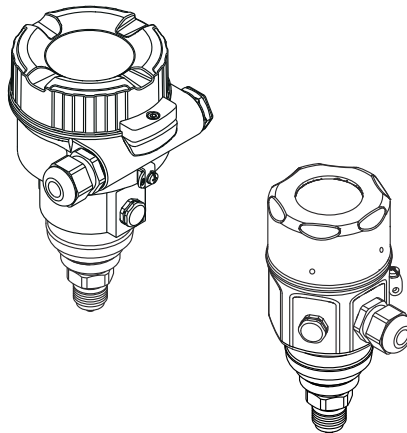


Brief Operating Instructions Cerabar M PMC51, PMP51, PMP55

Process pressure measurement

Analog

Pressure transmitter with ceramic and metallic
measuring cells



These Brief Operating Instructions are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the additional documentation.

Available for all device versions via

- Internet: www.endress.com/deviceviewer
- Smartphone/tablet: *Endress+Hauser Operations app*

1 Associated documentation



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2 About this document

2.1 Document function

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

2.2 Symbols used

2.2.1 Safety symbols

DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

2.2.2 Electrical symbols

Protective earth (PE)

Ground terminals that must be connected to ground prior to establishing any other connections.

The ground terminals are located on the interior and exterior of the device:

- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

2.2.3 Symbols for certain types of information and graphics

Symbols for certain types of information and graphics

Permitted

Procedures, processes or actions that are permitted

Forbidden

Procedures, processes or actions that are forbidden

Tip

Indicates additional information



Reference to documentation



Reference to page



Visual inspection



Notice or individual step to be observed

1, 2, 3, ...

Item numbers

1, 2, 3

Series of steps



Result of a step

2.3 Registered trademarks

- KALREZ®
Registered label of E.I. Du Pont de Nemours & Co., Wilmington, USA
- TRI-CLAMP®
Registered label of Ladish & Co., Inc., Kenosha, USA
- GORE-TEX® trademark of W.L. Gore & Associates, Inc., USA

3 Basic safety instructions

3.1 Requirements for the personnel

Personnel must meet the following requirements for their tasks:

- ▶ Trained, qualified specialists must be suitably qualified to perform this function and task
- ▶ Are authorized by the plant owner/operator
- ▶ Are familiar with federal/national regulations
- ▶ They must have read and understood the instructions in the manual, supplementary documentation and certificates (depending on the application) prior to starting work
- ▶ They must follow instructions and comply with basic conditions

3.2 Intended use

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

3.2.1 Foreseeable incorrect use

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

Verification for borderline cases:

- ▶ For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability.

3.3 Workplace safety

For work on and with the device:

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

3.4 Operational safety

Risk of injury!

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

Conversions to the device

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

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

Repair

To ensure continued operational safety and reliability:

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

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):

- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

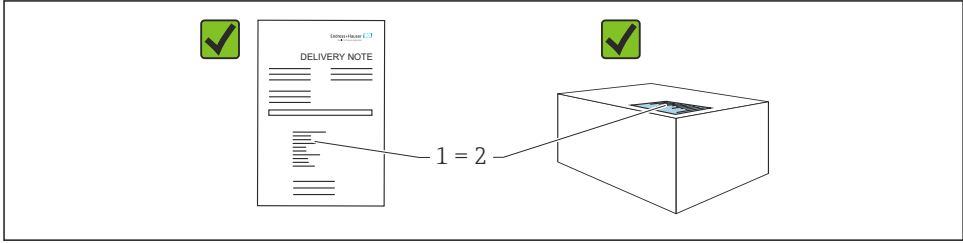
3.5 Product safety

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 they are safe to operate.

It fulfills general safety requirements and legal requirements. It also conforms to the EC directives listed in the device-specific EC declaration of conformity. Endress+Hauser confirms this fact by applying the CE mark.

4 Incoming acceptance and product identification

4.1 Incoming acceptance



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- Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?
- Are the goods undamaged?
- Do the data on the nameplate correspond to the order specifications and the delivery note?
- Is the documentation available?
- If required (see nameplate): Are the safety instructions (XA) present?



If one of these conditions is not fulfilled, please contact your Endress+Hauser sales office.

4.2 Storage and transport

4.2.1 Storage conditions

Use original packaging.

Store the measuring device in clean and dry conditions and protect from damage caused by shocks (EN 837-2).

4.2.2 Transporting the product to the measuring point

⚠ WARNING

Incorrect transport!

Housing and membrane 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.

5 Mounting

5.1 Mounting requirements

5.1.1 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 membrane, 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. tightening torque: 20 to 30 Nm (14.75 to 22.13 lbf ft)
- For the following process connections, a tightening torque of max. 40 Nm (29.50 lbf ft) is specified:
 - Thread ISO228 G1/2 (Order option "GRC" or "GRJ" or "G0J")
 - Thread DIN13 M20 x 1.5 (Order option "G7J" or "G8J")

5.1.2 Mounting sensor modules with PVDF thread

WARNING

Risk of damage to process connection!

Risk of injury!

- ▶ Sensor modules with PVDF thread 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 temperature loads.

- ▶ The integrity of the thread must be checked regularly. Also, 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.

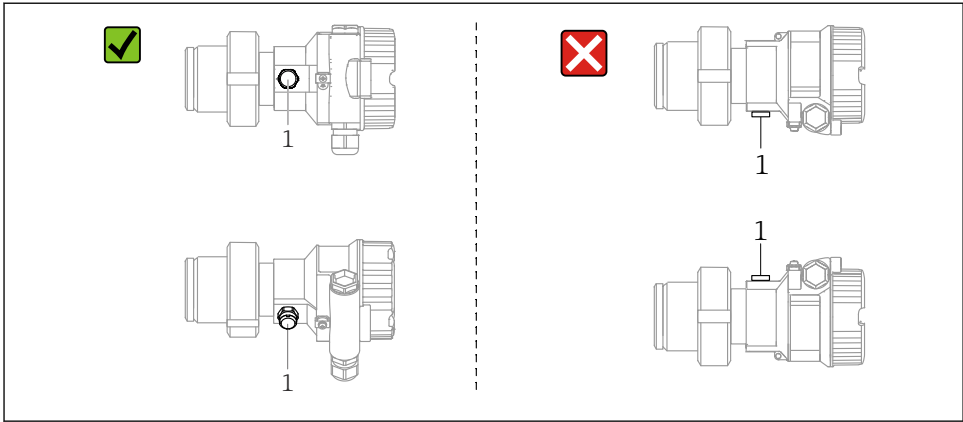
5.2 Installation instructions for devices without diaphragm seals – PMP51, PMC51

NOTICE

Damage to the device!

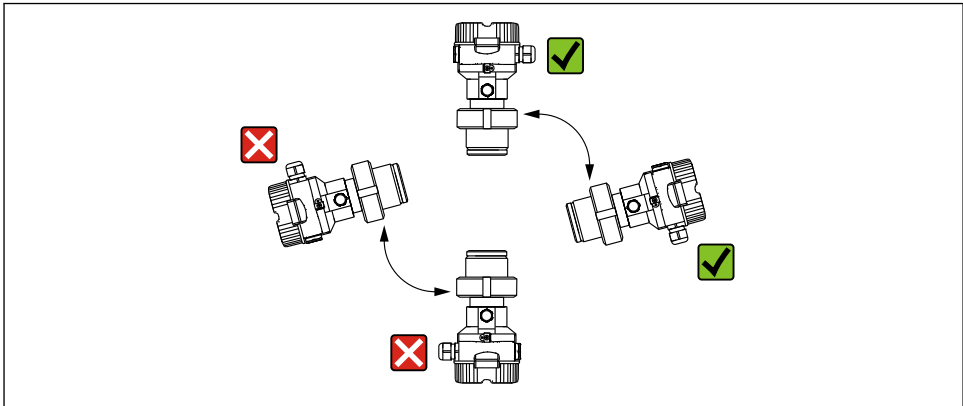
If a heated device is cooled during a cleaning process (e.g. by cold water), a vacuum develops for a short time and, as a result, moisture can enter the sensor through the pressure compensation element (1).

- ▶ Mount the device as follows.



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- 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 water pocket pipes. The orientation depends on the measuring application.
- Do not clean or touch process membranes 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):



A0028472

5.2.1 Pressure measurement in gases

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

5.2.2 Pressure measurement in vapors

- Mount the Cerabar M with the water pocket pipe below the tapping point.
- Fill the water pocket pipe with liquid before commissioning. The water pocket pipe reduces the temperature to almost ambient temperature.

5.2.3 Pressure measurement in liquids

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

5.3 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 membrane of the diaphragm seal with hard or pointed objects.
- Do not remove the protection on the process membrane until just before installation.

NOTICE

Incorrect 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.
- ▶ If a mounting bracket is used, sufficient strain relief must be ensured for the capillaries in order to prevent them from buckling (bending radius ≥ 100 mm (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
- ▶ Mount with a bending radius ≥ 100 mm (3.94 in)!
- ▶ Do not use the capillaries as a carrying aid for the diaphragm seals!

6 Electrical connection

6.1 Connecting requirements

6.1.1 Shielding/potential equalization

- A normal device cable suffices if only the analog signal is used.
- When using in hazardous areas, you must observe the applicable regulations. Separate Ex documentation with additional technical data and instructions is included with all Ex systems as standard. Connect all devices to the local potential equalization.

6.2 Connecting the device

⚠ WARNING

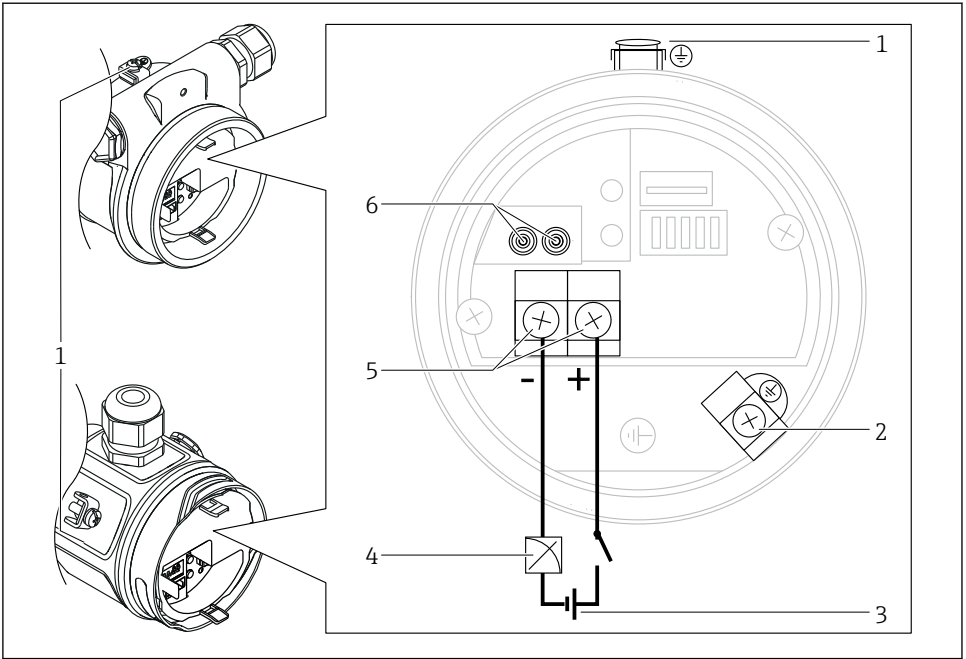
Supply voltage might be connected!

Risk of electric shock and/or explosion!

- ▶ Ensure that no uncontrolled processes are activated at the facility.
- ▶ Switch off the supply voltage before connecting the device.
- ▶ When using the measuring device in hazardous areas, installation must also comply with the applicable national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- ▶ In accordance with IEC/EN61010 a suitable circuit breaker must be provided for the device.
- ▶ 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:

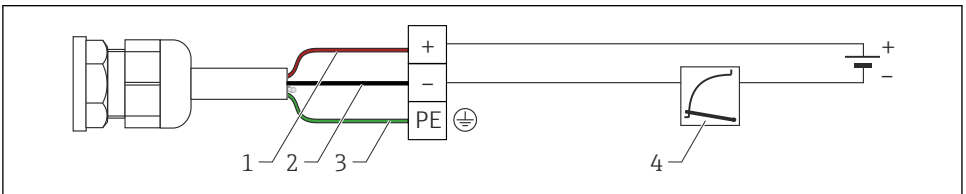
1. Check whether the supply voltage matches the supply voltage indicated on the nameplate.
2. Switch off the supply voltage before connecting the device.
3. Remove the housing cover.
4. Guide the cable through the gland. Preferably use a twisted, shielded two-wire cable.
5. Connect the device as indicated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



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- 1 External ground terminal
- 2 Grounding terminal
- 3 Supply voltage: 11,5 ... 45 VDC (versions with plug connectors: 35 V DC)
- 4 4...20 mA
- 5 Terminals for supply voltage and signal
- 6 Test terminals

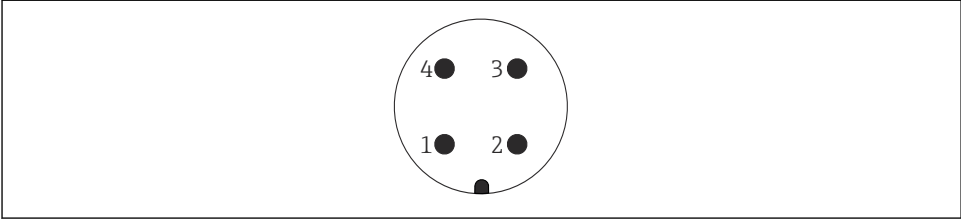
6.2.1 Connecting the cable version (all device versions)



A0019991

- 1 RD = red
- 2 BK = black
- 3 GNYE = green
- 4 4 to 20 mA

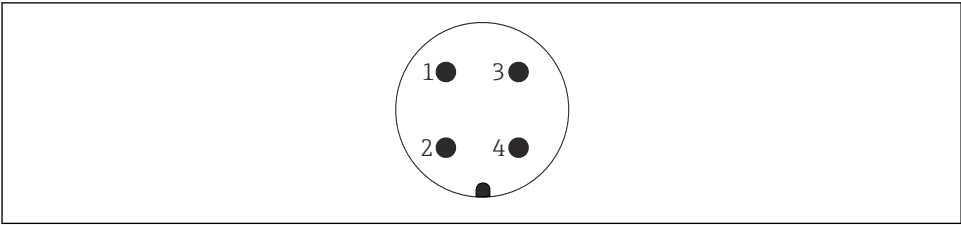
6.2.2 Connection of devices with M12 plug



A0011175

- 1 *Signal +*
- 2 *Not assigned*
- 3 *Signal -*
- 4 *Ground*

6.2.3 Connection of devices with 7/8" plug



A0011176

- 1 *Signal -*
- 2 *Signal +*
- 3 *Shielding*
- 4 *Not assigned*

6.2.4 Supply voltage

4 to 20 mA

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

Measuring a 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 $< 0.7 \Omega$.

6.2.5 Terminals

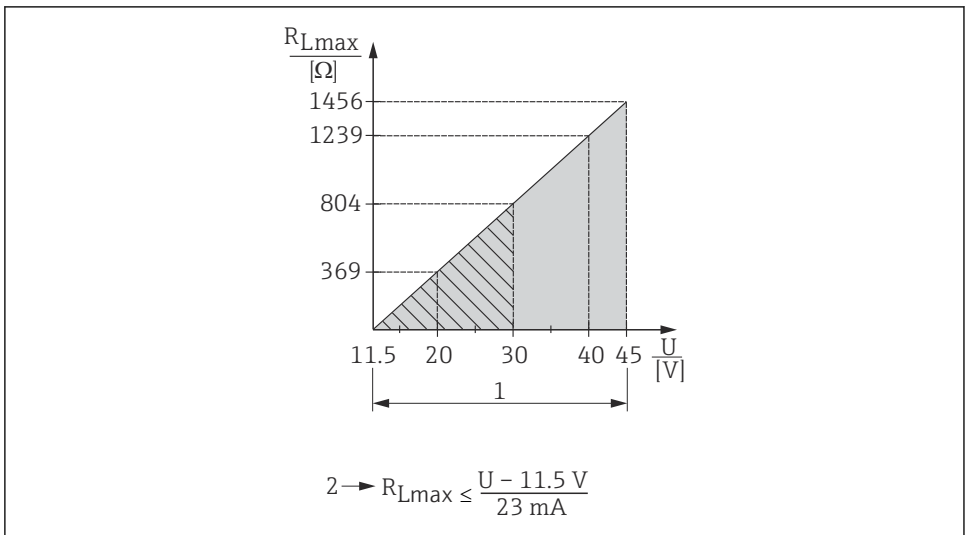
- Supply voltage and internal ground terminal: 0.5 to 2.5 mm² (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm² (20 to 12 AWG)

6.2.6 Cable specification

Analog

- 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

6.2.7 Load - 4 to 20 mA analog



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- 1 Supply voltage 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

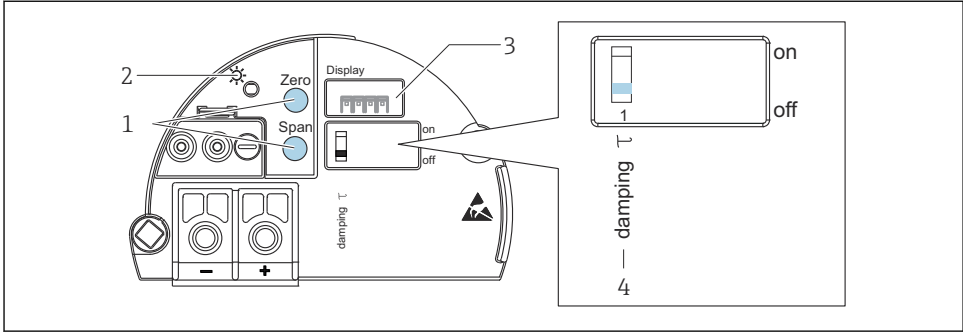
7 Operation options

7.1 Operation without an operating menu

7.1.1 Position of operating elements

The operating key and DIP switches are located on the electronic insert in the device.

Analog



A0032657

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

Function of the DIP switches

Symbol/labeling	Switch position	
	"off"	"on"
damping τ	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 τ . ¹⁾

- 1) The value for the delay time can be configured via the operating menu ("Setup" → "Damping"). Factory setting: $\tau = 2$ s or as per order specifications.

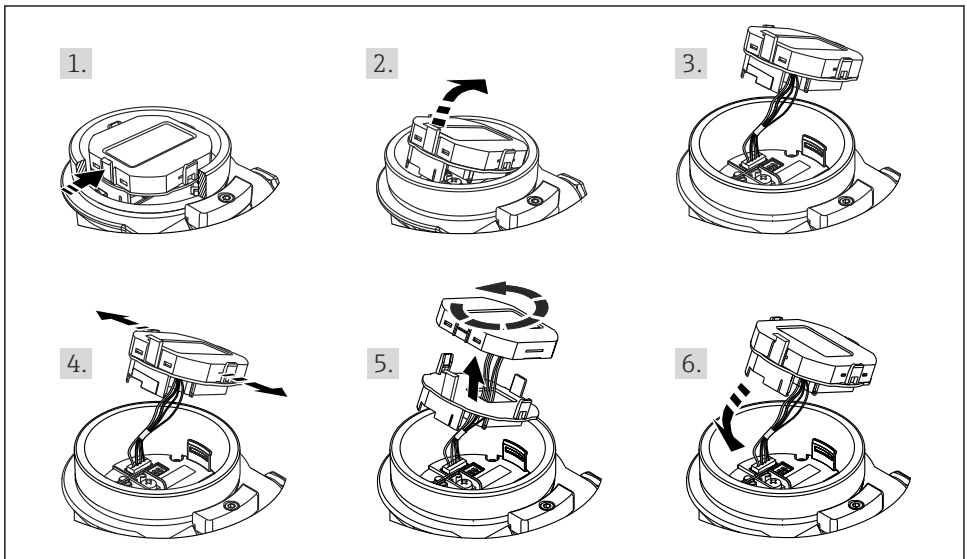
Function of the operating elements

Operating key(s)	Meaning
Zero pressed briefly	Display lower range value
Zero pressed for at least 3 seconds	Get LRV The pressure present is accepted as the lower range value (LRV).
Span pressed briefly	Display upper range value
Span pressed for at least 3 seconds	Get URV The pressure present is accepted as the upper range value (URV).

Operating key(s)	Meaning
Zero and Span pressed simultaneously for at least 3 seconds	Position adjustment The sensor characteristic is shifted in parallel so that the pressure present becomes the zero value.
Zero and Span pressed simultaneously for at least 12 seconds	Reset All the parameters are reset to the order configuration.

7.2 Display with device display (optional)

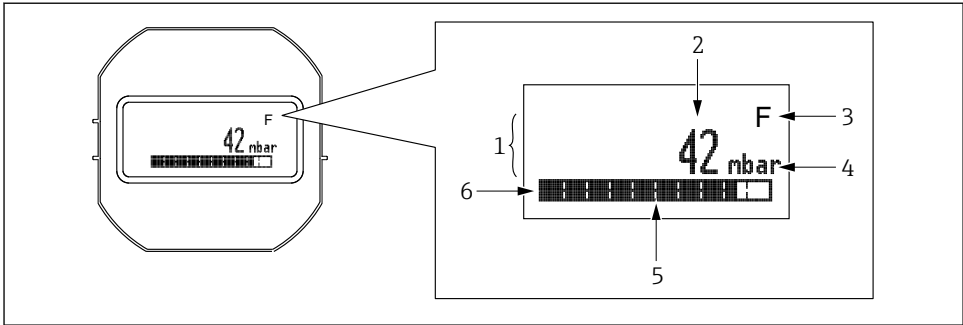
A 4-line liquid crystal display (LCD) is used. The local display shows measured values, fault messages and notice messages. For easy operation the display can be taken out of the housing (see figure steps 1 to 3). It is connected to the device via a cable that is 90 mm (3.54 in) long. The display of the device can be turned in 90° stages (see figure steps 4 to 6). Depending on the orientation of the device, it is therefore easy to read the measured values.



A0028500

Functions:

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



A0028501

- 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 may appear at the same time.

Symbol	Meaning
S A0013958	Error message "Out of specification" The device is being operated outside its technical specifications (e.g. during startup or cleaning).
C A0013959	Error message "Service mode" The device is in the service mode (e.g. during a simulation).
M A0013957	Error message "Maintenance required" Maintenance is required. The measured value remains valid.
F A0013956	Error message "Failure detected" An operating error has occurred. The measured value is no longer valid.

8 Commissioning

The device is configured for the "Pressure" measuring mode as standard.

The measuring range and the unit in which the measured value is transmitted correspond to the data on the nameplate.

⚠ WARNING**The permitted process pressure is exceeded!**

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

- ▶ If a pressure greater than the maximum permitted pressure is present at the device, the messages "S" and "Warning" alternate on the display. Only use the device within the sensor range limits!
- ▶ Only use the device within the sensor range limits!

NOTICE**The permitted process pressure is undershot!**

Messages are displayed if the pressure is too low.

- ▶ If a pressure lower than the minimum permitted pressure is present at the device, the messages "S" and "Warning" alternate on the display. Only use the device within the sensor range limits!
- ▶ Only use the device within the sensor range limits!

8.1 Commissioning without an operating menu

8.1.1 Pressure measuring mode

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

- Position adjustment (zero point correction)
 - Setting the lower range value and upper range value
 - Device reset
- i**
- Operation must be unlocked
 - The device is configured for the "Pressure" measuring mode as standard. You can change the measuring mode via the "Measuring mode" parameter .
 - The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

⚠ WARNING**Changing the measuring mode affects the span (URV)!**

This can result in product overflow.

- ▶ If the measuring mode is changed, the span setting (URV) must be verified and, if necessary, reconfigured!

Carrying out position adjustment

1. Make sure that pressure is present at the device. In doing so, pay attention to the nominal pressure limits of the sensor.
2. Press the **Zero** and **Span** keys simultaneously for at least 3 s.
 - ↳ LED on the electronic insert is lit briefly.
The applied pressure for position adjustment has been accepted.

Setting the lower range value

1. Make sure the desired pressure for the lower range value is present at the device. In doing so, pay attention to the nominal pressure limits of the sensor.

2. Press the **Zero** key for at least 3 s.
 - ↳ LED on the electronic insert is lit briefly.
The applied pressure for the lower range value has been accepted.

Setting the upper range value

1. Make sure the desired pressure for the upper range value is present at the device. In doing so, pay attention to the nominal pressure limits of the sensor.
2. Press the **Span** key for at least 3 s.
 - ↳ LED on the electronic insert is lit briefly.
The applied pressure for the upper range value has been accepted.



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