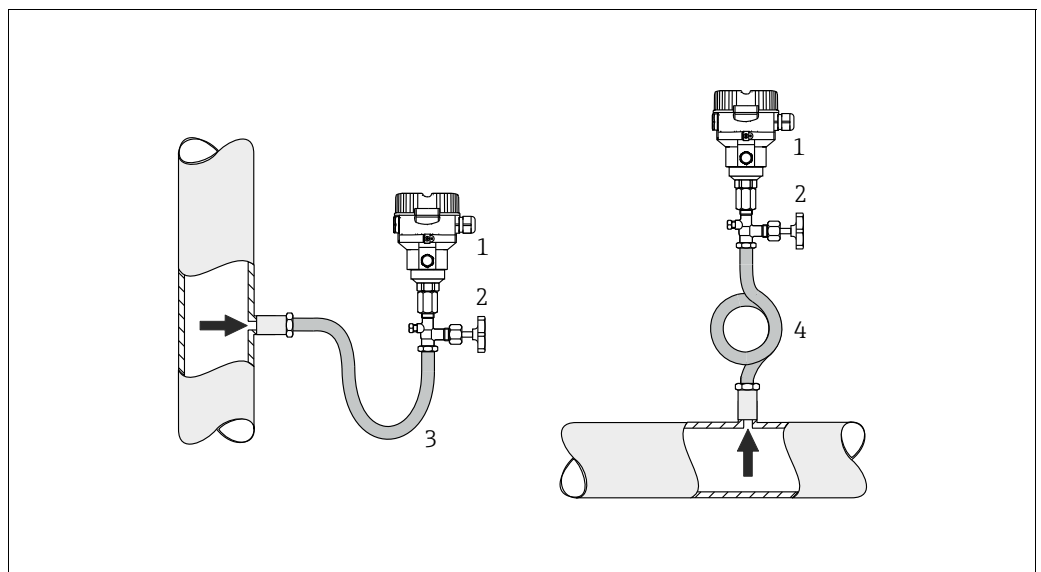


Fig. 6: Measuring arrangement for pressure measurement in steams

- 1 Cerabar M
- 2 Shutoff device
- 3 U-shaped siphon
- 4 Circular siphon

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

### Pressure measurement in liquids

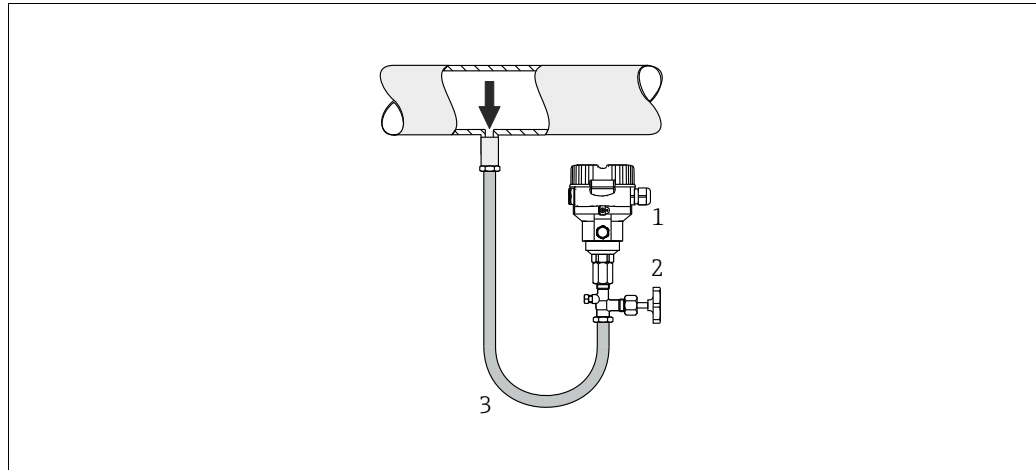


Fig. 7: Measuring arrangement for pressure measurement in liquids

- 1 Cerabar M
- 2 Shutoff device

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

### Level measurement

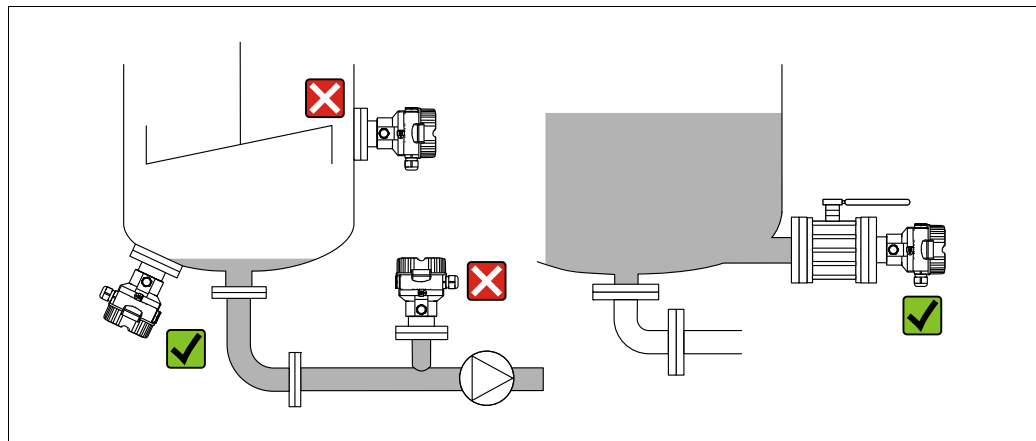


Fig. 8: Measuring arrangement for level

- Always install the Cerabar M below the lowest measuring point.
- Do not mount the device in the filling curtain or at a point in the tank which could be affected by pressure pulses from an agitator.
- Do not mount the device in the suction area of a pump.
- The calibration and functional test can be carried out more easily if you mount the device downstream of a shutoff device.



#### 4.5.2 Installation instructions for devices with diaphragm seals – PMP55

- Cerabar M devices with diaphragm seals are screwed in, flanged or clamped, depending on the type of diaphragm seal.
- Please note that the hydrostatic pressure of the liquid columns in the capillaries can cause zero point shift. The zero point shift can be corrected.
- Do not clean or touch the process isolating diaphragm of the diaphragm seal with hard or pointed objects.
- Do not remove process isolating diaphragm protection until shortly before installation.

##### **NOTICE**

##### **Improper handling!**

Damage to the device!

- ▶ A diaphragm seal and the pressure transmitter together form a closed, oil-filled calibrated system. The fill fluid hole is sealed and may not be opened.
- ▶ When using a mounting bracket, sufficient strain relief must be ensured for the capillaries in order to prevent the capillary bending down (bending radius  $\geq 100$  (3.94 in)).
- ▶ Please observe the application limits of the diaphragm seal filling oil as detailed in the Technical Information for Cerabar M TI00436P, "Planning instructions for diaphragm seal systems" section.

##### **NOTICE**

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

- ▶ Vibration-free (in order to avoid additional pressure fluctuations)
- ▶ Not in the vicinity of heating or cooling lines
- ▶ Insulate if the ambient temperature is below or above the reference temperature
- ▶ With a bending radius of  $\geq 100$  mm (3.94 in).
- ▶ Do not use the capillaries as a carrying aid for the diaphragm seals!

**Vacuum application**

For applications under vacuum, Endress+Hauser recommends mounting the pressure transmitter below the diaphragm seal. This prevents vacuum loading of the diaphragm seal caused by the presence of fill fluid in the capillary.

When the pressure transmitter is mounted above the diaphragm seal, the maximum height difference H1 in accordance with the illustrations below must not be exceeded.

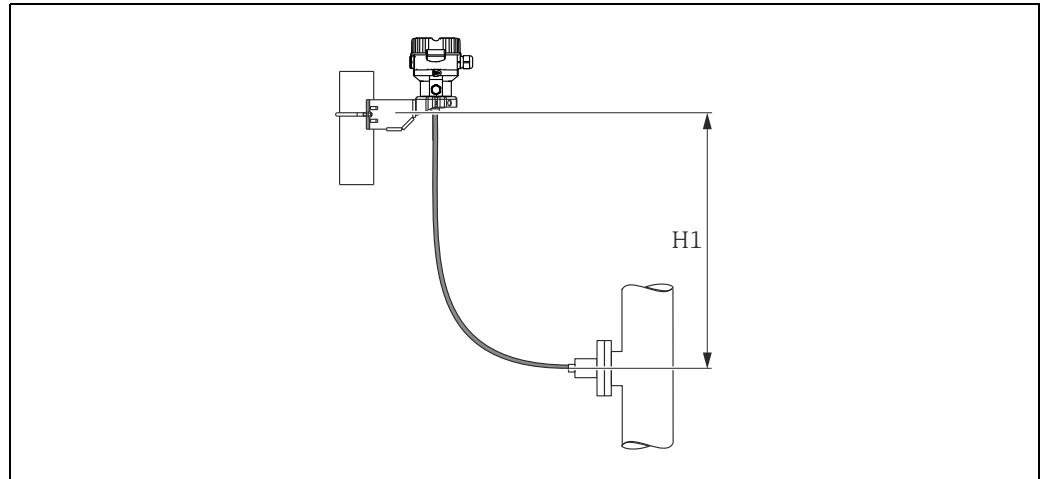


Fig. 9: Installation above the lower diaphragm seal

The maximum height difference depends on the density of the filling oil and the smallest ever pressure that is permitted to occur at the diaphragm seal (empty vessel), see illustration below:

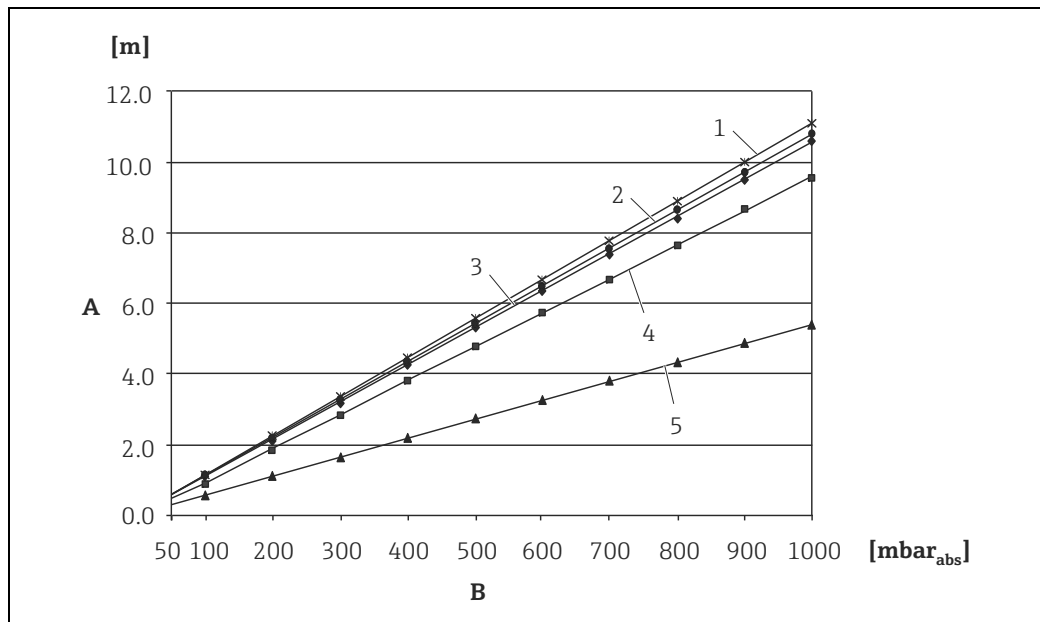


Fig. 10: Diagram of maximum installation height above the lower diaphragm seal for vacuum applications depending on the pressure at the diaphragm seal on the positive side

- A Height difference H1
- B Pressure at diaphragm seal
- 1 Low temperature oil
- 2 Vegetable oil
- 3 Silicone oil
- 4 High-temperature oil
- 5 Inert oil

**Mounting with temperature isolator**

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

Depending on the filling oil used, diaphragm seal systems with temperature isolators can be used for maximum temperatures of up to 400 °C (+752 °F). → For the temperature application limits, see technical Information, "Diaphragm seal filling oils" 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 maximum zero point shift of 21 mbar (0.315 psi) due to the hydrostatic column in the temperature isolator. You can correct this zero point shift at the device.

The temperature restrictions are lowest with an insulation height of 30 mm (1.18 inch).

Full insulation exhibits virtually the same behavior as no insulation!

The temperature limits with an insulation height of 30 mm (1.18 inch) are illustrated in the following graphic.

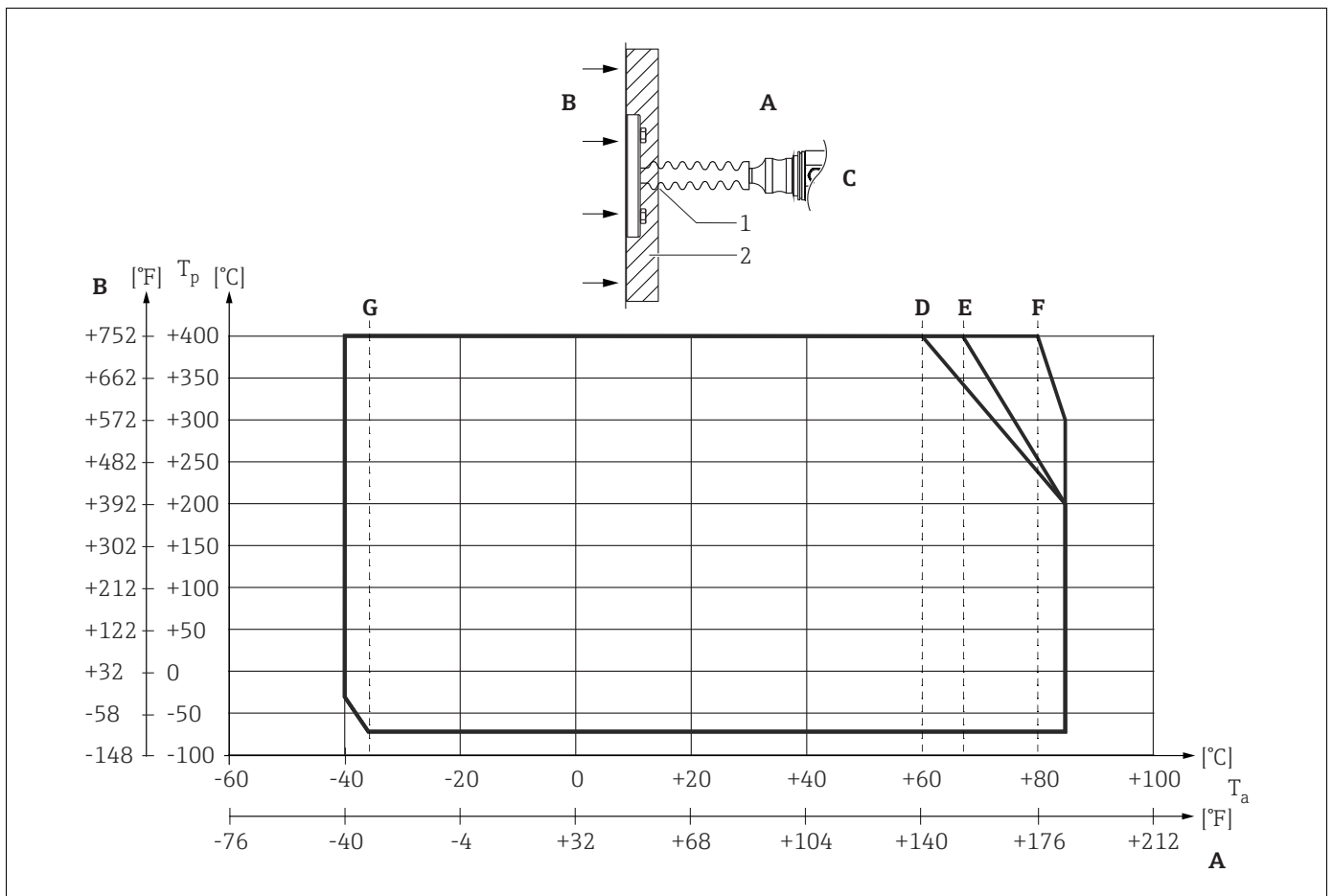


Fig. 11:

- A Ambient temperature:  $\leq 85$  °C (185 °F)
- B Process temperature: max. 400 °C (752 °F), depending on the filling oil used
- C Device with temperature isolator, material 316L (1.4404)
- D Without isolation
- E Maximum isolation
- F 30 mm (1.18. inch) isolation
- G Without isolation, maximum isolation, 30 mm (1.18. inch) isolation
- 1 Isolation height 30 mm (1.18. inch)
- 2 Isolation material

### 4.5.3 Seal for flange mounting

**NOTICE**

**Corrupted measurement results.**

The seal is not allowed to press against the process isolating diaphragm as this could affect the measurement result.

- ▶ Ensure that the seal is not touching the process isolating diaphragm.

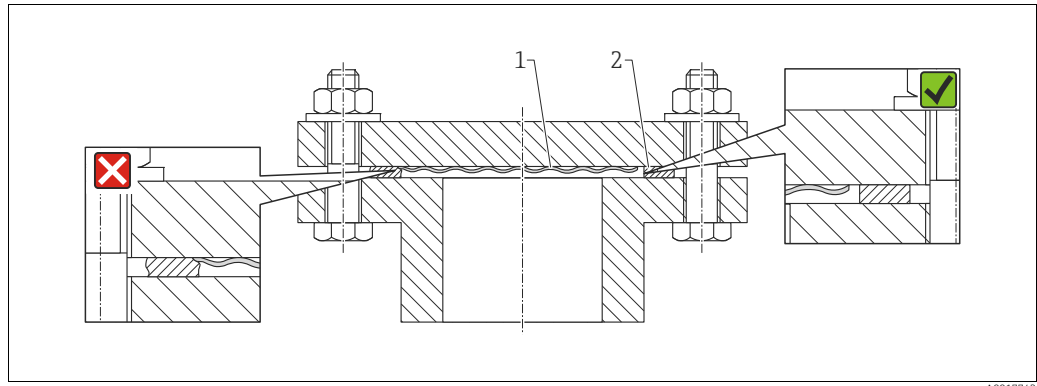


Fig. 12:  
 1 Process isolating diaphragm  
 2 Seal

### 4.5.4 Thermal insulation – PMP55

The PMP55 may only be insulated up to a certain height. The maximum permitted insulation height is indicated on the devices and applies to an insulation material with a heat conductivity  $\leq 0.04 \text{ W}/(\text{m} \times \text{K})$  and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air".

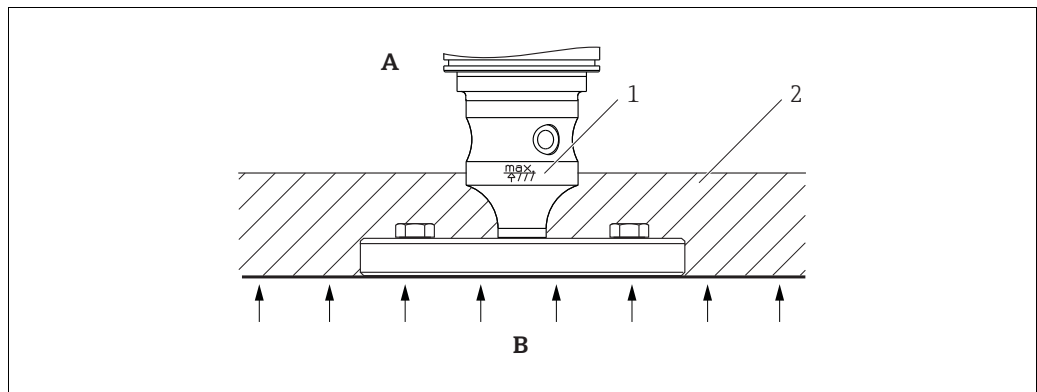
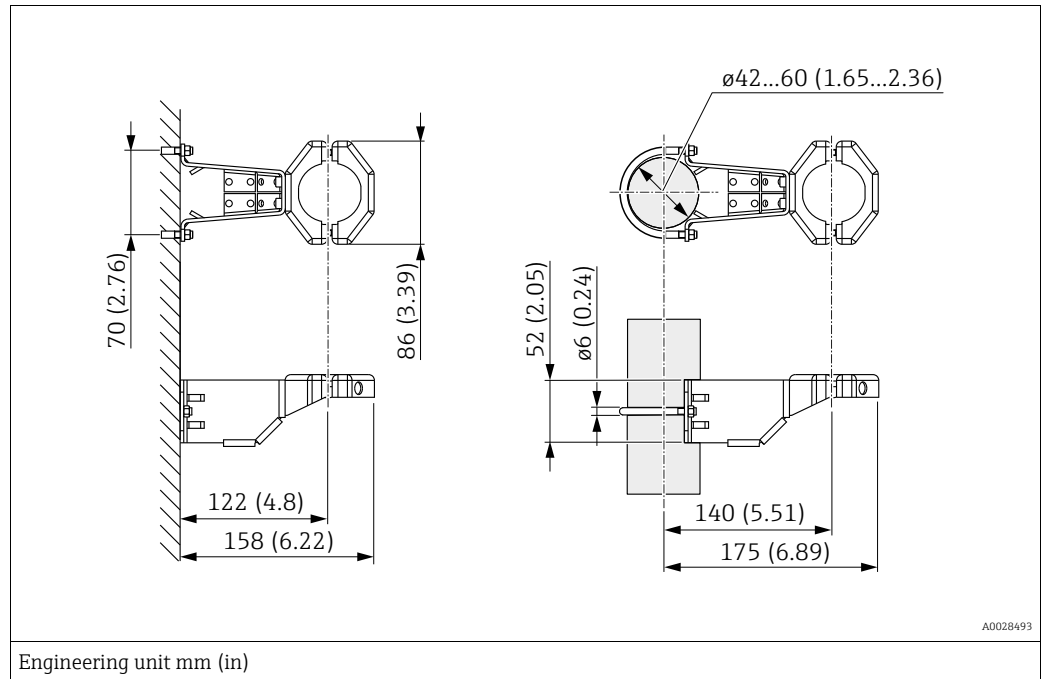


Fig. 13: Maximum permitted insulation height, here indicated on a PMP55 with a flange  
 A Ambient temperature:  $\leq 70 \text{ }^\circ\text{C}$  (158°F)  
 B Process temperature: max.  $400 \text{ }^\circ\text{C}$  (752°F), depending on the diaphragm seal filling oil used  
 1 Maximum permitted insulation height  
 2 Insulation material

### 4.5.5 Wall and pipe mounting (optional)

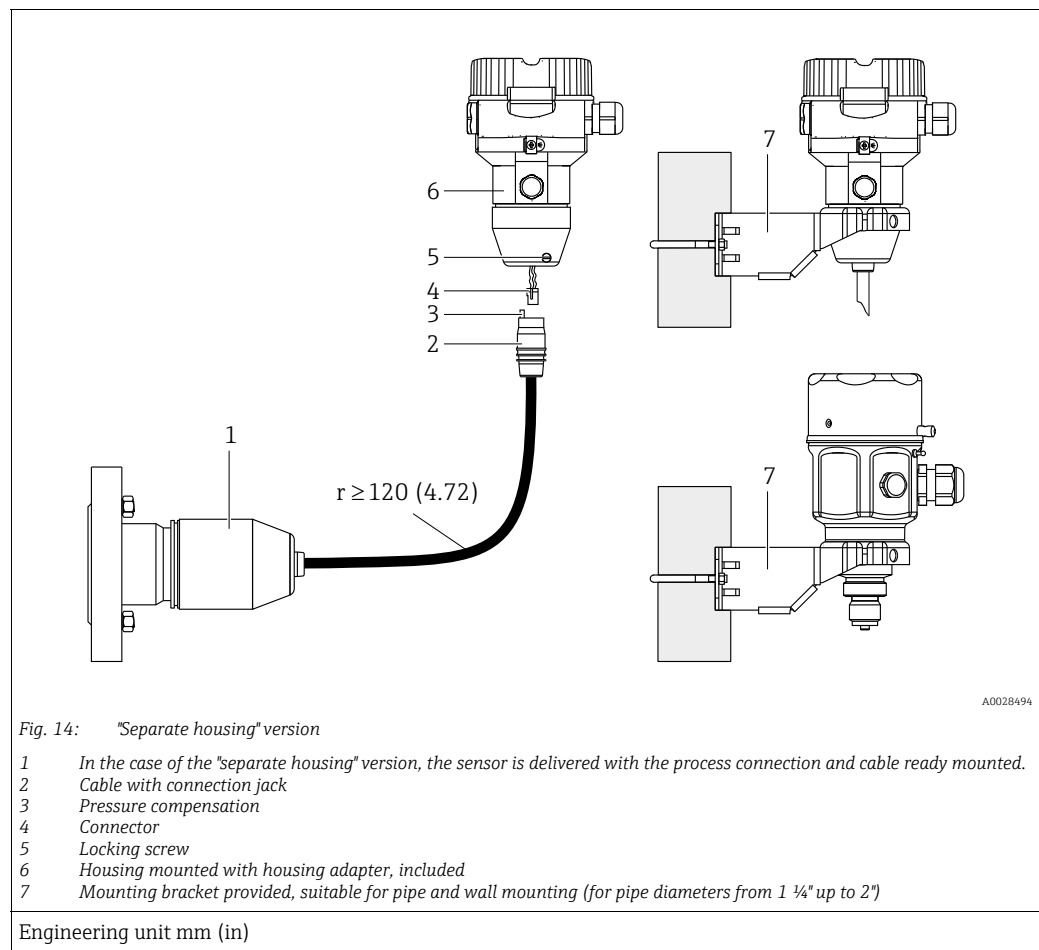
Endress+Hauser offers a mounting bracket for installation on pipes or walls (for pipe diameters from 1 ¼" to 2").



Please note the following when mounting:

- Devices with capillary tubes: mount capillaries with a bending radius  $\geq 100$  mm (3.94 in).
- When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbs ft).

#### 4.5.6 Assembling and mounting the "separate housing" version



#### Assembly and mounting

1. Insert the connector (item 4) into the corresponding connection jack of the cable (item 2).
2. Plug the cable into the housing adapter (item 6).
3. Tighten the locking screw (item 5).
4. Mount the housing on a wall or pipe using the mounting bracket (item 7).  
 When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbs ft).  
 Mount the cable with a bending radius ( $r$ )  $\geq$  120 mm (4.72 in).

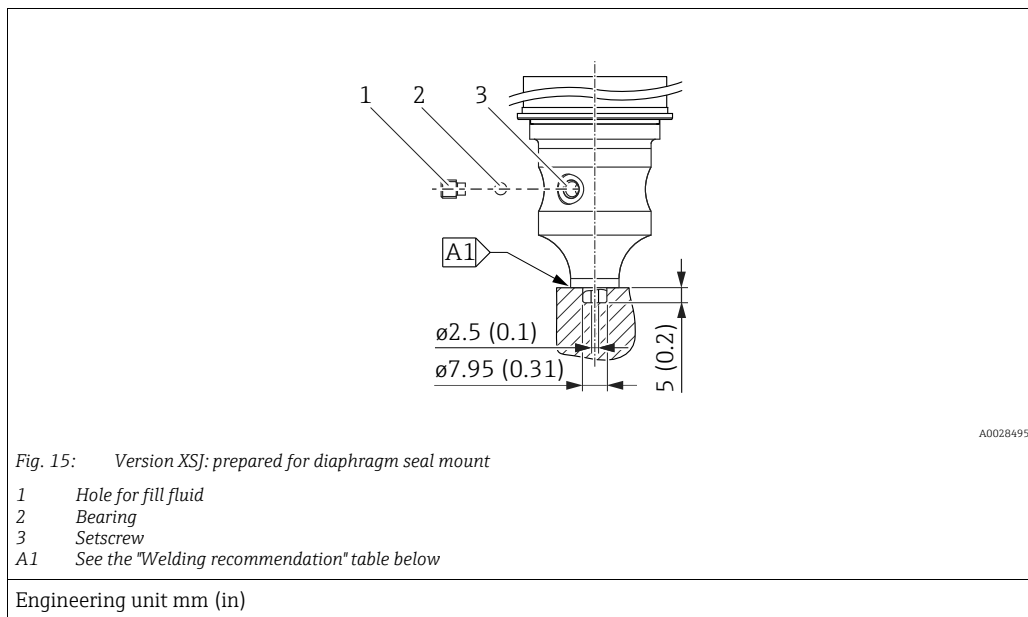
#### Routing the cable (e.g. through a pipe)

You require the cable shortening kit.

Order number: 71093286

For details on mounting, see SD00553P/00/A6.

### 4.5.7 PMP51, version prepared for diaphragm seal mount – welding recommendation



Endress+Hauser recommends welding on the diaphragm seal as follows for the "XSJ - prepared for diaphragm seal mount" version in feature 110 "Process connection" in the order code up to, and including, 40 bar (600 psi) sensors: the total welding depth of the fillet weld is 1 mm (0.04 in) with an outer diameter of 16 mm (0.63 in). Welding is performed according to the WIG method.

Consecutive seam no.	Sketch/welding groove shape, dimension as per DIN 8551	Base material matching	Welding method DIN EN ISO 24063	Welding position	Inert gas, additives
A1 for sensors ≤ 40 bar (600 psi)	A0024811	Adapter made of AISI 316L (1.4435) to be welded to diaphragm seal made of AISI 316L (1.4435 or 1.4404)	141	PB	Inert gas Ar/H 95/5  Additive: ER 316L Si (1.4430)

#### Information on filling

The diaphragm seal must be filled as soon as it has been welded on.

- After welded into the process connection, the sensor assembly must be properly filled with a filling oil and sealed gas-tight with a sealing ball and lock screw. Once the diaphragm seal has been filled, at the zero point the device display should not exceed 10% of the full scale value of the cell measuring range. The internal pressure of the diaphragm seal must be corrected accordingly.
- Adjustment / calibration:
  - The device is operational once it has been fully assembled.
  - Perform a reset. The device must then be calibrated to the process measuring range as described in the Operating Instructions.

## 4.6 Closing the housing covers

### NOTICE

#### Devices with EPDM cover seal - transmitter leakiness!

Mineral-based, animal-based or vegetable-based lubricants cause the EPDM cover seal to swell and the transmitter to become leaky.

- ▶ The thread is coated at the factory and therefore does not require any lubrication.

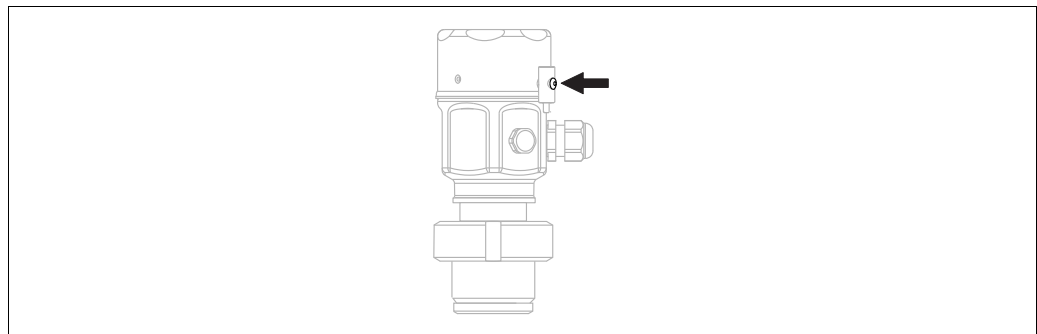
### NOTICE

#### The housing cover can no longer be closed.

Damaged thread!

- ▶ When closing the housing covers make sure that the threads on the covers and the housing are free from dirt, such as sand. If you encounter resistance when closing the covers, then check the threads again for dirt.

### 4.6.1 Closing the cover on the stainless steel housing



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Abb. 16: Closing the cover

The cover for the electronics compartment is tightened by hand at the housing until the stop. The screw serves as DustEx protection (only on devices with DustEx approval).

## 4.7 Mounting the profiled seal for the universal process adapter

For details on mounting, see KA00096F/00/A3.

## 4.8 Post-installation check

0	Is the device undamaged (visual inspection)?
0	Does the device comply with the measuring point specifications? For example: <ul style="list-style-type: none"> <li>▪ Process temperature</li> <li>▪ Process pressure</li> <li>▪ Ambient temperature range</li> <li>▪ Measuring range</li> </ul>
0	Are the measuring point identification and labeling correct (visual inspection)?
0	Is the device adequately protected against precipitation and direct sunlight?
0	Are the securing screw and securing clamp tightened securely?



## 5 Electrical connection

### 5.1 Connecting the device

#### **⚠ WARNING**

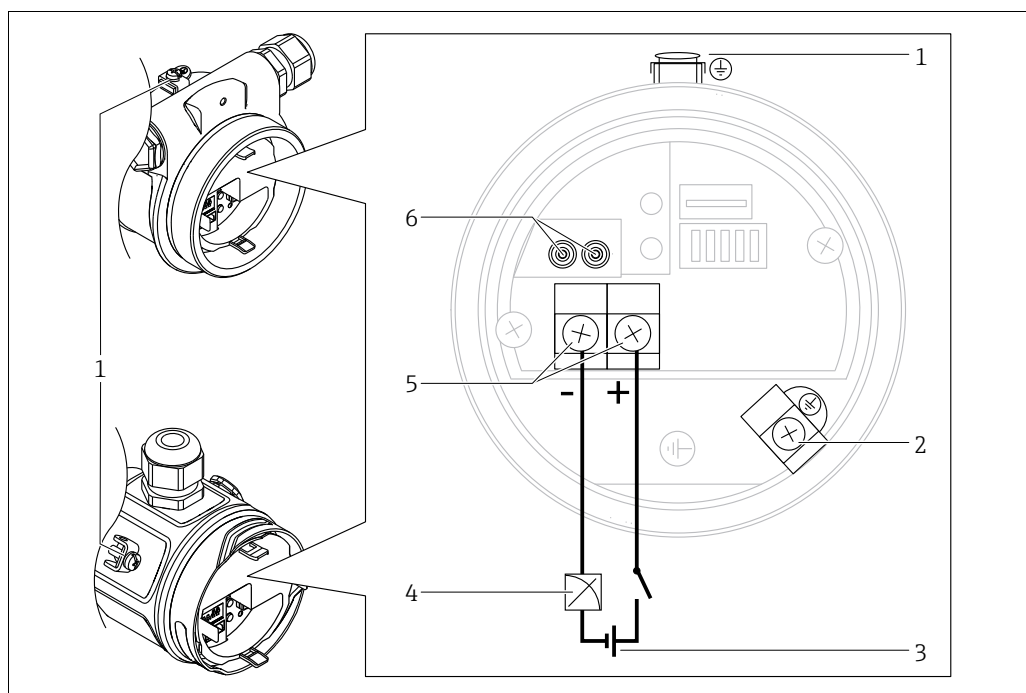
#### **Supply voltage might be connected!**

Risk of electric shock and/or explosion!

- ▶ Ensure that no uncontrolled processes are activated in the system.
- ▶ Switch off the supply voltage before connecting the device.
- ▶ 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.
- ▶ A suitable circuit breaker must be provided for the device in accordance with IEC/EN61010.
- ▶ Devices with integrated overvoltage protection must be grounded.
- ▶ Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.

Connect the device in the following order:

1. Check that the supply voltage corresponds to the supply voltage indicated on the nameplate.
2. Switch off the supply voltage before connecting the device.
3. Remove housing cover.
4. Guide the cable through the gland. Preferably use a twisted, shielded two-wire cable.
5. Connect the device in accordance with the following diagram.
6. Screw down the housing cover.
7. Switch on the supply voltage.

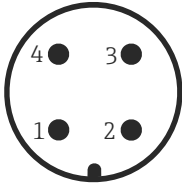


Electrical connection 4 to 20 mA

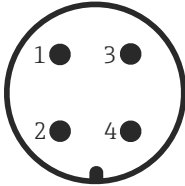
- 1 External grounding terminal
- 2 Internal grounding terminal
- 3 Supply voltage: 11.5 to 45 VDC (versions with plug-in connectors 35 V DC)
- 4 4 to 20 mA
- 5 Terminals for supply and signal
- 6 Test terminals

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### 5.1.1 Devices with M12 connector

PIN assignment for M12 connector	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal -
	4	Earth

### 5.1.2 Devices with 7/8" plug

PIN assignment for 7/8" connector	PIN	Meaning
	1	Signal -
	2	Signal +
	3	Not assigned
	4	Shield

### 5.1.3 Connecting the cable version

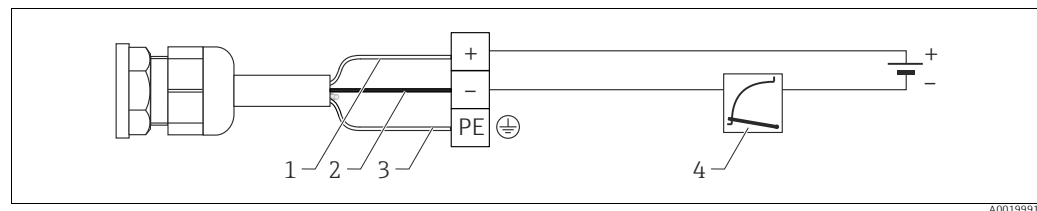


Fig. 17:

- 1 rd = red
- 2 bk = black
- 3 gnye = green
- 4 4 to 20 mA

## 5.2 Connecting the measuring unit

### 5.2.1 Supply voltage

Electronic version	
4 to 20 mA	11.5 to 45 V DC (Versions with plug-in connectors: 35 V DC)

#### Taking 4 to 20 mA test signal

A 4 to 20 mA test signal may be measured via the test terminals without interrupting the measurement. To keep the corresponding measured error below 0.1 %, the current measuring device should exhibit an internal resistance of  $< 0.7 \Omega$ .

### 5.2.2 Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm<sup>2</sup> (20 to 12 AWG)

### 5.2.3 Cable specification

- Endress+Hauser recommends using twisted, shielded two-wire cables.
- Cable outer diameter: 5 to 9 mm (0.2 to 0.35 in) depending on the cable gland used (see Technical Information)

### 5.2.4 Load

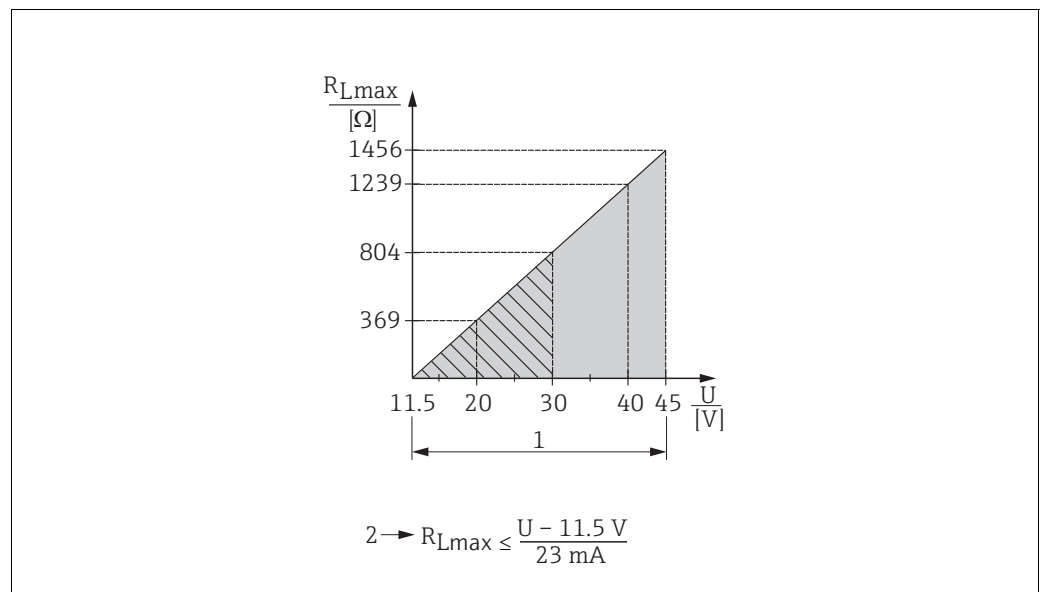


Abb. 18: Load diagram

1 Power supply 11.5 to 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified device versions

2  $R_{Lmax}$  Maximum load resistance

$U$  Supply voltage

### 5.2.5 Shielding/potential equalization

You achieve optimum shielding against disturbances if the shielding is connected on both sides (in the cabinet and on the device). If potential equalization currents are expected in the plant, only ground shielding on one side, preferably at the transmitter.

## 5.3 Potential equalization

Observe the applicable regulations.

## 5.4 Overvoltage protection (optional)

Devices showing version "NA" in feature 610 "Mounted accessories" in the order code are equipped with a surge arrester (see Technical Information "Ordering information" section). The surge arrester is mounted at the factory on the housing thread for the cable gland and is approx. 70 mm (2.76 in) in length (take additional length into account when installing). The device is connected as specified in the following graphic. For details refer to TI001013KEN, XA01003KA3 and BA00304KA2.

### 5.4.1 Wiring

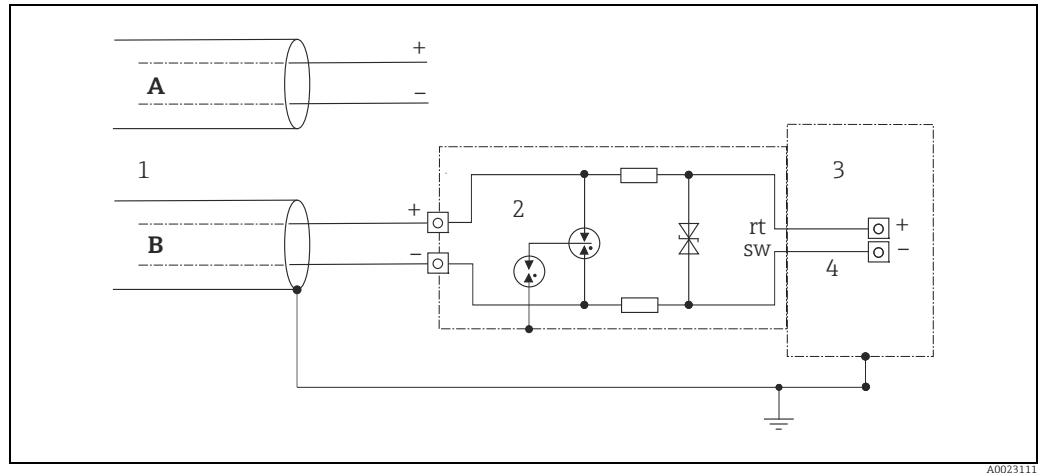
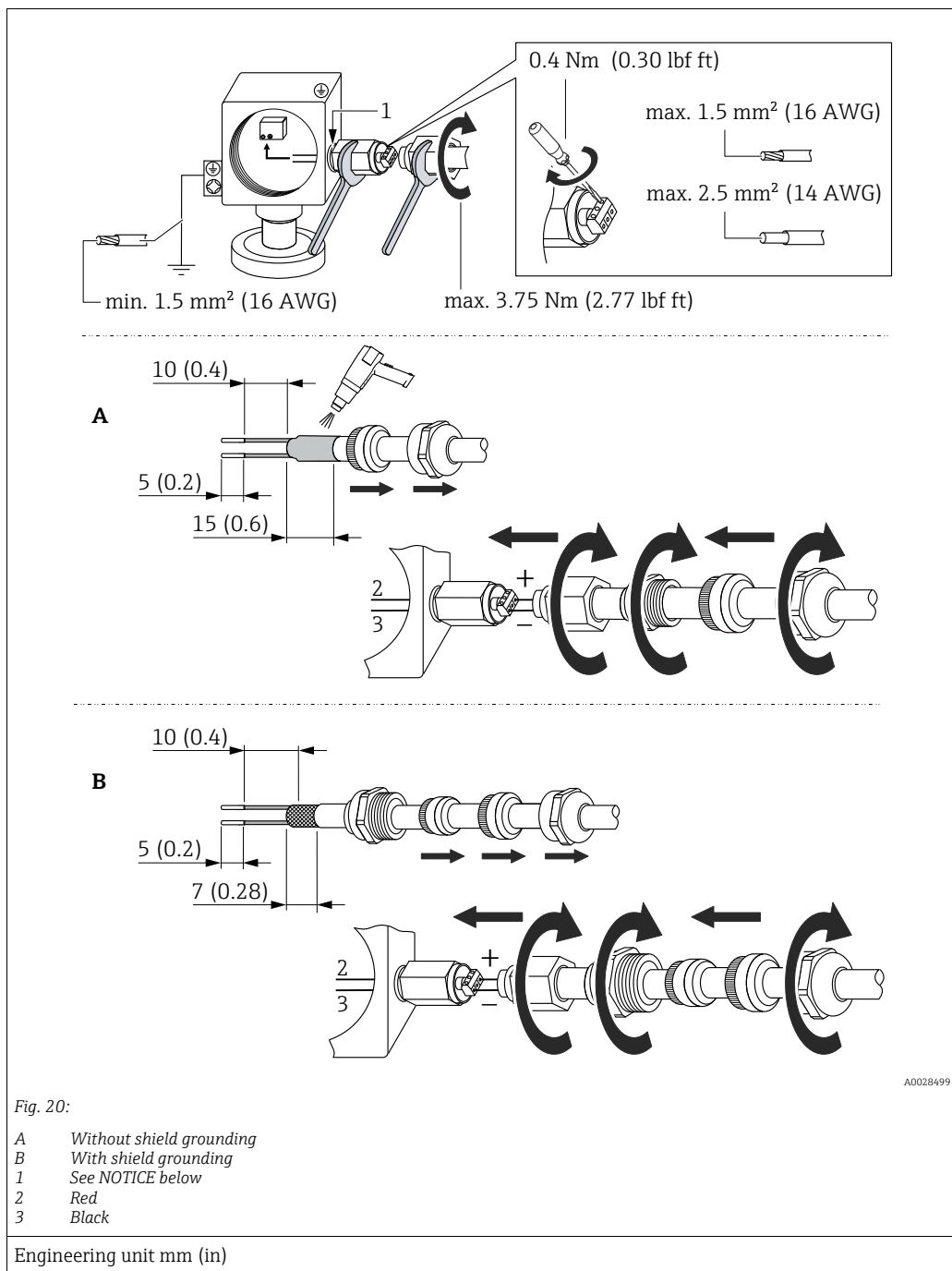


Fig. 19:

- A Without direct shield grounding
- B With direct shield grounding
- 1 Incoming connection cable
- 2 HAW569-DA2B
- 3 Unit to be protected
- 4 Connection cable

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### 5.4.2 Installation



**NOTICE**

**Screw connection glued at factory!**

Damage to the device and/or surge arrester!

- ▶ When releasing/tightening the union nut use a wrench to hold the screw steady so it does not turn.

## 5.5 Post-connection check

Perform the following checks after completing electrical installation of the device:

- Does the supply voltage match the specifications on the nameplate?
- Is the device properly connected?
- Are all screws firmly tightened?
- Is the housing cover screwed down tight?

As soon as voltage is applied to the device, the green LED on the electronic insert lights up for a few seconds or the connected local display lights up.

## 6 Operation

### 6.1 Position of operating elements

The operating keys and the DIP switch are located on the electronic insert in the device.

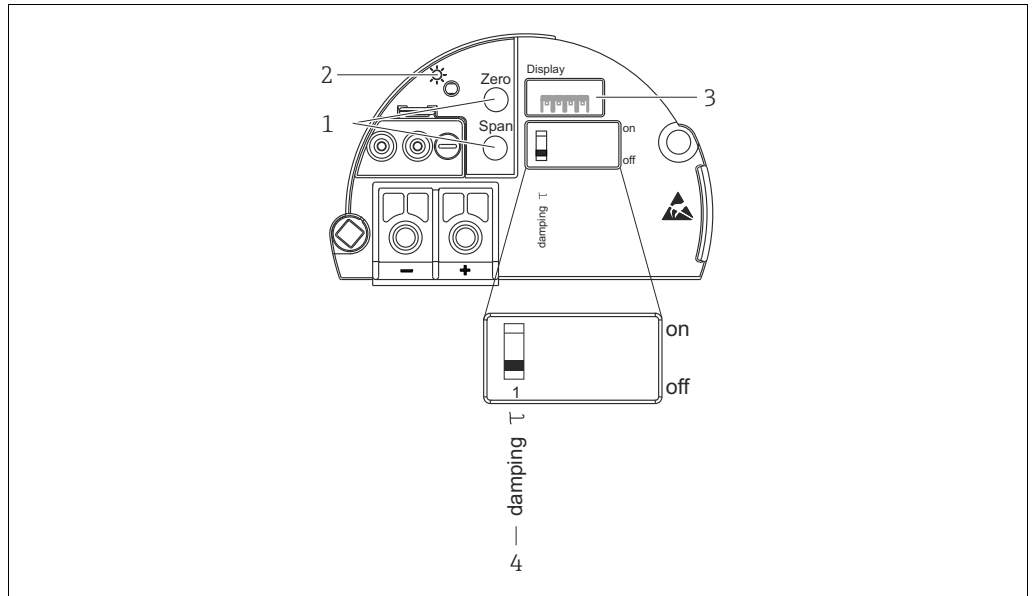


Fig. 21: Electronic insert

- 1 Operating keys for lower range value (zero) and upper range value (span)
- 2 Green LED to indicate successful operation
- 3 Slot for optional local display
- 4 DIP switch for switching damping on/off

#### 6.1.1 Function of the DIP switch

Switch position	
"off"	"on"
Damping is switched off. The output signal follows measured value changes without any delay.	Damping is switched on. The output signal follows measured value changes with the delay time $t$ (Factory setting: $t = 2$ s or as per order specifications).

### 6.1.2 Function of the operating elements

Operating key(s)	Meaning
"Zero" pressed briefly	<b>Display lower range value</b>
"Zero" pressed for at least 3 seconds	<b>Get lower range value</b> The pressure present is accepted as the lower range value (LRV).
"Span" pressed briefly	<b>Display upper range value</b>
"Span" pressed for at least 3 seconds	<b>Get upper range value</b> The pressure present is accepted as the upper range value (LRV).
"Zero" and "Span" pressed together briefly	<b>Display position adjustment</b>
"Zero" and "Span" pressed simultaneously for at least 3 seconds	<b>Position adjustment</b> The sensor characteristic curve is shifted parallel to itself, so that the pressure present becomes the zero value.
"Zero" and "Span" pressed simultaneously for at least 12 seconds	<b>Reset</b> All parameters are reset to the order configuration.

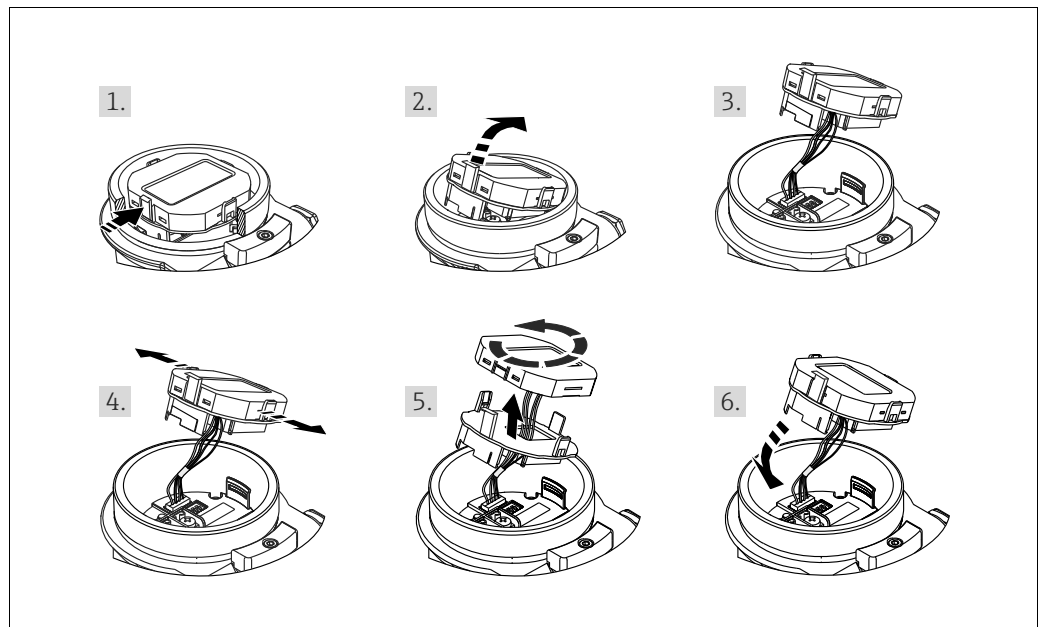
### 6.2 Using the device display (optional)

A 4-line liquid crystal display (LCD) is used. The local display shows measured values, fault messages and notice messages.

The display can be removed for easy operation (see diagram, steps 1 - 3). It is connected to the device via a 90 mm (3.54 in) long cable.

The device display can be rotated in 90° stages (see diagram, steps 4 - 6).

Depending on the orientation of the device, this makes it easy to read the measured values.



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Functions:

- 8-digit measured value display including sign and decimal point, bar graph for 4 to 20 mA as current display.
- Diagnostic functions (fault and warning message etc.)

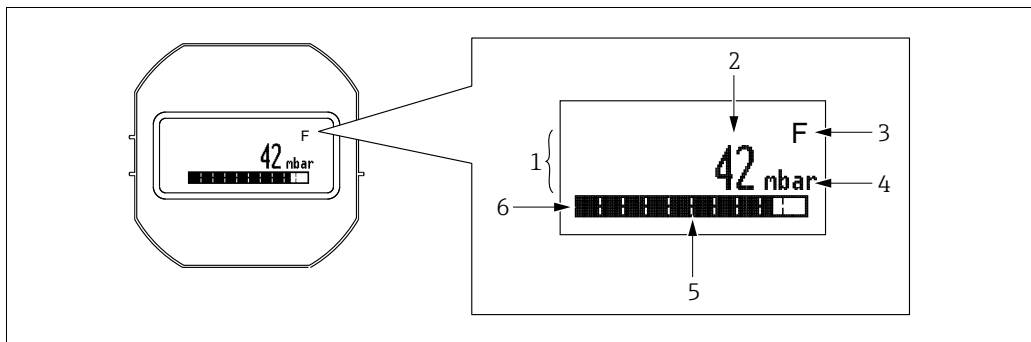


Fig. 22: Display

- 1 Main line
- 2 Value
- 3 Symbol
- 4 Unit
- 5 Bar graph
- 6 Information line

The following table illustrates the symbols that can appear on the local display. Four symbols can occur at one time.

Symbol	Meaning
<b>S</b>	<b>Error message "Out of specification"</b> The device is being operated outside its technical specifications (e.g. during warmup or cleaning processes).
<b>C</b>	<b>Error message "Service mode"</b> The device is in the service mode (during a simulation, for example).
<b>M</b>	<b>Error message "Maintenance required"</b> Maintenance is required. The measured value remains valid.
<b>F</b>	<b>Error message "Failure detected"</b> An operating error has occurred. The measured value is no longer valid.

## 7 Commissioning

The device is factory-configured for the pressure measuring mode. The measuring range and the unit in which the measured value is transmitted correspond to the specifications on the nameplate.

### **⚠ WARNING**

#### **Permitted process pressure exceeded!**

Risk of injury if parts burst! Warnings are displayed if the pressure is too high.

- ▶ If a pressure that is greater than the maximum permitted pressure is present at the device, the message "S" and "Warning" are output alternately. Only operate the device within the sensor range limits!

### **NOTICE**



#### **Permitted process pressure undershot!**

Messages are displayed if the pressure is too low.

- ▶ If a pressure that is lower than the minimum permitted pressure is present at the device, the message "S" and "Warning" are output alternately. Only operate the device within the sensor range limits!

### 7.1 Function check

Carry out a post-installation and a post-connection check as per the checklist before commissioning the device.

- "Post-installation check" →  24 checklist
- "Post-connection check" →  30 checklist

### 7.2 Commissioning

The following functions are possible via the keys on the electronic insert:

- Position adjustment (zero point correction). A pressure shift resulting from the orientation of the measuring device can be corrected by performing the position adjustment.
- Setting lower range value and upper range value
- Device reset
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

1.) Perform position adjustment	
Pressure is present at device.	
↓	
Press the "Zero" and "Span" keys simultaneously for at least 3 s.	
↓	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
Applied pressure for position adjustment has been accepted.	Applied pressure for position adjustment has not been accepted. Observe the input limits.

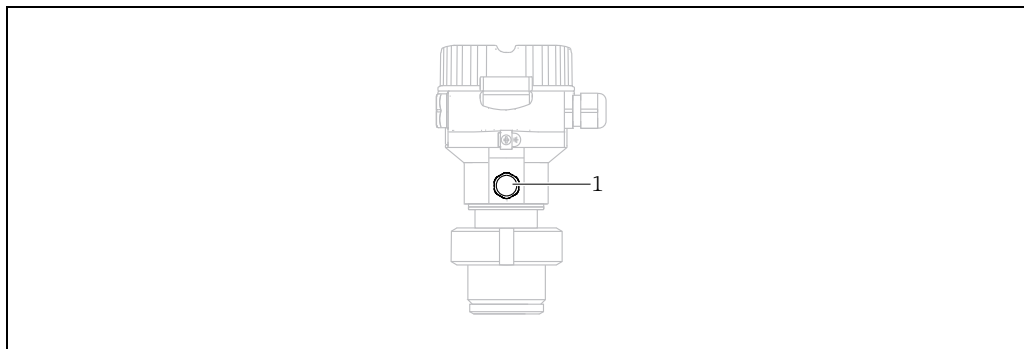
2.) Set lower range value	
Desired pressure for lower range value is present at device.	
↓	
Press the "Zero" key for at least 3 s.	
↓	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
Applied pressure for lower range value has been accepted.	Applied pressure for lower range value has not been accepted. Observe the input limits.

3.) Set upper range value	
Desired pressure for upper range value is present at device.	
↓	
Press the "Span" key for at least 3 s.	
↓	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
Applied pressure for upper range value has been accepted.	Applied pressure for upper range value has not been accepted. Observe the input limits.

4.) Check settings	
Press "Zero" key briefly to display the lower range value.	
↓	
Press "Span" key briefly to display the upper range value.	
↓	
Press "Zero" and "Span" keys together briefly to display the calibration offset.	

## 8 Maintenance

Keep the pressure compensation and GORE-TEX® filter (1) free from contamination.



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### 8.1 Cleaning instructions

Endress+Hauser offer flushing rings as accessories to clean process isolating diaphragms without taking the transmitters out of the process.

For further information please contact your local Endress+Hauser Sales Center.

#### 8.1.1 Cerabar M PMP55

We recommend you perform CIP (cleaning in place (hot water)) before SIP (sterilization in place (steam)) for pipe diaphragm seals. A frequent use of sterilization in place (SIP) will increase the stress on the process isolating diaphragm. Under unfavorable circumstances in the long term view we cannot exclude that a frequent temperature change could lead to a material fatigue of the process isolating diaphragm and possibly to a leakage.

### 8.2 Exterior cleaning

Please note the following points when cleaning the device:

- The cleaning agents used should not corrode the surface and the seals.
- Mechanical damage to the diaphragm, e.g. due to sharp objects, must be avoided.
- Observe the degree of protection of the device. See the nameplate if necessary (→ 8 ff).

## 9 Troubleshooting

### 9.1 Messages

The following is a list of the messages that can occur. The device has four different status information codes in accordance with NE107:

- F = failure
- M (warning) = maintenance required
- C (warning) = function check
- S (warning) = out of specification (deviations from the permitted ambient or process conditions determined by the device with the self-monitoring function, or errors in the device itself indicate that the measuring uncertainty is greater than what would be expected under normal operating conditions).

### 9.2 Measures

When a message is displayed, the following steps can be taken:


- Check cable/pressure value
- Restart device
- Perform a reset

If these steps do not correct the error, please contact your Endress+Hauser subsidiary.

### 9.3 Response of output to errors

In the event of an error, the current output adopts a value of 3.6 mA.

### 9.4 Repair

The Endress+Hauser repair concept provides for measuring devices to have a modular design and that the customer can also carry out repairs (→  37 "Spare parts").

- For certified devices, please consult the "Repair of Ex-certified devices" section.
- For more information on service and spare parts, contact Endress+Hauser Service.  
→ See [www.endress.com/worldwide](http://www.endress.com/worldwide).

### 9.5 Spare parts

- Some replaceable measuring device components are identified by a spare part nameplate. This contains information about the spare part.
- All the spare parts for the measuring device, along with the order code, are listed in the W@M Device Viewer ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)) and can be ordered here. If available, users can also download the associated Installation Instructions.



Measuring device serial number:

- Located on the device nameplate and spare part nameplate.
- Can be read out via the "SERIAL NO. TRANSM." parameter in the "TRANSMITTER DATA" submenu.

## 9.6 Return

The measuring device must be returned if it is in need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure the safe, professional and swift return of your device, please refer to the procedure and conditions for returning equipment on the Endress+Hauser website at [www.services.endress.com/return-material](http://www.services.endress.com/return-material).

## 9.7 Disposal

When disposing, separate and recycle the device components based on the materials.

## 9.8 Software history

Date	Software version	Software modifications	Documentation
			Operating Instructions
10.2009	01.00.zz	Original software.	BA385P/00/EN/10.09 71102503
			BA00385P/00/EN/13.10 71125888
			BA00385P/00/EN/15.11 71134887
			BA00385P/00/EN/16.12 71157152
			BA00385P/00/EN/17.12 71191314
			BA00385P/00/EN/18.14 71241498
			BA00385P/00/EN/20.16 71316876

## 10 Technical data

See Technical Information TI00436P

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