

Brief Operating Instructions Cerabar PMP50

Pressure measurement
HART



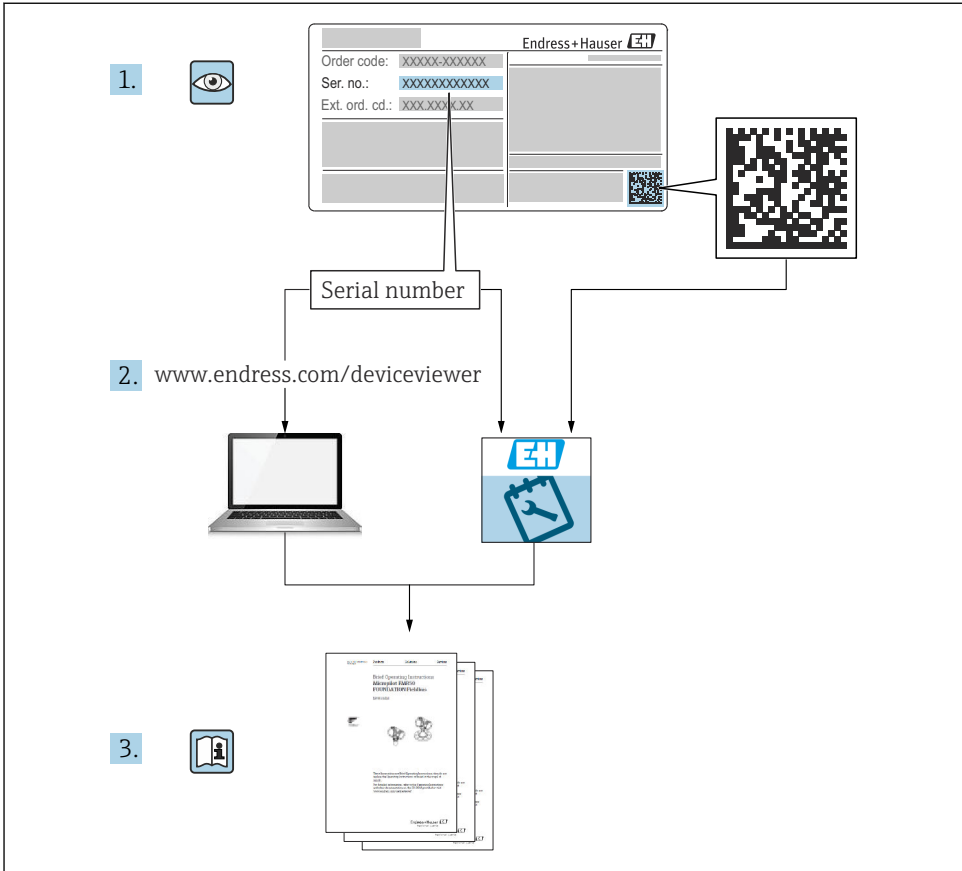
These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:

Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smart phone/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

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.

ℹ NOTICE

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

2.2.2 Electrical symbols


Ground connection: \perp

Terminal for connection to the grounding system.


2.2.3 Symbols for certain types of information


Permitted: 


Procedures, processes or actions that are permitted.

Forbidden: 


Procedures, processes or actions that are forbidden.

Additional information: 

Reference to documentation: 

Reference to page: 

Series of steps: 1, 2, 3

Result of an individual step: 



2.2.4 Symbols in graphics

Item numbers: 1, 2, 3 ...

Series of steps: 1, 2, 3

Views: A, B, C, ...

2.2.5 Symbols on the device

Safety instructions:  → 

Observe the safety instructions contained in the associated Operating Instructions.

2.2.6 Communication symbols

2.3 Registered trademarks

HART®

Registered trademark of the FieldComm Group, Austin, Texas, USA

3 Basic safety instructions

3.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill 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 federal/national regulations
- ▶ Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- ▶ Follow instructions and comply with conditions

The operating personnel must fulfill the following requirements:

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

3.2 Intended use

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

3.2.1 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

When working 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 only if it is in proper technical condition, free from errors and faults.
- ▶ The operator is responsible for the interference-free operation of the device.

Modifications 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 the repair of an electrical device.
- ▶ Use original spare parts and accessories from Endress+Hauser only.

Hazardous area

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

- ▶ Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area.
- ▶ Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

3.5 Product safety

This 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.

3.6 Functional Safety SIL (optional)

The Functional Safety Manual must be strictly observed for devices that are used in functional safety applications.

3.7 IT security

Endress+Hauser can only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings. IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

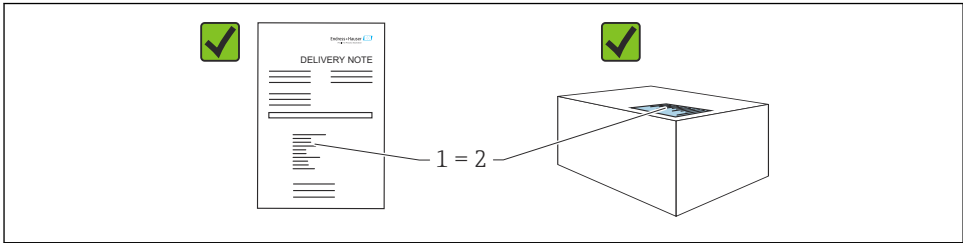
3.8 Device-specific IT security

The device offers specific functions to support protective measures by the operator. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section:

- Write protection via hardware write protection switch
- Access code to change the user role (applies to operation via FieldCare, DeviceCare, Asset Management Tools. e.g. AMS, PDM)


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) provided?

 If you can answer "no" to any of these questions, please contact Endress+Hauser.

4.2 Storage and transport

4.2.1 Storage conditions

- Use the original packaging
- Store the device in clean and dry conditions and protect from damage caused by shocks

Storage temperature range

See Technical Information.

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 device to the measuring point in the original packaging.

5 Mounting

5.1 Mounting requirements

5.1.1 General instructions

- Do not clean or touch the membrane with hard and/or pointed objects.
- Do not remove the membrane protection until shortly before installation.

Always firmly tighten the housing cover and the cable entries.

1. Counter-tighten the cable entries.

2. Tighten the coupling nut.

5.1.2 Installation instructions

- The standard devices (without diaphragm seal) are mounted according to the same guidelines as pressure gauges (DIN EN837-2).
- To ensure optimal readability of the color display, align the housing and color display.
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls.
- For measurements in media containing solids (e.g. dirty liquids), it makes sense to install strainer and drain valves.
- Using a valve manifold allows for easy commissioning, installation and maintenance without interrupting the process
- When mounting the device, establishing the electrical connection and during operation: prevent the penetration of moisture into the housing
- Point the cable downwards where possible to prevent moisture from entering (e.g. rain or condensation water).

5.1.3 Installation instructions for thread

Device with NPT thread:

- Wrap Teflon tape around the thread to seal it
- Only tighten the device at the hex bolt; do not turn it by the housing.
- When screwing in, do not overtighten the thread; tighten the NPT thread to the required depth according to the standard

5.1.4 Installation instructions for devices with diaphragm seals

NOTICE

Incorrect handling!

Damage to the device!

- ▶ The diaphragm seal and pressure transmitter together form a sealed, calibrated system filled with fill fluid. Do not open the fill openings under any circumstances.
- ▶ Keep within the application limits of the fill fluid.

General information

If a measuring cell with a narrow measuring range is selected, a position adjustment can possibly cause the measuring range to be overridden (position adjustment due to zero offset, caused by the orientation of the fill fluid liquid column). Perform zero adjustment if necessary.

Additional installation instructions are provided in the Applicator "[Sizing Diaphragm Seal](#)".

5.2 Mounting the device

5.2.1 Pressure measurement in gases

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

5.2.2 Pressure measurement in vapors

Observe the maximum permitted ambient temperature of the transmitter!

Mounting:

- Preferably mount the device with an O-shaped siphon below the tapping point.
The device may also be mounted above the tapping point
- Fill the siphon with liquid before commissioning

Advantages of using siphons:

- Protection of the measuring instrument from hot, pressurised media by forming and accumulating condensate
- Damping of pressure shocks
- The defined water column only causes minimal (negligible) measurement errors and minimal (negligible) thermal effects on the device.



For technical data (e.g. materials, dimensions or order numbers), see the accessory document SDO1553P.

5.2.3 Pressure measurement in liquids

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

5.2.4 Level measurement

- Always install the device below the lowest measuring point.
- Do not install the device at the following positions:
 - In the filling curtain
 - In the tank outlet
 - In the suction area of a pump
 - At a point in the tank that could be affected by pressure pulses from the agitator
- Mount the device downstream from a shutoff device: the functional test and adjustment can then be carried out more easily.

5.2.5 Closing the housing covers

NOTICE

Thread and housing cover damaged from dirt and fouling!

- ▶ Remove dirt (e.g. sand.) on the thread of the cover and housing.
- ▶ If you continue to encounter resistance when closing the cover, check the thread again for fouling.



Housing thread

The threads of the electronics and connection compartment can be coated with an anti-friction coating.

The following applies for all housing materials:

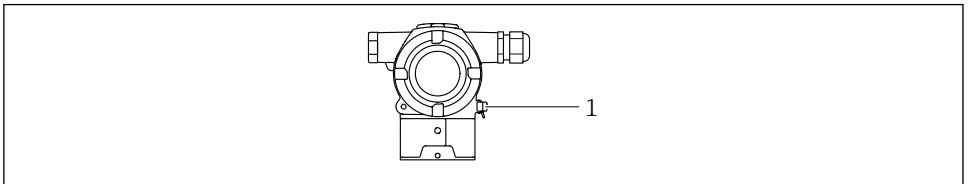
- ✘ **Do not lubricate the housing threads.**

6 Electrical connection

6.1 Connecting requirements

6.1.1 Potential equalization

The protective ground on the device must not be connected. If necessary, the potential matching line can be connected to the outer ground terminal of the device before the device is connected.



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- 1 Ground terminal for connecting the potential matching line



If necessary, the potential matching line can be connected to the outer ground terminal of the device before the device is connected.

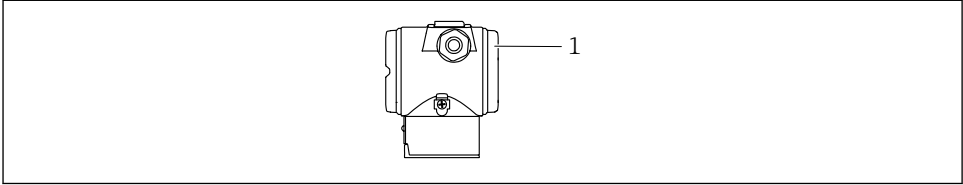
⚠ WARNING**Risk of explosion!**

- ▶ Please refer to the separate documentation on applications in hazardous areas for the safety instructions.



For optimum electromagnetic compatibility:

- Potential matching line as short as possible
- Maintain a cross-section of at least 2.5 mm² (14 AWG)

6.2 Connecting the device

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1 Connection compartment cover

**Housing thread**

The threads of the electronics and connection compartment can be coated with an anti-friction coating.

The following applies for all housing materials:

- ✘ **Do not lubricate the housing threads.**

6.2.1 Supply voltage

- Ex d, Ex e, non Ex: supply voltage: 10.5 to 35 V_{DC}
- Ex i: supply voltage: 10.5 to 30 V_{DC}
- Nominal current: 4 to 20 mA HART



The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications. For 4 to 20 mA, the same requirements apply as for HART.

A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.

6.2.2 Power consumption

To ensure the safety of the device, the maximum supply current must be limited to 500 mA (e.g. connect a fuse upstream).

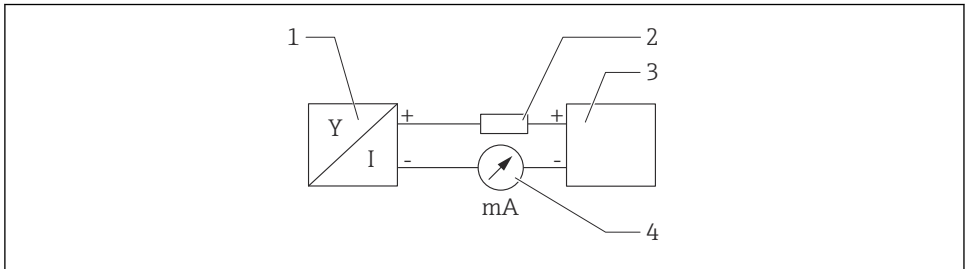
6.2.3 Terminals

- 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)

6.2.4 Cable specification

- Protective ground or grounding of the cable shield: rated cross-section $> 1 \text{ mm}^2$ (17 AWG)
Rated cross-section of 0.5 mm^2 (20 AWG) to 2.5 mm^2 (13 AWG)
- Cable outer diameter: $\varnothing 5$ to 9 mm (0.2 to 0.35 in) depends on the cable gland used (see Technical Information)

6.2.5 4-20 mA HART



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1 Block diagram of HART connection

- 1 Device with HART communication
- 2 HART communication resistor
- 3 Power supply
- 4 multimeter



The HART communication resistor of 250Ω in the signal line is always necessary in the case of a low-impedance power supply.

Take the voltage drop into consideration:

Maximum 6 V for a communication resistor of 250Ω

6.2.6 Overvoltage protection

Devices without optional overvoltage protection

Equipment from Endress+Hauser fulfills the requirements of the product standard IEC/DIN EN 61326-1 (Table 2 Industrial Environment).

Depending on the type of port (DC power supply, input/output port) different testing levels according to IEC/DIN EN 61326-1 against transient overvoltages (Surge) are applied (IEC/DIN EN 61000-4-5 Surge):

Test level on DC power ports and input / output ports is 1000 V line to earth

Devices with optional overvoltage protection

- Spark-over voltage: min. 400 V DC
- Tested according to IEC/DIN EN 60079-14 sub chapter 12.3 (IEC/DIN EN 60060-1 chapter 7)
- Nominal discharge current: 10 kA

Overvoltage category

Overvoltage category II

6.2.7 Wiring

⚠ WARNING

Supply voltage might be connected!

Risk of electric shock and/or explosion!

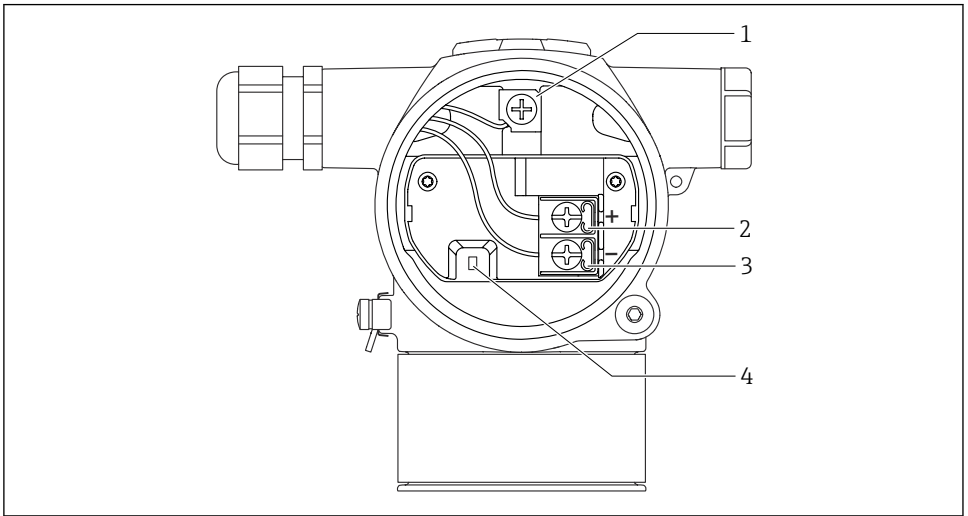
- ▶ When operating the device in hazardous areas, ensure compliance with national standards and the specifications outlined in the Safety Instructions (XAs). Use the specified cable gland.
- ▶ The supply voltage must match the specifications on the nameplate.
- ▶ Switch off the supply voltage before connecting the device.
- ▶ If necessary, the potential matching line can be connected to the outer ground terminal of the transmitter before the device is connected.
- ▶ A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.
- ▶ The cables must be adequately insulated, with due consideration given to the supply voltage and the overvoltage category.
- ▶ The connecting cables must offer adequate temperature stability, with due consideration given to the ambient temperature.
- ▶ Only operate the device with the covers closed.
- ▶ Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

Connect the device in the following order:

1. Release the cover lock (if provided).
2. Unscrew the cover.
3. Guide the cables into the cable glands or cable entries.
4. Connect the cables.
5. Tighten the cable glands or cable entries so that they are leak-tight. Counter-tighten the housing entry. Use a suitable tool with width across flats AF24/25 8 Nm (5.9 lbf ft) for the M20 cable gland.
6. Screw the cover securely back onto the connection compartment.

6.2.8 Terminal assignment

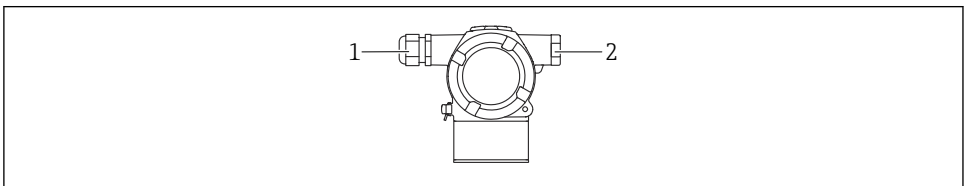
Dual-compartment housing



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- 1 Internal ground terminal
- 2 Positive terminal
- 3 Negative terminal
- 4 Interlock diode: An interlock diode is used for uninterrupted measurement of the output signal.

6.2.9 Cable entries



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- 1 Cable entry
- 2 Dummy plug

The type of cable entry depends on the device version ordered.



Always route connecting cables downwards so that moisture cannot penetrate the connection compartment.

If necessary, create a drip loop or use a weather protection cover.

6.3 Ensuring the degree of protection

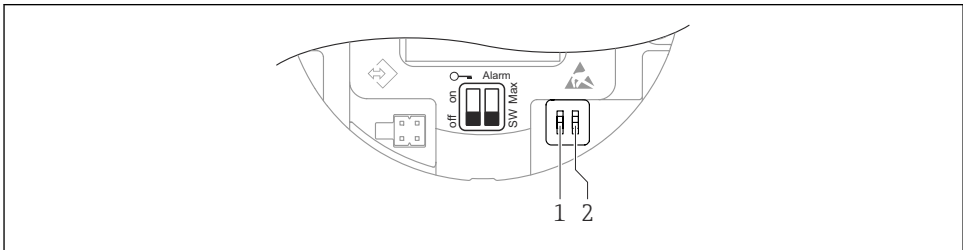
6.3.1 Cable entries

- Gland M20, plastic, IP66/68 TYPE 4X/6P
- Gland M20, brass nickel plated, IP66/68 TYPE 4X/6P
- Gland M20, 316L, IP66/68 TYPE 4X/6P
- Thread M20, IP66/68 TYPE 4X/6P
- Thread G1/2, IP66/68 TYPE 4X/6P
 - If the G1/2 thread is selected, the device is delivered with an M20 thread as standard and a G1/2 adapter is included with the delivery, along with the corresponding documentation
- Thread NPT1/2, IP66/68 TYPE 4X/6P
- Dummy plug transport protection: IP22, TYPE 2

7 Operation options

7.1 Operating keys and DIP switches on the electronic insert

7.1.1 DIP switch on the electronic insert



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- 1 *DIP switch for locking and unlocking the device*
- 2 *DIP switch for alarm current*

 The setting of the DIP switches has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).

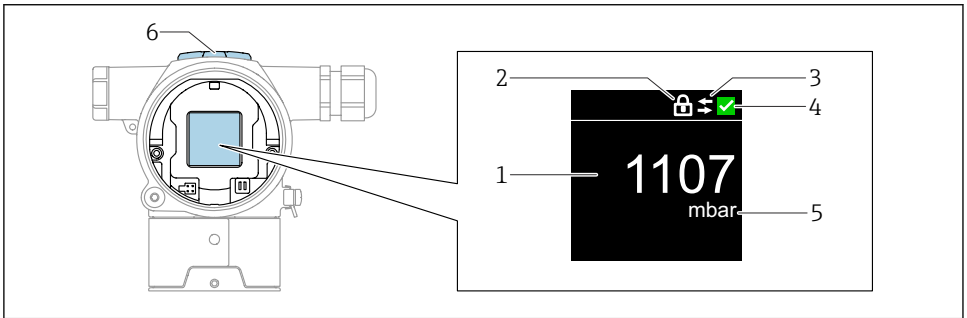
7.2 Access via color display (optional) and magnetic button

Functions that can be executed with the magnetic button:

- Zero point and span
- Turning the display
- Position adjustment
- Resetting user role password
- Device reset



The brightness of the color display is adjusted depending on the supply voltage and the current consumption.



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2 Color display

- 1 Measured value (up to 5 digits)
- 2 Locking (symbol appears when device is locked)
- 3 HART communication (symbol appears when HART communication is enabled)
- 4 Status symbol according to NAMUR
- 5 Measured value output in %
- 6 Magnetic keys (Zero and Span)

8 Commissioning

8.1 Preliminaries

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

WARNING

The settings of the current output are relevant for safety!

This situation can result in product overflow.

- ▶ The setting of the current output depends on the setting in the **Assign PV** parameter.
- ▶ After changing the **Assign PV** parameter, check the span settings (LRV and URV) and reconfigure if necessary.

⚠ WARNING**Process pressure above or below permitted maximum/minimum!**

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

- ▶ If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, a message is output.
- ▶ Only use the device within the measuring range limits.

8.1.1 As-delivered state

If no customized settings were ordered:

- **Assign PV** parameter **Pressure** option
- Calibration values defined by defined measuring cell nominal value
- The alarm current is set to min. (3.6 mA), (only if no other option was selected when ordering)
- DIP switch to Off position

8.2 Setting the operating language

The operating language is set via the operating tool.

8.2.1 Farbanzeige - Locking or unlocking

Operation is locked from the outside using a plastic cover that can be secured with a screw.

8.2.2 Operating tool

See the description of the relevant operating tool.

8.3 Configuring the measuring instrument**8.3.1 Commissioning with keys**

The following functions can be activated using the keys:

- Rotating the color display
- Position adjustment (zero point correction)
The orientation of the measuring device may cause a pressure shift.
This pressure shift can be corrected by a position adjustment
- Setting the lower range value and upper range value
The pressure applied must be within the nominal pressure limits of the sensor (see the specifications on the nameplate)
- Resetting the device

Performing position adjustment

1. Ensure the device is installed in the desired position and without applied pressure.
2. Press the "Zero" and "Span" keys simultaneously for at least 3 seconds.
3. After "done" appears on the color display, the applied pressure is used for position adjustment.

Setting the lower range value (pressure or scaled variable)

1. The desired pressure for the lower range value is present at the device.
2. Press "Zero" for at least 3 seconds.
3. After "done" appears on the color display, the applied pressure is accepted for the lower range value.

Setting the upper range value (pressure or scaled variable)

1. The desired pressure for the upper range value is present at the device.
2. Press "Span" for at least 3 seconds.
3. After "done" appears on the color display, the applied pressure is used for the upper range value.
4. Does the "done" flag not appear on the colour display?
 - ↳ Applied pressure for upper range value has not been accepted.
If **Table** option selected, wet calibration is not possible.

Checking the settings (pressure or scaled variable)

1. Briefly press "Zero" key (approx. 1 second) to display lower range value.
2. Briefly press "Span" key (approx. 1 second) to display upper range value.
3. Briefly press "Zero" and "Span" keys simultaneously (approx. 1 second) to display position offset.

Resetting the device

- ▶ Press and hold the "Zero" and "Span" keys simultaneously for at least 12 seconds.

Rotating the color display

To activate this function:

1. Press the **Span**-key 3x briefly in succession.
2. Press and hold the **Span**-key for at least 3 seconds within 15 seconds.

Resetting user role password

To activate this function:

1. Press the Zero key 3x briefly in succession.
2. Press the Zerokey again within 15 seconds.

8.3.2 Commissioning with the commissioning wizard

Available in FieldCare, DeviceCare¹⁾ the **Commissioning** wizard guides the user through initial commissioning.

1) DeviceCare is available for download at www.software-products.endress.com. To download the software, it is necessary to register on the Endress+Hauser software portal.

1. Connect the device with FieldCare or DeviceCare.
2. Open the device in FieldCare or DeviceCare.
 - ↳ The dashboard (homepage) of the device is displayed:
3. In the **Guidance** menu, click the **Commissioning** wizard to open the wizard.
4. Enter the appropriate value in each parameter or select the appropriate option. These values are written directly to the device.
5. Click "Next" to go to the next page.
6. Once all the pages are completed, click "End" to close the **Commissioning** wizard.

i If the **Commissioning** wizard is canceled before all necessary parameters have been configured, the device may be in an undefined state. In such situations, it is advisable to reset the device to the factory default settings.

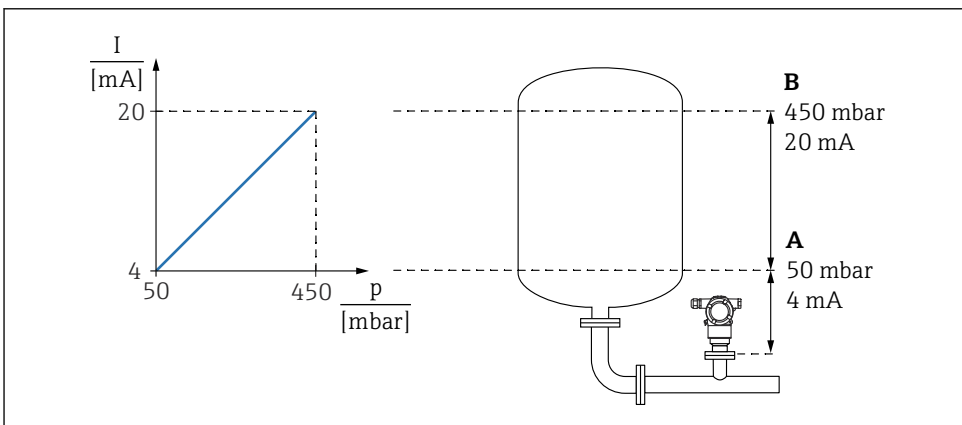
Example: Outputting of the pressure value at the current output

i Pressure and temperature units are converted automatically. Other units are not converted.

In the following example, the pressure value should be measured in a tank and output on the current output. The maximum pressure of 450 mbar (6.75 psi) corresponds to the 20 mA current. The 4 mA current corresponds to a pressure of 50 mbar (0.75 psi).

Prerequisites:

- Measured variable in direct proportion to the pressure
- Due to the orientation of the device, there may be pressure shifts in the measured value (when the vessel is empty or partly filled, the measured value is not zero).
Perform a position adjustment if necessary.
- In the **Assign PV** parameter, the **Pressure** option must be selected (factory setting).



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- A Lower range value output
B Upper range value output

Adjustment:

1. Enter the pressure value for the 4 mA current via the **Lower range value output** parameter (50 mbar (0.75 psi)).
2. Enter the pressure value for the 20 mA current via the **Upper range value output** parameter (450 mbar (6.75 psi))

Result: The measuring range is set to 4 to 20 mA.

8.3.3 Commissioning without the commissioning wizard

Example: Commissioning a volume measurement in the tank

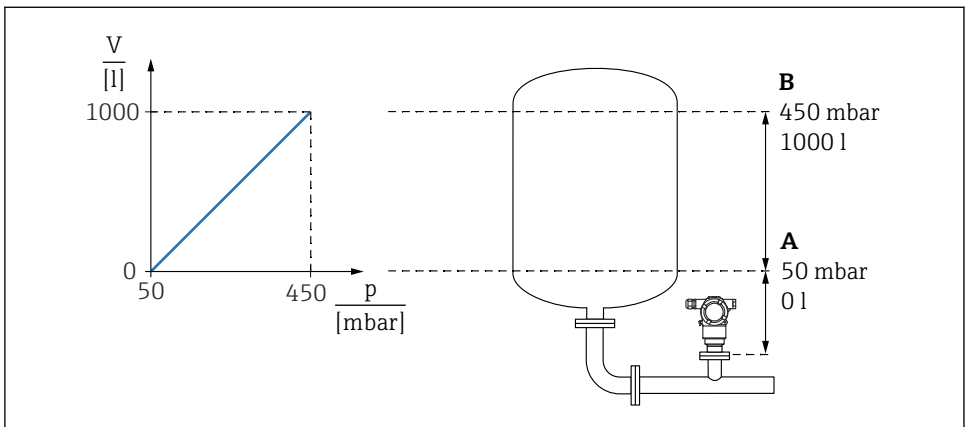
i Pressure and temperature units are converted automatically. Other units are not converted.

In the following example, the volume in a tank should be measured in liters. The maximum volume of 1 000 l (264 gal) corresponds to a pressure of 450 mbar (6.75 psi).

The minimum volume of 0 liters corresponds to a pressure of 50 mbar (0.75 psi).

Prerequisites:

- Measured variable in direct proportion to the pressure
- Due to the orientation of the device, there may be pressure shifts in the measured value (when the vessel is empty or partly filled, the measured value is not zero).
Perform position adjustment if necessary



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A "Pressure value 1" parameter and "Scaled variable value 1" parameter

B "Pressure value 2" parameter and "Scaled variable value 2" parameter

i The pressure present is displayed in the operating tool on the same settings page in the "Pressure" field.

1. Enter the pressure value for the lower calibration point via the **Pressure value 1** parameter: 50 mbar (0.75 psi)
 - ↳ Menu path: Application → Sensor → Scaled variable → Pressure value 1
2. Enter the volume value for the lower calibration point via the **Scaled variable value 1** parameter: 0 l (0 gal)
 - ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable value 1
3. Enter the pressure value for the upper calibration point via the **Pressure value 2** parameter: 450 mbar (6.75 psi)
 - ↳ Menu path: Application → Sensor → Scaled variable → Pressure value 2
4. Enter the volume value for the upper calibration point via the **Scaled variable value 2** parameter: 1 000 l (264 gal)
 - ↳ Menu path: Application → Sensor → Scaled variable → Scaled variable value 2

Result: The measuring range is set for 0 to 1 000 l (0 to 264 gal). Only the **Scaled variable value 1** parameter and **Scaled variable value 2** parameter are set with this setting. This setting has no effect on the current output.



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