

Operating Instructions

Liquiline CM42B

Two-wire transmitter

Field device

Measurement with digital or analog sensors






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1 About this document



1.1 Warnings

Structure of information	Meaning
 DANGER Causes (/consequences) If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation will result in a fatal or serious injury.
 WARNING Causes (/consequences) If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.
 CAUTION Causes (/consequences) If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE Cause/situation If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.2 Symbols

-  Additional information, tips
-  Permitted
-  Recommended
-  Not permitted or not recommended
-  Reference to device documentation
-  Reference to page
-  Reference to graphic
-  Result of an individual step

1.3 Symbols on the device

-  Reference to device documentation
-  Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

1.4 Documentation


In addition to these Operating Instructions , the following manuals are available on the product pages on our website:

- Brief Operating Instructions, KA01730C
- Security Manual, SD03215C

2 Basic safety instructions

2.1 Requirements for personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

 Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Designated use

2.2.1 Areas of application

The device is a two-wire transmitter for connecting digital sensors with Memosens technology or analog sensors (configurable). It features a 4 to 20 mA current output with optional HART communication and can be operated via an onsite display or optionally using a smartphone or other mobile devices via Bluetooth.

The device is designed for use in the following industries:

- Chemical industry
- Pharmaceutical industry
- Water and wastewater
- Food and beverage production
- Power stations
- Applications in hazardous areas
- Other industrial applications

2.2.2 Non-designated use

Any use other than that intended puts the safety of people and the measuring system at risk. Therefore, any other use is not permitted.

The manufacturer is not liable for harm caused by improper or unintended use.

2.3 Safety at the workplace

The operator is responsible for ensuring compliance with the following safety regulations:

- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

Electromagnetic compatibility

- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.

Procedure for damaged products:

1. Do not operate damaged products, and protect them against unintentional operation.
2. Label damaged products as defective.

During operation:

- ▶ If errors cannot be rectified,
take products out of service and protect them against unintentional operation.

2.5 Product security

The product is designed 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. The relevant regulations and international standards have been observed.

2.6 IT security

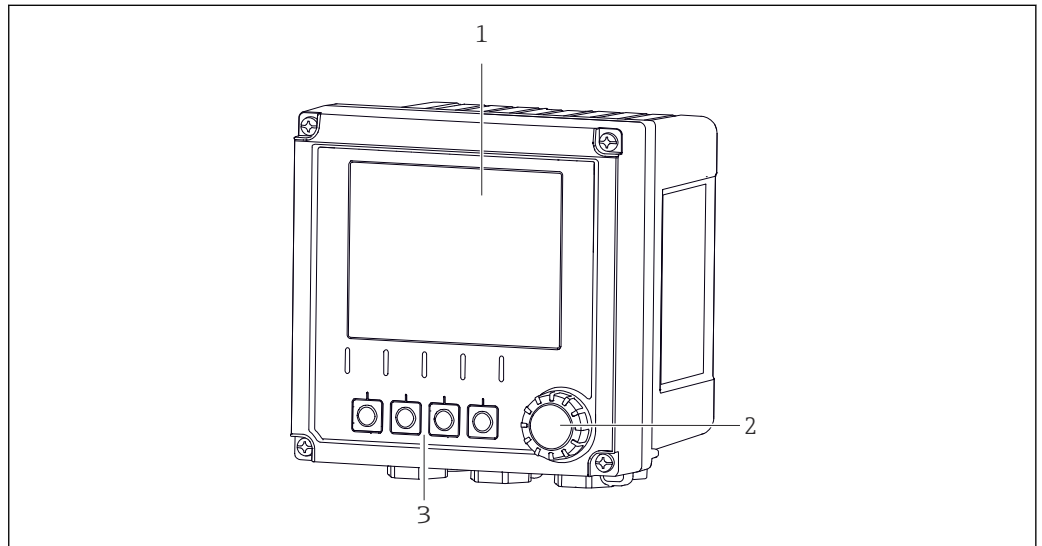
We only provide a warranty if the device is installed and used as described in the Operating Instructions and the Security Manual. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

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. For further information, see the Security Manual.

3 Product description

3.1 Product design

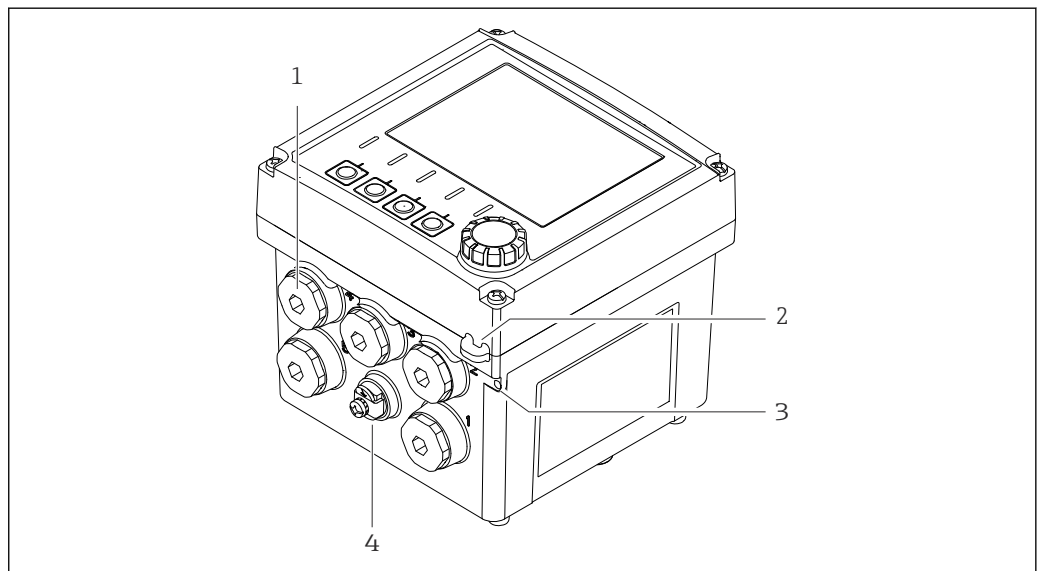
3.1.1 Housing closed



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1 Exterior view

- 1 Display
- 2 Navigator
- 3 Soft keys, assignment depends on menu



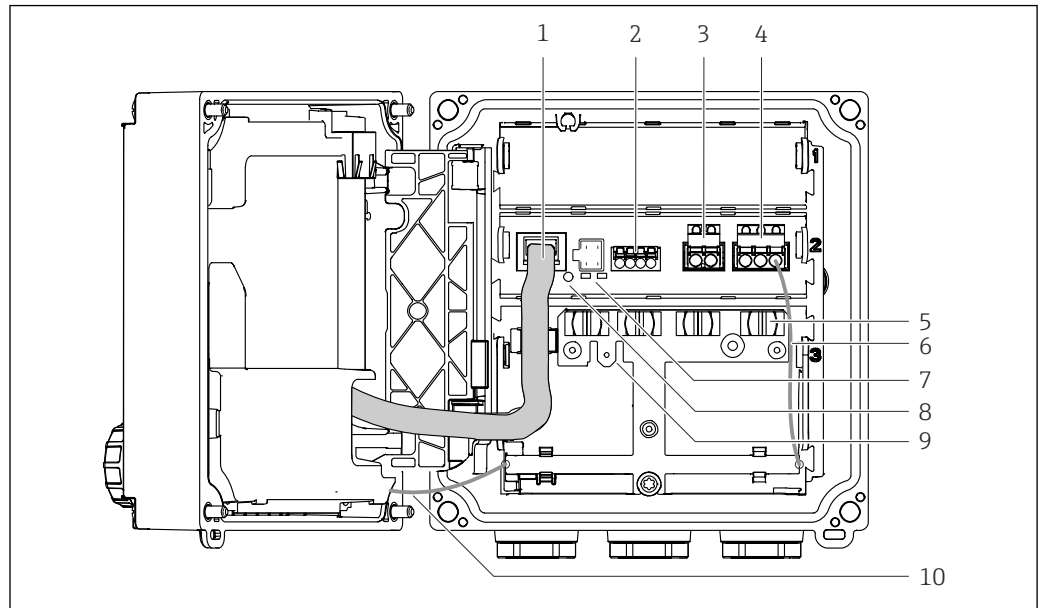
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2 Exterior view

- 1 Connections for cable glands
- 2 Eyelet for security seal
- 3 Eyelet for Tagging (TAG)
- 4 Connection for potential equalization or functional ground

3.1.2 Housing open

Design of Memosens sensors



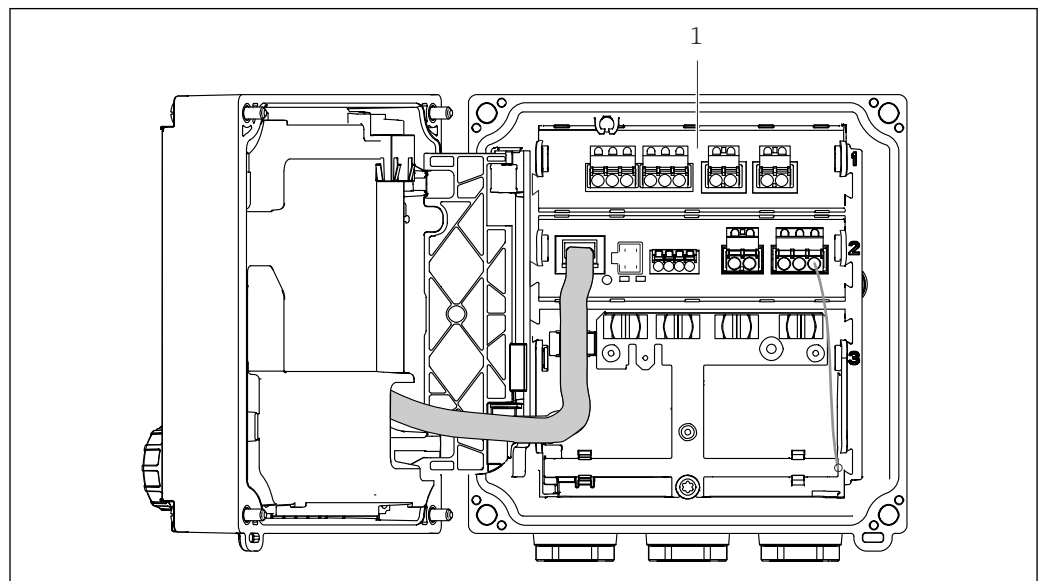
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- 1 Display cable
- 2 Memosens input
- 3 Current output 1: 4 to 20 mA, passive/optional HART
- 4 Current output 2 (optional): 4 to 20 mA, passive
- 5 Cable mounting rail
- 6 Internal ground cable, wired at the factory
- 7 Status LEDs
- 8 Reset button
- 9 Internal grounding connection for blade receptacle 6.35 mm x 0.8 mm (0.25 in x 0.032 in), usage optional
- 10 Internal ground cable for display (only for devices with a stainless steel housing), wired at the factory



The status LEDs are only active if the display is not connected.

Design of analog sensors (pH/ORP, inductive/conductive conductivity)



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- 1 Connection area for analog sensors (different layout depending on the design)

3.1.3 Measuring parameters

Depending on the order, the transmitter is designed for digital Memosens sensors or for analog sensors. A transmitter for analog sensors can be reconfigured to Memosens. This requires an activation code and the analog input module must be removed.

 A device for Memosens sensors cannot be retrofitted for analog sensors.

The following measuring parameters are possible with Memosens sensors:

- pH/ORP
- Conductivity, measured conductively
- Conductivity, measured inductively
- Dissolved oxygen, measured amperometrically
- Dissolved oxygen, measured optically

The measuring parameters and sensor type can be switched via the user interface.

The following measuring parameters are possible with analog sensors:

- pH/ORP
- Conductivity, measured conductively
- Conductivity, measured inductively

For a list of compatible sensors, see the "Accessories" section ([link](#)).

4 Incoming acceptance and product identification

4.1 Incoming acceptance

1. Verify that the packaging is undamaged.
 - ↳ Notify the supplier of any damage to the packaging.
Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
 - ↳ Notify the supplier of any damage to the delivery contents.
Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
 - ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
 - ↳ The original packaging offers the best protection.
Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

4.2 Product identification

4.2.1 Nameplate

The following information on the device can be found on the nameplate:

- Manufacturer identification
 - Product designation
 - Serial number
 - Ambient conditions
 - Input and output values
 - Safety information and warnings
 - Ex markings
 - Certification information
 - Warnings
- ▶ Compare the information on the nameplate with the order.

4.2.2 Identifying the product

Manufacturer address

Endress+Hauser Conducta GmbH+Co. KG
Dieselstraße 24
70839 Gerlingen
Germany

Product page

www.endress.com/CM42B

Interpreting the order code

The order code and serial number of your product can be found in the following locations:

- On the nameplate
- In the delivery papers
- On the internal label

Obtaining information on the product

1. Scan the QR code on the product.
2. Open the URL in a web browser.
3. Click the product overview.
 - ↳ A new window opens. Here you fill information pertaining to your device, including the product documentation.

Obtaining information on the product (if there is no option for scanning the QR code)

1. Go to www.endress.com.
2. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
 - ↳ The product structure is displayed in a popup window.
4. Click the product overview.
 - ↳ A new window opens. Here you fill information pertaining to your device, including the product documentation.



4.3 Scope of delivery

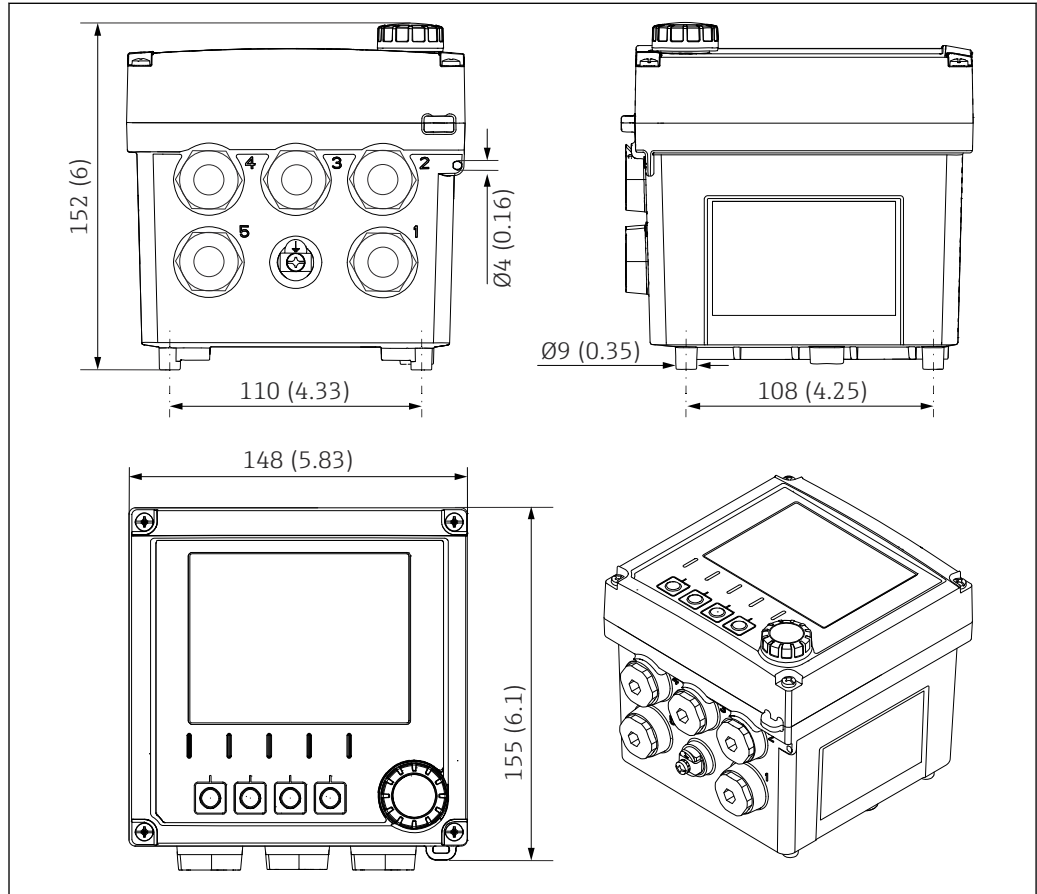
The scope of delivery includes:

- Liquiline CM42B
- Cable glands depending on order
- Field device mounting plate
- Brief Operating Instructions
- Safety instructions for hazardous area (for Ex versions)
- ▶ If you have any queries:
Please contact your supplier or local sales center.

5 Mounting

5.1 Mounting requirements

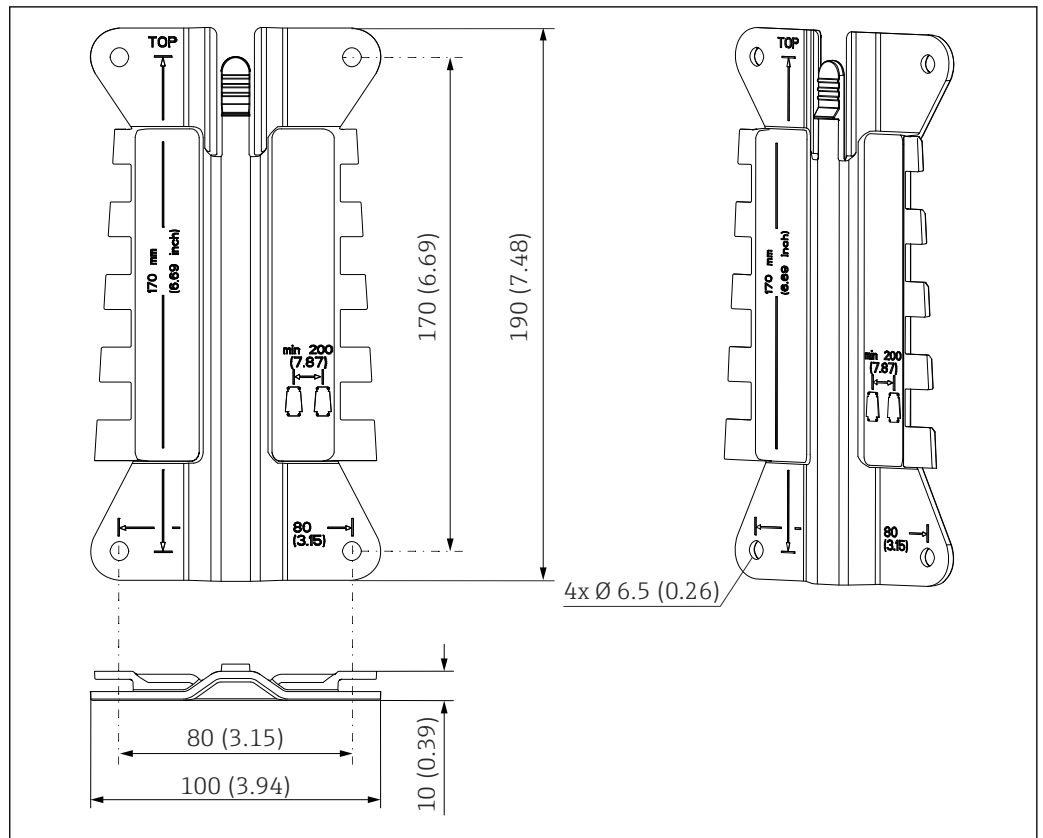
5.1.1 Dimensions



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3 Dimensions of field housing in mm (in)

5.1.2 Mounting plate (included in the scope of delivery)



4 Dimensions of mounting plate in mm (in)

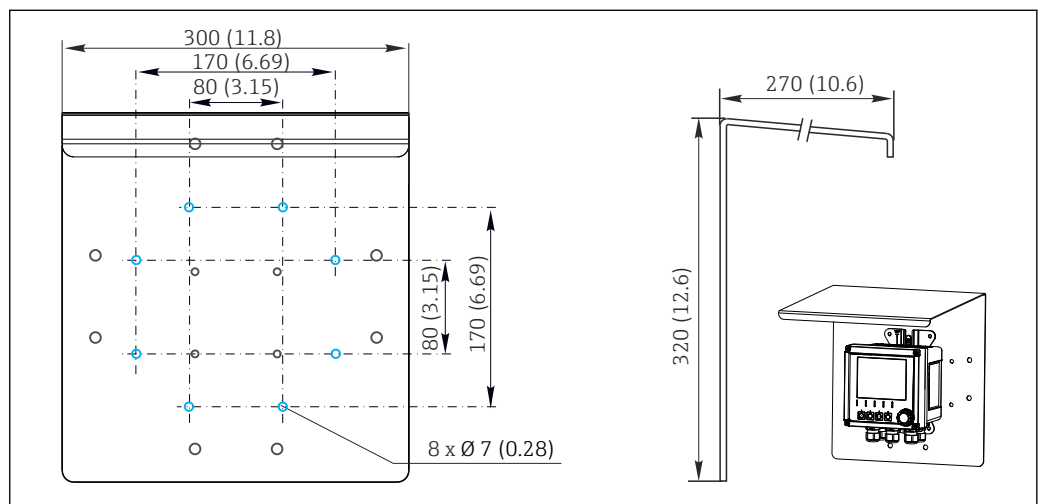
5.1.3 Weather protection cover (optional)

NOTICE

Effect of climatic conditions (rain, snow, direct sunlight etc.)

Impaired operation to complete transmitter failure are possible!

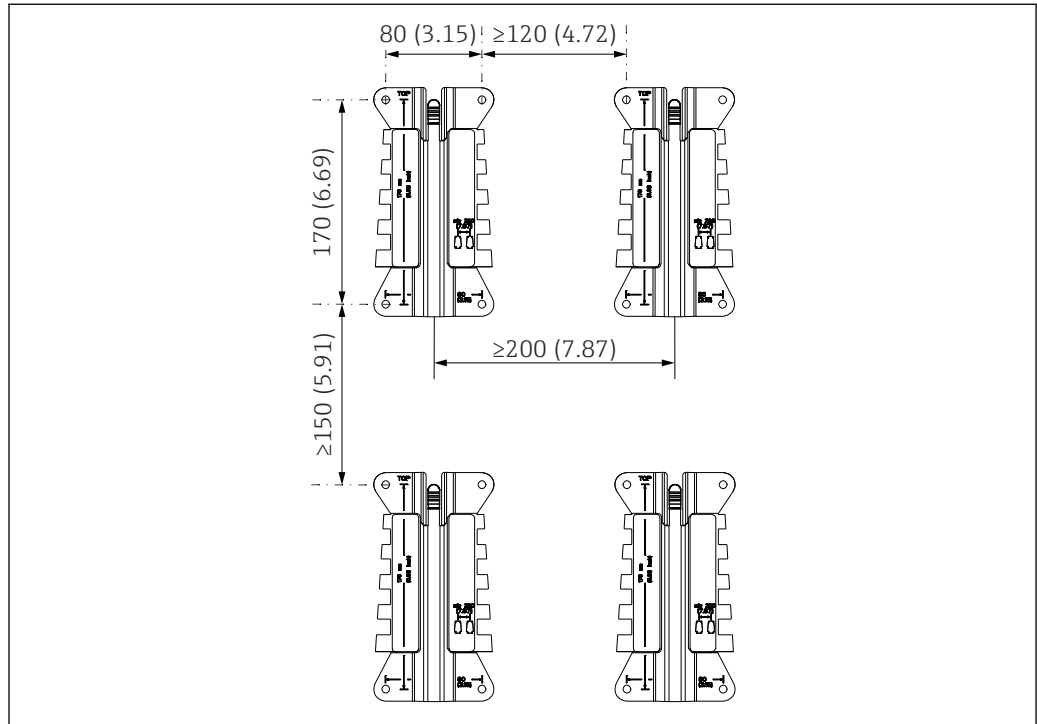
- ▶ Always use the weather protection cover (accessory) when installing the device outdoors.



5 Dimensions of the weather protection cover in mm (in)

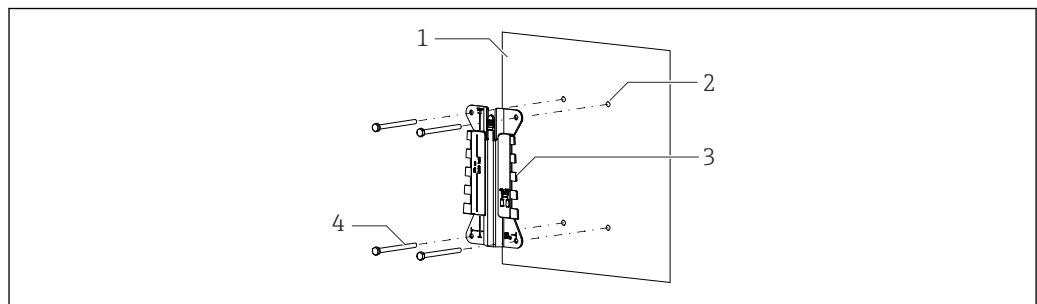
5.2 Mounting the device

5.2.1 Wall mounting



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6 Mounting clearances in mm (in)



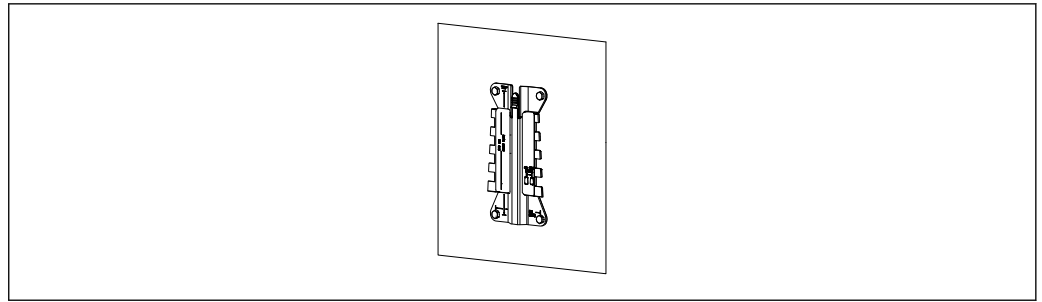
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7 Wall mounting

- 1 Wall
- 2 Four drill holes
- 3 Mounting plate
- 4 Screws (not included in the scope of delivery)

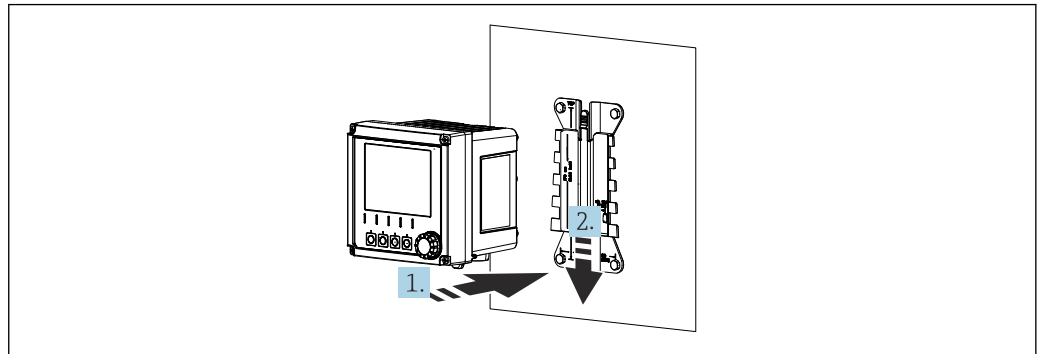
The size of the drill holes depends on the mounting material used. Mounting material must be provided by the customer.

Screw diameter: Max. 6 mm (0.23 in)



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8 Mounting plate mounted on wall



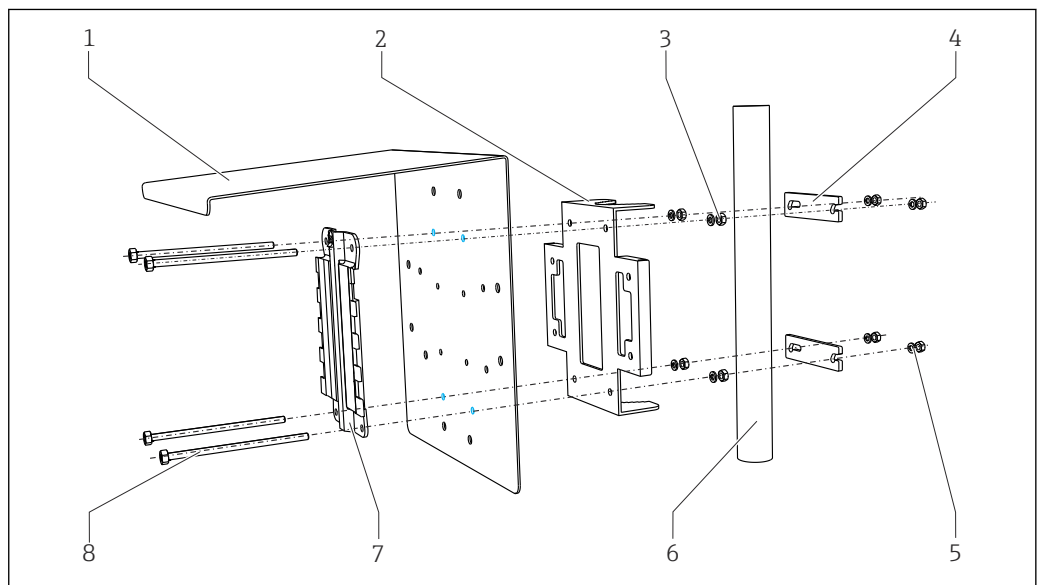
A0053944

9 Attach the device and click it into place

1. Place the device on the mounting plate.
2. Slide the device downwards in the guide on the mounting rail until it clicks into place.

5.2.2 Post mounting

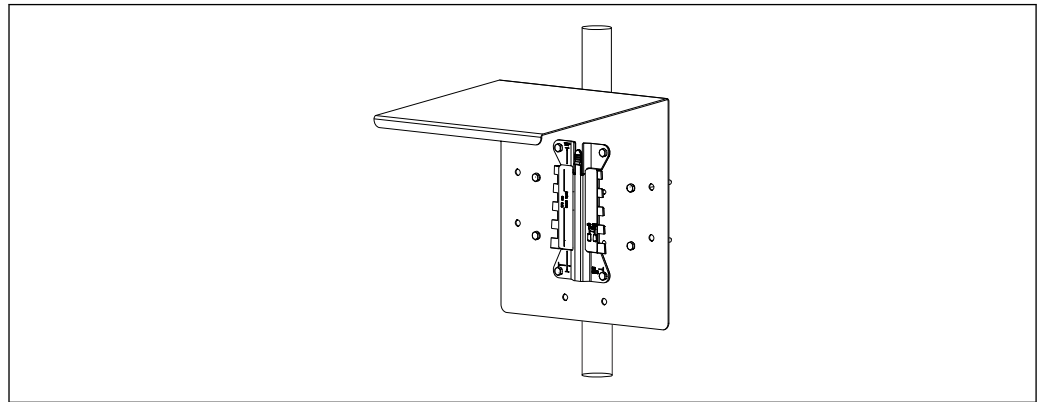
i You require the post mounting kit (optional) to mount the unit on a pipe, post or railing (square or circular, clamping range 20 to 61 mm (0.79 to 2.40")).



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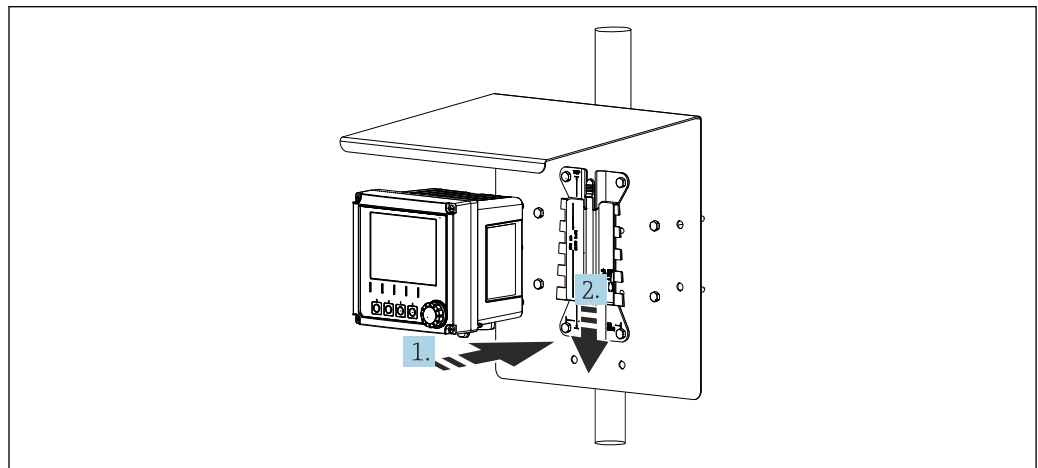
10 Post mounting

- | | | | |
|---|---|---|---|
| 1 | Weather protection cover (optional) | 5 | Spring washers and nuts (post mounting kit) |
| 2 | Post mounting plate (post mounting kit) | 6 | Pipe or post (circular/square) |
| 3 | Spring washers and nuts (post mounting kit) | 7 | Mounting plate |
| 4 | Pipe clamps (post mounting kit) | 8 | Screws (post mounting kit) |



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11 Post mounting



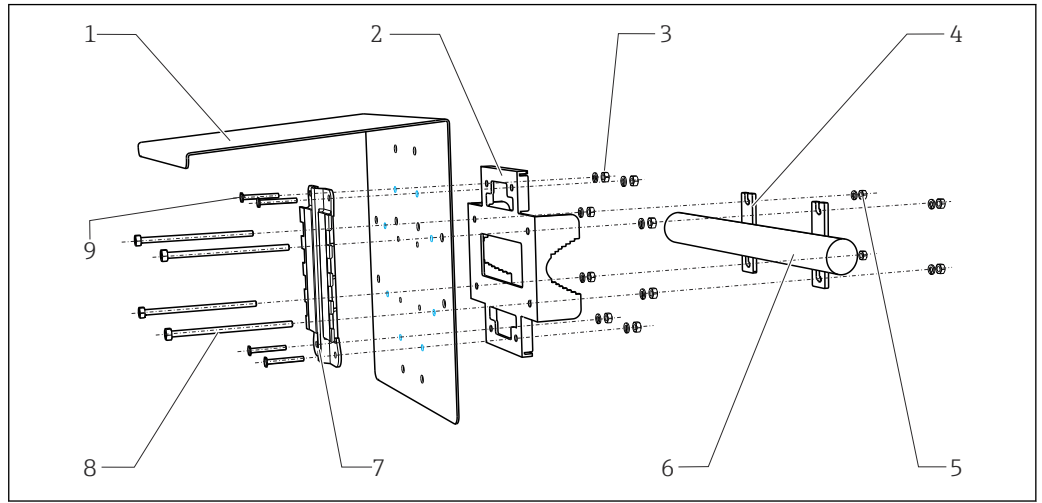
A0053917

12 Attach the device and click it into place

1. Place the device on the mounting plate.
2. Slide the device downwards in the guide on the mounting rail until it clicks into place.

5.2.3 Rail mounting

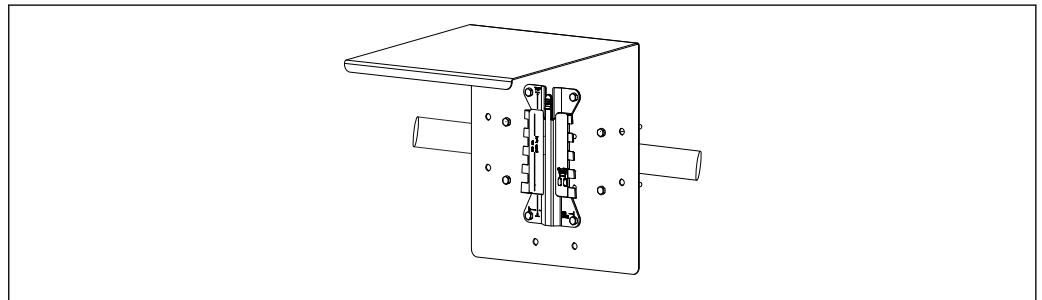
You require the post mounting kit (optional) to mount the unit on a pipe, post or railing (square or circular, clamping range 20 to 61 mm (0.79 to 2.40")).



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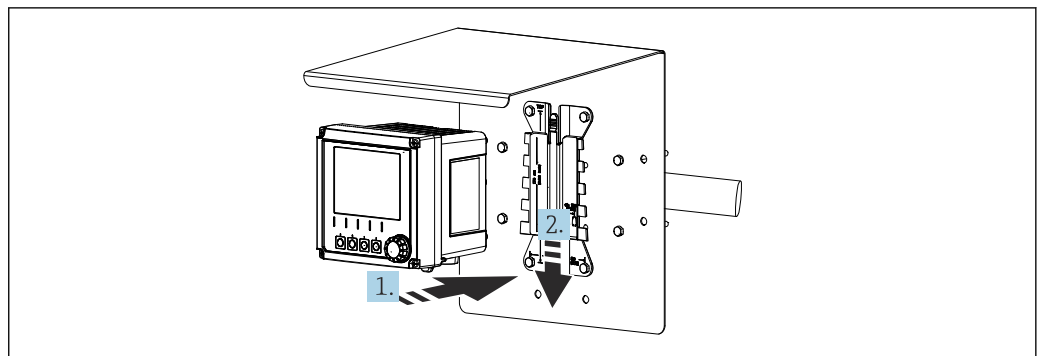
13 Rail mounting

- | | | | |
|---|---|---|-----------------------------------|
| 1 | Weather protection cover (optional) | 6 | Pipe or railing (circular/square) |
| 2 | Post mounting plate (post mounting kit) | 7 | Mounting plate |
| 3 | Spring washers and nuts (post mounting kit) | 8 | Threaded rods (post mounting kit) |
| 4 | Pipe clamps (post mounting kit) | 9 | Screws (post mounting kit) |
| 5 | Spring washers and nuts (post mounting kit) | | |



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14 Rail mounting



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15 Attach the device and click it into place

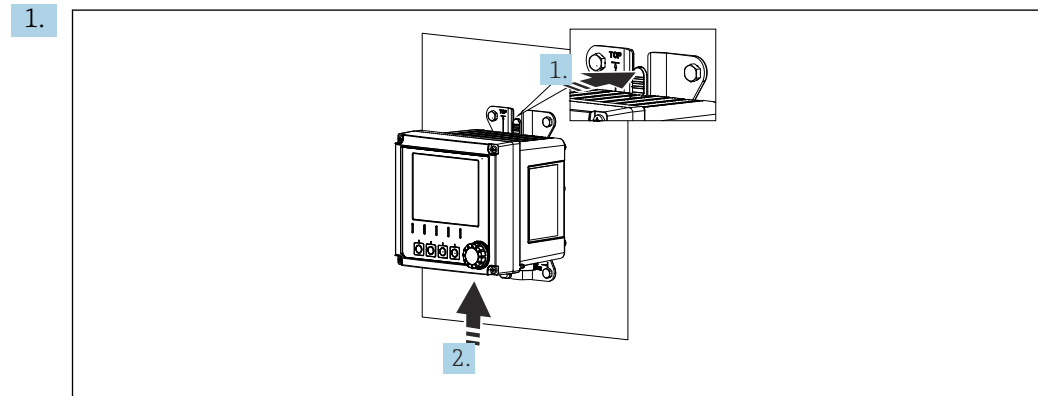
1. Place the device on the mounting plate.
2. Slide the device downwards in the guide on the mounting rail until it clicks into place.

5.2.4 Disassembly (for conversion, cleaning, etc.)

⚠ CAUTION

Risk of injury and damage to the device if the device is dropped

- ▶ When pushing the housing out of the holder, secure the housing to prevent it from falling.

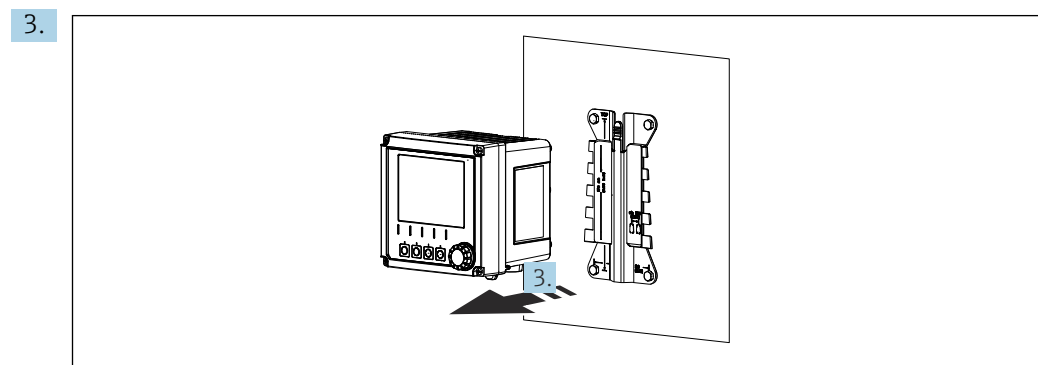


16 Disassembly

All cables have been removed.

Hold down the latch.

2. Push up the device to remove it from the holder.



17 Disassembly

Remove the device towards the front.

5.3 Post-mounting check

1. Check the device for damage following mounting.
2. Check whether the device is protected against precipitation and direct sunlight (e.g. by the weather protection cover).
3. Verify that the specified installation clearances have been observed.
4. Ensure that the temperature limits are observed at the mounting location.

6 Electrical connection

6.1 Connecting requirements

6.1.1 Supply voltage

- ▶ Connect the device to a Safety Extra Low Voltage (SELV) or Protective Extra Low Voltage (PELV) system only.

6.1.2 Power units

- ▶ Use power units according to IEC 60558-2-16, IEC 62368-1 Class ES1 or IEC 61010-1.

6.1.3 Electrostatic discharge (ESD)

NOTICE

Electrostatic discharge (ESD)

Risk of damaging the electronic components

- ▶ Take personal protective measures to avoid ESD, such as discharging beforehand at PE or permanent grounding with a wrist strap, for example.

6.1.4 Unconnected cable cores

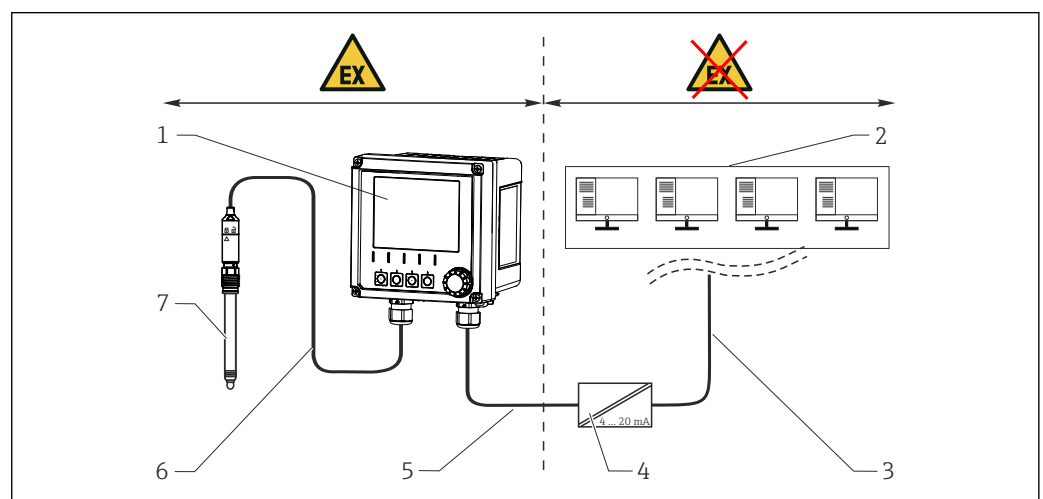
NOTICE

Unconnected cable cores can lead to malfunctions or damage to the device if they come into contact with connections, terminals and other conductive parts.

- ▶ Ensure that unconnected cable cores are sufficiently insulated from earth and from other cores by suitable terminations, e.g. by using heat-shrink tubing.

6.1.5 Installation in hazardous areas

Installation in hazardous area Ex ia Ga



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- 1 Hazardous area version of Liquiline CM42B
- 2 Control station
- 3 4 to 20 mA signal line/optional HART
- 4 Ex ia active barrier
- 5 Supply and signal circuit Ex ia (4 to 20 mA)
- 6 Intrinsically safe sensor circuit Ex ia
- 7 Hazardous area version of sensor

6.2 Connecting the device

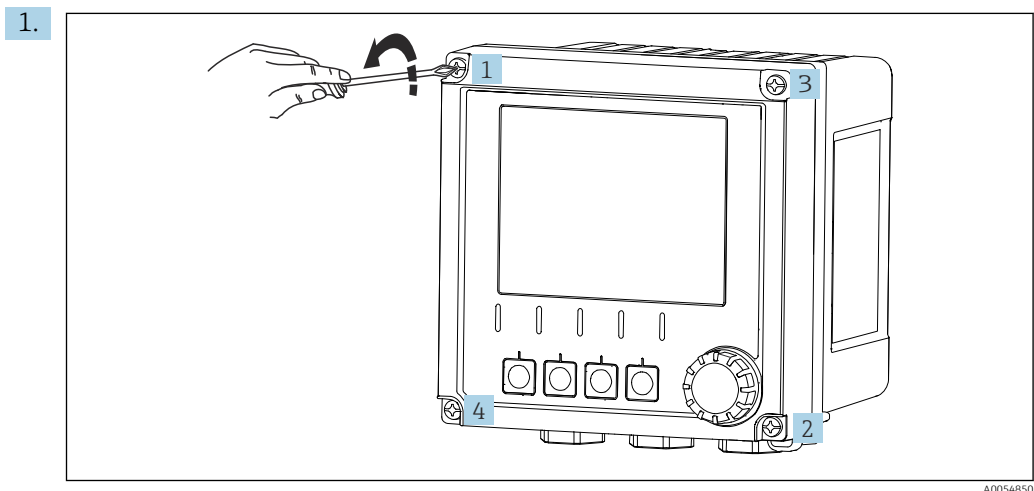
6.2.1 Opening the housing

NOTICE

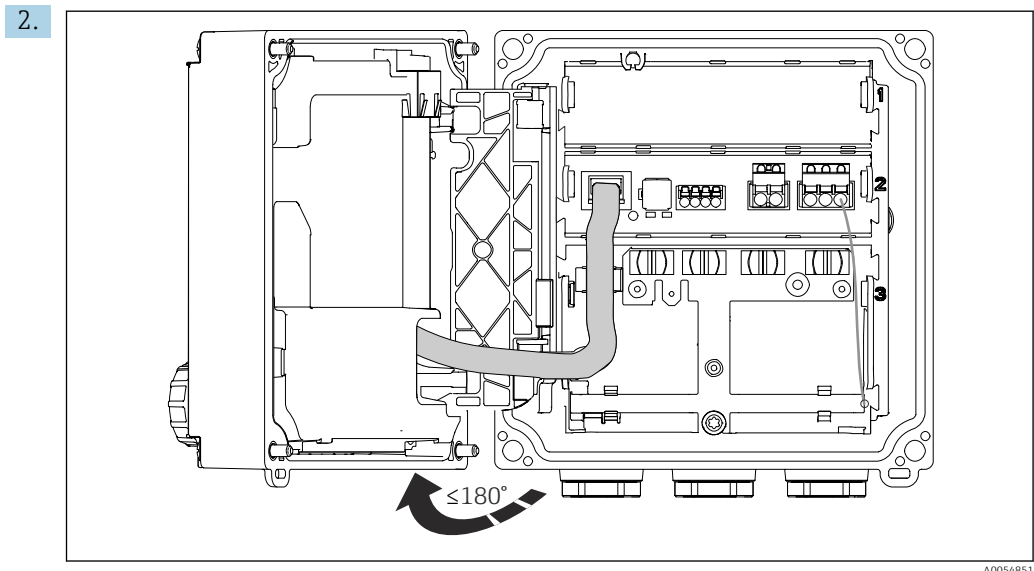
Cordless screwdriver, screw driller, pointed or sharp tools

The use of a cordless screwdriver or screw driller can cause damage to the threads and impair the leak-tightness of the housing. If unsuitable tools are used, they can scratch the housing or damage the seal, and thus have a negative impact on the leak-tightness of the housing.

- ▶ Do not use a cordless screwdriver or screw driller to release and tighten the housing screws.
- ▶ Do not use any sharp or pointed objects, e.g. a knife, to open the housing.
- ▶ Use a suitable handheld screwdriver only.



Slacken the housing screws crosswise.



Open the cover by a maximum of 180° (depending on the orientation).

3. When closing the housing: Tighten the housing screws gradually and crosswise. Tightening torque 1 Nm

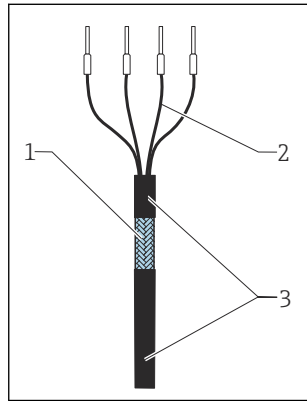
6.2.2 Connecting the cable shield

The descriptions of each of the connections specify which cables must be shielded.

i Only use terminated original cables where possible.

Clamping range of grounding clamps: 4 to 11 mm (0.16 to 0.43 in)

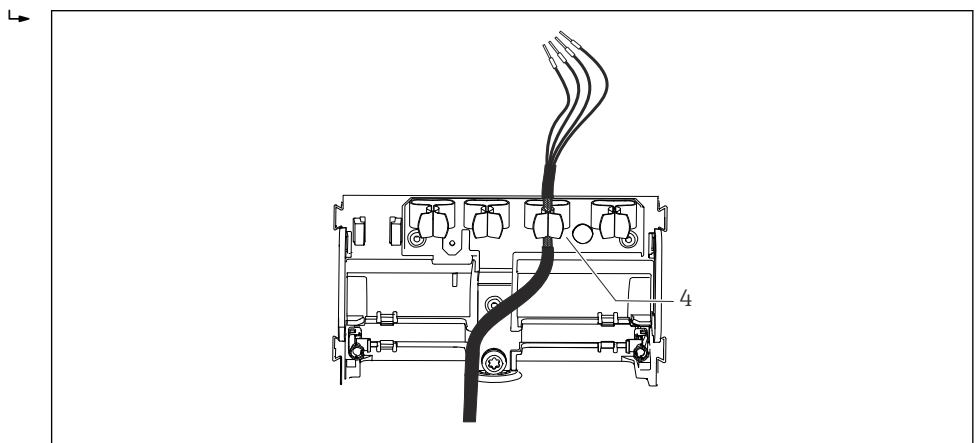
Cable sample (does not necessarily correspond to the original cable supplied)



18 Terminated cable

- 1 Outer shield (exposed)
- 2 Cable cores with ferrules
- 3 Cable sheath (insulation)

1. Remove one sealing plug at the bottom of the housing.
2. Screw in a suitable cable gland.
3. Attach the gland to the cable end, making sure the gland is facing the right direction.
4. Pull the cable through the gland and into the housing.
5. Route the cable in such a way that the exposed cable shield fits into one of the grounding clamps and the cable cores can be easily routed as far as the terminal plugs.
6. Connect the cable to the grounding clamp.
7. Clamp the cable into place.



19 Cable into grounding clamp

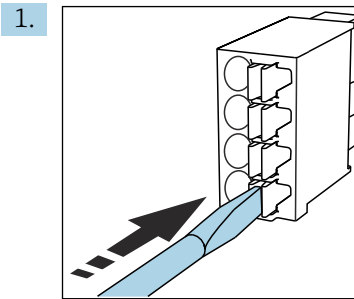
- 4 Grounding clamp

The cable shield is grounded by the grounding clamp. ¹⁾

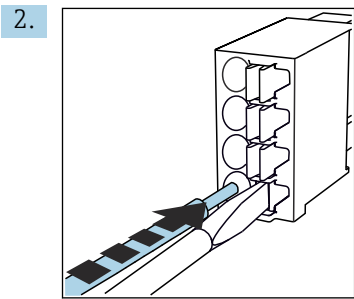
1) Refer to the instructions provided in the "Ensuring the degree of protection" section. → **39**

8. Connect cable cores as per the wiring diagram.
9. Tighten the cable gland with the required torque.

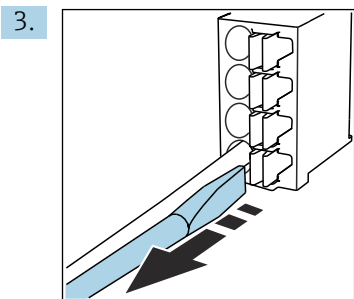
6.2.3 Cable terminals



Press the screwdriver against the clip (opens the terminal).



Insert the cable until the limit stop.



Remove the screwdriver (closes the terminal).

4. After connecting, check all the cable cores to ensure they are secure.

6.2.4 Mounting the cable glands

NOTICE

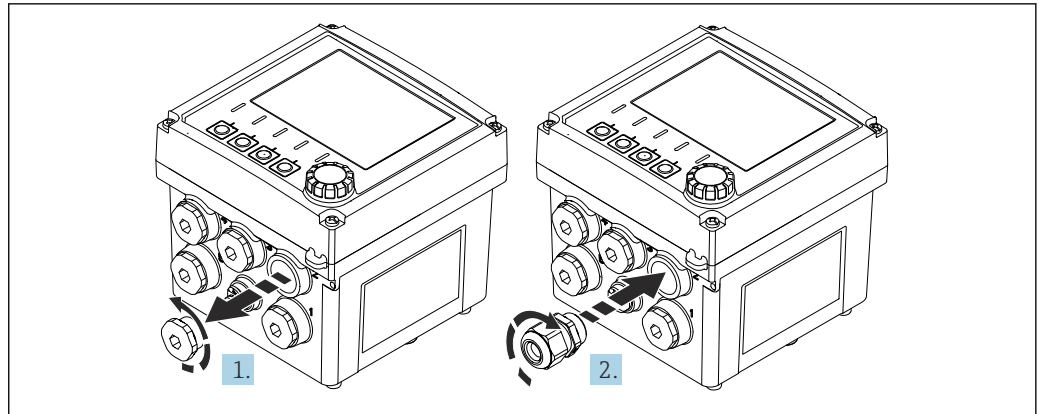
Unused cable glands installed

Housing not leak-tight

- ▶ Only fit cable glands at the positions where cables are fed through.
- ▶ Do not remove the sealing plugs at any of the other positions.

Cable glands with M20 thread

The cable glands are included in the scope of delivery in accordance with the order.

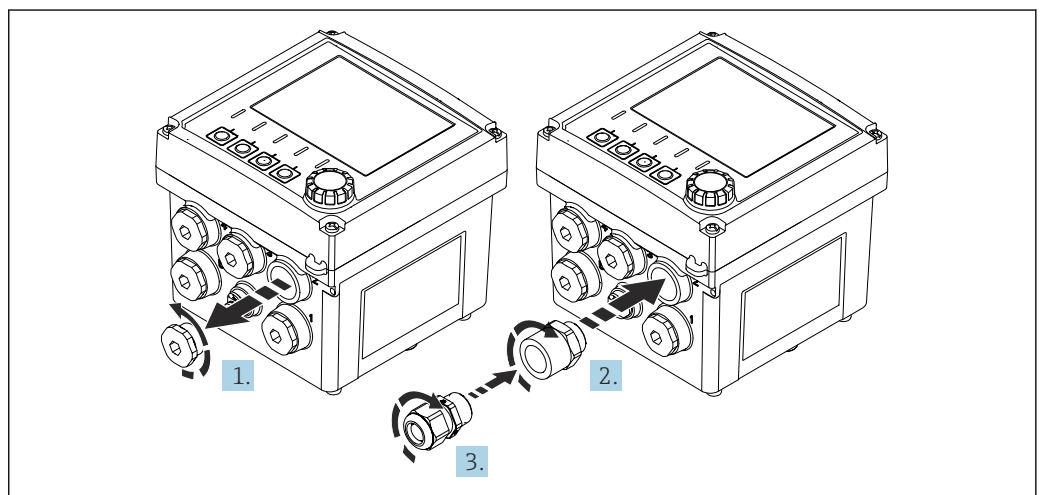


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1. Remove the sealing plug.
2. Screw in the cable gland. Tightening torque 2.5 to 3 Nm.

Cable glands with G1/2 thread or NPT1/2 thread

The cable glands and adapters are included in the delivery in accordance with the order.

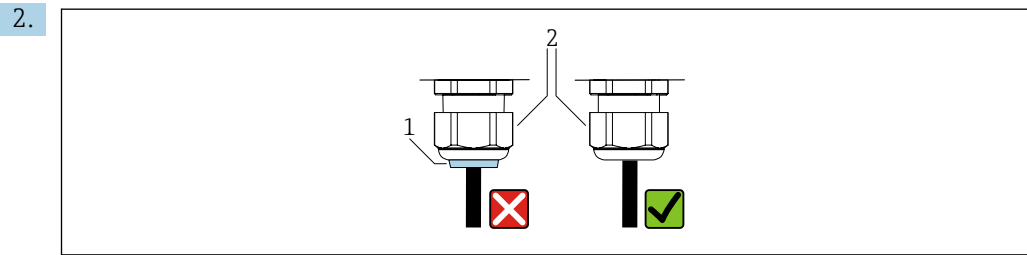


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1. Remove the sealing plug.
2. Screw in the adapter. Tightening torque 2.5 to 3 Nm.
3. Screw the cable gland into the adapter. Tightening torque 2.5 to 3 Nm.

Assignment of the cable glands

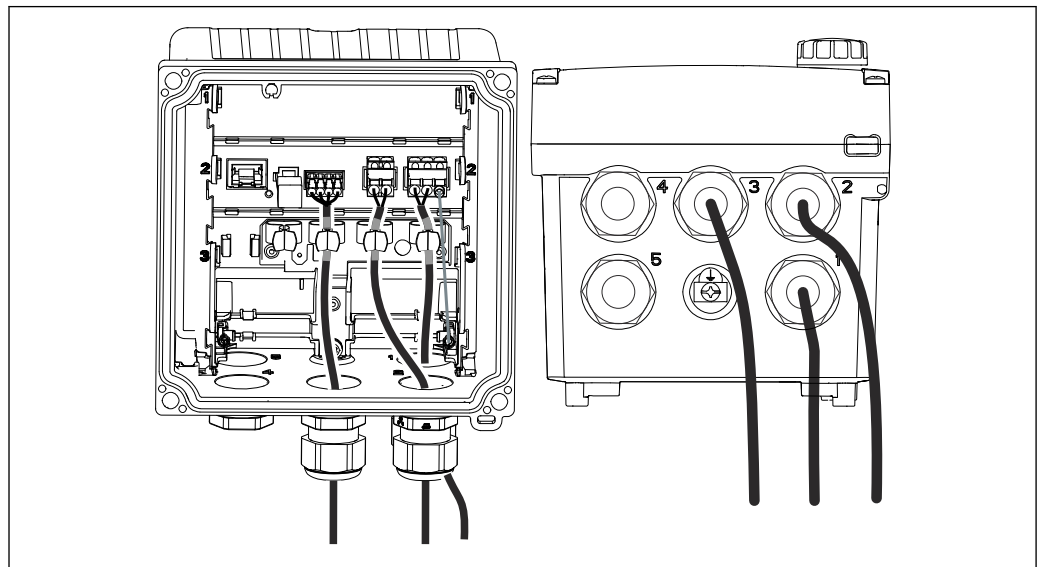
1. Feed the cables through the cable glands and connect. The illustration shows an example of how the cable glands are assigned.



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Tighten the cable gland again after the cable has been fed through. Make sure that the sealing insert (1) does not protrude from the pressure screw (2).

Feed through only one cable per cable gland.



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20 Example: Current outputs 1 and 2 through cable glands 1 and 2, Memosens cable through cable gland 3

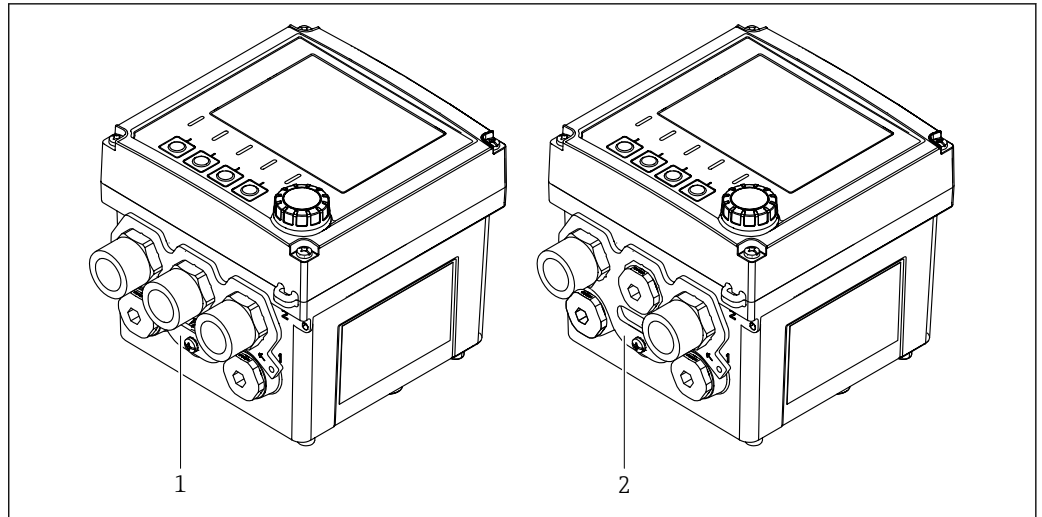
6.2.5 Mounting the adapters for conduit installation

The adapters are included in the scope of delivery in accordance with the order.

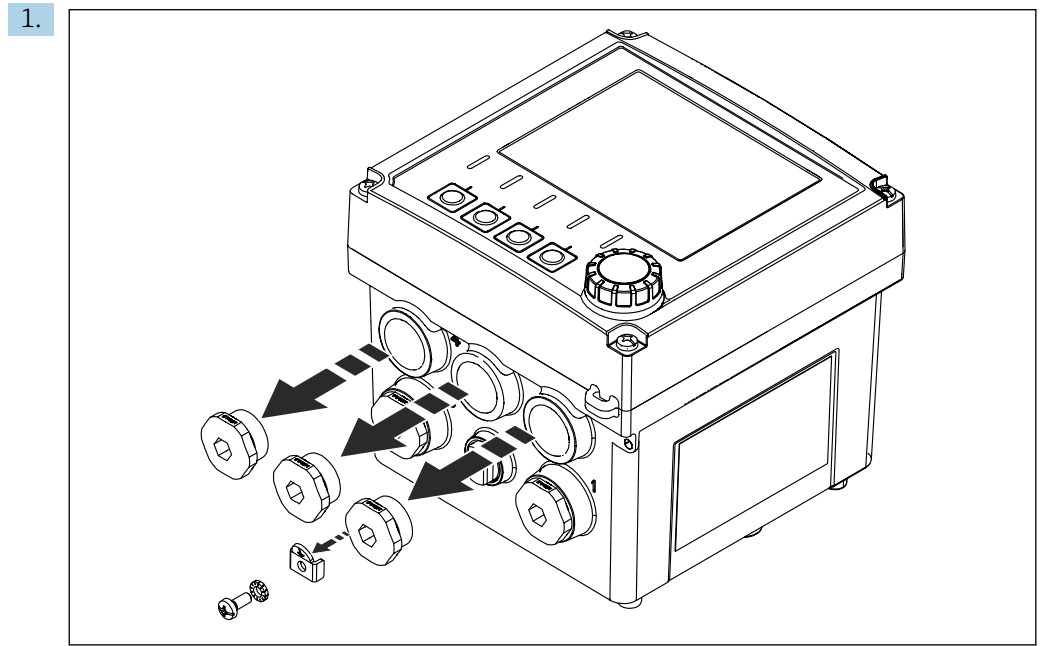
NOTICE

Leaks due to conduit adapter without connected pipe

- ▶ With two pipes: Mount adapters at positions 2 and 4. Leave the sealing plugs at all the other positions.
- ▶ With three pipes: Mount adapters at positions 2, 3 and 4. Leave the sealing plugs at all the other positions.
- ▶ If a non-piped conduit adapter is mounted, seal it with a sealing plug (customer-supplied).



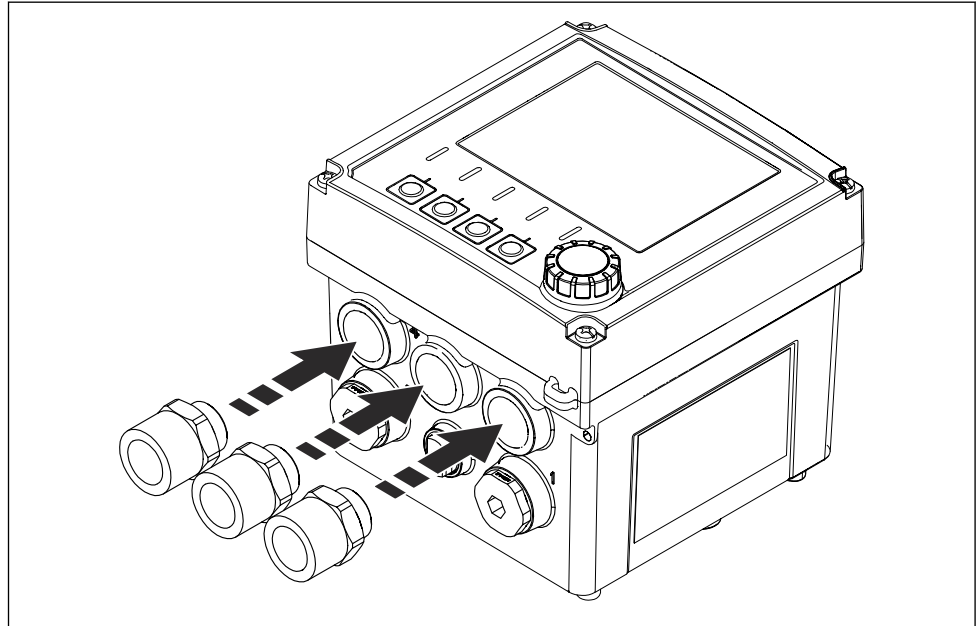
- 1 Example: Three conduit adapters mounted at positions 2, 3 and 4
- 2 Example: Two conduit adapters mounted at positions 2 and 4



Remove the sealing plug.

- 2. Remove the screw, securing disk and retaining plate from the potential equalization connection.

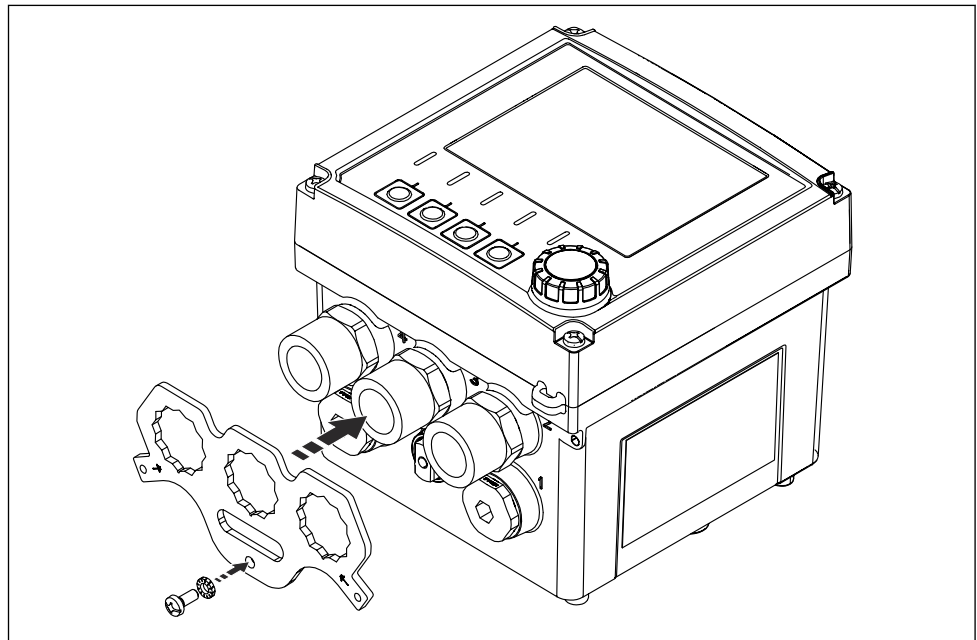
3.



A0057687

Screw in the conduit adapter. Tightening torque 2.5 to 3 Nm.

4.



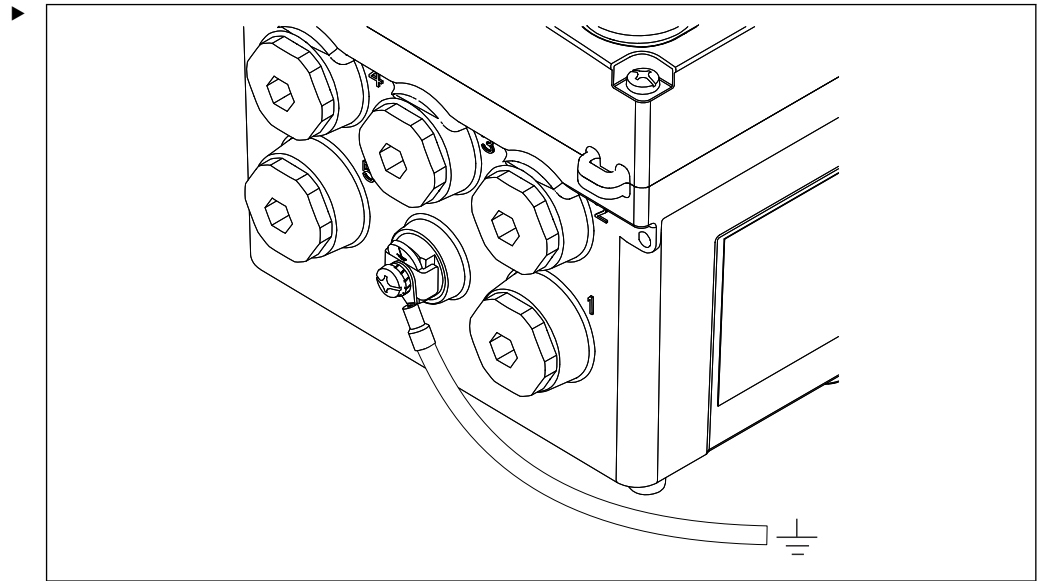
A0057690

Fit the conduit adapter support on the adapters or sealing plugs. Where necessary, align the adapters or sealing plugs by turning them.

5. Bolt the conduit adapter support to the potential equalization connection using the screw and securing disk.
6. Bolt the piping with the adapters.

6.2.6 Connecting the potential equalization

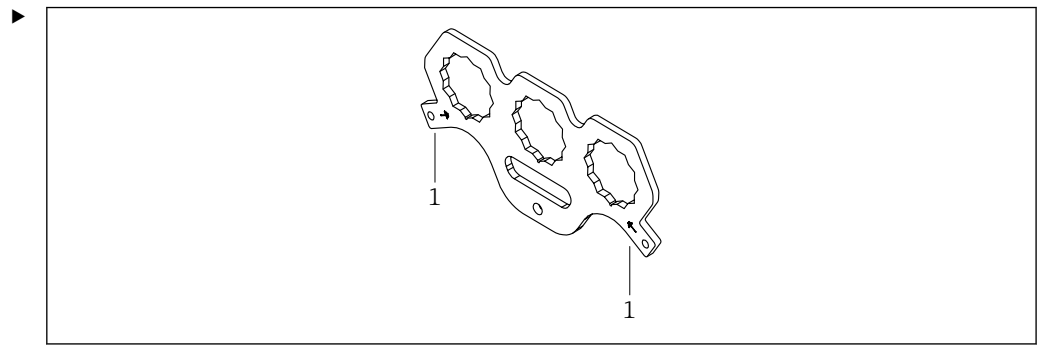
Connecting the potential equalization – Installation without a conduit



21 Potential equalization connection

Attach the potential equalization connection of the housing to the earth or to the potential equalization system with a separate line. Cable cross-section max. 6 mm^2 (0.009 in^2). Where necessary, use a cable lug.

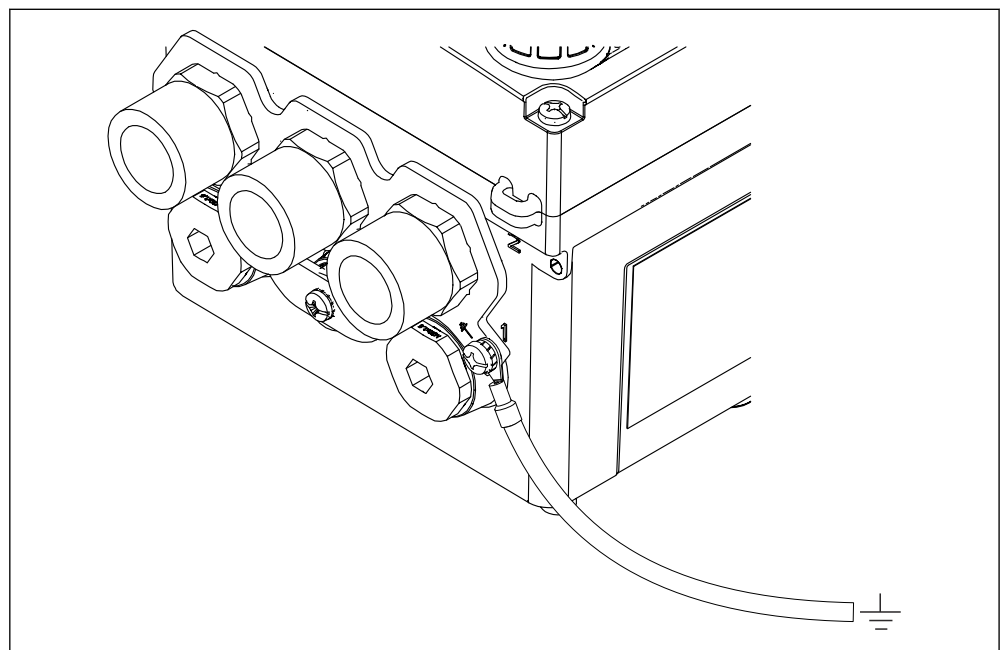
Connecting the potential equalization for conduit installation



A0057719

▣ 22 Conduit adapter support

1 Connections for potential equalization



A0057705

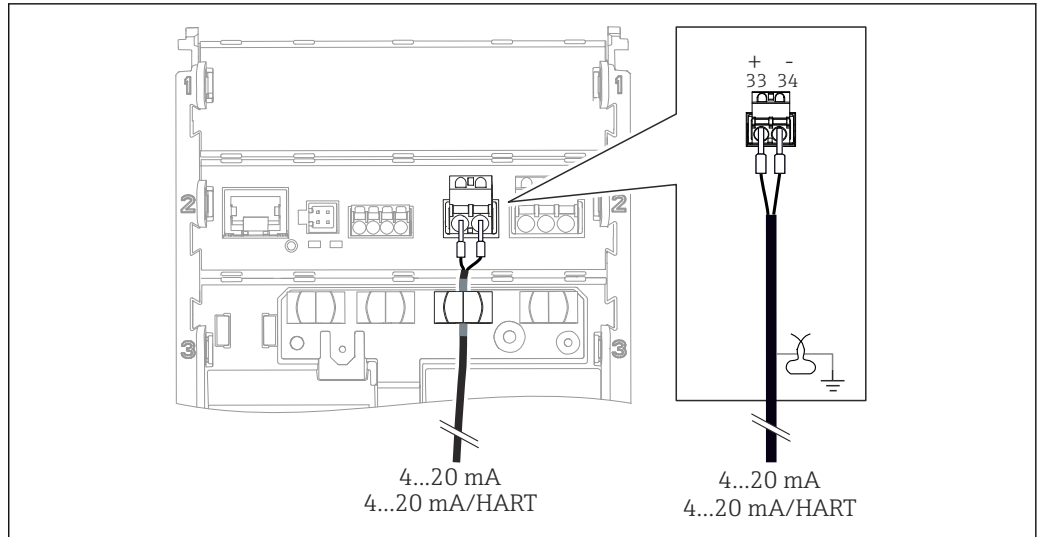
▣ 23 Potential equalization connection for conduit mounting

For conduit mounting, connect the ground cable to a potential equalization connection of the conduit adapter support. The conduit adapter support has two potential equalization connections.

6.2.7 Connecting the power supply and signal circuit

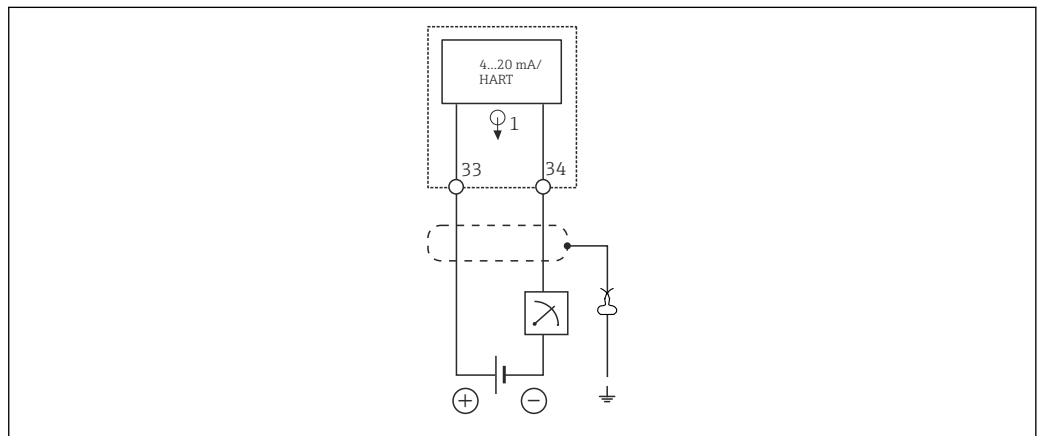
- ▶ Connect the current outputs with shielded two-wire cables as described in the following illustrations.

The type of shield connection depends on the anticipated interference influence. Grounding one side of the shield is sufficient to suppress electrical fields. To suppress interference due to an alternating magnetic field, the shield must be earthed on both sides.



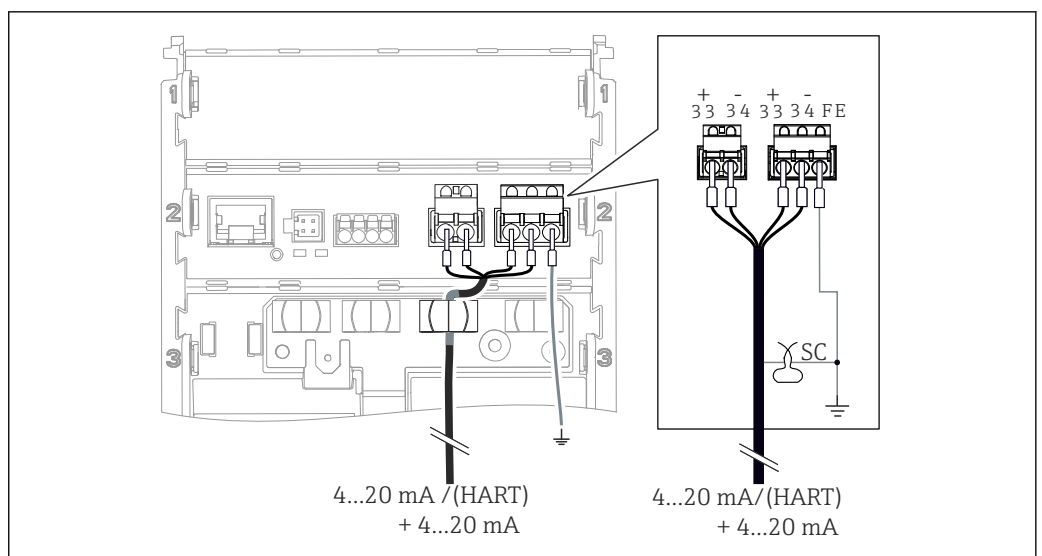
A0054900

24 Connection of 1 current output



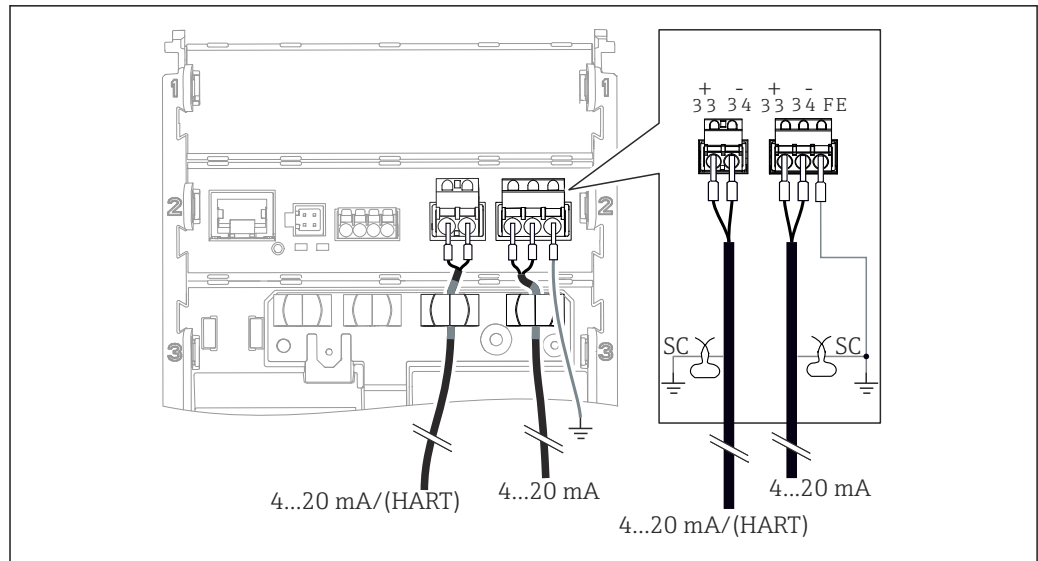
A0054914

25 Wiring diagram: 1 current output



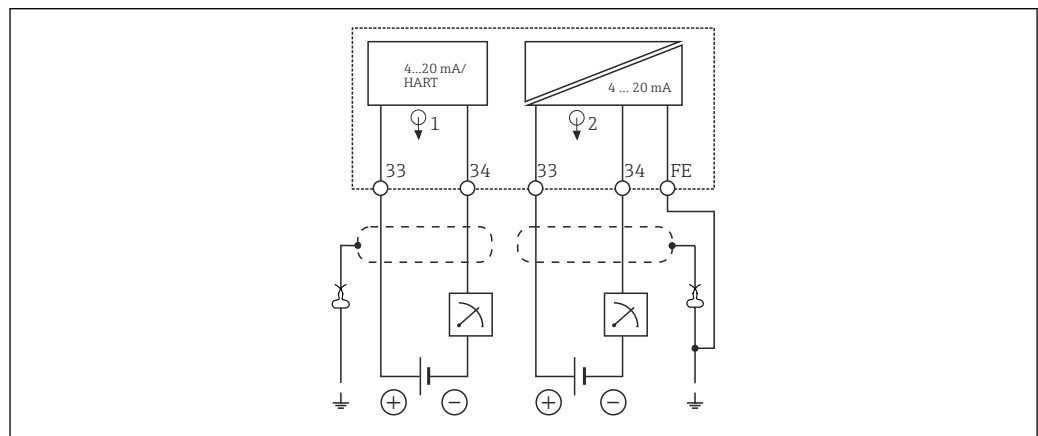
A0054901

26 Connection of 2 current outputs via 1 cable



A0054902

27 Connection of 2 current outputs via 2 cables




A0054915

28 Wiring diagram: 2 current outputs

6.2.8 Connecting the sensor

Abbreviations and color codes used

Explanation of abbreviations and labels used in the following illustrations:

Abbreviation	Meaning
pH	pH signal
Ref	Signal from reference electrode
PM	Potential Matching = Potential equalization (PAL)
Sensor	Sensor
ϑ	Signal of temperature sensor
d.n.c.	do not connect!
	Cable shield grounding clamp

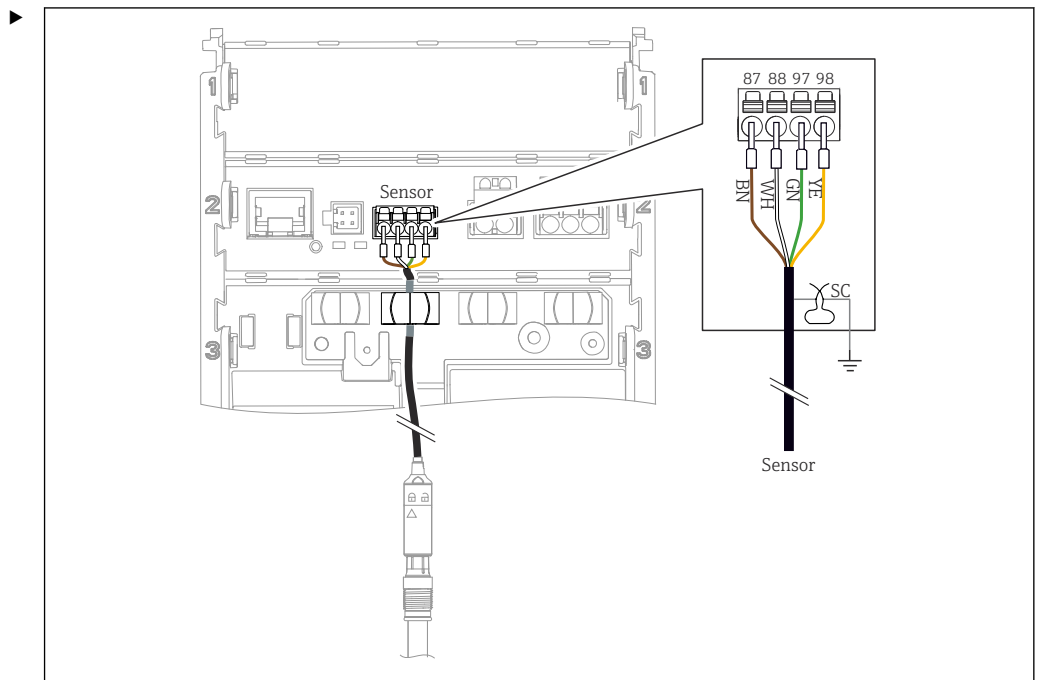
A0056947

Explanation of color codes in the following illustrations:

Color code	Meaning
BK	Black
BN	Brown
BU	Blue
GN	Green
OG	Orange
RD	Red
YE	Yellow
VT	Violet
WH	White
TR	Transparent
SC	Braided shield/silver

Memosens sensors

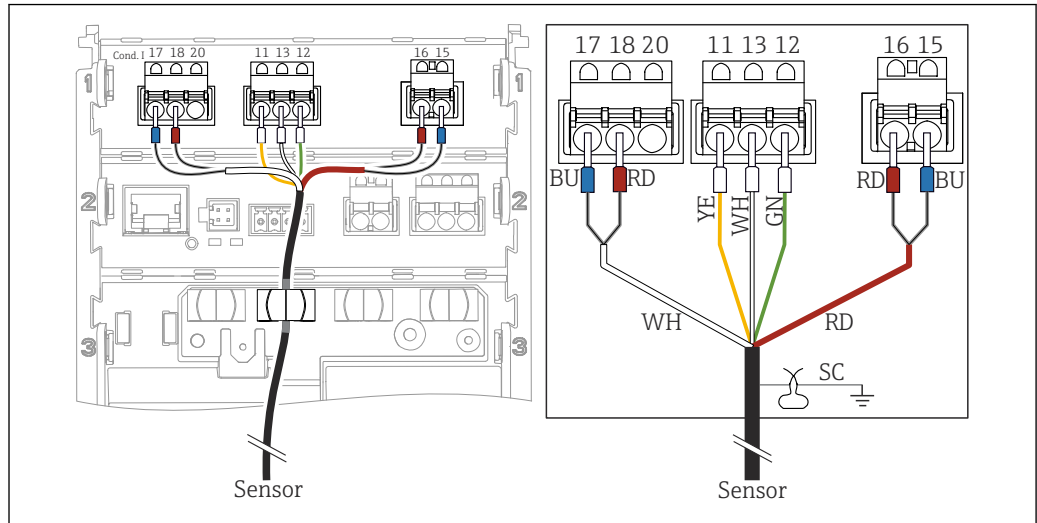
Connecting sensors with Memosens plug-in head (via Memosens cable) and sensors with a fixed cable and Memosens protocol



29 Connecting Memosens sensors

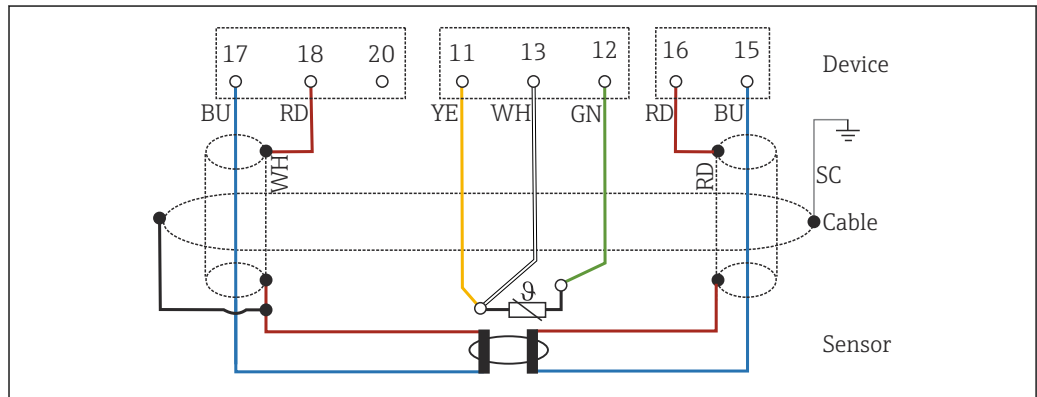
Connect the sensor cable as shown in the illustration.

Analog conductivity sensors (inductive)



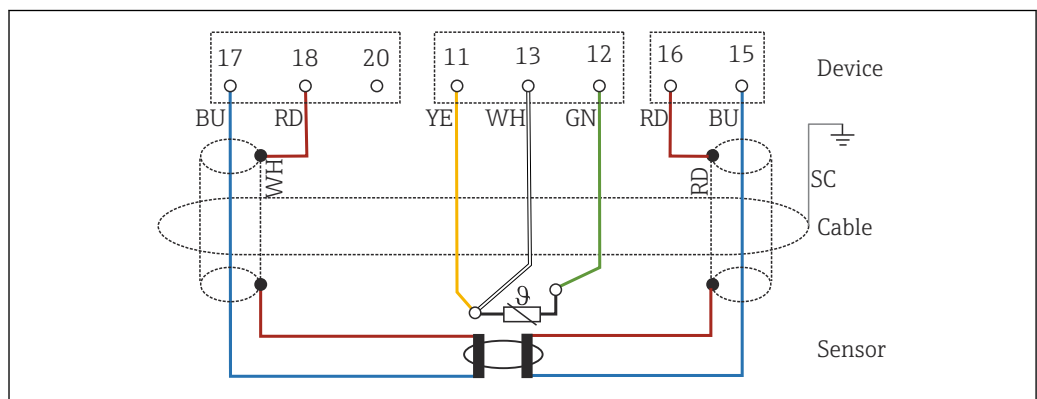
A0055787

30 Device view



A0055796

31 Wiring diagram CLS50

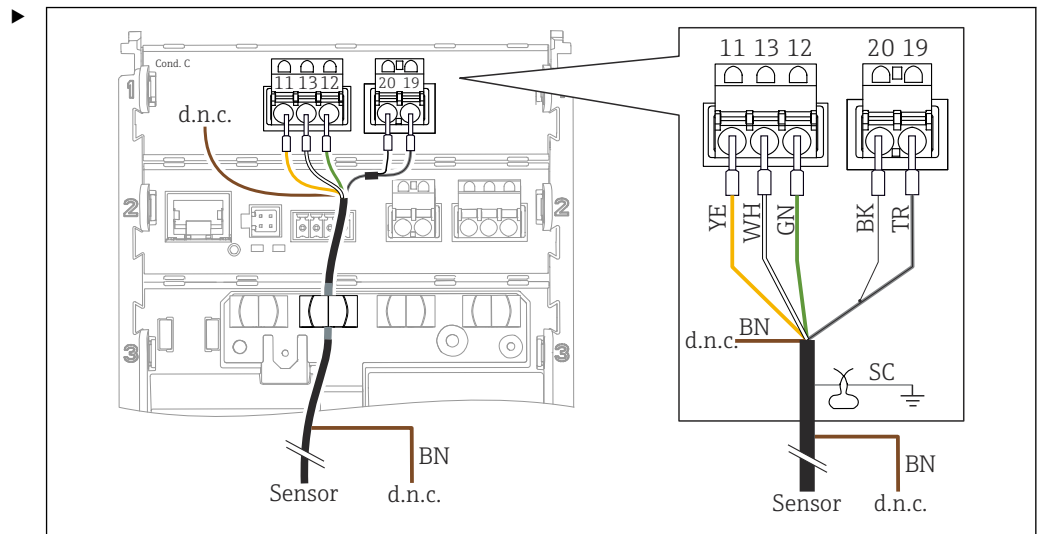


A0055799

32 Wiring diagram CLS54

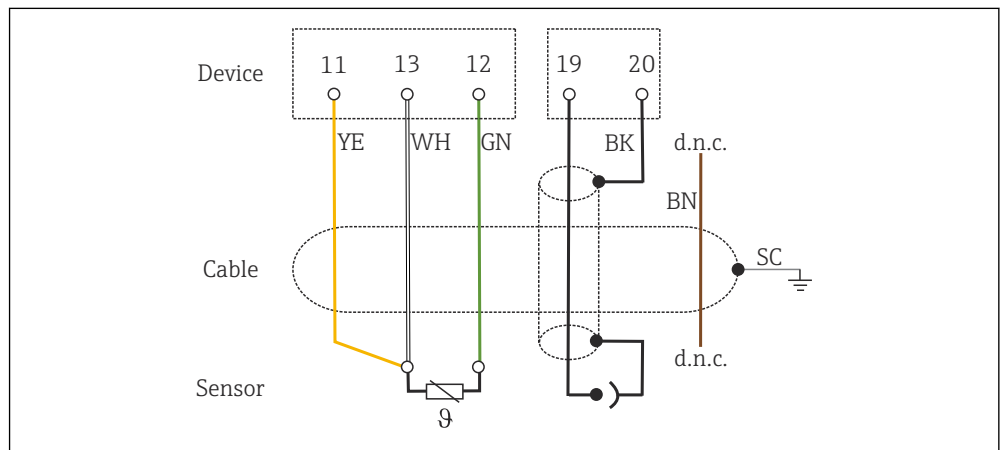
► Connect the sensor as shown in the illustration.

Analog conductivity sensors (conductive)



A0055786

33 Device view



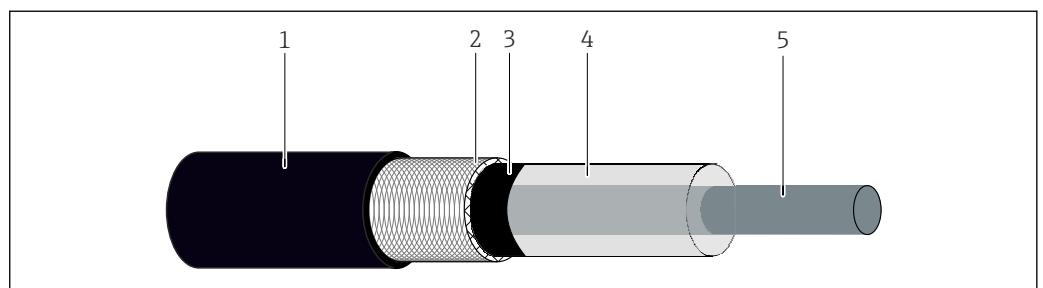
A0055795

34 Wiring diagram

Connect the sensor as shown in the illustration.

analog pH sensors

Note on connecting coaxial cables



A0056259

35 Coaxial cable structure

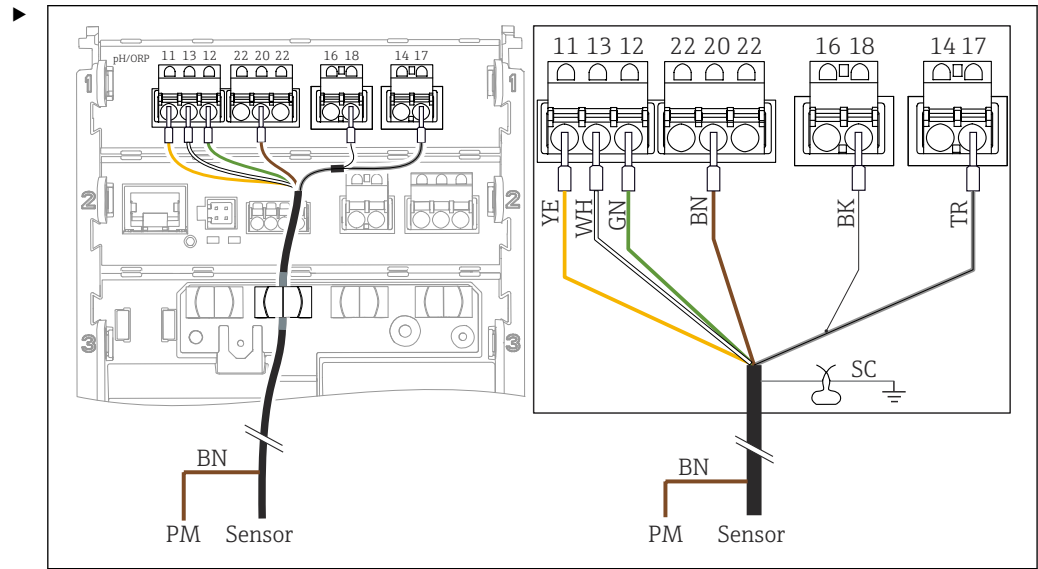
- 1 Protective sheath
- 2 Shield/outer conductor of the coaxial cable
- 3 Semi-conductive polymer layer
- 4 Inner insulation
- 5 Inner conductor

1. Completely remove the semi-conductive polymer layer (3) up to the end of the shield.
2. Ensure that the inner insulation (4) of the coaxial cable is not in contact with other components. Ensure there is an air gap around all components; otherwise, measurement errors may occur.

Unconnected cables

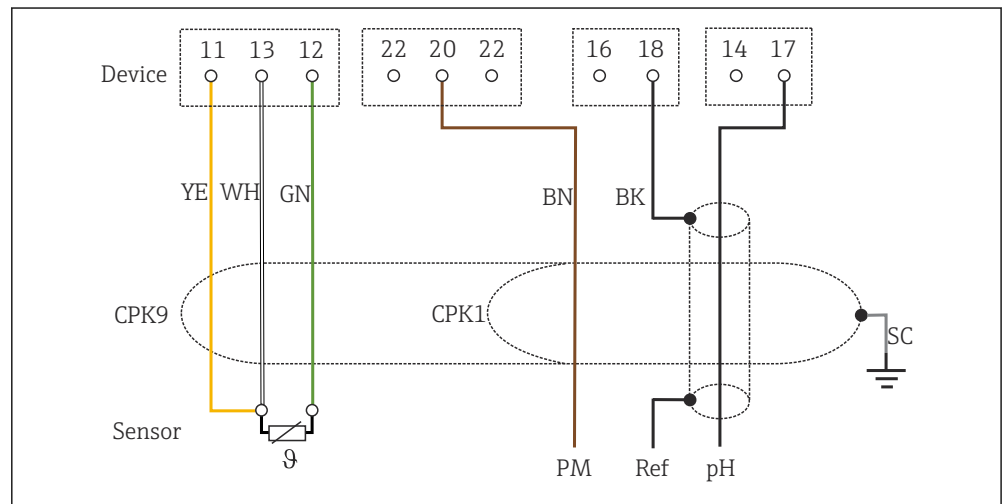
- ▶ Route unconnected cables (marked with d.n.c.) in such a way that they are not in contact with other connections.

Connecting pH glass electrodes with PML (symmetrical)



A0055755

36 Device view

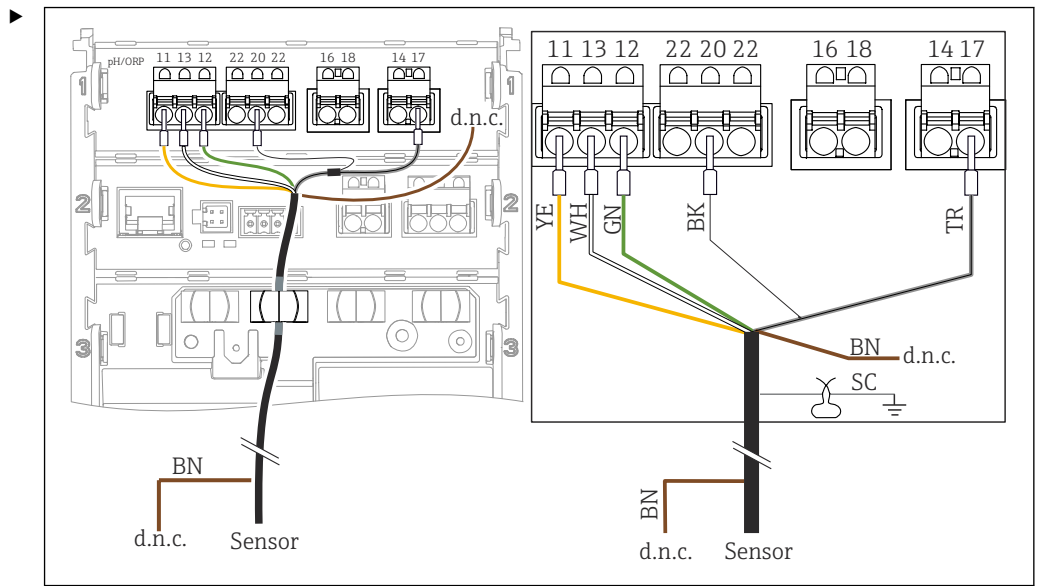


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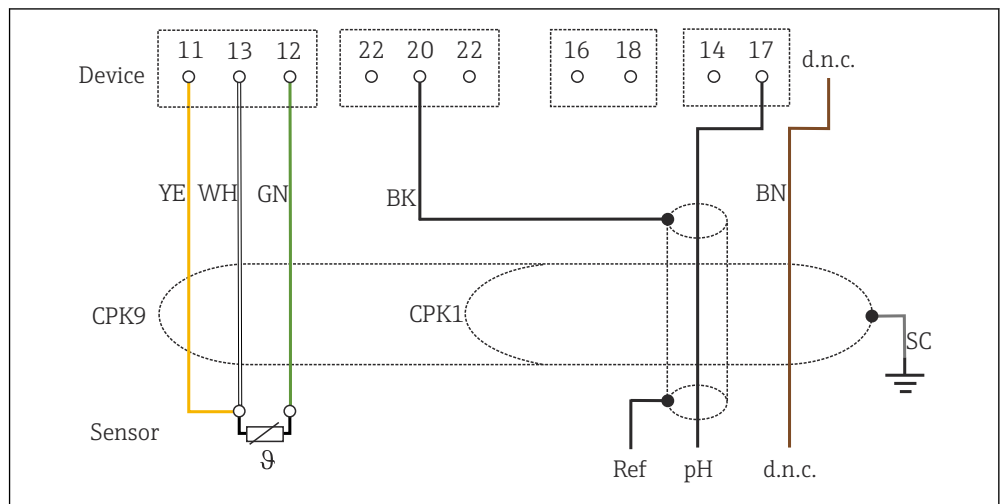
37 Wiring diagram

Connect the sensor as shown in the illustration.

Connecting pH glass electrodes without PML (asymmetrical)



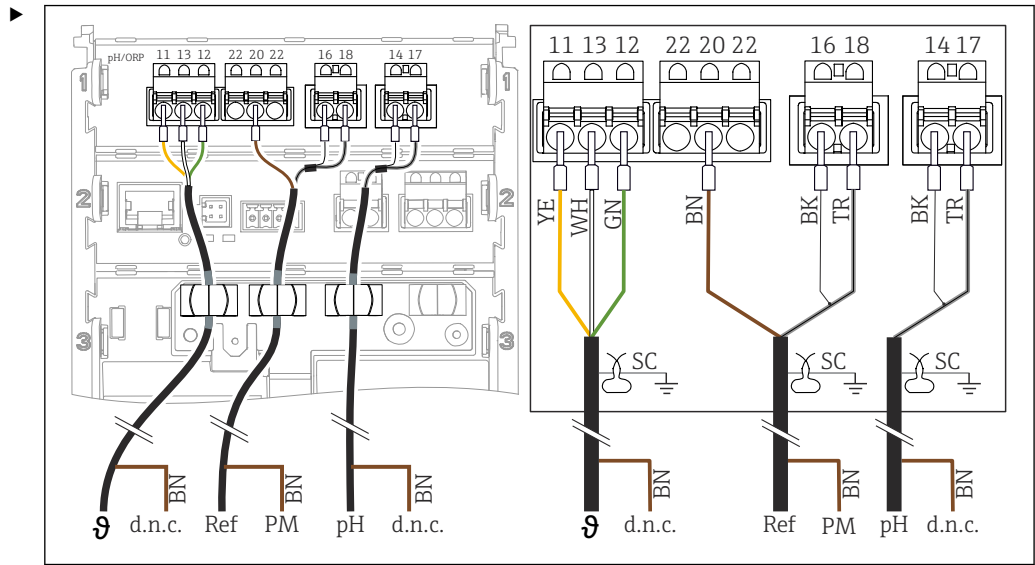
38 Device view



39 Wiring diagram

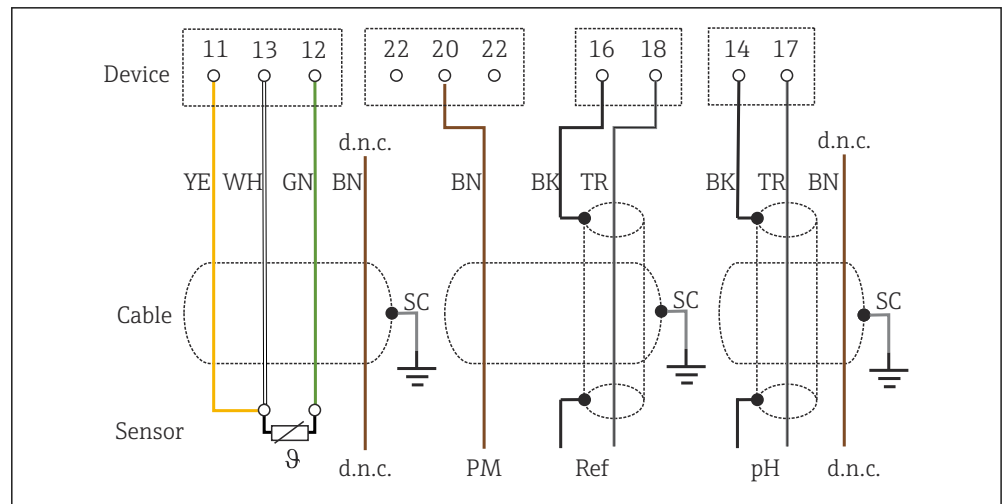
Connect the sensor as shown in the illustration.

Connecting pH single electrodes with PML (symmetrical) and separate reference electrode and separate temperature sensor



A0055769

40 Device view

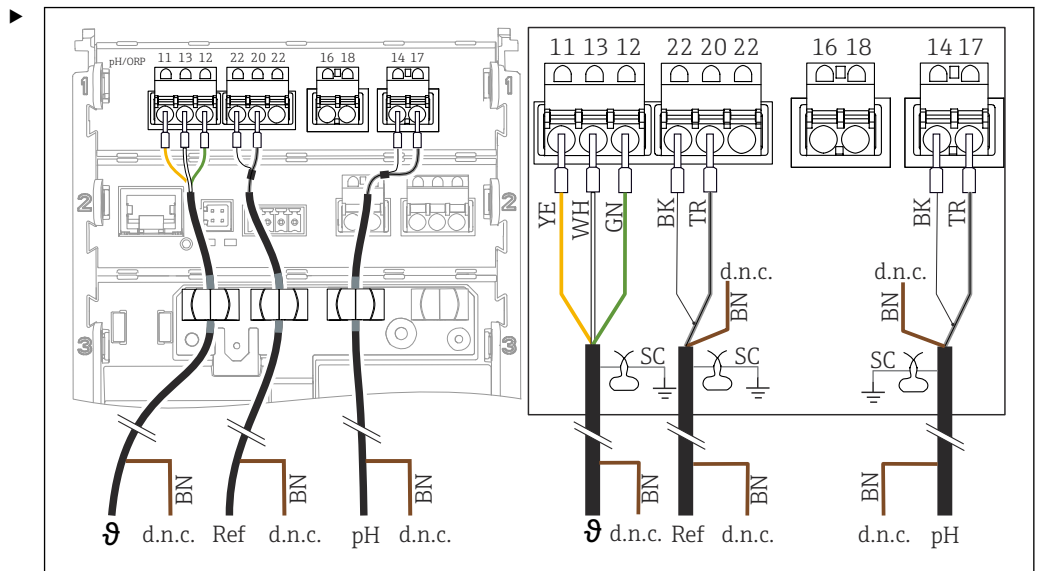


A0055772

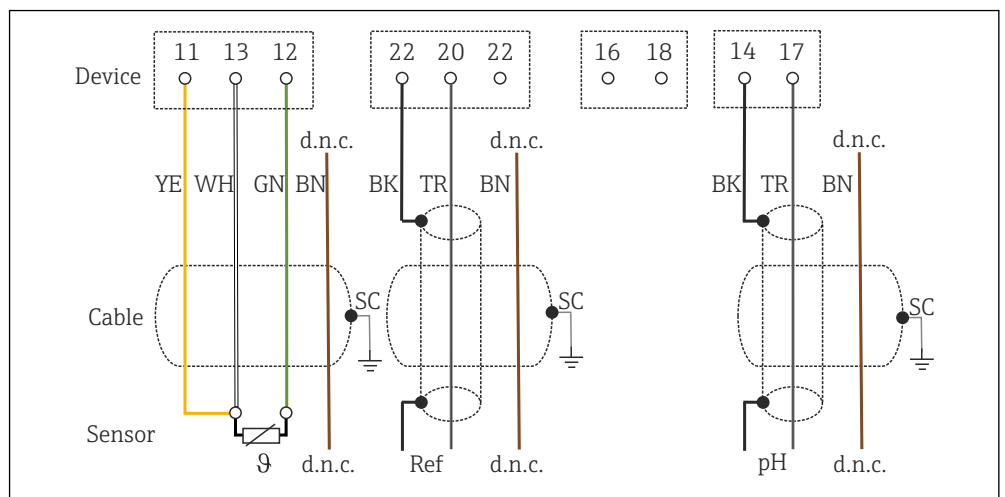
41 Wiring diagram

Connect the sensor as shown in the illustration.

Connecting pH single electrodes without PML (asymmetrical) and separate reference electrode and separate temperature sensor



42 Device view

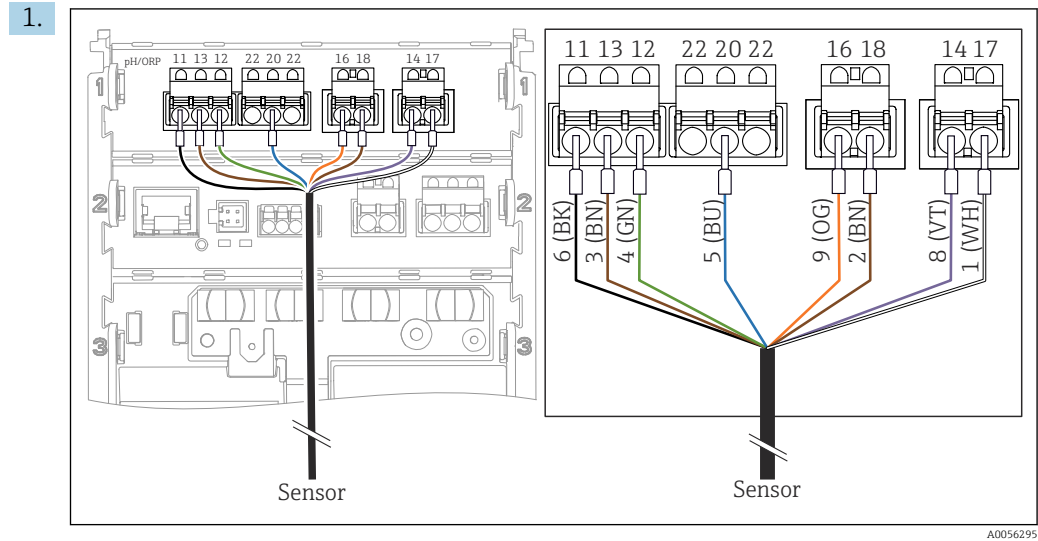


43 Wiring diagram

Connect the sensor as shown in the illustration.

Connecting pH enamel electrodes

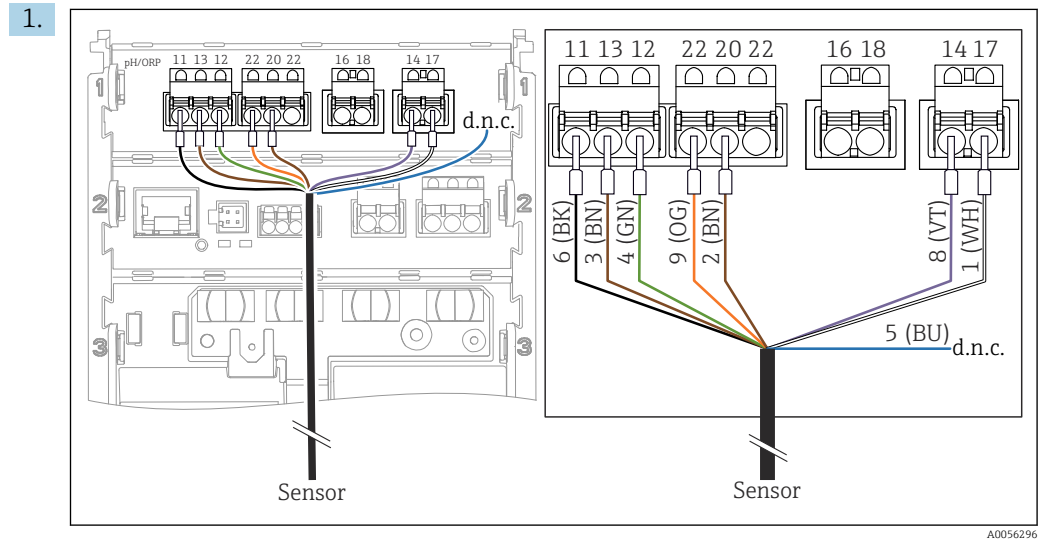
Pfaunder electrode, absolute (type O3/type O4) with PML (symmetrical) with LEMOSA cable



Connect the sensor as shown in the illustration.

2. Only ground the cable shield on the sensor side.

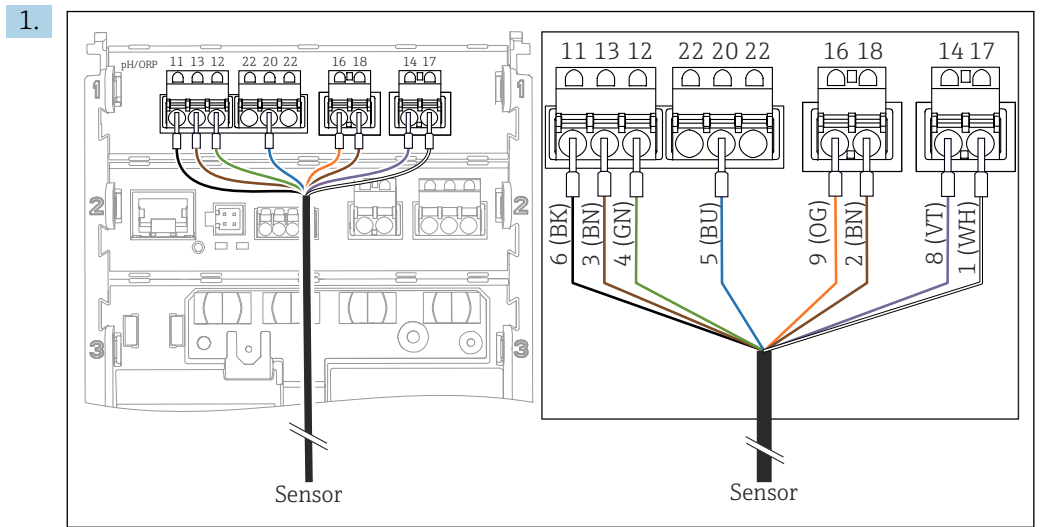
Pfaunder electrode, absolute (type O3/type O4) without PML (asymmetrical) with LEMOSA cable



Connect the sensor as shown in the illustration.

2. Only ground the cable shield on the sensor side.

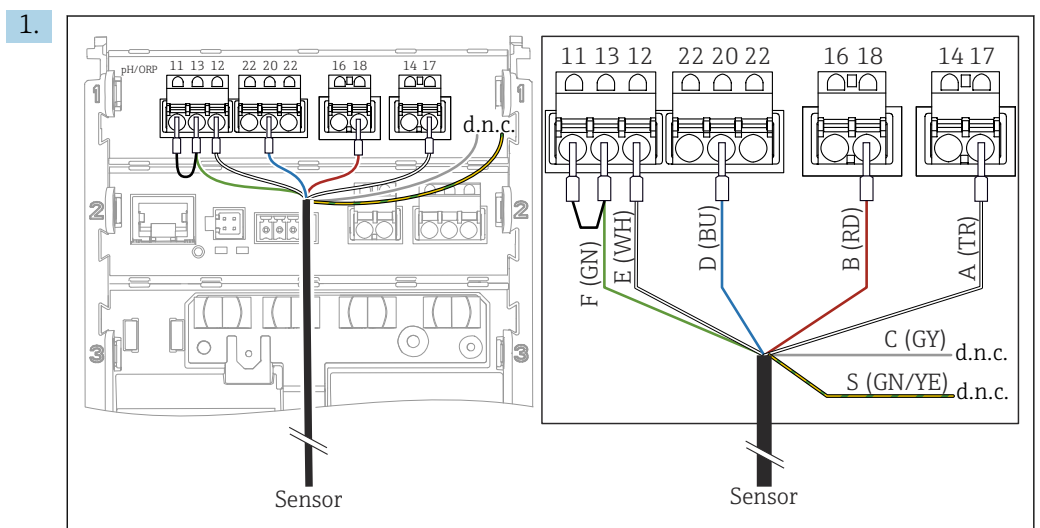
Pfaudler electrode, relative (type 18/type 40) with PML (symmetrical) with LEMOSA cable



Connect the sensor as shown in the illustration.

2. Only ground the cable shield on the sensor side.

pH-Reiner Pfaudler electrode with PML (symmetrical) with VARIOPIN cable



Connect the sensor as shown in the illustration.

2. Only ground the cable shield on the sensor side.

6.3 Ensuring the degree of protection

Only the mechanical and electrical connections which are described in these instructions, and which are necessary for the required designated application, may be established on the device delivered.

- ▶ Exercise care when carrying out the work.

Individual types of protection permitted for this product (impermeability (IP), electrical safety, EMC interference immunity, explosion protection) can no longer be guaranteed if, for example:

- Covers are left off
- Different power units from the ones permitted are used
- Cable glands are not tightened sufficiently

- Unsuitable cable diameters are used for the cable glands
- The housing cover is not properly secured (danger of moisture entering due to inadequate sealing)
- Cables/cable ends are loose or insufficiently tightened
- Cable shields not grounded using grounding clamp in accordance with the instructions
- Grounding is not ensured via the connection for potential equalization

6.4 Post-connection check

WARNING

Connection errors

The safety of people and of the measuring point is under threat. The manufacturer does not accept any responsibility for errors that result from failure to comply with the instructions in this manual.

- ▶ Put the device into operation only if you can answer **yes** to **all** the following questions.
 - Are the device and cable undamaged (visual inspection)?
 - Do the cables have adequate strain relief?
 - Are the cables routed without loops and cross-overs?
 - Does the supply voltage match the information on the nameplate?
 - No reverse polarity?
 - Correct terminal assignment?

7 Operation options

7.1 Overview of operation options

Operation and settings via:

- Operating elements on the device
- SmartBlue app (does not support the full range of functions)
- Control station (via HART)

7.2 Access to operating menu via onsite display

7.2.1 User management

The onsite display menu offers user management functions. There are two roles in user management.

- Operator
- Maintenance

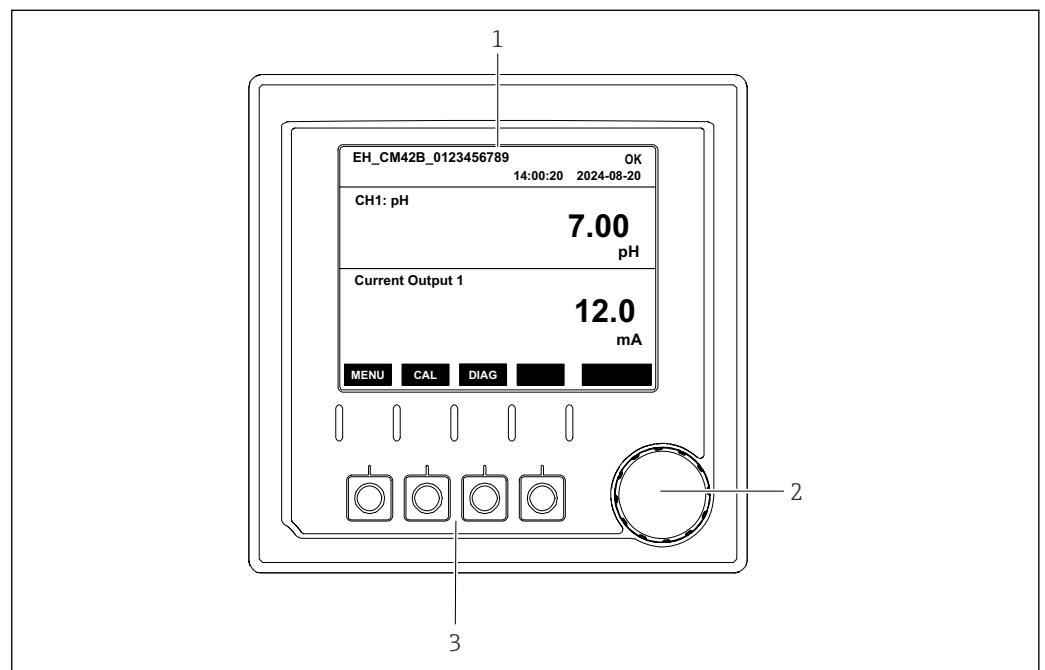
Both roles can be protected via a PIN as an option. Only one PIN can be set for the Operator role if a PIN is also set for the Maintenance role.

The Maintenance role has the authorization to change both PINs.

It is recommended to set the PINs after initial commissioning.

If PINs are set, the two roles first appear when the menu is called up. To access other menu items, login is required with a role.

7.2.2 Operating elements

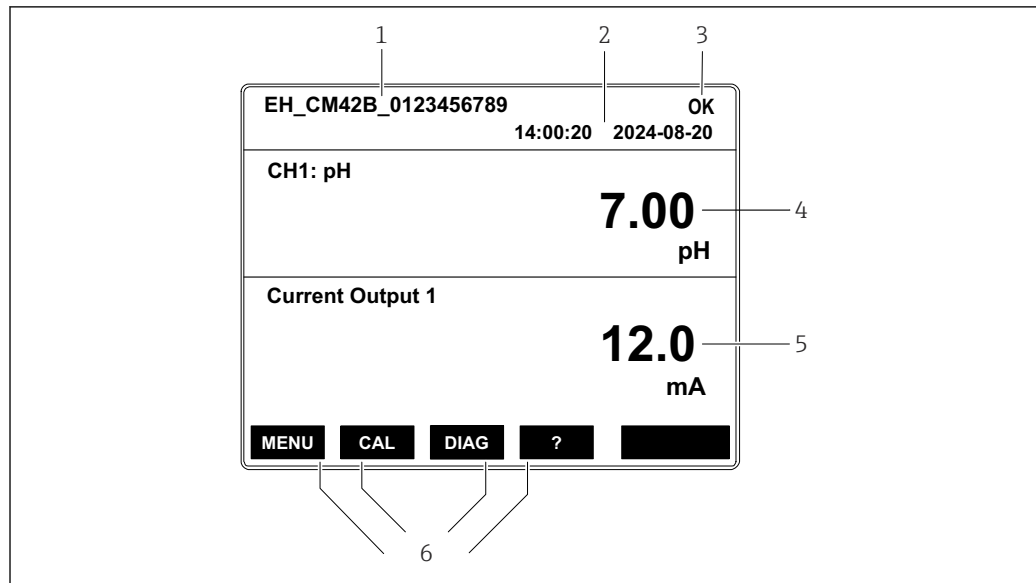


44 Operating elements

- 1 Display
- 2 Navigator
- 3 Soft keys

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7.2.3 Structure of the display



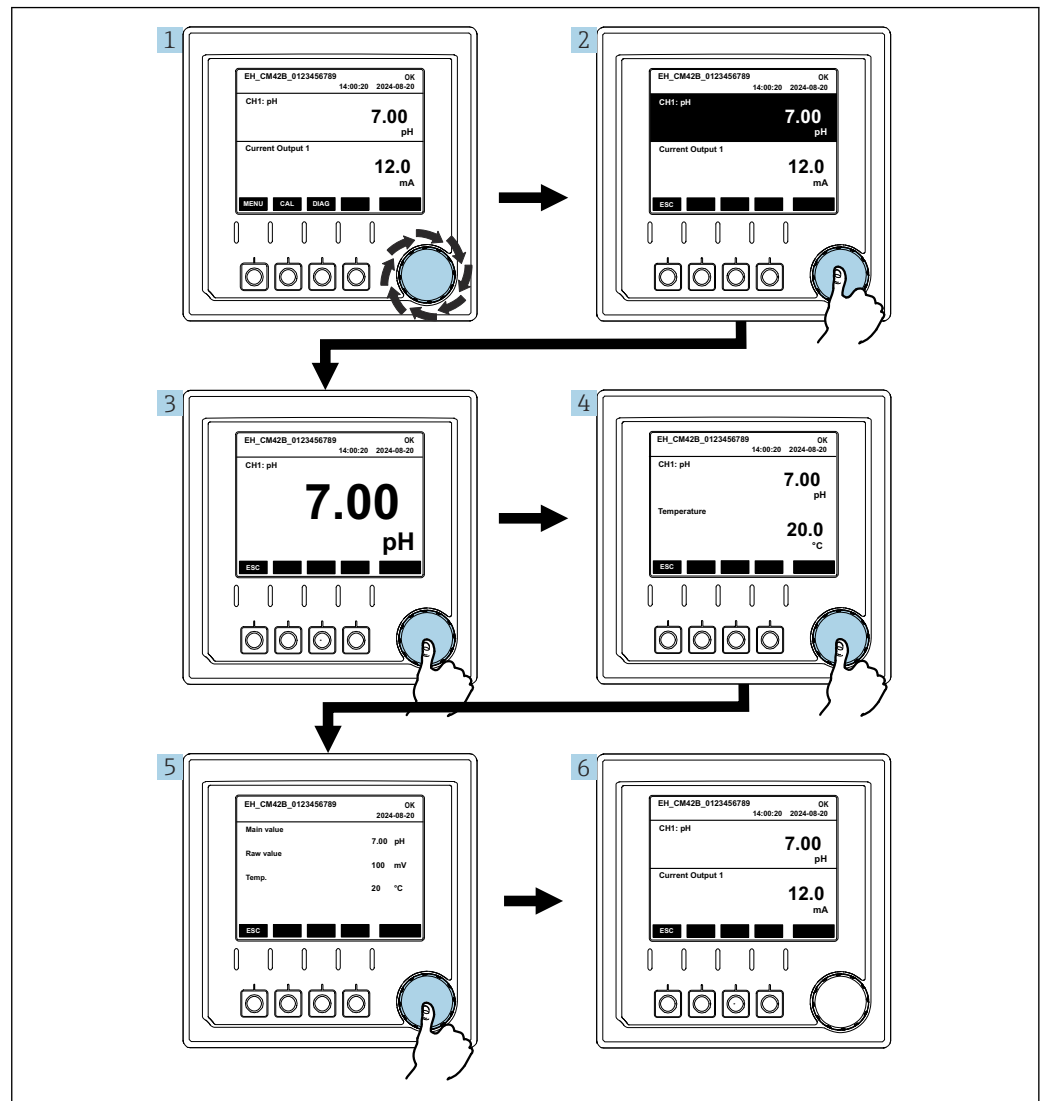
A0056328

45 Structure of the display: Start screen (device with one current output)

- 1 Device name or menu path
- 2 Date and time
- 3 Status symbols
- 4 Primary value display
- 5 Display of current output value (depending on the order, the device has 1 or 2 current outputs, the illustration shows a device with one current output)
- 6 Assignment of the soft keys

7.2.4 Navigating through the display

Measured values

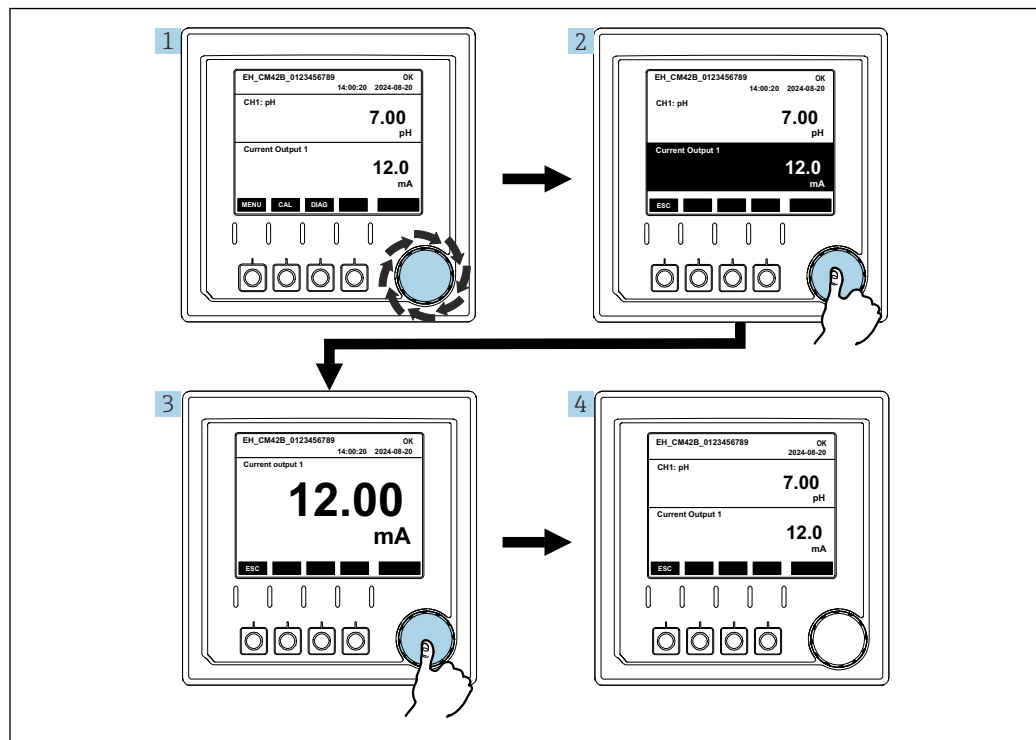


46 Navigating through measured values

A0056209

1. Press the navigator, or turn the navigator and continue turning.
 - ↳ Measured value is selected (inverted display).
2. Press the navigator.
 - ↳ The display shows the primary value.
3. Press the navigator.
 - ↳ The display shows the primary value and temperature.
4. Press the navigator.
 - ↳ The display shows the primary value, temperature and secondary measured values.
5. Press the navigator.
 - ↳ The display shows the primary value and current outputs.

Current output

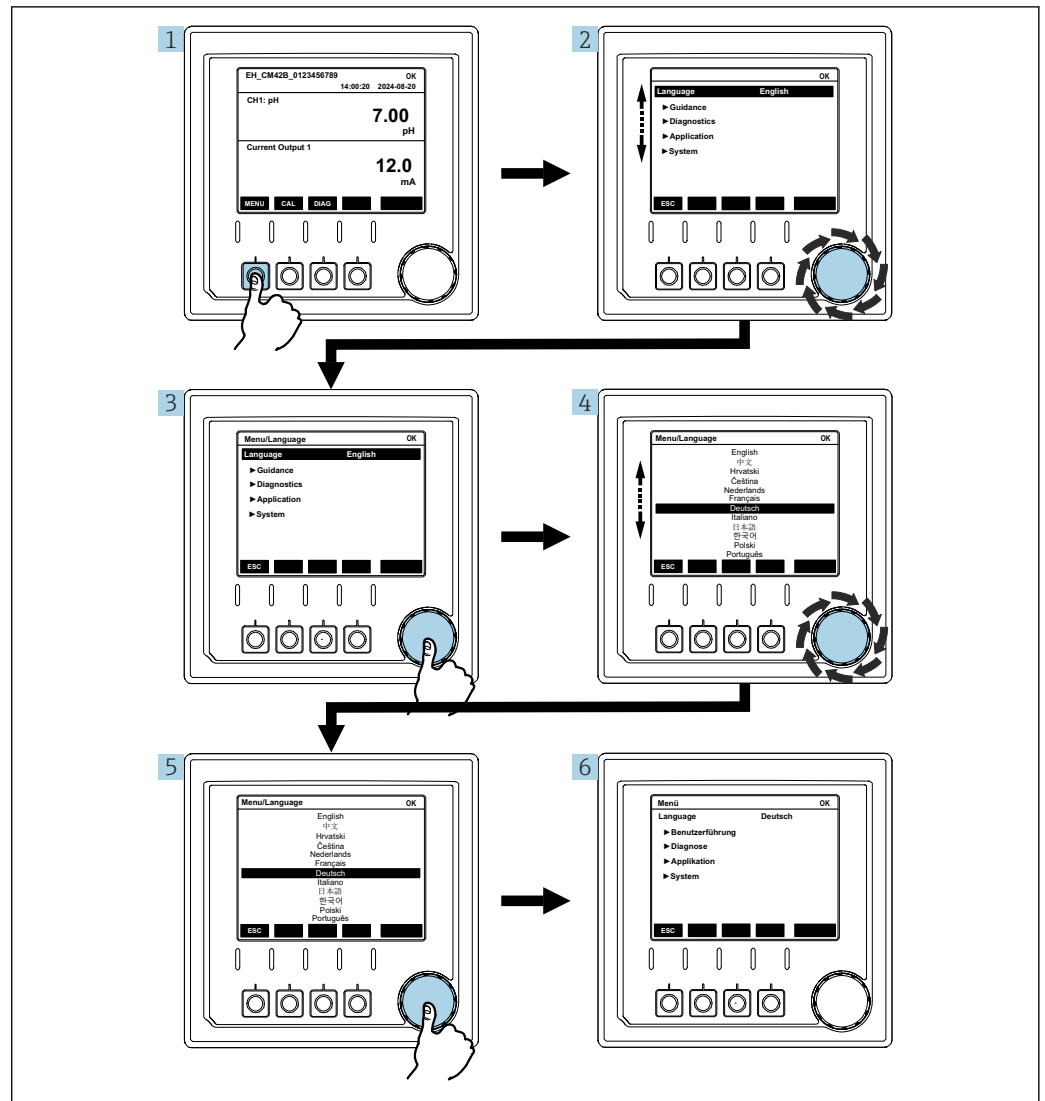


A0056210

47 Navigation, displaying a current output

1. Press the navigator, or turn the navigator and continue turning.
 - ↳ Current output is selected (black background).
2. Press the navigator.
 - ↳ The display shows the current output details.
3. Press the navigator.
 - ↳ The display shows the primary value and current outputs.

7.2.5 Operation concept menus



A0056305

The options available in the menu depend on the specific user authorization.

1. Press the soft key.
 - ↳ The menu is called up.
2. Turn the navigator.
 - ↳ The menu item is selected.
3. Press the navigator.
 - ↳ The function is called up.
4. Turn the navigator.
 - ↳ The value is selected (e.g. from a list).
5. Press the navigator.
 - ↳ The setting is adopted.

7.3 Access to the operating menu via the operating tool

7.3.1 Access to the operating menu via the SmartBlue app

The SmartBlue app is available for download from the Google Play Store for Android devices and from the Apple App Store for iOS devices.

System requirements

- Mobile device with Bluetooth® 4.0 or higher
- Internet access

Download the SmartBlue app:



Download the SmartBlue app via a QR code.

Connect the device to the SmartBlue app:

1. Bluetooth is enabled on the mobile device.
Activate Bluetooth on the device: **Menu/System/Connectivity/Bluetooth**



Launch the SmartBlue app on the mobile device.

↳ The live list displays all of the devices that are within range.

3. Tap the device to select it.
4. Log in with username and password.

Initial access data:

- Username: admin
- Default password: Serial number of the device

i If the mainboard of the device is replaced, the default password of the admin account may change.

This is the case if a generic kit that was not ordered for the serial number of the device was used when replacing the mainboard.

In this case, the module serial number of the mainboard is the default password.

7.3.2 SmartBlue app accounts

The SmartBlue app is protected against unauthorized access by means of password-protected accounts. The authentication options of the mobile device can be used to log into the accounts.

The following accounts are available:

- operator
- maintenance
- admin

7.3.3 Functions via the SmartBlue app

The SmartBlue app supports the following functions:

- Firmware update
- User management
- Export of information for the service

8 System integration

8.1 Integrating the measuring instrument into the system

Interfaces for measured value transmission (depending on order):

- 4 to 20 mA current output (passive)
- HART

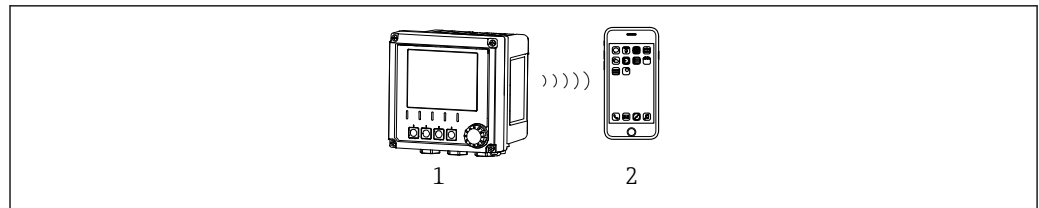
8.1.1 Current output

Depending on the order, the device has 1 or 2 current outputs.

- Signal range 4 to 20 mA (passive)
- The assignment of a process value to a current value is configurable within the signal range.
- Failure current can be configured from list.

8.1.2 Bluetooth® LE wireless technology

With the Bluetooth® LE wireless technology (energy-efficient wireless transmission) option that can be ordered, the device can be controlled via mobile devices.



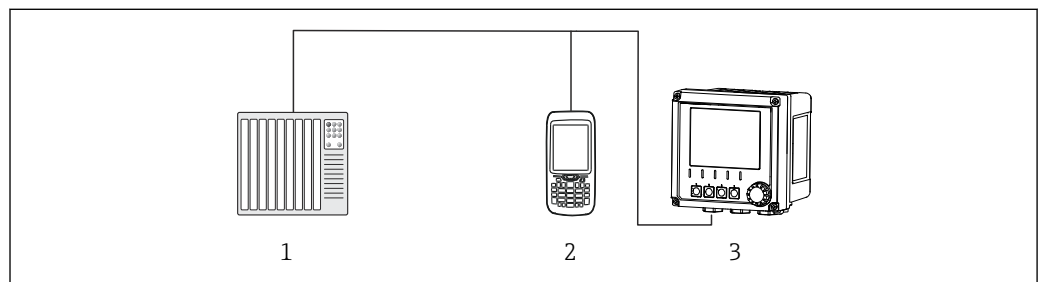
A0056361

48 Options for remote operation via Bluetooth® LE wireless technology

- 1 Transmitter with Bluetooth® LE wireless technology
- 2 Smartphone/tablet with SmartBlue app

8.1.3 HART

HART operation is possible via different hosts.



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49 Wiring options for remote operation via HART protocol

- 1 PLC (programmable logic controller)
- 2 HART operating device (e.g. SFX350), optional
- 3 Transmitter

The device can communicate via the HART protocol using current output 1 (depending on the order).

Follow the steps below to integrate the device into the system for this purpose:

1. Connect the HART modem or HART handheld terminal to current output 1 (communication load 250–500 Ohm).
2. Establish a connection via the HART device.
3. Operate the transmitter via the HART device. To do so, follow the HART device Operating Instructions.

9 Commissioning

9.1 Preliminaries

- ▶ Connect the device.
 - ↳ The device starts and displays the measured value.

Bluetooth® must be enabled on the mobile device for operation via the SmartBlue app.

9.2 Post-installation and function check




Incorrect connection, incorrect supply voltage

Safety risks for staff and device malfunctions!

- ▶ Check that all connections have been established correctly in accordance with the wiring diagram.
- ▶ Ensure that the supply voltage matches the voltage indicated on the nameplate.

9.2.1 LED displays

The displays use the status LEDs. The status LEDs are only active if no display is connected to the device.

LED behavior	Status
Green Continuous	Device is in normal operating mode.
Green Flashes quickly	Starting process for the device
Red Continuous	Category F diagnostic message is present. The complete message can be seen via HART or the service display. For information on the diagnostic categories, see →  56
Red Flashes slowly	Category M, C or S diagnostic message is present. The complete message can be seen via HART or the service display. For information on the diagnostic categories, see →  56
Alternating 2x red flashes and 2x green flashes	Squawk mode is enabled. See also →  55
Alternating 1x red flash and 1x green flash	Error during the starting process. Contact the Service Team.

9.3 Establishing a connection via the SmartBlue (app) app

1. The SmartBlue App is installed on the mobile device and Bluetooth is enabled.
Start the SmartBlue app.
 - ↳ The SmartBlue App shows all available devices in the live list.
2. Select device from the live list.
3. Log in with username and password.

Initial access data:

- Username: admin
- Password: serial number of the device



It is advisable to change the username and password after logging in for the first time.



You can drag additional information (e.g. main menu) onto the screen by swiping across the screen.

9.4 Time and date

- ▶ Configure the time and date under the following path: **Menu/System/Date and Time**


When using the SmartBlue app, the date and time can also be automatically transferred from the mobile device.

9.5 Configuring the operating language

- ▶ Configure the operating language under the following path: **Menu/Language**

10 Operation

10.1 Reading the measured values

See →  41

10.2 Adapting the measuring instrument to the process conditions

10.2.1 Calibrating the sensor

Different calibration methods are available depending on the measuring parameter and connected sensor.

1. Navigate to the path: **Menu/Guidance/Calibration** or press the **CAL** softkey.
2. Select the desired calibration method.
3. Follow the instructions in the wizard.

10.2.2 Damping

Damping causes smoothing of the measured value with the entered time constant.

Configuration options:

Enter the time constant (the time over which the mean value is generated) for all measured values of the sensor.

- ▶ Navigate to the path: **Menu/Application/Sensor/Damping**

10.2.3 Calibration settings

Calibration monitoring

Displays

- Number of sensor calibrations
- Operating hours of the sensor since last calibration

Configuration options:

- Enable calibration monitoring when operating/enable during the connection process/disable
- Define the warning limit and the alarm limit for the time after the last calibration.
- ▶ Navigate to the path: **Menu/Application/Sensor/Calibration settings/Adjustment monitoring**

Stability criteria (only pH, ORP or dissolved oxygen measuring parameters)

The stability criteria are permitted measured value fluctuations which must not be exceeded in a certain timeframe during calibration. If the permitted fluctuation is exceeded, calibration cannot be started. It is then possible to regenerate the measured value.

Configuration options:

Depending on the measuring parameter

- ▶ Navigate to the path: **Menu/Application/Sensor/Calibration settings/Stability criteria**

Calibration methods

Different calibration methods are available depending on the measuring parameter and the sensor used.

Configuration options:

Select the calibration methods that are displayed under **Menu/Guidance/Calibration**

- ▶ Navigate to the path: **Menu/Application/Sensor/Calibration settings/Calibration methods**

Further calibration settings

Further calibration settings are available depending on the measuring parameter and connected sensor.

10.2.4 Operating hours monitoring

The total operating time of the sensor and its use under extreme conditions are recorded. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostic message.

Configuration options:

- Enable/disable operating hours monitoring
- Enter limit value for total operating hours
- Select diagnostic behavior if an operating hours upper limit is exceeded
- ▶ Navigate to the path: **Menu/Application/Sensor/Operating hours monitoring**



For oxygen sensors, operating hours monitoring is also available for the cap.

Path: **Menu/Application/Sensor/Operating hours monitoring cap**

10.2.5 Tag control

Tag control specifies which sensors the device allows.

When tag control is enabled, the device only allows sensors with the same measuring point name/measuring point group or identical and brand-new sensors.

Configuration options:

- Enable/disable tag control for individual measuring point name or measuring point group
- Enter the name of the measuring point
- Enter the name of the measuring point group
- ▶ Navigate to the path: **Menu/Application/Sensor/Tag control**

10.2.6 Cleaning in place (CIP)

Displays:

Number of CIP cycles performed by the sensor

Configuration options:

- Enable/disable CIP detection
- Configure parameters for CIP detection
- Enable/disable CIP monitoring (CIP cycle counter)
- Configure warning limit and diagnostic behavior for CIP monitoring.
- ▶ Navigate to the path: **Menu/Application/Sensor/Cleaning in place (CIP)**

10.2.7 Sterilization

Displays:

Number of sterilization cycles performed by the sensor

Configuration options:

- Configure parameters for sterilization detection
- Enable/disable sterilization monitoring (sterilization cycle counter)
- Configure warning limit and diagnostic behavior for sterilization monitoring.
- ▶ Navigate to the path: **Menu/Application/Sensor/Sterilization**

10.3 Settings of the current output

Configuration options:

- Failure current
- Process variable/measured value
- Linear output mode/table
- Start and end of measuring range
- Hold behavior of the current output
- ▶ Navigate to the path: **Menu/Application/Current output**

10.4 Bluetooth

Displays:

Bluetooth device name

Configuration options:

Enable/disable Bluetooth

- ▶ Navigate to the path: **Menu/System/Connectivity/Bluetooth**

10.5 HART settings

Configuration options:

- Enable/disable HART communication
- Configure the HART interface
- ▶ Navigate to the path: **Menu/Application/HART output**

10.6 Hold settings

Configuration options:

- Enable/disable device hold
- Specify hold delay
- Enable/disable automatic calibration hold
- ▶ Navigate to the path: **Menu/Application/Hold settings**

10.7 Squawk

Squawk mode makes the device easier to find in larger installations.

When squawk mode is enabled, the display screen flashes (alternates between normal display and inverted display). If no display is connected, squawk mode is shown via the status LEDs (alternates between 2x green flashes and 2x red flashes).

Configuration options:

Enable/disable squawk mode

- ▶ Navigate to the path: **Menu/System/Device Management**

11 Diagnosis and troubleshooting


11.1 General troubleshooting

The transmitter continuously monitors its functions itself.

If a diagnostic message occurs, the display alternates between the diagnostic message and the measured value in the measuring mode .

In the **DIAG/Diagnostics list** menu, you can find more detailed information on the current diagnostic messages displayed.

In accordance with NAMUR specification NE 107, the diagnostic messages are characterized by:

- Message number
 - Error category (letter in front of the message number)
 - **F** = (Failure) a malfunction has been detected
The measured value of the affected channel is no longer reliable. The cause of the malfunction is to be found in the measuring point. Any controller connected should be set to manual mode.
 - **C** = (Function check), (no error)
Maintenance work is being performed on the device. Wait until the work has been completed.
 - **S** = (Out of specification), the measuring point is being operated outside its specification
Operation is still possible. However, you run the risk of increased wear, a shorter operating life or lower accuracy levels. The cause of the problem is to be found outside the measuring point.
 - **M** = Maintenance required. Action must be taken as soon as possible
The device still measures correctly. Immediate measures are not necessary. However, proper maintenance efforts would prevent a possible malfunction in the future.
 - Message text
-  If you contact the Service Department, please cite the message number only. Since you can individually change the assignment of an error to an error category, the Service Department cannot use this information.

11.2 Diagnostic information via LEDs

See LED displays in the "Commissioning" section. →  50

11.3 Diagnostic information on the onsite display

Current diagnostic events appear on the display. In the measuring mode, the display shows the diagnostic message with what is currently the highest priority. If a menu is currently open, you have to navigate to the diagnostic list.

11.4 Diagnostic information via communication interface

Diagnostic events, status signals and more information are transmitted according to the definitions and technical capability of the respective fieldbus systems.

11.5 Adapting the diagnostic information

Configuration options:

- Specify the error category for the diagnostic messages as per NAMUR NE 107 (F, M, C, S).
- Specify the diagnostic behavior for the diagnostic messages.
- ▶ Navigate to the path: **Menu/Diagnostics/Diagnostics settings**

11.6 Diagnostic list

Displays:

List of active diagnostic messages

- ▶ Navigate to the path: **Menu/Diagnostics/Diagnostic List**

11.7 Event logbook

Diagnostic events, calibration events, firmware changes, hardware changes, configuration changes, system events, etc. are saved in the event logbook.

- ▶ Navigate to the path: **Menu/Diagnostics/Event logbook**

11.8 Simulation


Certain parameters can be simulated for test purposes:

- Current value of the current outputs
- Primary value
- Temperature
- ▶ Navigate to the path: **Menu/Diagnostics/Simulation**

11.9 Firmware history

Date	Version	Changes to firmware	Documentation
02/2025	01.00.00	Release	BA02425C/07/EN/01.24

11.9.1 Firmware update

 Information about firmware updates can be found in the sales office or on the www.endress.com/CM42B product page.

The current firmware version and device type can be found under: **System/Information/Device**

12 Maintenance

The maintenance of the measuring point comprises:

- Calibration
- Cleaning the transmitter, assembly and sensor
- Checking cables and connections.

WARNING

Process pressure and temperature, contamination

Risk of serious or fatal injury

- ▶ If the sensor has to be removed during maintenance work, avoid dangers posed by pressure, temperature and contamination.

NOTICE

Electrostatic discharge (ESD)

Risk of damaging the electronic components

- ▶ Take personal protective measures to avoid ESD, such as discharging beforehand to earth or permanent grounding with a wrist strap.

12.1 Maintenance work

12.1.1 Cleaning the device

- ▶ Clean the front of the housing using commercially available cleaning agents only.

The front is resistant to:

- Ethanol (for a short time)
- Diluted acids (max. 2% HCl)
- Diluted bases (max. 3% NaOH)
- Soap-based household cleaning agents

Cleaning agents not permitted

Damage to the housing surface or housing seal possible!

- ▶ Never use concentrated mineral acids or alkaline solutions for cleaning.
- ▶ Never use organic cleaners such as acetone, benzyl alcohol, methanol, methylene chloride, xylene or concentrated glycerol cleaner.
- ▶ Never use high-pressure steam for cleaning.

13 Repair

13.1 General information

- ▶ Only use spare parts from Endress+Hauser to guarantee the safe and stable functioning of the device.

Detailed information on the spare parts is available at:

www.endress.com/device-viewer

13.2 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

www.endress.com/support/return-material

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered.

To ensure safe, professional and swift product returns, please contact your local Sales Center for information on the procedure to be followed and general conditions.

13.3 Disposal

The device contains electronic components. The product must be disposed of as electronic waste.

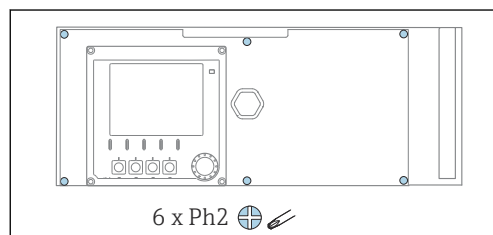
- ▶ Observe the local regulations.

Battery disposal

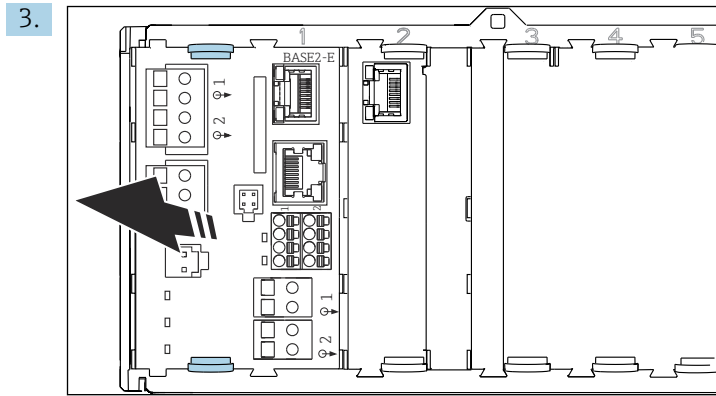
A lithium button cell is located on the backplane of the controller. This must be removed as electronic waste prior to disposal of the device.

1. Disconnect the device from the power supply.

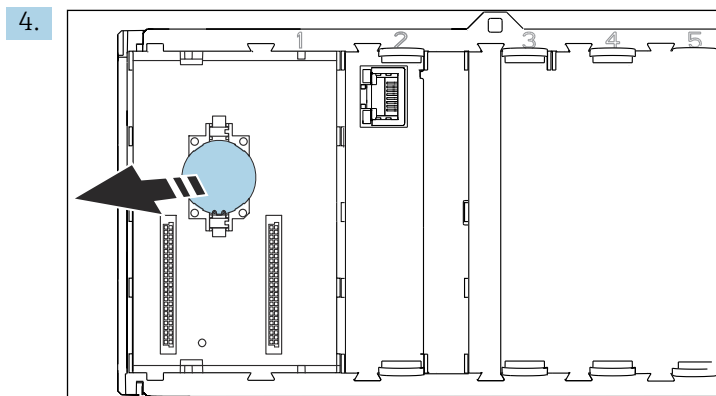
- 2.



Release the six screws on the electronics compartment cover using a Phillips screwdriver and fold out the cover towards the front.



Press together the securing clips of the base module and pull them out of the base module.



Release the lithium button cell from the backplane and dispose of it according to local battery regulations.



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

14 Accessories

The latest list of accessories, all compatible sensors and activation codes is provided on the product page: www.endress.com/CM42B

15 Technical data

15.1 Input

Measured variable

- pH
- ORP
- pH/ORP
- Conductivity
- Dissolved oxygen

Measuring range

→ Documentation of the connected sensor

Type of input

Depending on the ordered variant, the device has one of the following types of input:

- Digital sensor input for Memosens sensors
- Sensor input for analog sensors
 - pH/ORP
 - Conductivity, inductive
 - Conductivity, conductive

Memosens input

Cable specifications

- Memosens data cable or fixed sensor cable, in each case with ferrules
- Cable length max. 100 m (330 ft)

pH/ORP analog input

Cable specifications

Analog pH sensors and analog ORP sensors from Endress+Hauser

- Recommended cable length max. 30 m (98 ft)
- For cable types, see the documentation of the connected sensor

Pfaunder electrodes type 03/04, type 18, type 40, pH Reiner
Cable length max. 10 m

Temperature sensors

- Pt100
- Pt1000

Input impedance

> $10^{12} \Omega$ (at rated operating conditions)

Input leakage current

< 10^{-13} A (at rated operating conditions)

Analog input of conductivity, measured inductively

Cable specifications

- Cable length max. 55 m (180 ft)
- For cable types, see the documentation of the connected sensor

Temperature sensors

- Pt100
- Pt1000

Analog input of conductivity, measured conductively*Cable specifications*

- Cable length max. 15 m (49.2 ft)
- For cable types, see the documentation of the connected sensor

Temperature sensors

- Pt100
- Pt1000

15.2 Output

Output signal

Passive current output

Current output 1

- 4 to 20 mA, optionally with HART support
- Galvanic isolations
 - Against current output 2
 - Depends on the device version against the analog sensor input

Current output 2 (optional)

- 4 to 20 mA
- Galvanic isolations
 - Against current output 1
 - Depends on the device version against the analog sensor input or against the Memosens input

HART	
Signal encoding	FSK ± 0.5 mA above current signal
Data transmission	1200 baud
Galvanic isolation	See current output 1
Load (communication resistor)	250 Ω

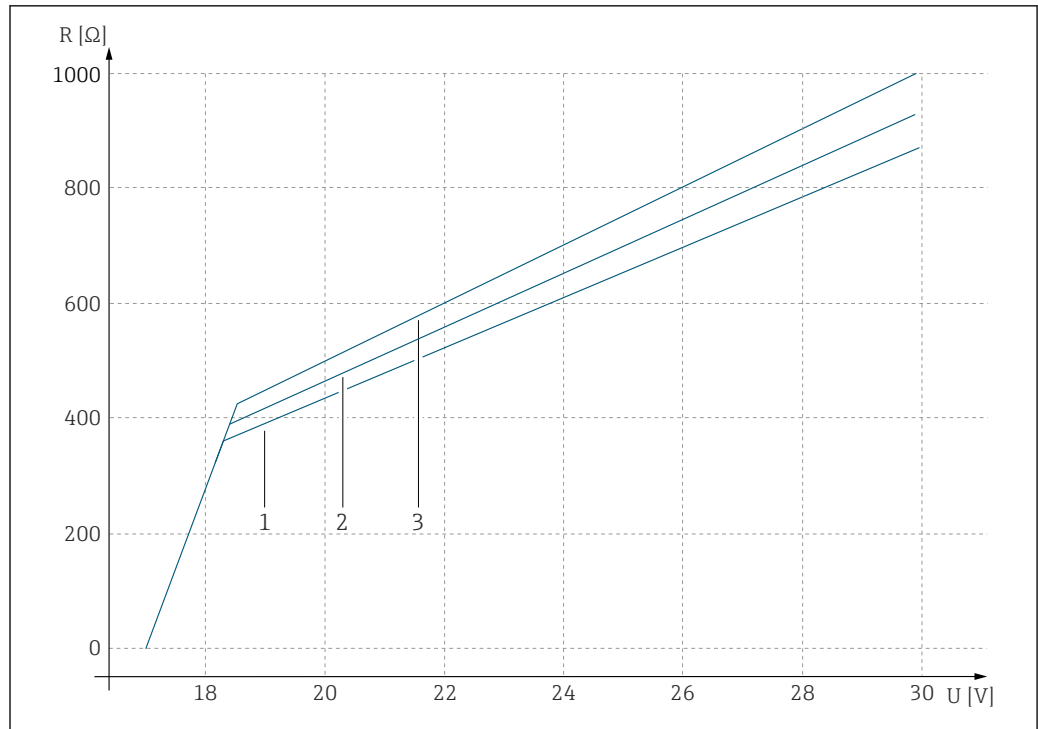
Signal on alarm as per NAMUR NE 43

The following values can be selected:

- < **3.6 mA**
- 21.5 mA
- 22.0 mA
- 22.5 mA
- 23.0 mA

Load

For load, see characteristic curve.



A0055514

- U* Supply voltage [V]
- R* Load [Ω]
- 1 Max. load with configured failure current 23 mA
- 2 Max. load with configured failure current 21.5 mA
- 3 Max. load with configured failure current < 3.6 mA


Output span 3.6 to 23 mA

15.3 Protocol-specific data

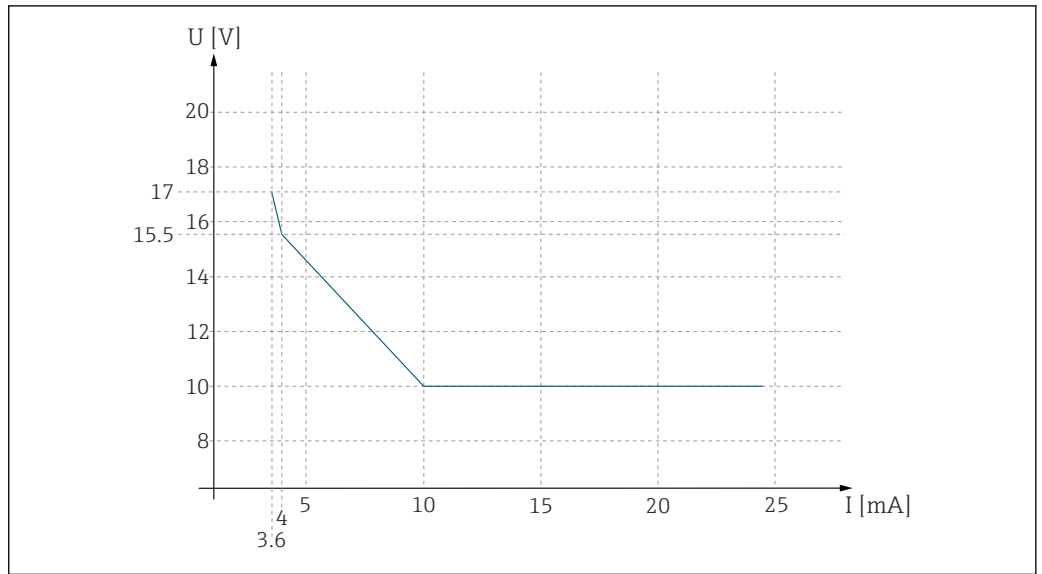
HART	Manufacturer ID	0x0011
	Device type	0x11A4 (pH), 0x11A5 (conductivity), 0x11A6 (oxygen)
	Device revision	1
	Manufacturer name	Endress+Hauser
	Model name	Depends on the measuring principle
	HART version	7.9
	Device description files (DD/DTM)	www.endress.com/hart https://www.fieldcommgroup.org/registered-products Device Integration Manager DIM
	Device variables	PV, SV, TV and QV can be selected from all device variables. All measured values are each available as a device variable.
	Supported features	FDI packages

15.4 Power supply

Supply voltage

 The power supply must comply with the relevant safety requirements and be separated from the mains voltage by double or reinforced insulation. (ELV)

- For supply voltage, see characteristic curve
- Max. supply voltage: 30 V DC



50 Min. supply voltage at the transmitter depending on the output current

U Supply voltage [V DC]
 I Output current [mA]

Cable specification

Qualified cable glands

Cable gland	Clamping area, permitted cable diameter
M20	6 mm to 12 mm (0.24" to 0.47") 5 mm to 9 mm (0.2" to 0.35")
NPT1/2 Via M20 adapter on NPT1/2	6 mm to 12 mm (0.24" to 0.47") 5 mm to 9 mm (0.2" to 0.35")
G1/2 Via M20 adapter on G1/2	7 mm to 12 mm (0.28" to 0.47") 4 mm to 9 mm (0.16" to 0.35")

Cable cross-section

Terminal connector is suitable for strands and ferrules.

Cable cross-section: 0.25 mm² (≈23 AWG) to 2.5 mm² (≈12 AWG)

15.5 Performance characteristics

Response time of current output

t₉₀ = max. 500 ms for an increase from 4 to 20 mA

Memosens measurement error

Thanks to digital data transmission, the measured value supplied by the sensor is passed on exactly at the sensor input. The accuracy depends solely on the connected sensor and the quality of its adjustment.

Tolerance, current outputs

- Tolerance at ambient temperature 20 °C (77 °F):
- At output current 20 mA: ±50 µA
 - At output current 4 mA: ±20 µA

15.6 Environment

Ambient temperature	<p>Non-Ex version -30 to 70 °C (-20 to 160 °F)</p> <p>For Ex versions, please refer to the relevant safety instructions (XA) on the online product pages.</p>
Storage temperature	-40 to +80 °C (-40 to 176 °F)
Relative humidity	10 to 95 %, non-condensing
Degree of protection	<p>IP66/67 as per IEC 60529</p> <p>Housing protection rating NEMA Type 4X as per UL 50E</p>
Electromagnetic compatibility	<p>According to IEC 61326-1</p> <ul style="list-style-type: none"> ■ Interference immunity: Table 2 (industrial environments) ■ Interference emission: Class B (residential environments)
Pollution degree	The product is suitable for pollution degree 3 according to EN 61010-1.

15.7 Mechanical construction

Dimensions See →  12

Weight

Plastic housing
1.5 kg (3.3 lbs)

Stainless steel housing
4 kg (8.8 lbs)

Materials

<p>Plastic housing</p> <p>Housing</p> <p>Housing seals</p>	<p>PC-FR (polycarbonate, flame-retarding)</p> <p>EPDM</p>
<p>Stainless steel housing</p> <p>Housing</p> <p>Housing seals</p>	<p>Stainless steel 1.4408</p> <p>EPDM</p>
<p>Other materials</p> <p>Cable glands</p> <p>Sealing plug</p> <p>Adapter for G or NPT cable glands (plastic housing)</p> <p>Adapter for G or NPT cable glands (stainless steel housing)</p>	<p>PA</p> <p>PA</p> <p>PA</p> <p>Stainless steel 1.4404</p>

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