



Brief Operating Instructions **Liquiline CM42**

Two-wire transmitter for pH/ORP, conductivity or oxygen
Measurement with digital or analog sensors



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

Detailed information on the device can be found in the Operating Instructions and in the other documentation available at:

- www.endress.com/device-viewer
- Smart phone/tablet: Endress+Hauser Operations App



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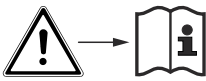
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1 About this document

1.1 Symbols used

	Additional information, tips
	Permitted or recommended
	Not permitted or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of a step

1.2 Symbols on the device

Symbol	Meaning
	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.

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

Liquiline M CM42 is a two-wire transmitter for liquid analysis in all areas of process technology.

The main areas of application are:

- Chemical processes
- Pharmaceutical industry
- Food technology
- Applications in hazardous areas

 The use of the transmitter depends greatly on the sensor that is used. It is essential to adhere to the information concerning designated use in the Operating Instructions for the sensor.

The transmitter is suitable for pollution degree 3 according to IEC/EN 61010-1.

2.2.2 Non-designated use

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

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

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:

- 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.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

- If faults cannot be rectified:
products must be taken out of service and protected against unintentional operation.

2.5 Product safety

2.5.1 State-of-the-art technology

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.

2.5.2 IT security

We 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 Incoming acceptance and product identification

3.1 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.

3.2 Product identification

3.2.1 Nameplate

Nameplates can be found:
on the packaging (adhesive label, portrait format)

The nameplate provides you with the following information on your device:

- Manufacturer identification
 - Order code
 - Extended order code
 - Serial number
 - Firmware version
 - Safety information and warnings
 - Ex marking on hazardous area versions
 - Certificate information
- Compare the information on the nameplate with the order.

3.2.2 Manufacturer address

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

3.3 Scope of delivery

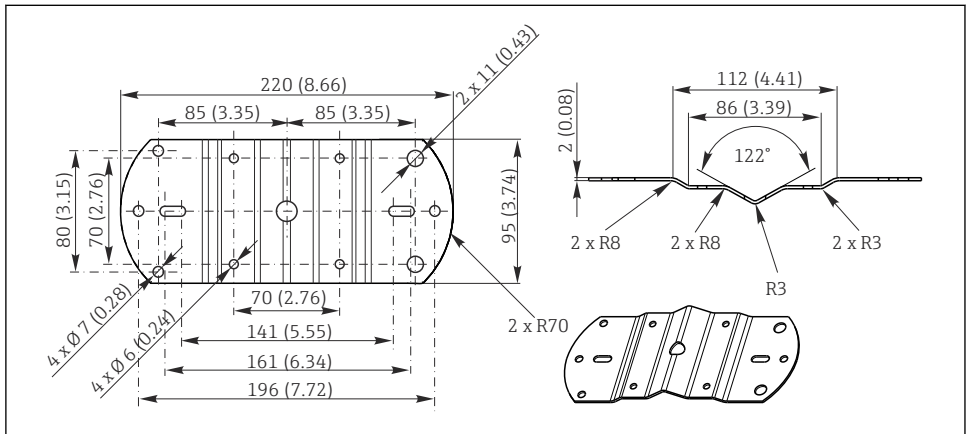
The scope of delivery comprises:

- 1 transmitter in the version ordered
 - 1 mounting plate incl. 4 flat head screws
 - 1 set of adhesive labels (nameplate, terminal connection signs)
 - 1 test certificate according to EN 10204-3.1 (optional)
 - Operating Instructions Part 1 and 2, BA00381C and BA00382C, in the language ordered
 - 1 manufacturer's certificate
- If you have any queries:
Please contact your supplier or local sales center.

4 Installation

4.1 Installation conditions

4.1.1 Mounting plate



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1 Dimensions in mm (inch)

4.1.2 Weather protection cover

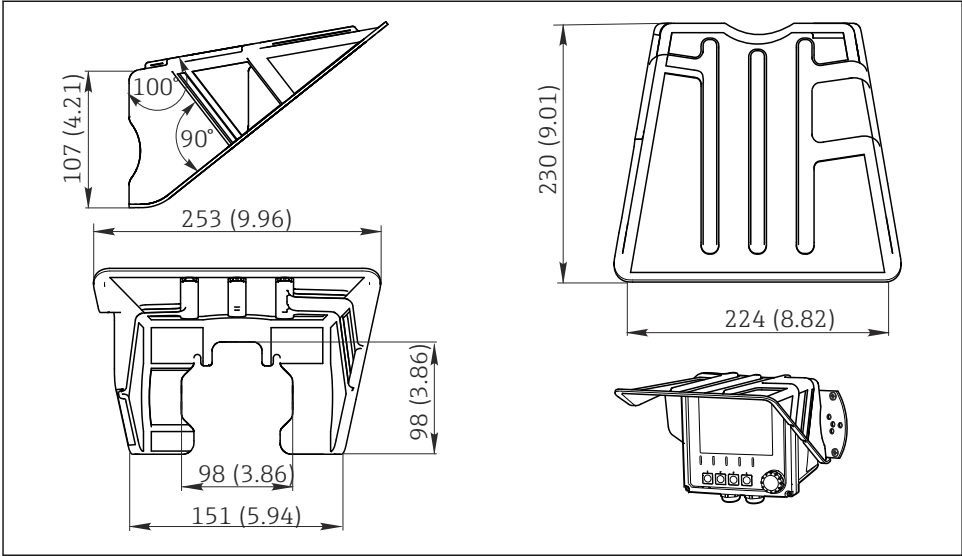
NOTICE

Effect of climatic conditions: rain, snow, direct sunlight

Device damage to total device failure is possible!

- When installing outside, always use the weather protection cover.

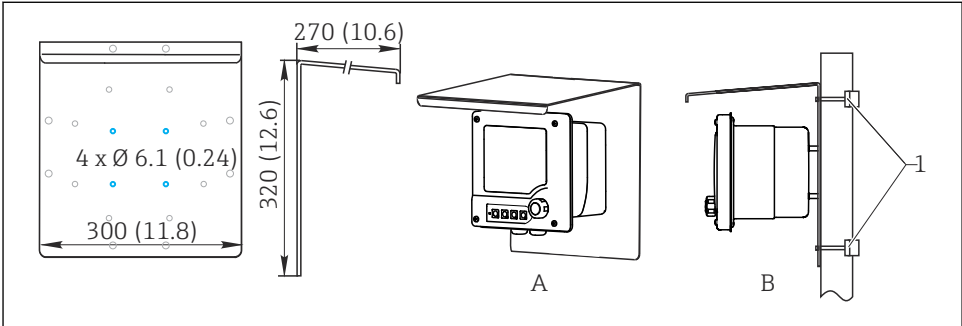
For transmitter with plastic housing



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2 Dimensions in mm (inch)

For transmitter with stainless steel housing



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3 Dimensions in mm (inch)

4.2 Mounting the measuring device

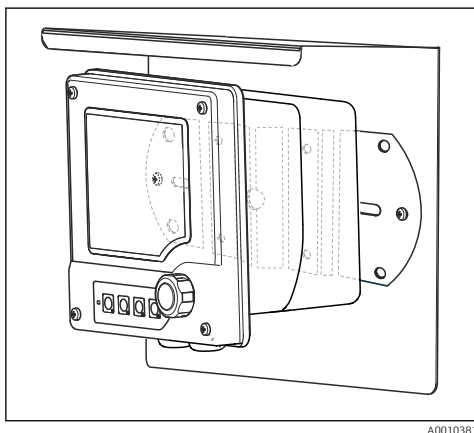
4.2.1 Wall or field mounting

You have the following installation options:

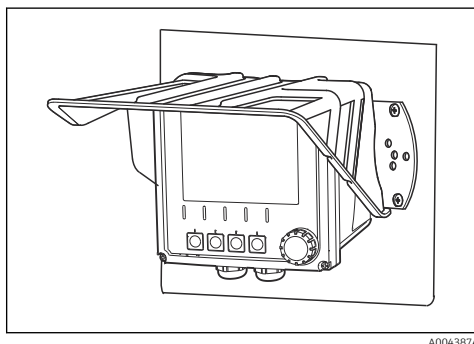
- Wall mounting
- Mounting on a vertical pipe or post (round or square)
- Mounting on a railing or horizontal pipe (round or square)

Diameter of a pipe, post or railing suitable for mounting: 30 to 61 mm (1.18 to 2.40 ").

Wall mounting

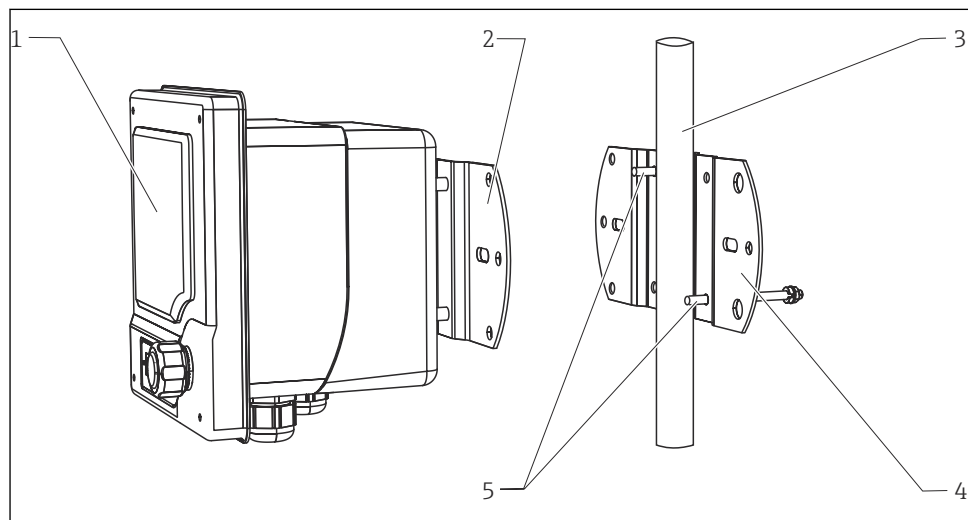


■ 4 *Wall mounting of stainless steel version*



■ 5 *Wall mounting of plastic version*

Mounting on a vertical pipe or post

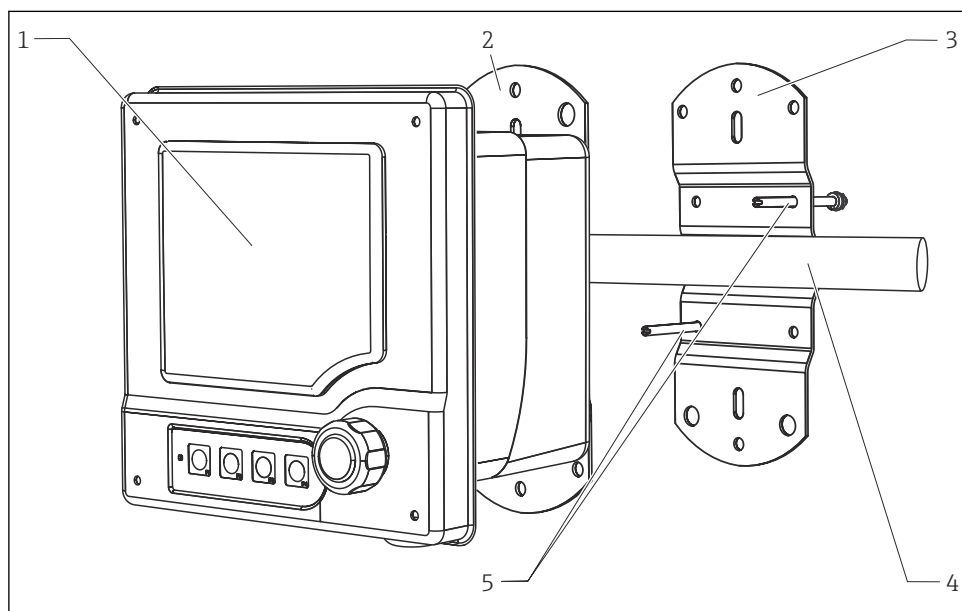


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6 Mounting example

- 1 Transmitter (illustrated in image: plastic version)
- 2 Mounting plate (included in the delivery)
- 3 Pipe or railing (circular/square)
- 4 Mounting plate (post retainer, accessory)
- 5 Threaded bolts with spring washer, washer and nut (included in the delivery of the post retainer)

Mounting on the horizontal pipe or railing



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7 Mounting example

- 1 Transmitter (illustrated in image: stainless steel version)
- 2 Mounting plate (included in the delivery)
- 3 Pipe or railing
- 4 Mounting plate (post retainer, accessory)
- 5 Threaded bolts with spring washer, washer and nut (included in the delivery of the post retainer)

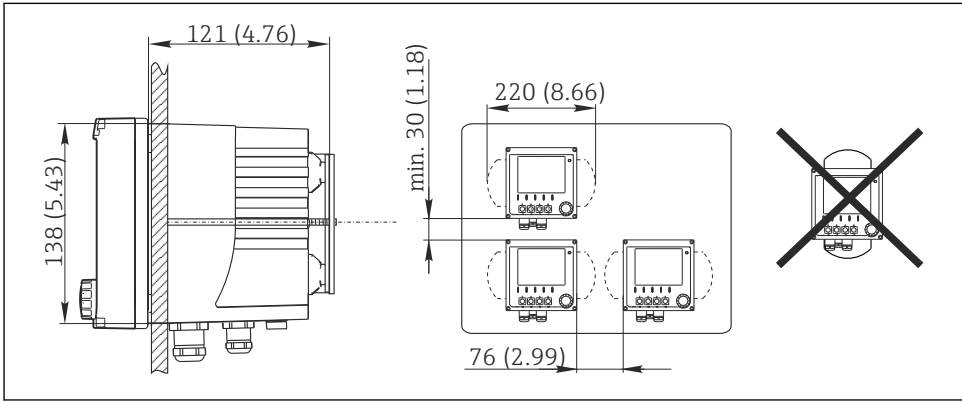
 You require the post retainer to mount the device on a post, pipe or railing. This is an accessory and not included in the scope of delivery.

4.2.2 Panel mounting

For panel mounting, you require the installation kit, consisting of tensioning screws and a front seal. This is an accessory and not included in the scope of delivery.

- If devices are installed **above one another**, you must observe a minimum clearance for the cable glands of the upper device in each case.
- If the devices are installed **beside one another**, you must observe a minimum clearance to be able to open the front of the housing.
- If the devices are arranged **in a square**, you must take the lengths of the mounting plates on the back of the device and the cable glands into consideration for the minimum clearance.

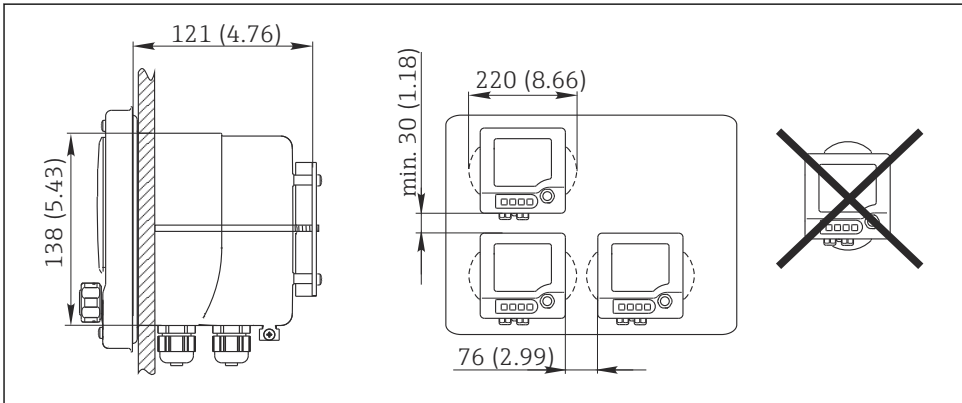
Plastic version



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8 Panel mounting: left side view, right front view, dimensions in mm (in)

Stainless steel version



A0043870

9 Panel mounting: left side view, right front view, dimensions in mm (in)

4.3 Post-installation check

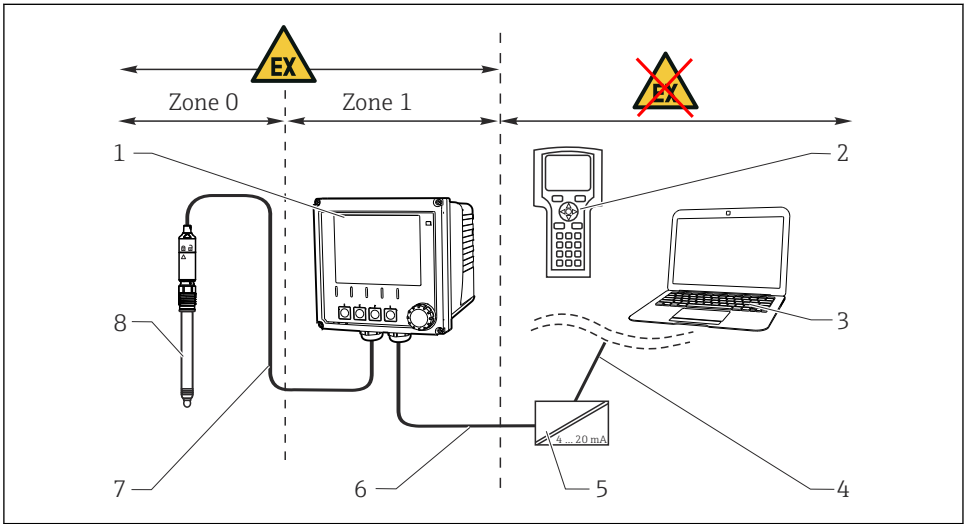
1. After installation, check the transmitter for damage.
2. Check whether the transmitter is protected against precipitation and direct sunlight (e.g. by the weather protection cover).

5 Electrical connection

5.1 Connection conditions

5.1.1 Installation in hazardous areas

CM42-*E/I/J/K

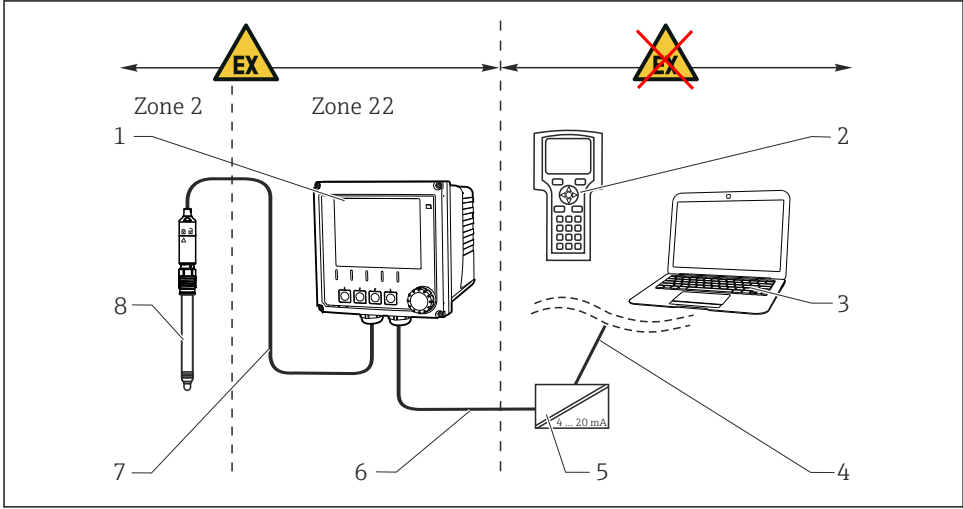


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10 Installation in hazardous area Ex ib (ia Ga)

- | | | | |
|---|---|---|--|
| 1 | Transmitter | 5 | Active barrier, e.g. RN221 |
| 2 | HART handheld terminal | 6 | Supply and signal circuit Ex ib (4 to 20 mA) |
| 3 | FieldCare via PROFIBUS/FOUNDATION Fieldbus | 7 | Intrinsically safe sensor circuit Ex ia |
| 4 | Signal line HART/PROFIBUS/FOUNDATION Fieldbus | 8 | Hazardous area version of sensor |

CM42-*F

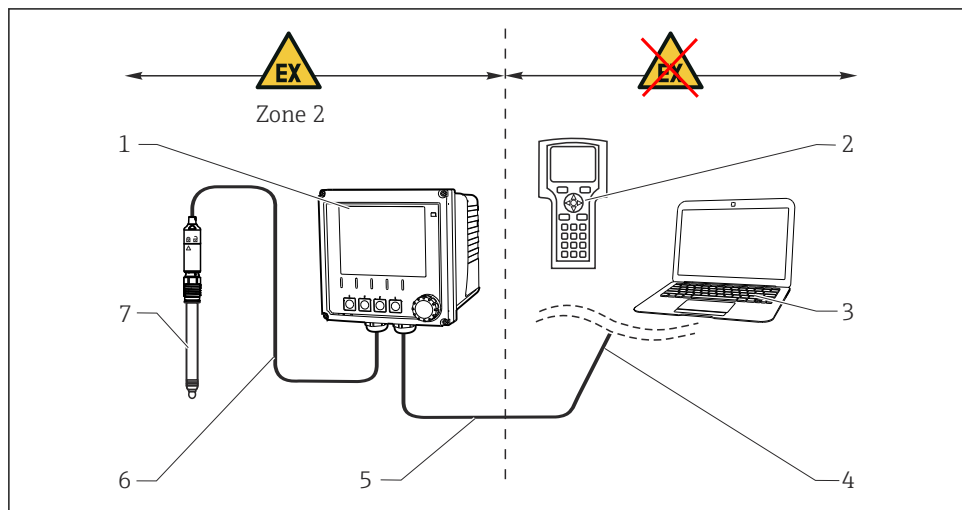


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11 Installation in hazardous area Ex tc (ic)

- | | | | |
|---|---|---|--|
| 1 | Transmitter | 5 | Active barrier, e.g. RN221 |
| 2 | HART handheld terminal | 6 | Supply and signal circuit (4 to 20 mA) |
| 3 | FieldCare via PROFIBUS/FOUNDATION Fieldbus | 7 | Intrinsically safe sensor circuit |
| 4 | Signal line HART/PROFIBUS/FOUNDATION Fieldbus | 8 | Hazardous area version of sensor |

CM42-*V

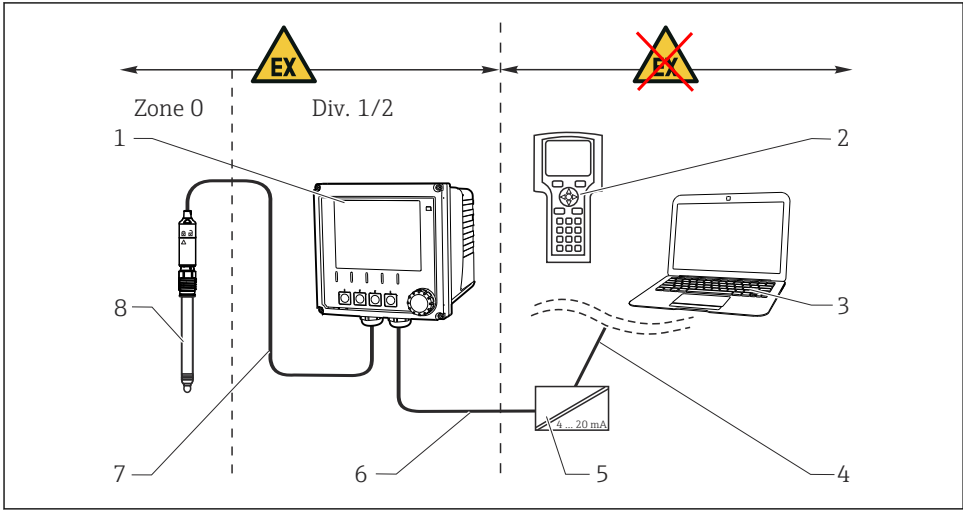


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 12 Installation in hazardous area Ex nA (ic)

- | | | | |
|---|---|---|--|
| 1 | Transmitter | 5 | Supply and signal circuit Ex nA (4 to 20 mA) |
| 2 | HART handheld terminal | 6 | Intrinsically safe sensor circuit Ex ic |
| 3 | FieldCare via PROFIBUS/FOUNDATION Fieldbus | 7 | Hazardous area version of sensor |
| 4 | Signal line HART/PROFIBUS/FOUNDATION Fieldbus | | |

CM42-*P/S

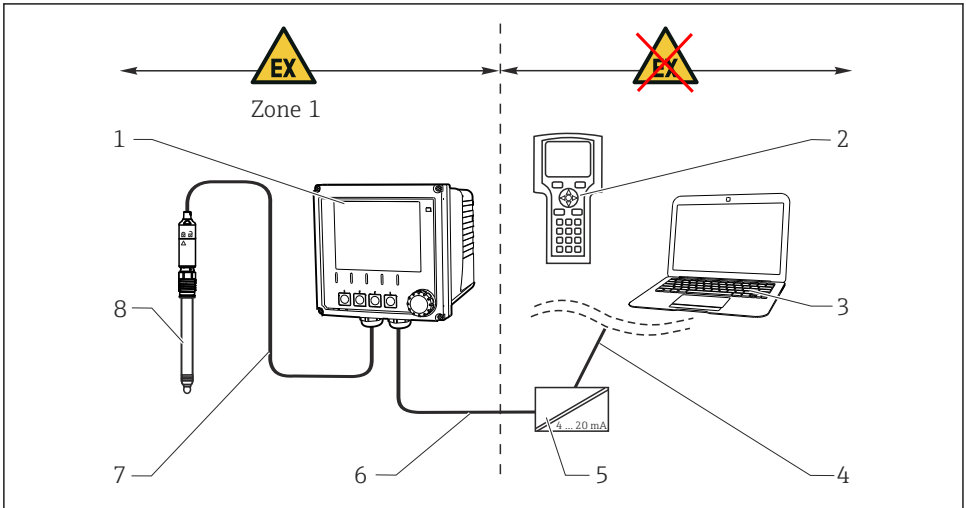


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13 Installation in hazardous area FM/CSA

- | | | | |
|---|---|---|--|
| 1 | Transmitter | 5 | Active barrier, e.g. RN221 |
| 2 | HART handheld terminal | 6 | Supply and signal circuit (4 to 20 mA) |
| 3 | FieldCare via PROFIBUS/FOUNDATION Fieldbus | 7 | Intrinsically safe sensor circuit |
| 4 | Signal line HART/PROFIBUS/FOUNDATION Fieldbus | 8 | Hazardous area version of sensor |

CM42-*U



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 14 Installation in hazardous area JPN

- | | | | |
|---|------------------------|---|--|
| 1 | Transmitter | 5 | Active barrier, e.g. RN221 |
| 2 | HART handheld terminal | 6 | Supply and signal circuit (4 to 20 mA) |
| 3 | FieldCare | 7 | Intrinsically safe sensor circuit |
| 4 | HART signal line | 8 | Hazardous area version of sensor |

5.1.2 Opening the housing

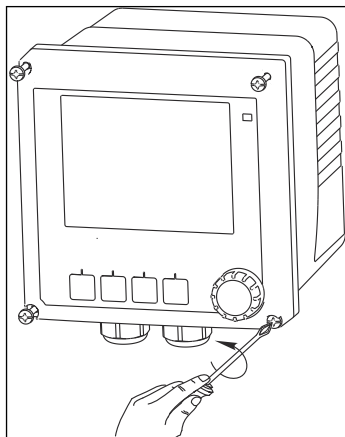
NOTICE

Pointed or sharp tools

Damage to the housing seal, scratches on the housing or similar!

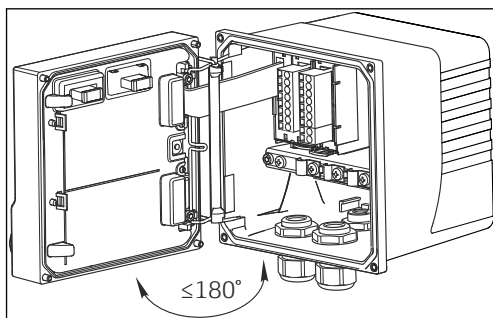
- Do not use any sharp or pointed tools, such as a screwdriver or knife, to open the housing.

1.



Loosen the 4 screws on the front with a Phillips head screwdriver.

2.



Open the housing.

Grounding the housing

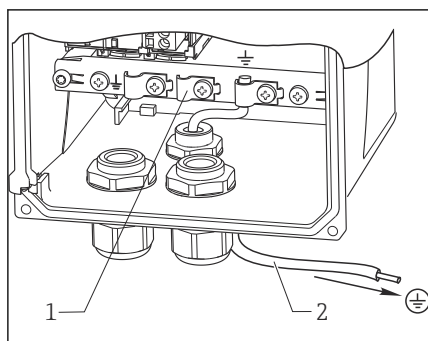
Plastic housing



Electrical voltage at non-grounded cable mounting rail

No shock protection is provided!

- Connect the cable mounting rail to the foundation ground using a separate $\geq 2.5 \text{ mm}^2$ (≈ 14 AWG) functional ground.



- 1 Cable mounting rail
2 $\geq 2.5 \text{ mm}^2$ (14 AWG) functional ground

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15 Grounding the housing

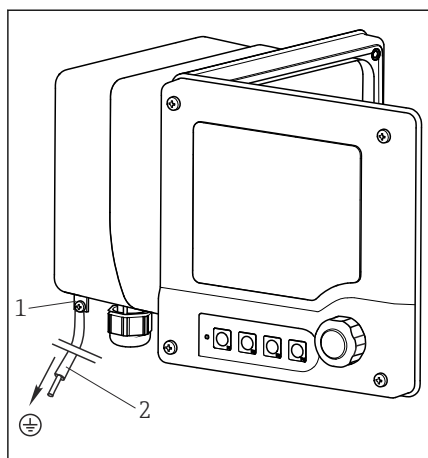
Stainless steel housing

⚠ WARNING

Electrical voltage at non-grounded housing

No shock protection is provided!

- ▶ Connect the external ground connection on the housing to the foundation ground using a separate cable (GN/YE) ($\geq 2.5 \text{ mm}^2$, $\approx 14 \text{ AWG}$).



- 1 External ground connection
2 $\geq 2.5 \text{ mm}^2$ ($\approx 14 \text{ AWG}$) cable (GN/YE)

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16 Grounding the housing

5.2 Connecting the measuring device

⚠ WARNING

Device is live!

Incorrect connection may result in injury or death!

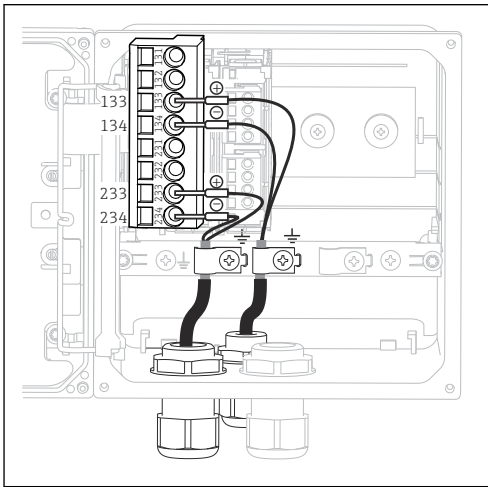
- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present on any cable.

5.3 Power supply and signal circuit

5.3.1 4 to 20 mA

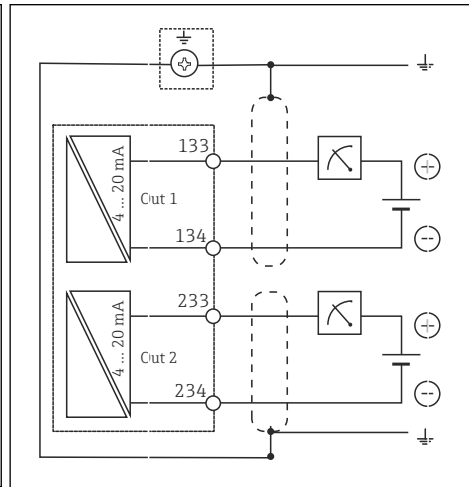
- ▶ Connect the transmitter with a shielded two-wire cable.
 - ↳ The type of shield connection depends on the anticipated interference influence. To suppress electrical fields, it suffices to ground the shield on one side. If you also want to suppress interference from an alternating magnetic field, you must ground the shield on both sides.

i The second current output is optionally available (Product Configurator on www.endress.com/cm42).



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17 In-device view (CPU module)



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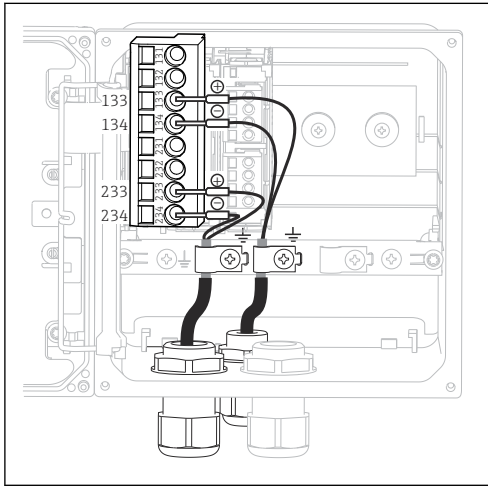
18 Wiring diagram

The figures show the version with the shield grounded at both sides to suppress interference from an alternating magnetic field.

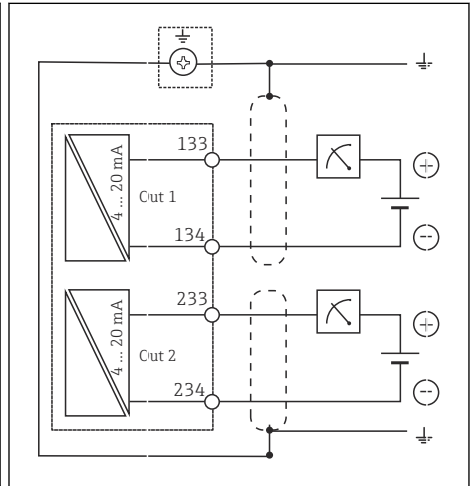
5.3.2 4 to 20 mA / HART

You must use a two-wire cable grounded on both sides to ensure secure communication via the HART protocol and to comply with NAMUR NE 21 specifications.

- Connect the transmitter with a two-wire cable grounded at both sides.



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19 In-device view (CPU module)

20 Wiring diagram



Power is only supplied to the device via current output 1, not via current output 2.

5.3.3 PROFIBUS PA and FOUNDATION Fieldbus

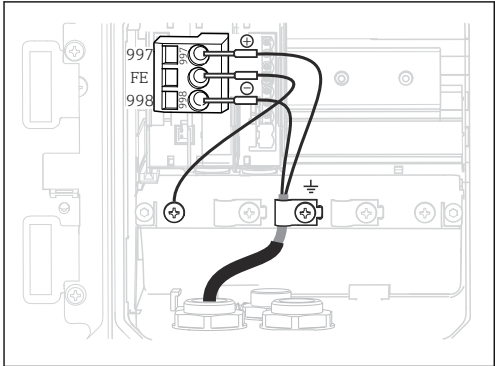
Use a fieldbus cable grounded on both sides (device **and** PCS).

There are various ways to establish the connection:

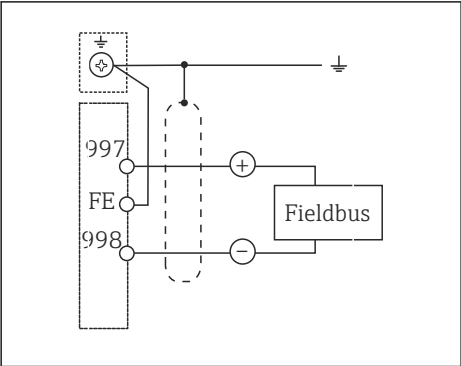
1. Two-wire cable grounded on both sides, "hard grounding" (generally to be preferred over "capacitive ground connection")
2. If there is a risk of large potential equalization currents:
Shielded two-wire cable, "Capacitive ground connection" (shield grounded at the device via capacitor, "C-module" accessory required)
Not for use in the hazardous area!
3. Using the fieldbus connection socket (accessories)

"Hard grounding"

1. Connect the cable shield to the cable mounting rail.
2. Connect the cable cores according to the assignment.



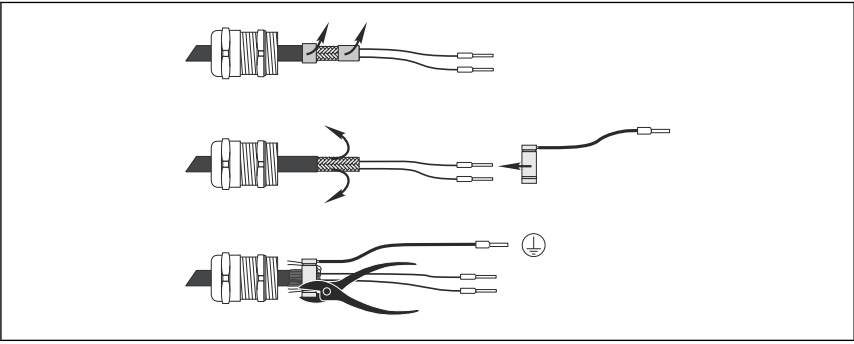
21 In-device view (CPU module)



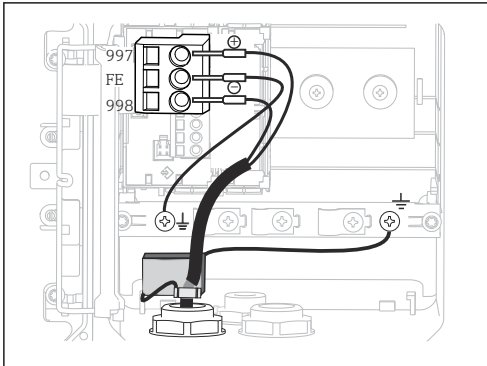
22 Wiring diagram

"Capacitive ground connection" with the C-module

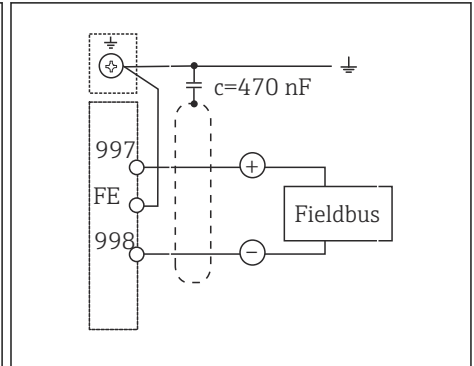
1. Pull back the braided shield, put the stranded extension wire of the C-module (item 1) onto the exposed shield and tighten the clip:



2. Connect the stranded extension wire to the cable mounting rail.
3. Connect the cable cores according to the assignment.



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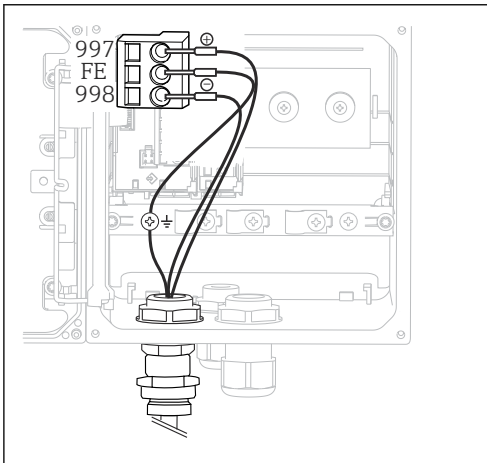
A0027323

23 In-device view (CPU module)

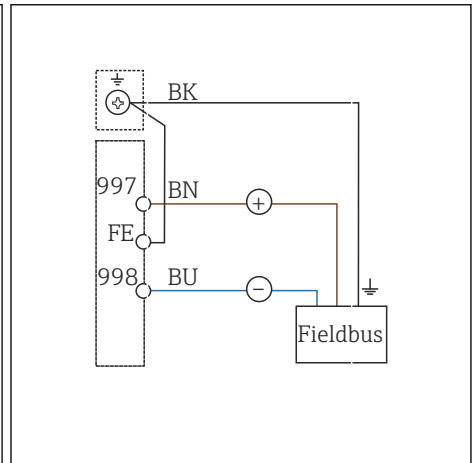
24 Wiring diagram

"Fieldbus connection socket"

1. Screw the fieldbus connection socket into the corresponding housing gland.
2. Shorten the socket connection wires to approx. 15 cm.
3. Connect the cable cores according to the assignment. In doing so, you must connect the cable shield (GN/YE) to the cable mounting rail.



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25 In-device view (CPU module)

26 Wiring diagram

5.4 Sensor connection

NOTICE

No shield against electrical and magnetic interference

Interference can lead to incorrect measurement results!

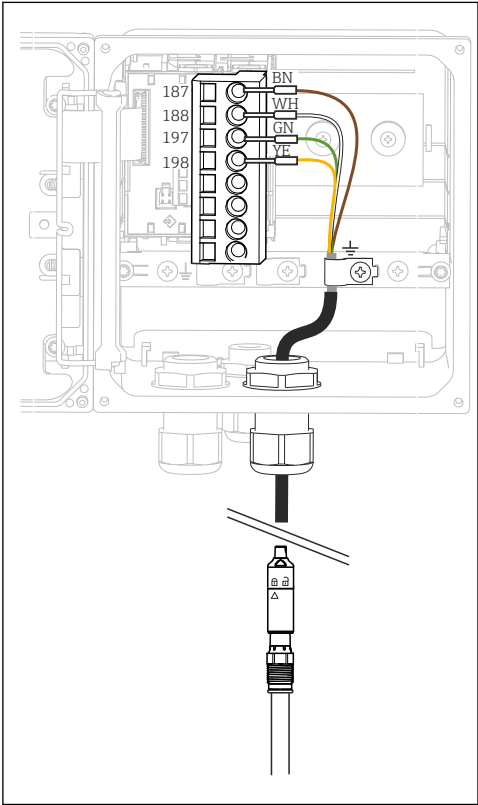
- ▶ Connect shielded connections or terminals to the functional ground ($\perp$) (there is no protective ground on the plastic housing ($\oplus$)).
- ▶ Keep magnetic interference away from the sensor, as inductive conductivity sensors use magnetic fields.

Explanation of abbreviations used in the following graphics:

Abbreviation	Meaning
pH	pH signal
Ref	Signal from reference electrode
Src	Source
Drn	Drain
PM	Potential matching
U ₊	Power supply of digital sensor
U ₋	
Com A	Communication signals of digital sensor
Com B	
Θ	Signal of temperature sensor
d.n.c.	do not connect

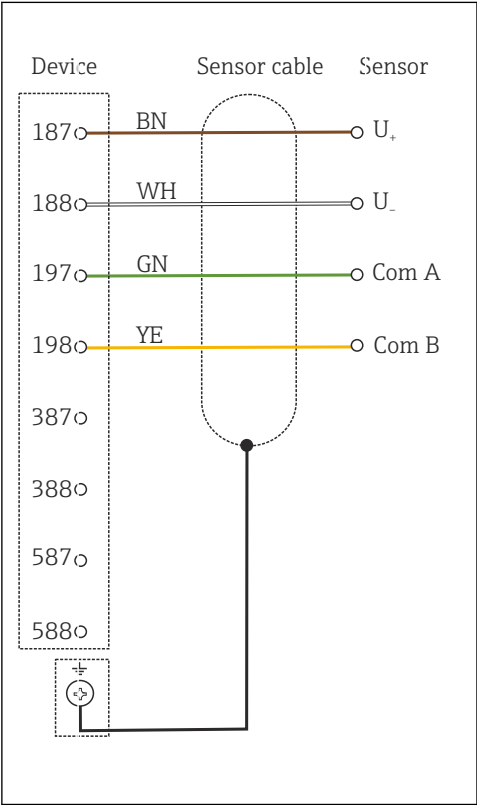
5.4.1 Memosens sensors

Connection via Memosens cable CYK10



A0027328

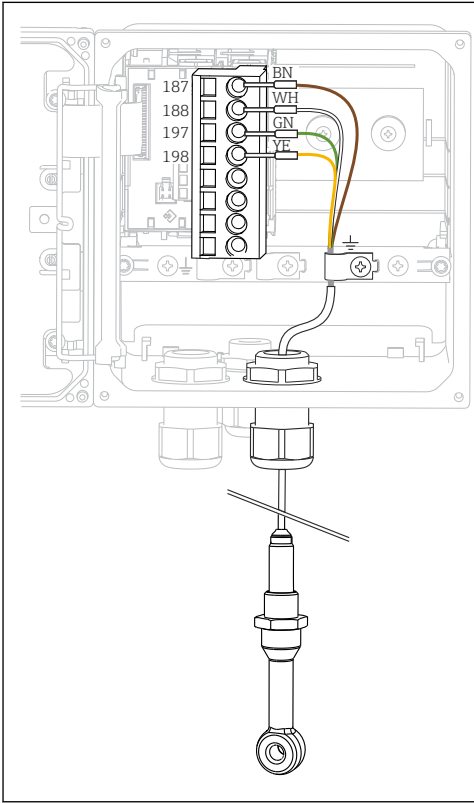
27 In-device view (sensor module)



A0027329

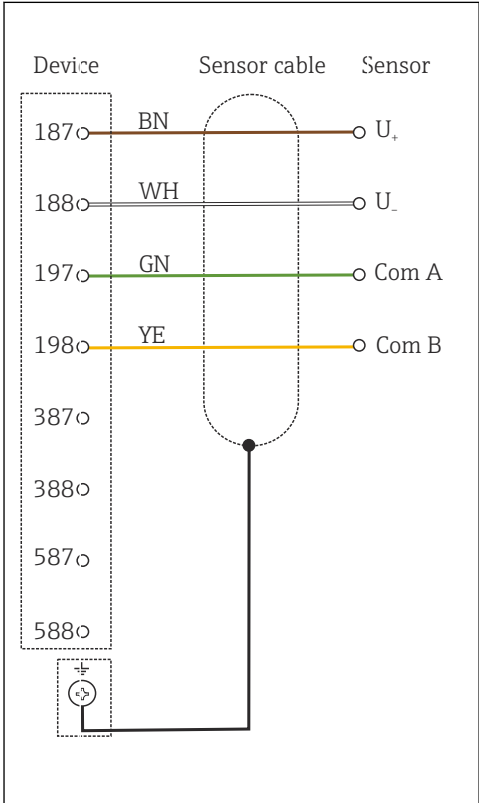
28 Wiring diagram

Connection via sensor fixed cable



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29 In-device view (sensor module)



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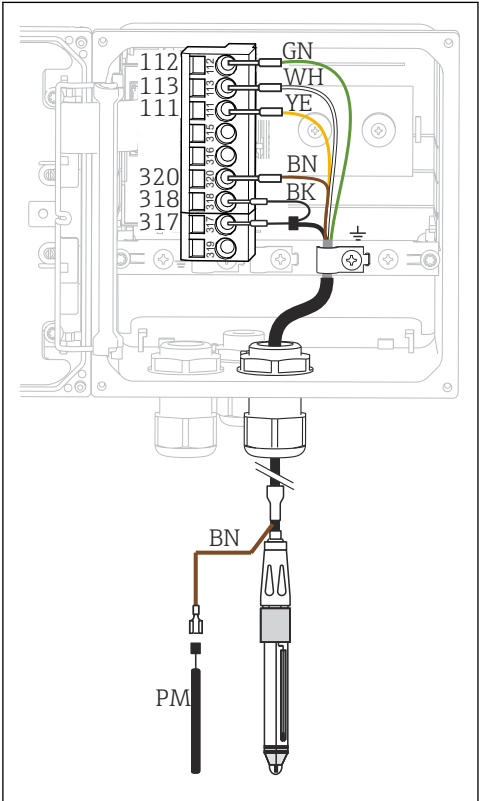
30 Wiring diagram

CLS50D: from serial numbers J3xxxx05LI0

CLS54D: from serial numbers H9xxxx05LI1

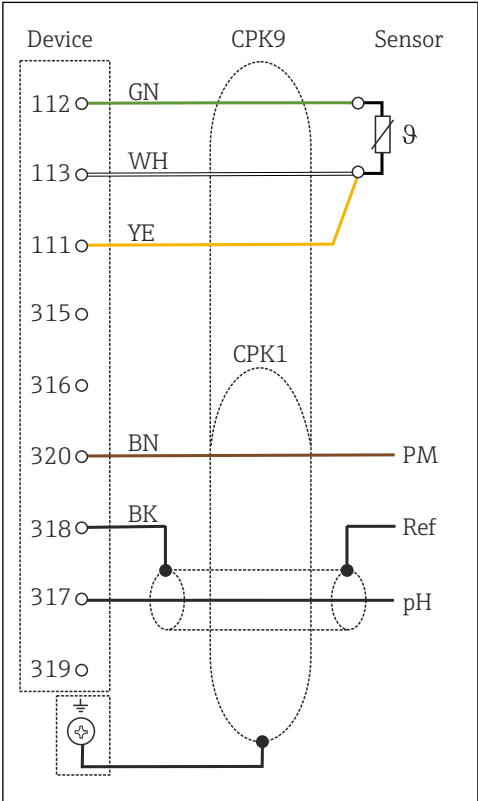
5.4.2 Analog pH/ORP sensors

Glass electrodes, with PML (symmetrical)



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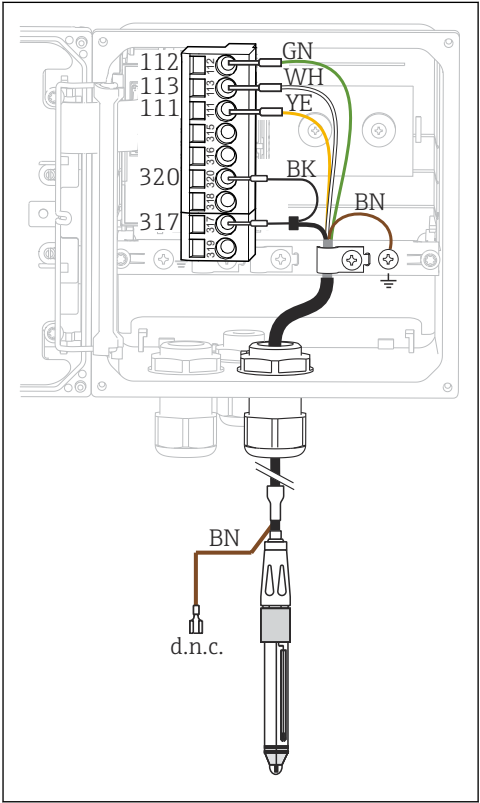
31 In-device view (sensor module)



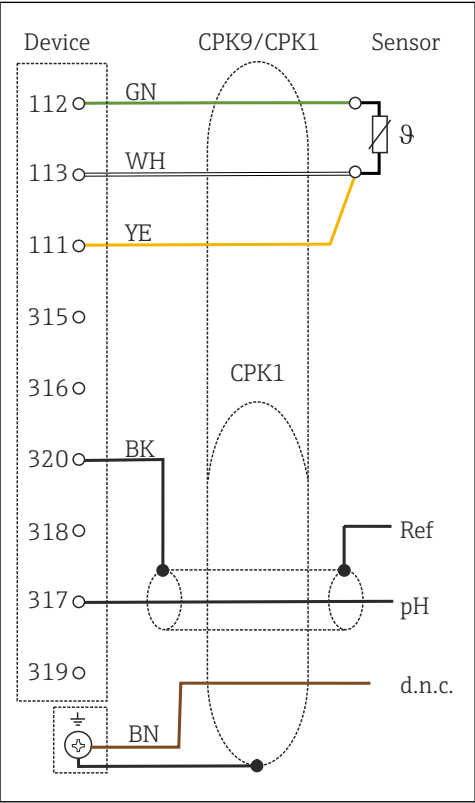
A0046123

32 Wiring diagram

Glass electrodes, without PML (asymmetrical)



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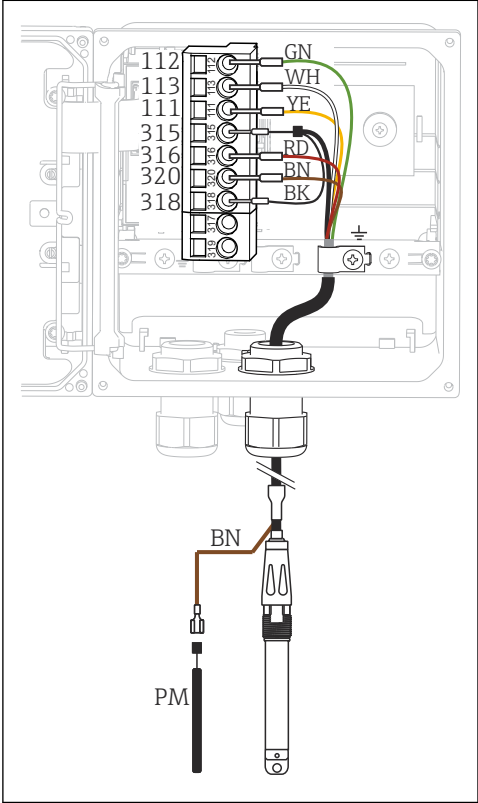


A0046124

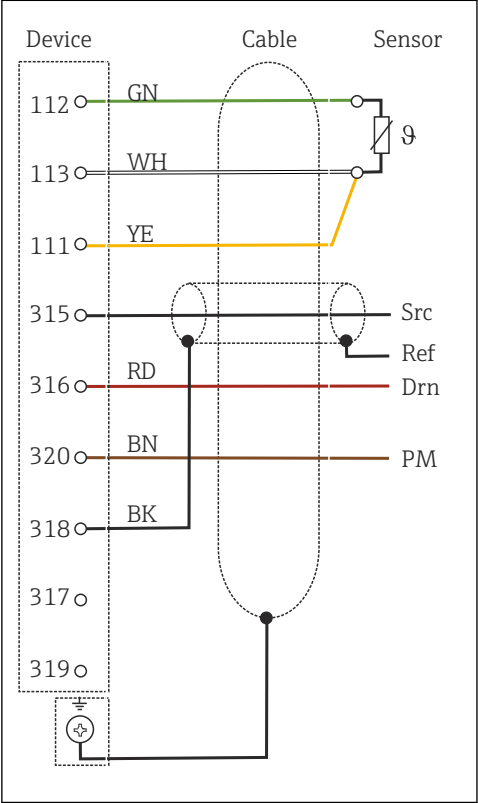
33 In-device view (sensor module)

34 Wiring diagram

ISFET sensors, with PML (symmetrical)



A0027340

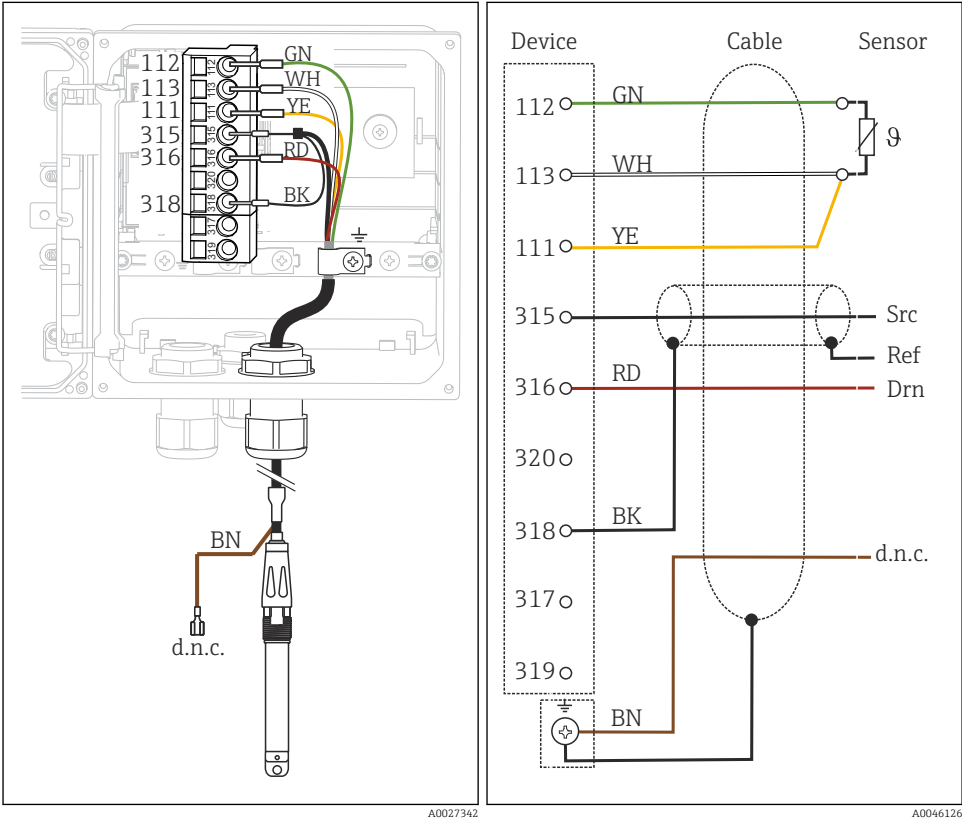


A0046125

35 In-device view (sensor module)

36 Wiring diagram

ISFET sensors, without PML (asymmetrical)



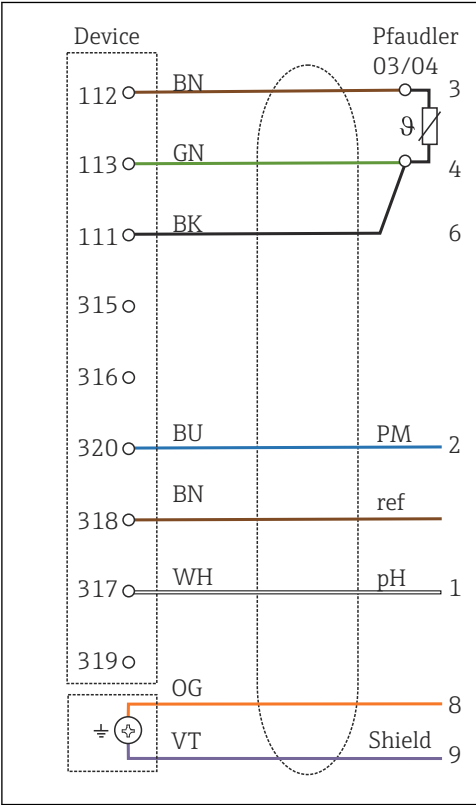
37 In-device view (sensor module)

38 Wiring diagram

pH enamel electrodes

With PML (symmetrical)

Pfaußler electrode, absolute
Type 03 / type 04

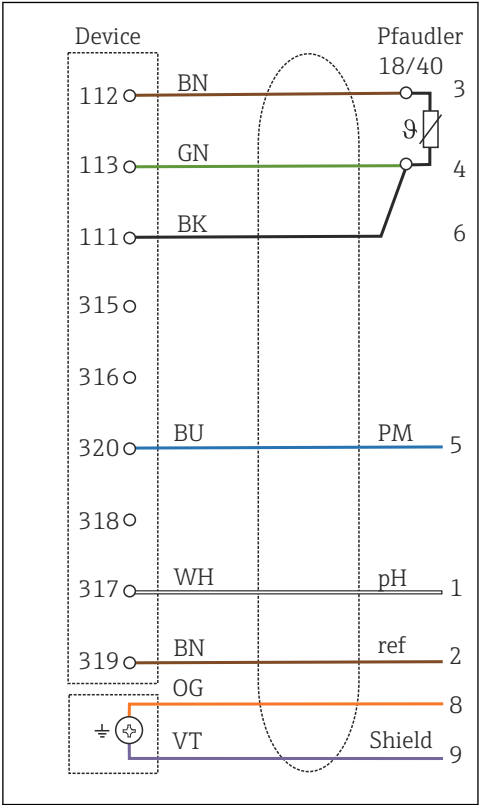


A0027344

39 Wiring diagram

With PML (symmetrical)

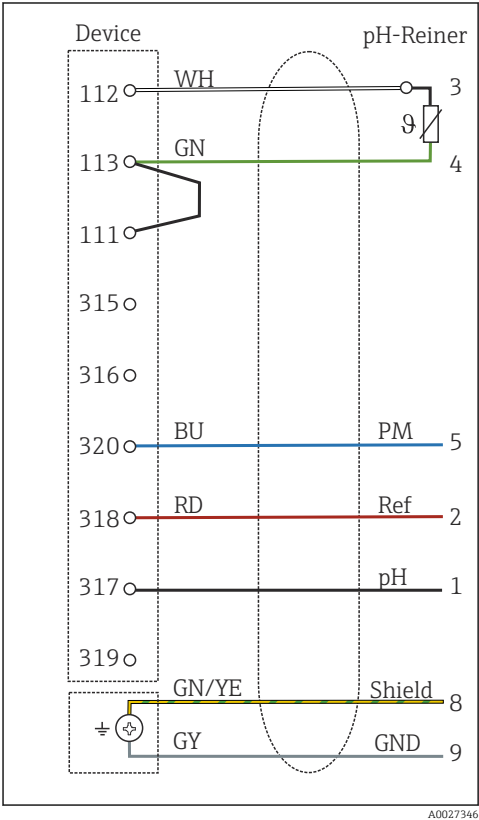
Pfaußler electrode, relative
Type 18 / type 40



A0027345

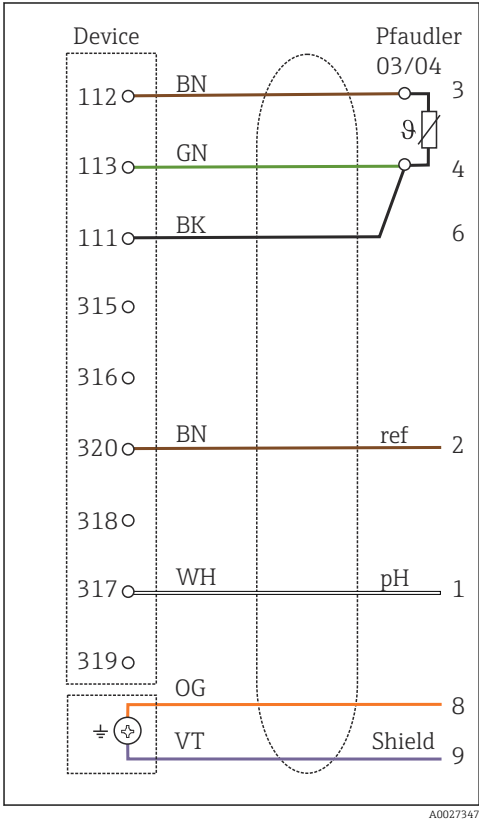
40 Wiring diagram

With PML (symmetrical)
pH-Reiner



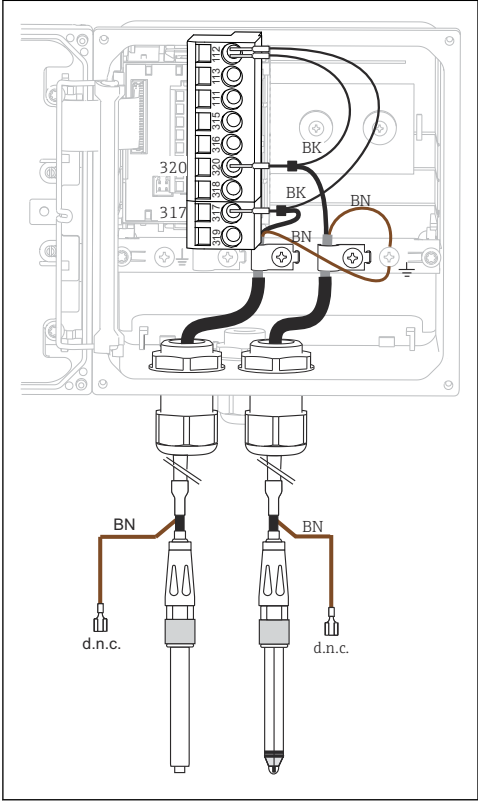
41 Wiring diagram

Without PML (asymmetrical)
Pfaudler electrode, absolute
Type 03 / type 04

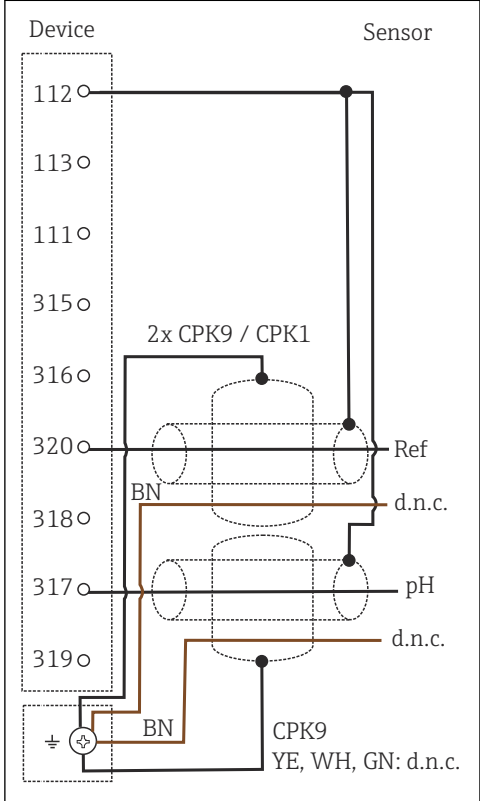


42 Wiring diagram

Single electrodes (e.g. CPS64 glass or antimony), without PML (asymmetrical)

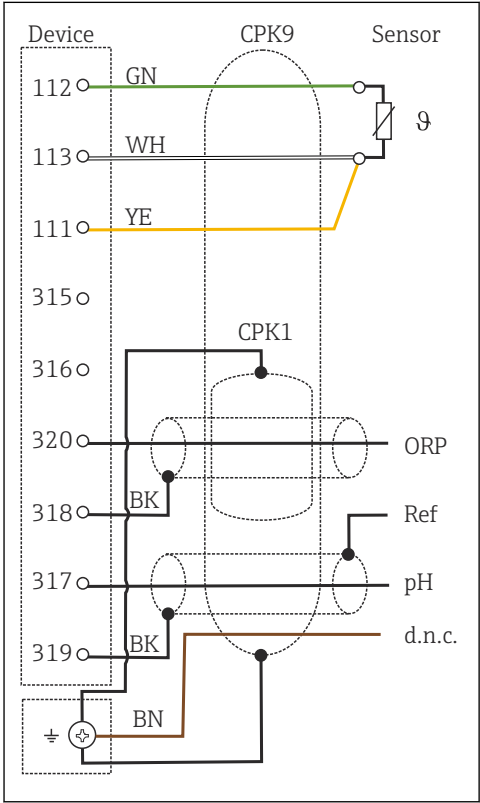


43 In-device view (sensor module)



44 Wiring diagram

Glass electrode and ORP sensor for rH measurement



A0046128

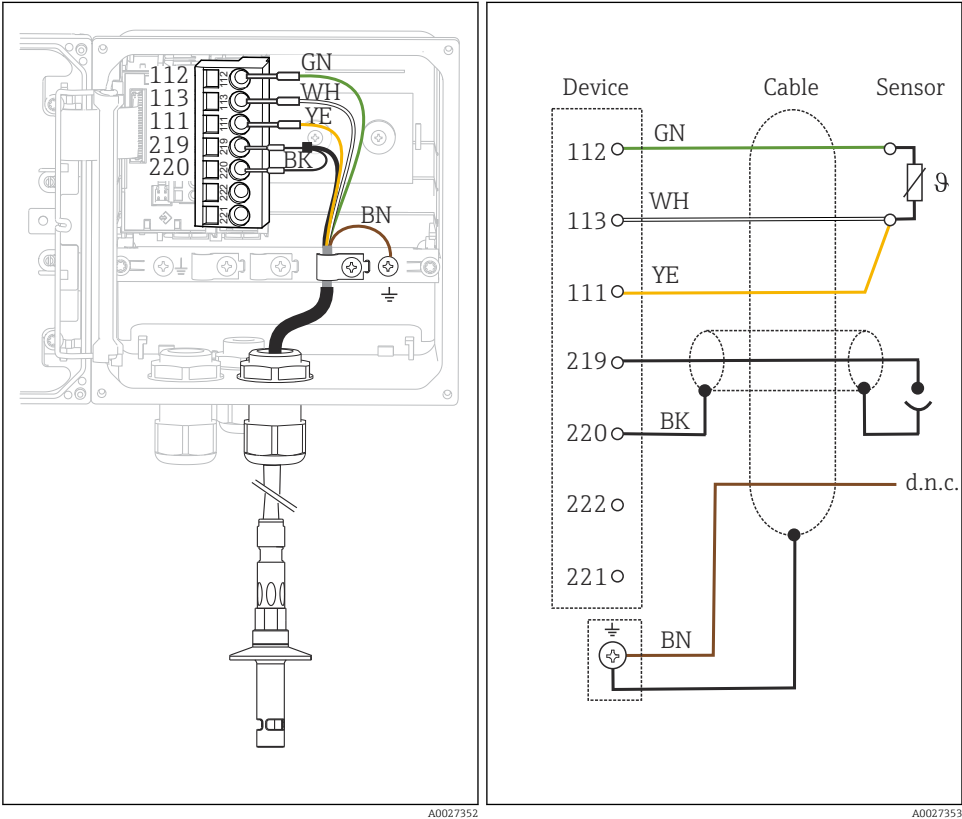


For rH measurement, connect a pH sensor (e.g. CPS11 with CPK9 sensor cable) **and** an ORP sensor (e.g. CPS12 with CPK1 sensor cable).

45 Wiring diagram

5.4.3 **Analog conductivity sensors**

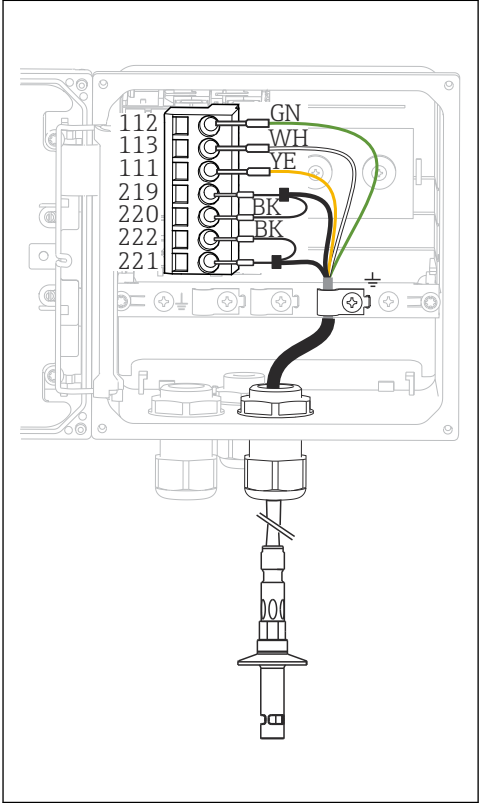
Sensors with conductive measurement of conductivity, two-electrode sensors



46 *In-device view (sensor module)*

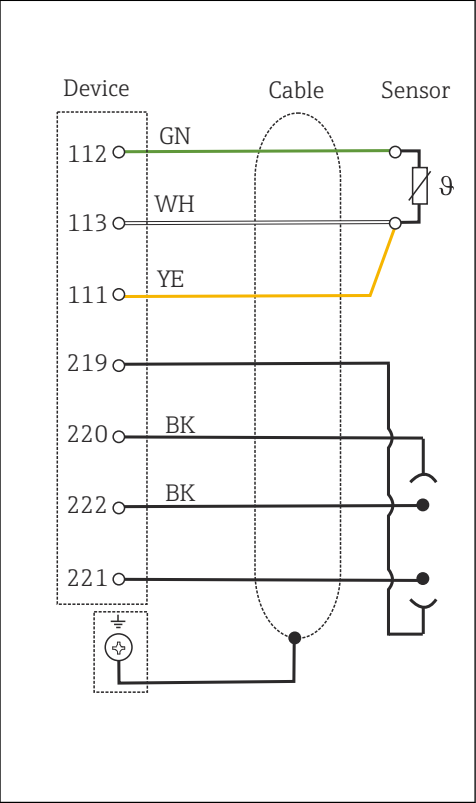
47 *Wiring diagram*

Sensors with conductive measurement of conductivity, four-electrode sensors



A0027354

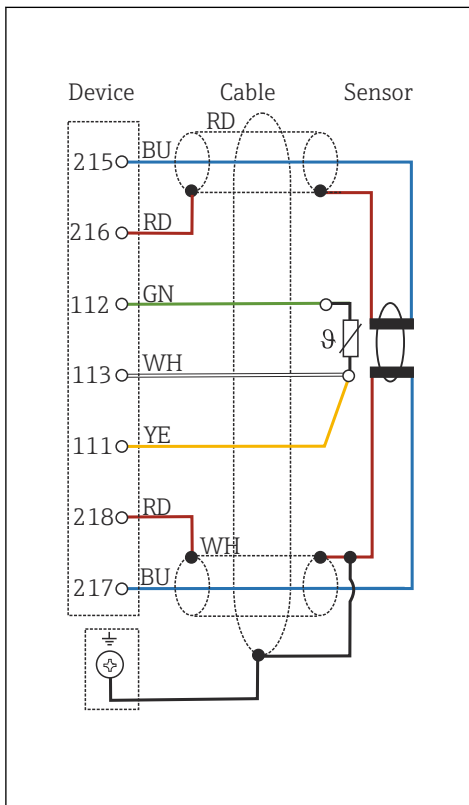
48 In-device view (sensor module)



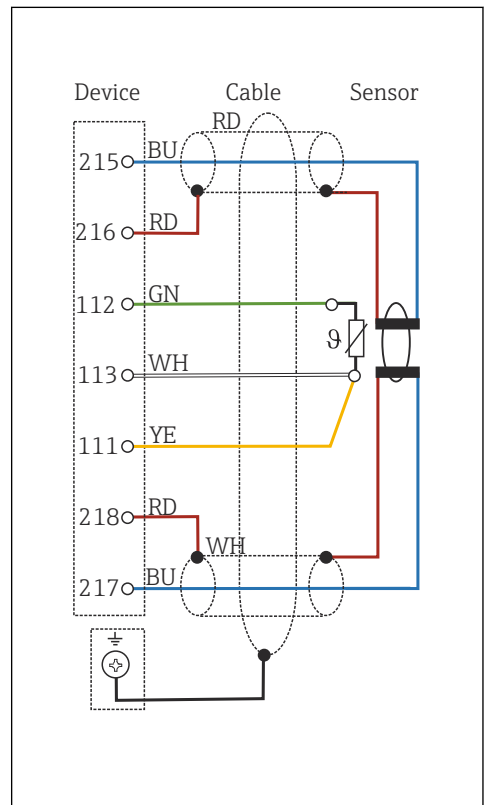
A0027355

49 Wiring diagram

Sensors with inductive measurement of conductivity



50 Wiring diagram CLS50



51 Wiring diagram CLS54

5.5 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 use, may be carried out 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, Ex protection) can no longer be guaranteed if, for example :

- Covers are left off
- Different power units to the ones supplied are used
- Cable glands are not sufficiently tightened (must be tightened with 2 Nm (1.5 lbf ft) for the permitted level of IP protection)
- Unsuitable cable diameters are used for the cable glands
- Modules are not fully secured

- The display is not fully secured (risk of moisture entering due to inadequate sealing)
- Loose or insufficiently tightened cables/cable ends
- Conductive cable strands are left in the device

5.6 Post-connection check

WARNING

Connection errors

The safety of people and of the measuring point is at risk! 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.

Device condition and specifications

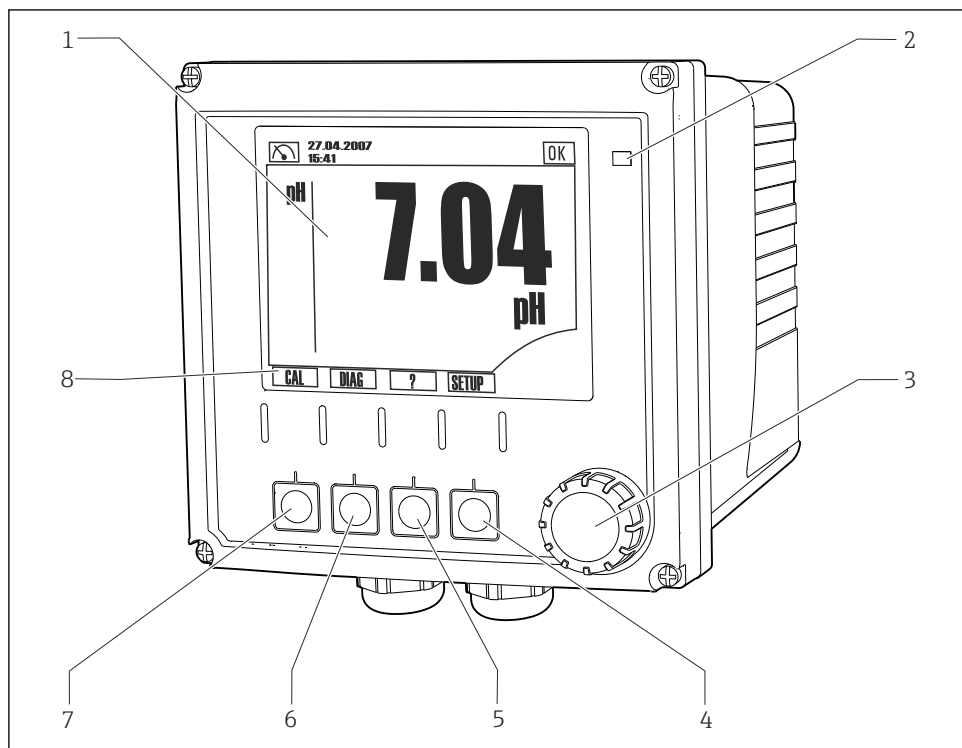
- ▶ Are the device and all the cables free from damage on the outside?

Electrical connection

- ▶ Are the mounted cables strain relieved?
- ▶ Are the cables routed without loops and cross-overs?
- ▶ Are the signal cables correctly connected as per the wiring diagram?
- ▶ Are all plug-in terminals securely engaged?
- ▶ Are all the connection wires securely positioned in the cable terminals?

6 Operation options

6.1 Display and operating elements

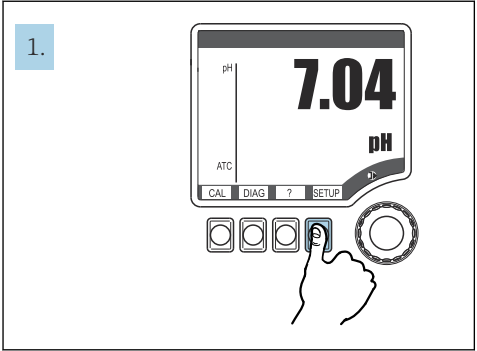


A0032528

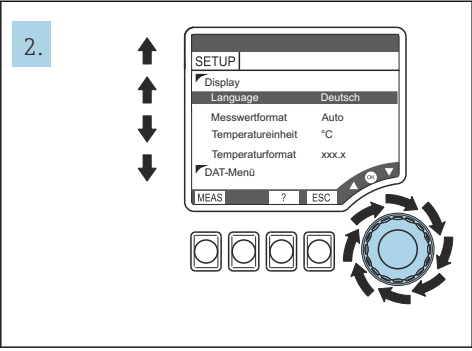
52 Overview of operation

- 1 Display, current display: pH measuring mode
- 2 Alarm LED
- 3 Navigator
- 4-7 Soft keys
- 8 Displays the soft key function (menu-dependent)

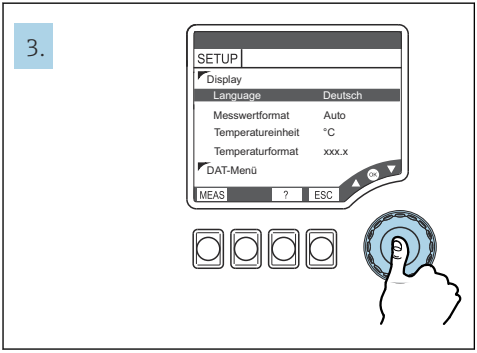
6.2 Access to the operating menu via the local display



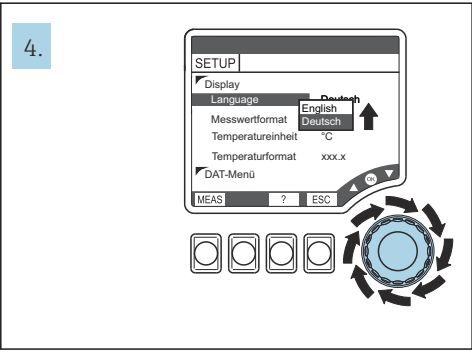
53 Press the soft key: select the menu directly



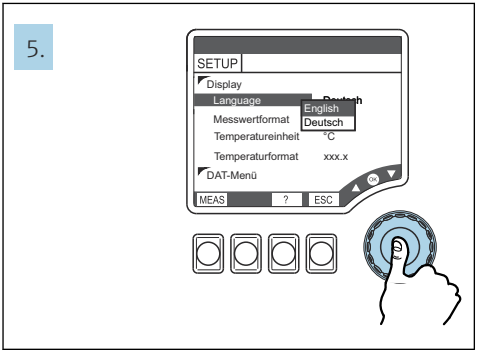
54 Turn the navigator: move the cursor



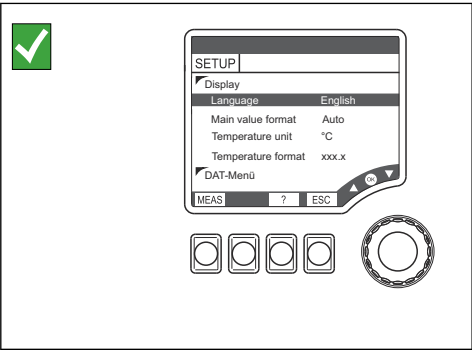
55 Press the navigator: select the values



56 Turn the navigator: change the value



57 Press the navigator: accept a new value



58 Result: setting is changed

6.3 Access to the operating menu via the operating tool

6.3.1 HART Communicator

If a Liquiline-DD (Device Description) is installed on your Communicator, you can make all the parameter settings via the Communicator. Only limited parameterization or operation is possible with a (pre-installed) universal DD.



For information on the operation of the handheld terminal, please refer to the Operating Instructions supplied with this device.

Where to find Liquiline HART-DDs

1. <https://www.endress.com/download>
2. Select "device driver" from the list.
3. Enter the CM42 product code in the text search field and run a search.
 - ↳ The device drivers that are available are displayed.

You can use additional filters to narrow down your search and reduce the number of hits. Select the appropriate filters for your purpose from the drop-down lists.

6.3.2 FieldCare

The fieldbus communication system will only function properly if correctly configured. You can obtain special configuration and operating programs from various manufacturers for the configuration. These can be used for configuring both the fieldbus functions and all of the device-specific parameters. The predefined function blocks allow uniform access to all the network and fieldbus device data.

Process control systems	Asset management systems
Endress+Hauser ControlCare	■ FieldCare ■ FieldXPert ■ National Configurator System ■ AMS ■ Handheld terminal ■ FieldMate
Emerson DeltaV	
Yokogawa Centum CS3000, VP, STARDOM	
Honeywell PKS Experion	
Invensys I/A Series	

"FieldCare" is a service and communication software for universal use that is based on FDT/DTM technology.¹⁾

The DTMs available for the device also allow operation via the software of other vendors that support FDT/DTM technology.



For more detailed information, see the Installation Instructions supplied with the software.

1) FDT = Field Device Tool, DTM = Device Type Manager

Downloading DTM files

1. <https://www.endress.com/download>
2. Select "device driver" from the list.
3. Select "Device Type Manager (DTM)" as the type and then set the product root as an additional filter criterion.
 - ↳ The DTMs that are available are displayed.

7 Commissioning

7.1 Function check

WARNING

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.

7.2 Basic setup

1. Establishing the supply voltage.
2. Wait for initialization to be finished.
3. If you do not want to work with the default language:
Navigate to: **SETUP/Quick setup**.
4. Set the desired language.
5. Configure basic settings to adapt your device to the local conditions of the measuring point.



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