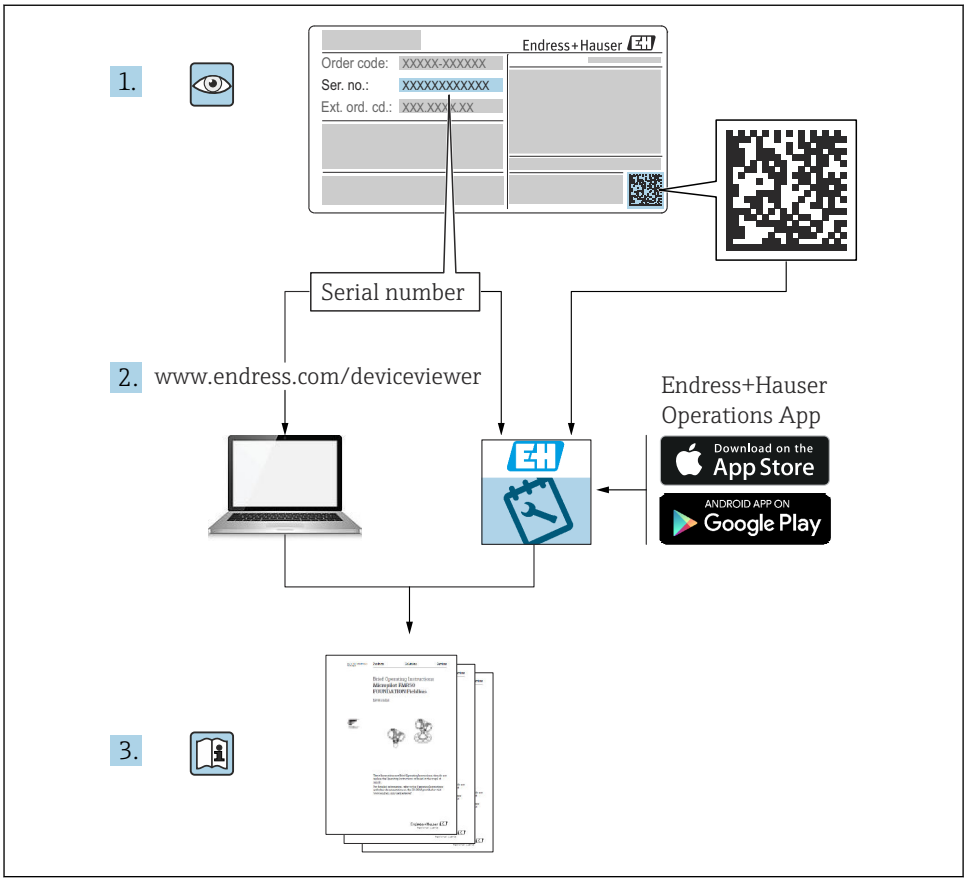
KA01454F/00/EN/03.21
71537022
2021-08-01

Brief Operating Instructions
Liquicap M
FMI52 HART

Capacitive
Continuous level measurement for liquids

Endress+Hauser
People for Process Automation

1 Related documents



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2 About this document

2.1 Document conventions

2.1.1 Safety symbols

DANGER

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

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

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

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

2.1.2 Electrical symbols

⏚ Protective earth (PE)

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

The ground terminals are located on the interior and exterior of the device:
- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

2.1.3 Tool symbols


Flat blade screwdriver


Phillips head screwdriver


Open-ended wrench

2.1.4 Symbols for certain types of information and graphics

✓✓ Preferred
Procedures, processes or actions that are preferred

✗ Forbidden
Procedures, processes or actions that are forbidden

Tip
Indicates additional information


Reference to documentation


Reference to page

▶
Notice or individual step to be observed

1., 2., 3.
Series of steps


Visual inspection

1, 2, 3, ...
Item numbers

A, B, C, ...
Views

Hazardous area
Indicates the hazardous area

3 Basic safety instructions

3.1 Requirements for the personnel

The personnel must fulfill the following requirements to carry out the necessary tasks:
- Are trained, qualified to perform specific functions and tasks.
- Are authorized by the plant owner or operator to perform specific tasks.
- Are familiar with federal or national regulations.
- Have read and understood the instructions in the manual and supplementary documentation.
- They follow instructions and comply with conditions.

3.2 Workplace safety

For work on and with the device:
- Wear the required protective equipment according to federal or national regulations.

3.3 Operational safety

When performing configuration, testing, and maintenance work on the device, alternative supervisory measures must be taken to guarantee the operational safety and process safety.

3.3.1 Ex-area

When using the measuring system in Ex-areas, the appropriate national standards and regulations must be observed. Separate Ex-documentation, which constitutes an integral part of this documentation, is supplied with the device. The installation procedures, connection data and safety instructions it contains must be observed.

- Make sure that the technical staff has adequate training.
- The special measuring and safety-related requirements for the measuring points must be observed.

3.4 Product safety

This measuring device is designed following good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It is compliant with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Check whether the packaging or content is damaged. Check that the goods delivered are complete and compare the scope of delivery with the information in your order.

4.2 Product identification

See Operating Instructions → 🖹 2

4.3 Storage and transport

For storage and transportation, pack the device to protect it against impact. The original packing offers the best protection for this. The permitted storage temperature is −50 to +85 °C (−58 to +185 °F).

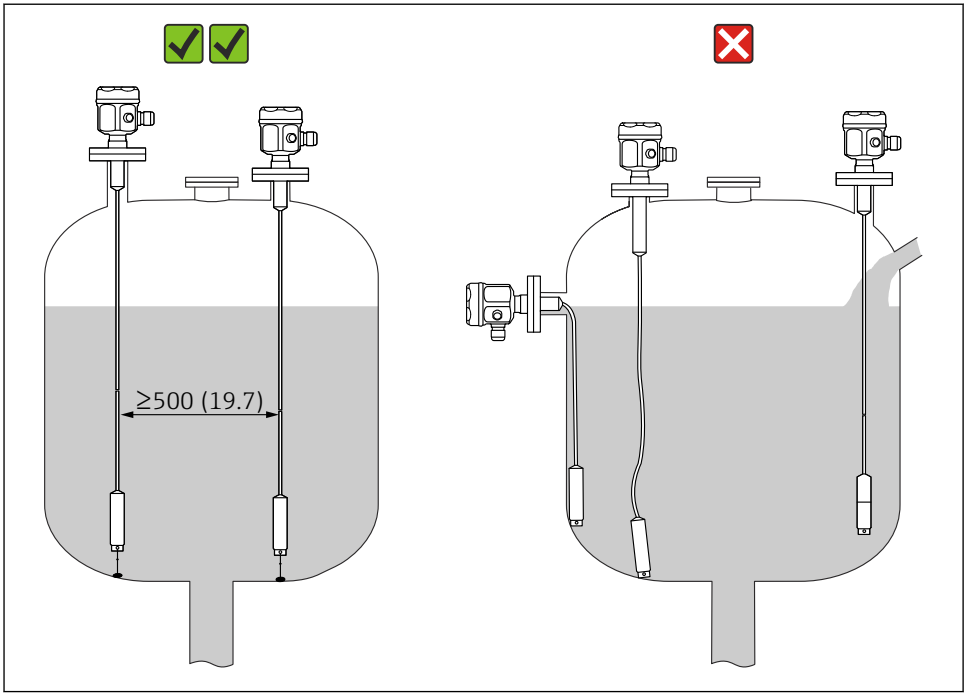
5 Mounting

5.1 Mounting requirements

5.1.1 Mounting the sensor

The Liquicap M FMI52 can be installed vertically from above.

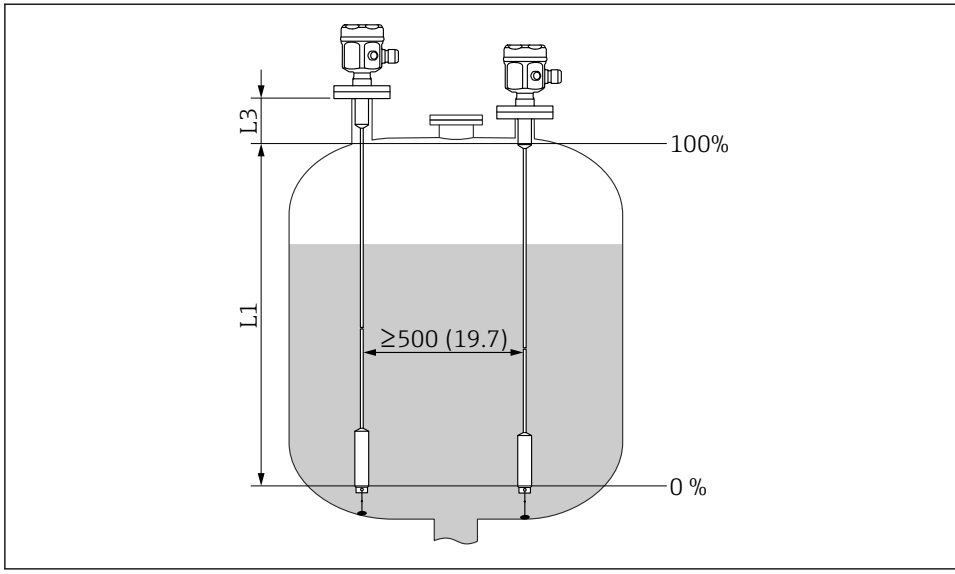
Make sure that:
- the probe is not installed in the area of the filling curtain
- the probe is not in contact with the container wall
- the distance from the container floor is ≥10 mm (0.39 in)
- multiple probes are mounted next to each other at the minimum distance between the probes of 500 mm (19.7 in)



Unit of measurement mm (in)

5.1.2 Measuring condition

Measuring range L1 is possible from the tip of the probe to the process connection.



Unit of measurement mm (in)

L1 Measuring range
L3 Inactive length

When installing in a nozzle, use inactive length L3.

The 0 % and 100 % calibration can be inverted.

5.1.3 Installation examples

Rope probes

The probe can be installed from above in conductive tanks made from metal.

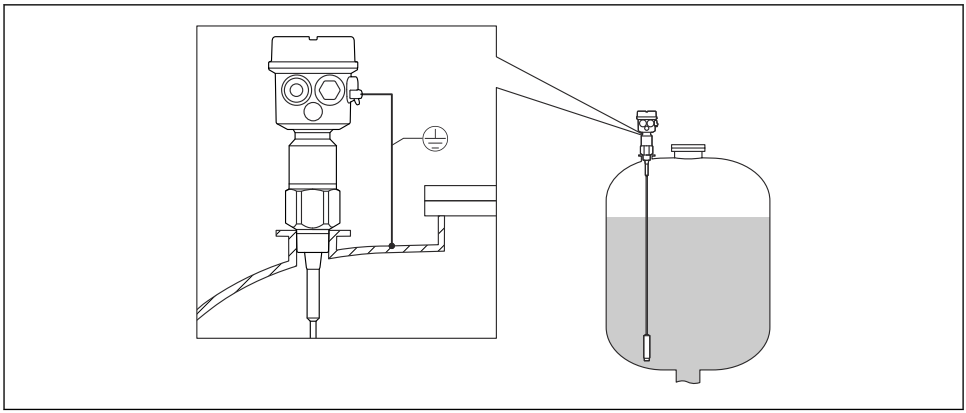
If the process connection of the probe is insulated from the metal tank using a seal material, then the ground connection on the probe housing must be connected to the tank using a short line.

- The probe may not come into contact with the container wall! Do not install probes in the area of the filling curtain.
- If multiple probes are mounted next to each other, a minimum distance of 500 mm (19.7 in) between the probes must be observed.
- When mounting, ensure there is a good electrically conductive connection between the process connection and the tank. Use an electrically conductive sealing band for example.

A fully insulated rope probe may be neither shortened nor extended.

Damaged insulation of the probe rope causes improper measurements.

The following application examples show the vertical installation for continuous level measurement.



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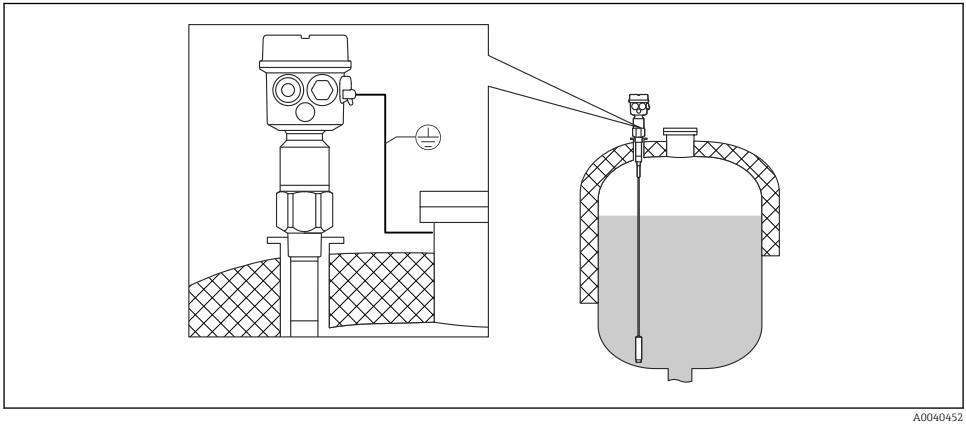
1 Rope probe



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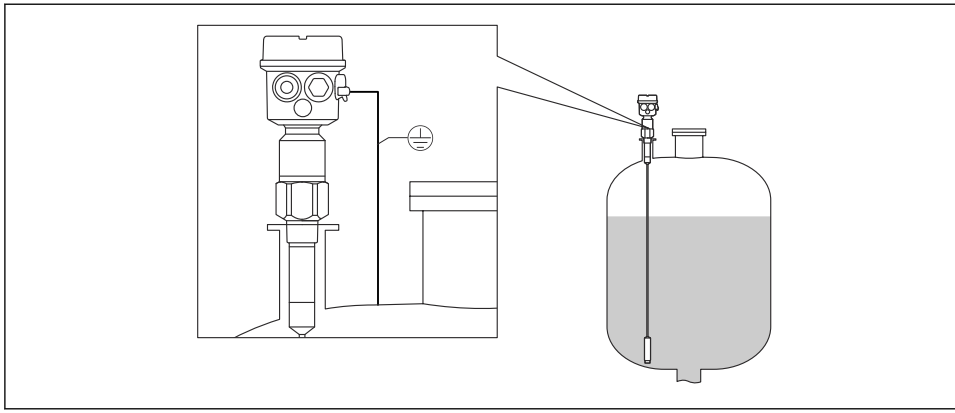
2 A probe with inactive length for the insulated tanks



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3 A probe with fully insulated inactive length for mounting nozzles

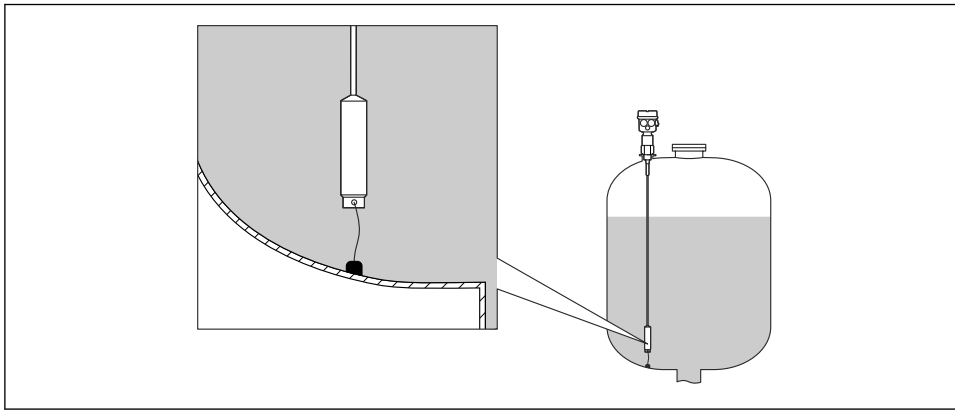
Shortening the rope

For information about the shortening kit, see Brief Operating Instructions KA061F/00.

Tensioning weight with tension

The end of the probe needs to be secured if the probe would otherwise touch the silo wall or another part in the tank. This is what the internal thread in the probe weight is intended for. The bracing can be conductive or insulating to the tank wall.

To avoid too high tensile load, the rope should be loose or guyed with a spring. The maximum tensile load may not exceed 200 Nm (147.5 lbf ft).



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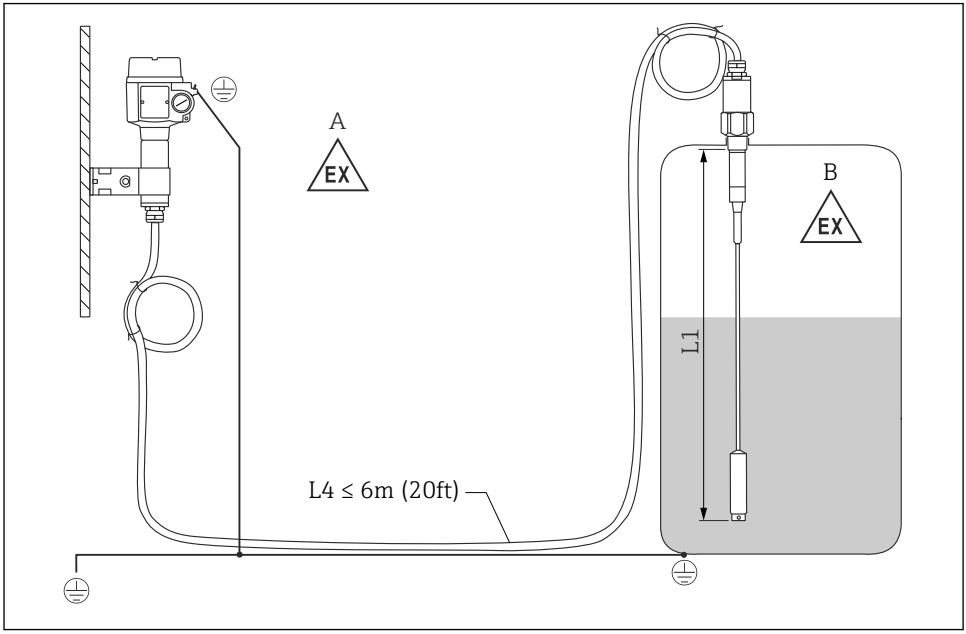
5.2 Probe with separate housing



4 *Connection of the probe and separate housing*

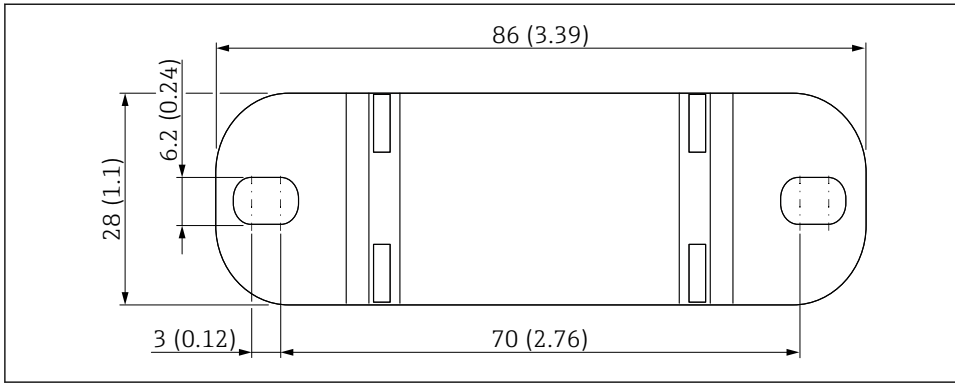
A Explosive zone 1
B Explosive zone 0
L1 Rope length: max 9.7 m (32 ft)
L4 Cable length: max. 6 m (20 ft)

The maximum cable length L4 and rope length L1 cannot exceed 10 m (33 ft).

Check Operating Instructions, → 2

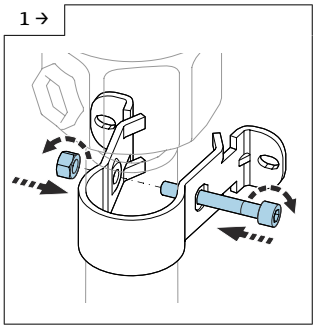
5.2.1 Wall bracket

- The wall bracket is a part of the scope of delivery.
- To use the wall bracket as a drill template, the wall bracket must be first screwed to the separate housing.
- The distance between the holes is reduced by screwing it to the separate housing.

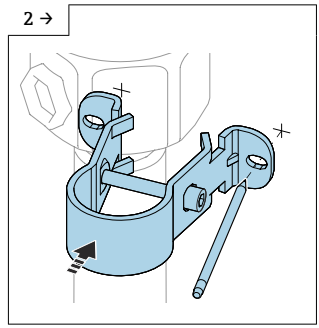


Unit of measurement mm (in)

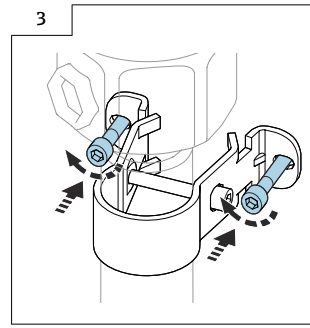
5.2.2 Wall mounting



▶ Screw together the wall bracket on the tube.



▶ Mark the distance between the holes on the wall before drilling.

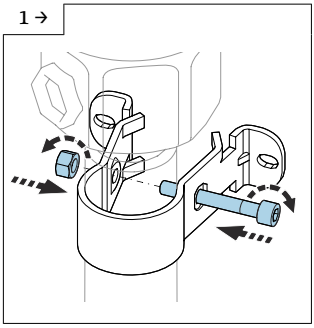


▶ Screw the separate housing on the wall.

5.2.3 Pipe mounting

The maximum pipe diameter is 50.8 mm (2 in).

1 →



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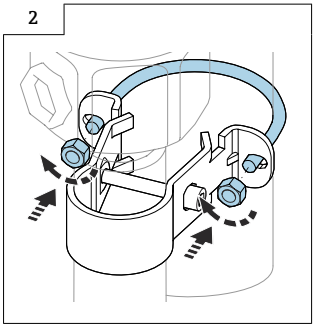
▶ Screw together the wall bracket on the tube.

2



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▶ Screw the separate housing on a pipe.

5.2.4 Shortening the connecting cable

NOTICE

Risk of damage to connections and cable.

▶ Make sure that neither the connecting cable nor the probe is turning with the pressing screw!

Recalibration must be performed before commissioning.

The maximum connection length between the probe and the separate housing is 6 m (20 ft).

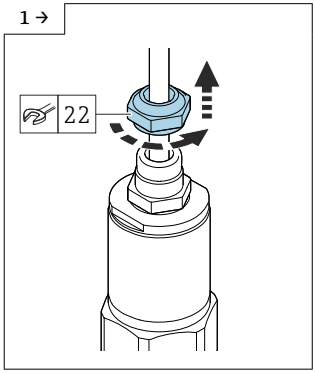
When ordering a device with separate housing, the desired length must be specified.

If the cable connection has to be shortened or led through a wall, it must be separated from the process connection.

Disconnecting the connection cable

Make sure that the connecting cable and the probe is not turning with the pressing screw.

1 →



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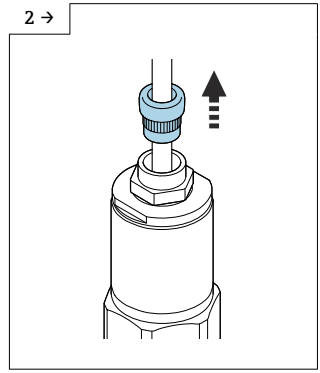
- Loosen the pressing screw with an open-end wrench AF22.

2 →



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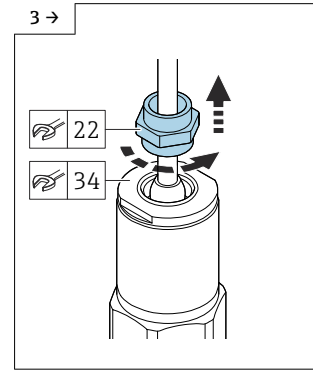
- Pull the insert seal out of the cable gland.

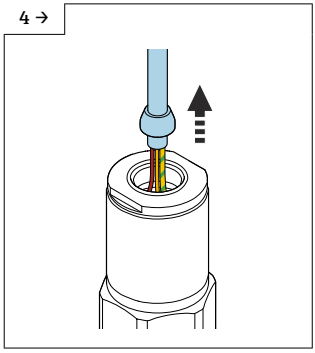
3 →



A0042113

- Block the adapter disk with the open-end wrench AF34 and loosen the cable gland with the open-end wrench AF22.

4 →



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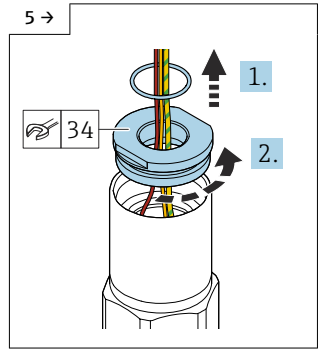
- Pull out the cable with the cone.

5 →



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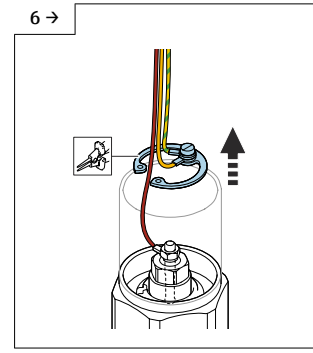
- Remove the seal and loosen the adapter disk with the open-end wrench AF34.

6 →



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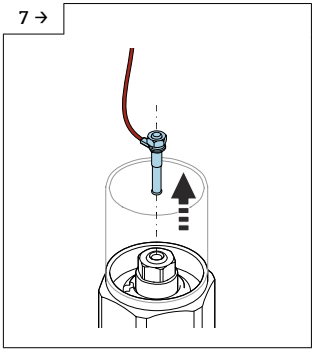
- Remove the snap ring with a snap ring pliers.

7 →



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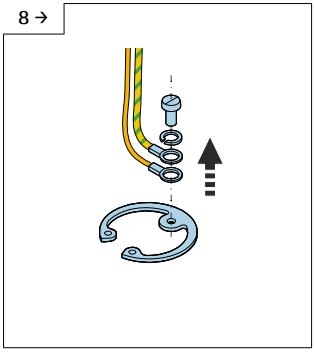
▶ Remove the blade plug from the socket.

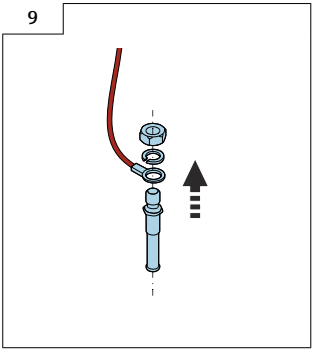
8 →



A0042118

▶ Loosen the screw to disconnect the yellow and yellow-green cables.

9



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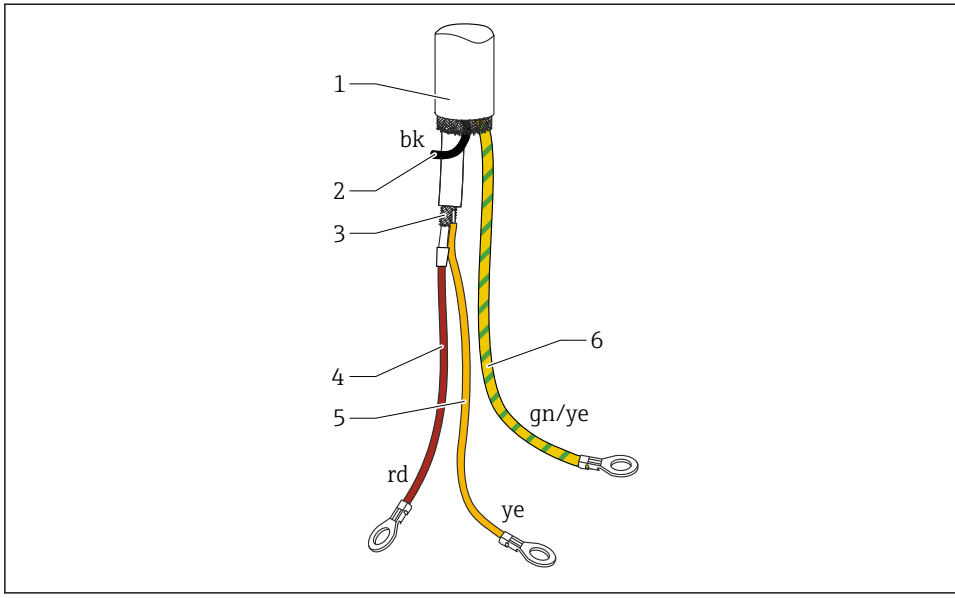
▶ Loosen the nut (M4) of the blade plug.



5 *Cable connections*

1 *External screening (not required)*
2 *Strand black (bk) (not required)*
3 *Coaxial cable with central core and screening*
4 *Solder the red (rd) strand with the central core of the coaxial cable (probe)*
5 *Solder the strand with the screening of the yellow (ye) coaxial cable (ground)*
6 *Strand yellow and green (gn/ye) with a ring terminal*

- We recommend reusing all strands with ring terminals in case of shortening the connecting cable
- To avoid the risk of short-circuiting when the strands are not to be reused, the connections of the new ring terminals must be insulated with a heat shrinking sleeve
- Use heat-shrink tubes to insulate all soldered joints

5.3 Installation instructions

NOTICE

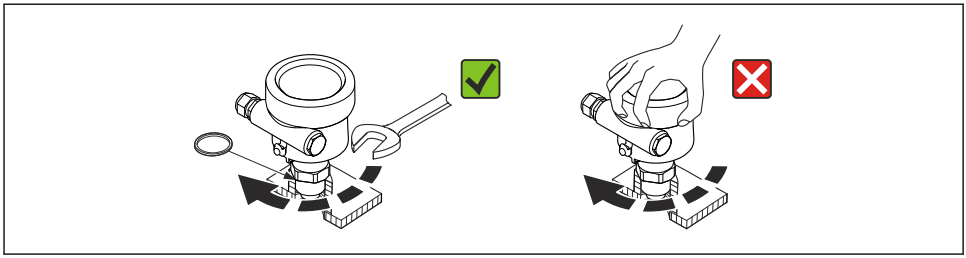
Do not damage the probe insulation during installation!

▶ Check the rod insulation.

NOTICE

Do not screw the probe using the probe housing!

▶ Use an open-end wrench to screw the probe.



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5.3.1 Probe installation

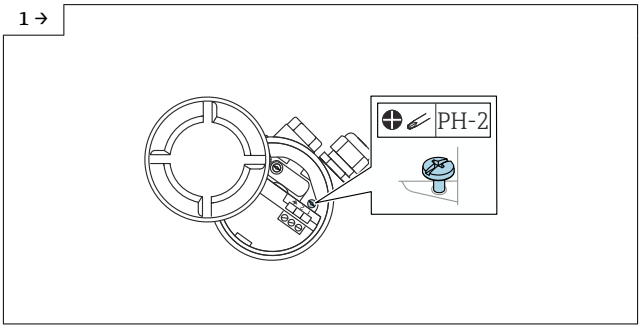
The following probes can be installed:
- Probe with thread
- Probe with Tri-Clamp, sanitary connection or flange
- Probe with PTFE-clad flange

5.3.2 Aligning the housing

The housing can be rotated 270 ° to align the cable entry. To prevent moisture penetration, route the connecting cable downwards in front of the cable gland and secure it with a cable tie. This is particularly recommended for outdoor mounting.

Aligning the housing

1 →



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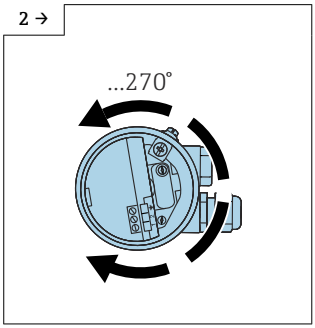
▶ Loosen the clamping screw.

2 →



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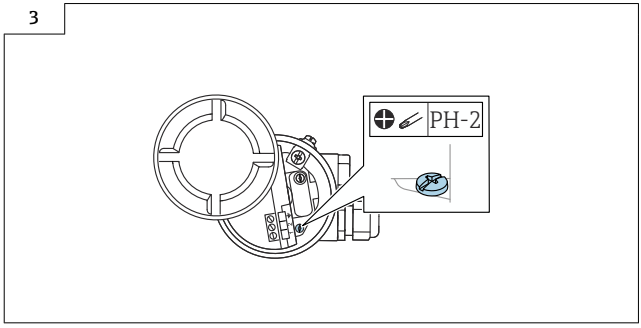
▶ Align the housing into the needed position.

3



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▶ Tighten the clamping screw with torque < 1 Nm (0.74 lbf ft).

The clamping screw for aligning the housing type T13 is located in the electronics compartment.

5.3.3 Sealing the probe housing

Make sure that the cover is sealed.

NOTICE

▶ Never use mineral oil-based grease as this destroys the O-ring.

6 Electrical connection

Before connecting the power supply, note the following:
- the supply voltage must match the data specified on the nameplate
- switch off the supply voltage before connecting the device
- connect the potential equalization to the ground terminal on the sensor

When using the probe in hazardous areas, the relevant national standards and the information in the safety instructions (XA) must be observed.

Use the specified cable gland only.

6.1 Connecting requirements

6.1.1 Potential equalization

DANGER

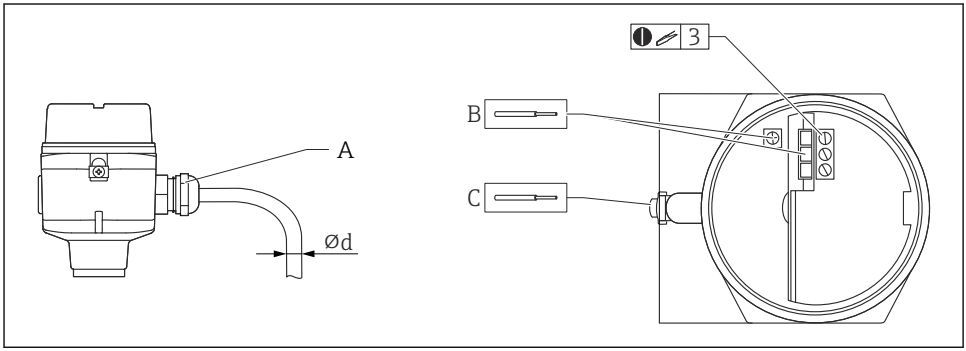
Risk of explosion!

▶ Connect the cable screen on the sensor side only if installing the probe in Ex-areas!

Connect the potential equalization to the outer ground terminal of the housing (T13, F13, F16, F17, F27). In the case of the stainless steel housing F15, the ground terminal can also be located in the housing. For further safety instructions, please refer to the separate documentation for applications in hazardous areas.

6.1.2 Cable specification

Connect the electronic inserts by using commercially available instrument cables. If a potential equalization is present, and the shielded instrument cables are used, connect the shielding on both sides to optimize the shielding effect.



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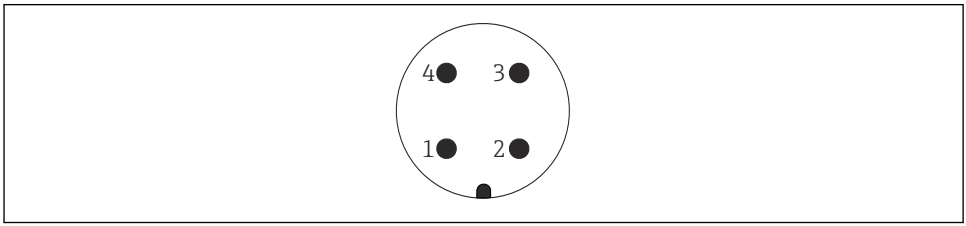
A Cable entry
B Electronic insert connections: cable size max. 2.5 mm² (14 AWG)
C The ground connection outside the housing, cable size max. 4 mm² (12 AWG)
Ød Cable diameter

Cable entries
- Nickel-plated brass: Ød = 7 to 10.5 mm (0.28 to 0.41 in)
- Synthetic material: Ød = 5 to 10 mm (0.2 to 0.38 in)
- Stainless steel: Ød = 7 to 12 mm (0.28 to 0.47 in)

6.1.3 Connector

For the version with a connector M12, the housing does not have to be opened for connecting the signal line.

PIN assignment for M12 connector



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1 Positive potential
2 Not used
3 Negative potential
4 Ground

6.1.4 Supply voltage

All of the following voltages are terminal voltages directly at the device:

- 12.0 to 36.0 V_{DC} in the non-hazardous area
- 12.0 to 30.0 V_{DC} in the Ex ia hazardous area
- 14.4 to 30.0 V_{DC} in the Ex d hazardous area

6.2 Wiring and connecting

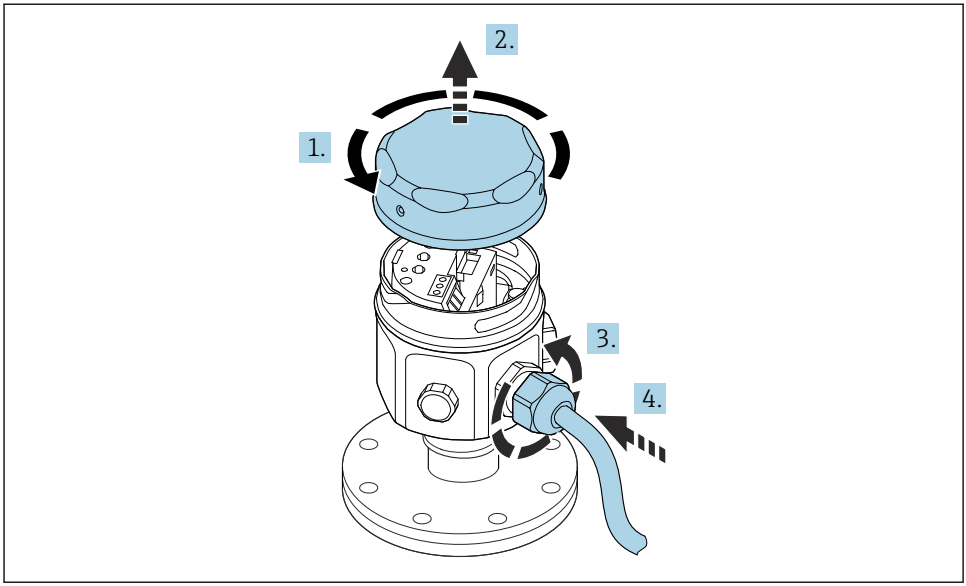
6.2.1 Connection compartment

Depending on explosion protection, the connection compartment is available in the following variants:

Standard protection, Ex ia protection
- polyester housing F16
- stainless steel housing F15
- aluminum housing F17
- aluminum housing F13 with gas-tight process seal
- stainless steel housing F27
- aluminum housing T13, with the separate connection compartment

Ex d protection, Gas-tight process seal
- aluminum housing F13 with gas-tight process seal
- stainless steel housing F27 with gas-tight process seal
- aluminum housing T13, with the separate connection compartment

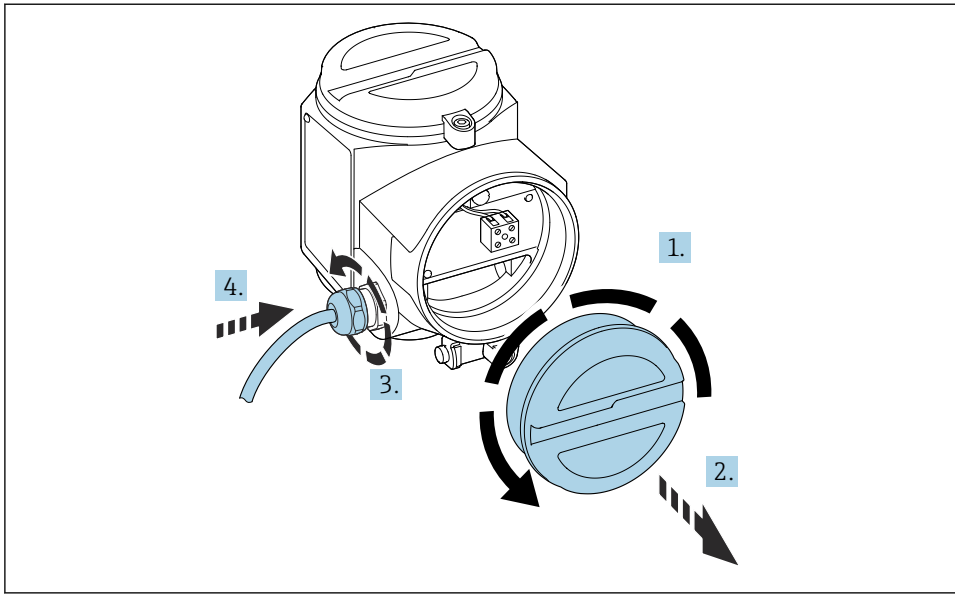
Connecting the electronic insert to the power supply:



A0040635

1. Unscrew the housing cover.
2. Remove the housing cover.
3. Release the cable gland.
4. Insert the cable.

Connecting the electronic insert to the power supply mounted in the housing T13:



A0040637

1. Unscrew the housing cover.
2. Remove the housing cover.
3. Release the cable gland.
4. Insert the cable.

6.2.2 Terminal assignment

Possible terminal assignments:
- 2-wire, 4 to 20 mA with HART
- HART with other supply units

See Operating Instructions → 2

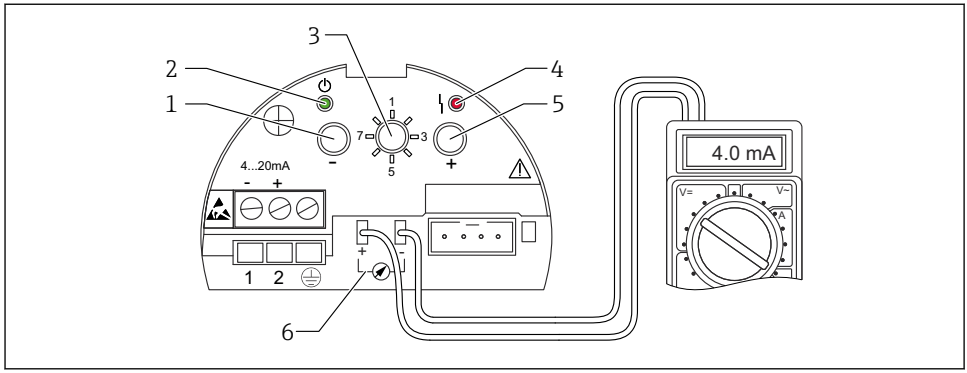
7 Operation options

7.1 Overview of operation options

This device can operate with:

- the operating elements at the FEI50H electronic insert
- the display and operating module
- the HART protocol with Commubox FXA195 and FieldCare operating program
- the HART handheld terminal DXR375

7.1.1 Display and operating elements at the FEI50H electronic insert



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6 FEI50H electronic insert

1 *Key −*
2 *Green LED - operational status*
3 *Function switch*
4 *Red LED - fault*
5 *Key +*
6 *Current pick-off 4 to 20 mA*

Function switch
- 1: Operation: select for normal operation
- 2: Empty calibration: select to set empty calibration
- 3: Full calibration: select to set full calibration
- 4: Measuring modes: select to choose between operation for media that form buildup (e.g. yogurt) or for media without buildup (e.g. water)
- 5: Measuring range: select the measuring range in pF for:
  - measuring range probe length < 6 m (20 ft) corresponds to 2 000 pF
  - measuring range probe length > 6 m (20 ft) corresponds to 4 000 pF
- 6: Self-test: select to activate the self-test
- 7: Reset - factory settings: select to restore the factory settings
- 8: Upload sensor DAT (EEPROM)
  - select to transfer the calibration values in the electronic insert to the sensor DAT (EEPROM) if replacing the probe
  - select to transfer the calibration values of the sensor DAT (EEPROM) to the electronics if replacing the electronic insert

Red LED - indicates a fault or malfunction
- Flashes 5x per second:
  - capacity at probe is too large, short-circuit at the probe or FEI50H is defective
- Flashes 1x per second:
  - the temperature in the electronic insert is outside the permitted temperature range

Key ⊞
Press to execute the functions set via the function switch

Display connector
Connector dedicated for optional onsite display and operating module

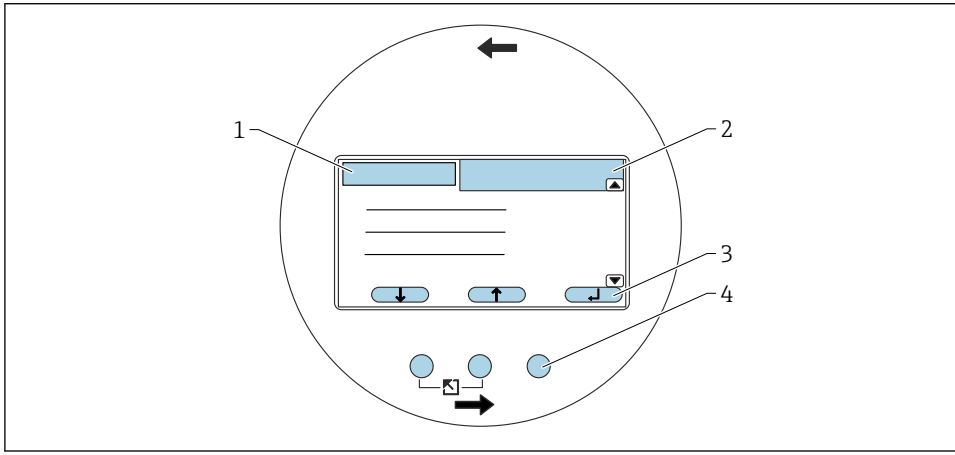
Current pick-off 4 to 20 mA
Connect the multimeter for full or empty calibration without disconnecting the main circuit

Key ⊟
Press to execute the functions set via the function switch

Green LED - indicates operation
- Flashes 5x per second: the device operates
- Flashes 1x per second: the device is in the calibration mode

7.1.2 Operation via the optional display and operating module

Display and operating elements



7 Display and operating elements

1 Menu title
2 Item code of a displayed function
3 Key symbols
4 Hardware keys

Symbols on the display

Operating mode of the device

- **User**
  user parameters can be edited
- **Lock**
  all parameters are locked
- **Scrollbar**
  scroll up or down to access more functions

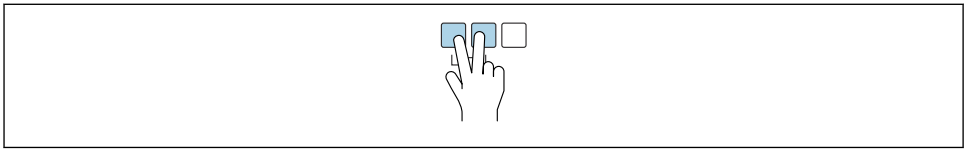
Locking state of the currently displayed parameter

- **Display parameter**
  the parameter cannot be edited in the current operating mode of the device
- **Write parameter**
  the parameter can be edited

Hardware key combinations

The following hardware key combinations apply regardless of the menu item in question:

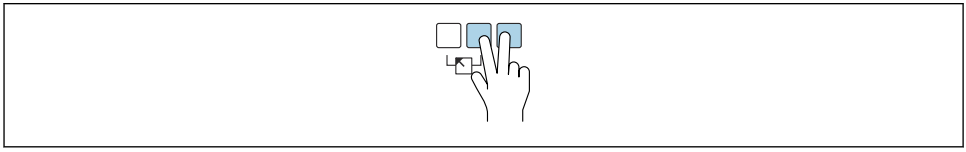
Escape



A0032709

1 Due to editing a function: exits the editing mode for the current function
2 Due to navigating: returns to the next-highest menu level

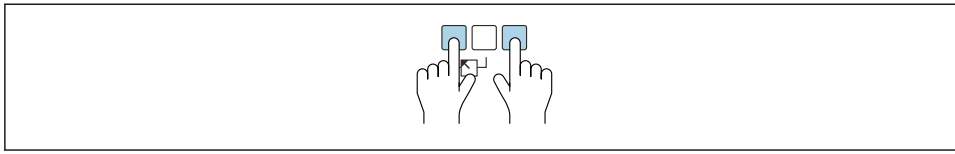
Increase contrast



A0032710

Increases the contrast of the display module

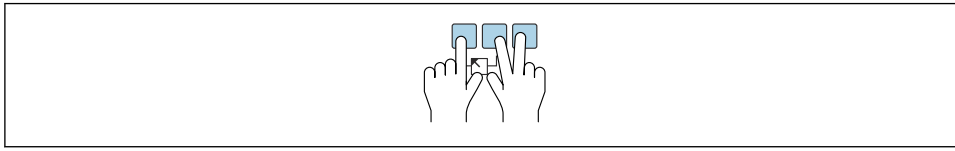
Decrease contrast



A0032711

Decreases the contrast of the display module

Locking and unlocking



A0032712

1 *Locks the device against parameter changes*
2 *Press all three keys to unlock the device*

7.2 Operation via FieldCare Device Setup

7.2.1 Function scope

FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field devices in a system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.

For additional information about FieldCare, see Operating Instructions BA00027S and BA00059S

Connection options: HART via Commubox FXA195 and the USB port of a computer

7.2.2 Source for device description files

- www.endress.com → Downloads
- CD–ROM (contact Endress+Hauser)
- DVD (contact Endress+Hauser)

8 Commissioning

The device is operated via the electronic insert, the display or with FieldCare. If a display is attached to the electronic insert, the function keys ⊟ or ⊞ and the Mode switch at the electronic insert are deactivated. All other settings can be made using the function keys on the display or with FieldCare.

8.1 Installation and function check


See Operating Instructions → 2

8.2 Setting the operating language


See Operating Instructions, Menu: "Device Properties" → 2

8.3 Configuring the device


See Operating Instructions, Menu: "Basic Setup" → 2

www.addresses.endress.com

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