KA01077F/00/EN/19.22-00
71565956
2022-04-05

Brief Operating Instructions
Levelflex FMP51, FMP52, FMP54
HART

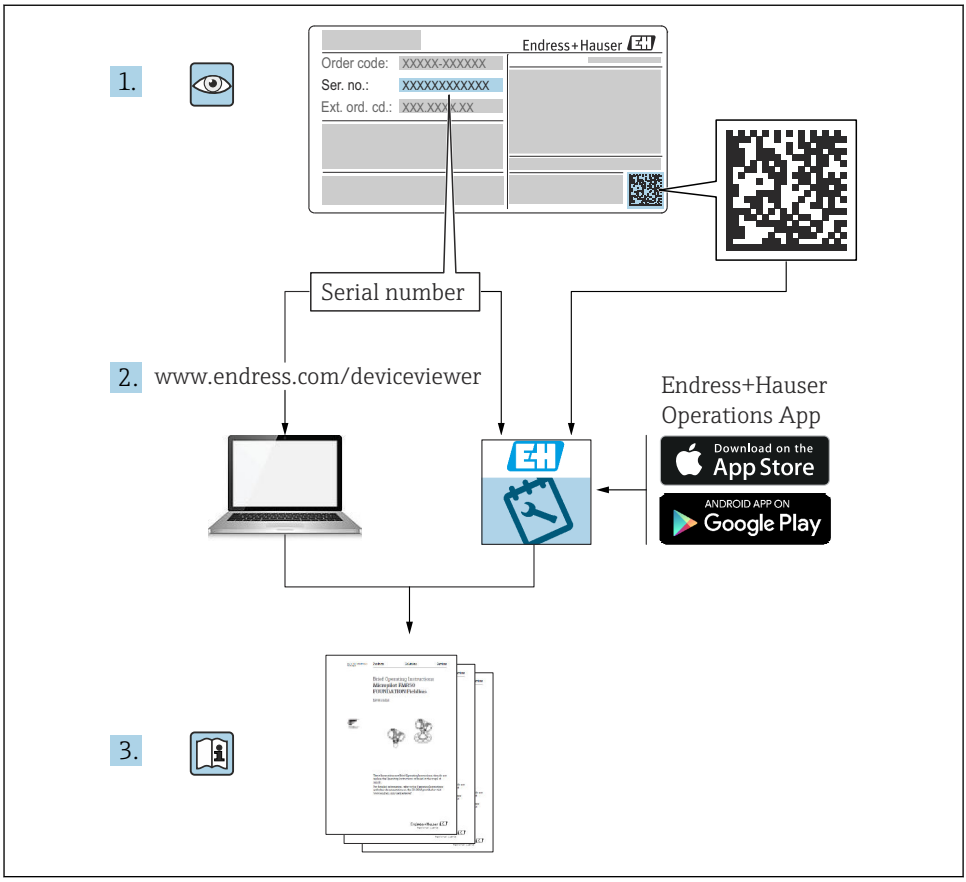
Guided wave radar

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

Detailed information about the device can be found in the Operating Instructions and the other documentation:
Available for all device versions via:
- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

Endress+Hauser
People for Process Automation

1 Associated documentation



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2 About this document

2.1 Symbols

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 inside and outside of the device.
- Inner ground terminal; protective earth is connected to the mains supply.
- Outer ground terminal; device is connected to the plant grounding system.

2.1.3 Tool symbols

Flat-blade screwdriver

Allen key

Torx screwdriver

Open-ended wrench

2.1.4 Symbols for certain types of information and graphics

✓ Permitted
Procedures, processes or actions that are permitted

✗ Forbidden
Procedures, processes or actions that are forbidden

Tip
Indicates additional information

Reference to documentation

Reference to graphic

▶
Notice or individual step to be observed

1., 2., 3.
Series of steps

↳
Result of a step


Visual inspection

1, 2, 3, ...
Item numbers

A, B, C, ...
Views

2.1.5 Symbols on the device

⚠ → Safety instructions
Observe the safety instructions contained in the associated Operating Instructions


Temperature resistance of the connection cables
Specifies the minimum value of the temperature resistance of the connection cables

3 Basic safety instructions

3.1 Requirements for personnel

The personnel must fulfill the following requirements for its tasks:
- Trained, qualified specialists must have a relevant qualification for the specific function and task
- Are authorized by the plant owner/operator
- Are familiar with federal/national regulations
- Must have read and understood the instructions in the manual and supplementary documentation
- Follow instructions and comply with conditions

3.2 Intended use

Application and media
The measuring device described in this manual is intended only for the level and interface measurement of liquids. Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

If the limit values specified in the "Technical data" and the conditions listed in the manual and additional documentation are observed, the measuring device may be used for the following measurements only:
- Measured process variables: level and/or interface height
- Calculable process variables: volume or mass in any shape of vessel (calculated from the level by the linearization functionality)

To ensure that the measuring device remains in proper condition for the operation time:
- ▶ Use the measuring device only for media to which the process-wetted materials have an adequate level of resistance.
- ▶ Observe the limit values in the "Technical data".

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

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

Residual risks
Due to heat transfer from the process as well as power loss in the electronics, the temperature of the electronics housing and the assemblies contained therein (e.g. display module, main electronics module and I/O electronics module) may rise up to 80 °C (176 °F). When in operation, the sensor may reach a temperature close to the medium temperature.

Danger of burns from contact with surfaces!
- ▶ In the event of high medium temperatures, ensure protection against contact to prevent burns.

3.3 Workplace safety

When working on and with the device:
- ▶ Wear the required personal protective equipment according to federal/national regulations.

With divisible probe rods, medium may penetrate the joints between the individual parts of the rod. This medium may escape when the joints are loosened. This can cause injuries in the case of dangerous (e.g., aggressive or toxic) media.
- ▶ When loosening the joints between the individual parts of the probe rod, wear appropriate protective equipment according to the medium.

3.4 Operational safety

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

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:
- ▶ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:
- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to the repair of an electrical device.

- ▶ Use only original spare parts and accessories from the manufacturer.

Hazardous area

To eliminate danger to persons or the installation when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):
- ▶ Check the nameplate to verify whether the ordered device can be put to its intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation, which is an integral part of this manual.

3.5 Product safety

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

NOTICE

Loss of degree of protection by opening of the device in humid environments
- ▶ If the device is opened in a humid environment, the degree of protection indicated on the nameplate is no longer valid. This may also impair the safe operation of the device.

3.5.1 CE mark

The measuring system meets the legal requirements of the applicable EU directives. These are listed in the corresponding EU Declaration of Conformity together with the standards applied.

The manufacturer confirms successful testing of the device by affixing to it the CE mark.

3.5.2 EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

The manufacturer confirms successful testing of the device by affixing to it the EAC mark.

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Check the following during incoming acceptance:
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): are the Safety Instructions (XA) provided?

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

4.2 Product identification

The device can be identified in the following ways:
- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note

- ▶ Enter serial number from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer)
  - ↳ All of the information on the measuring device and on the scope of the technical documentation pertaining to the device is displayed.

- ▶ Enter the serial number from the nameplate in the *Endress+Hauser Operations app* or scan the 2-D matrix code on the nameplate with the camera
  - ↳ All of the information on the measuring device and on the scope of the technical documentation pertaining to the device is displayed.

4.3 Storage and transport

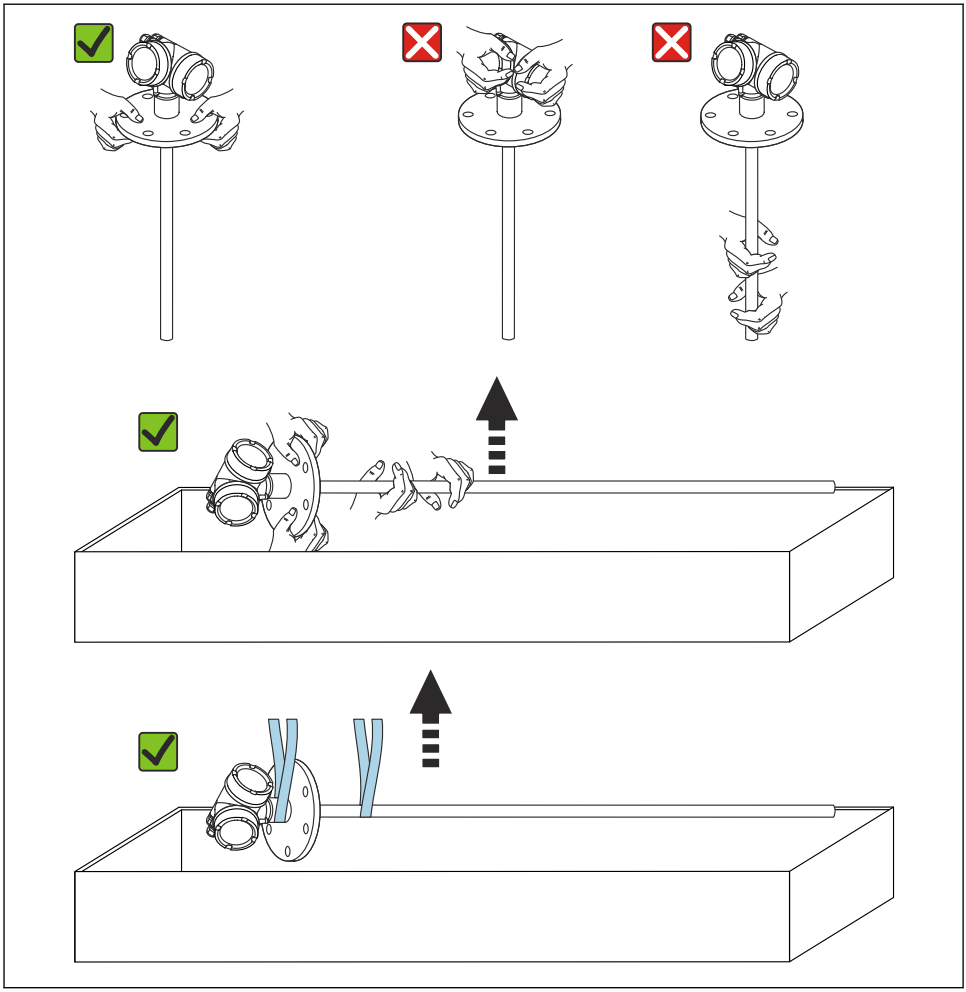
4.3.1 Storage temperature

- Permitted storage temperature: −40 to +80 °C (−40 to +176 °F)
- Use original packaging.
- Option for FMP51 and FMP54: −50 to +80 °C (−58 to +176 °F)
  This range applies if the option JN "Transmitter ambient temperature" −50 °C (−58 °F) was selected in order code 580 "Test, Certificate". If the temperature is permanently below −40 °C (−40 °F), higher failure rates can be expected.

4.3.2 Transporting the product to the measuring point

⚠ WARNING

Housing or rod may become damaged or pull off.
Risk of injury!
- ▶ Transport the measuring device to the measuring point in its original packaging or by the process connection.
- ▶ Always secure lifting equipment (slings, eyes, etc.) at the process connection and never lift the device by the electronic housing or probe. Pay attention to the center of gravity of the device so that it does not tilt or slip unintentionally.
- ▶ Follow the safety instructions and transport conditions for devices weighing more than 18 kg (39.6 lbs) (IEC 61010).



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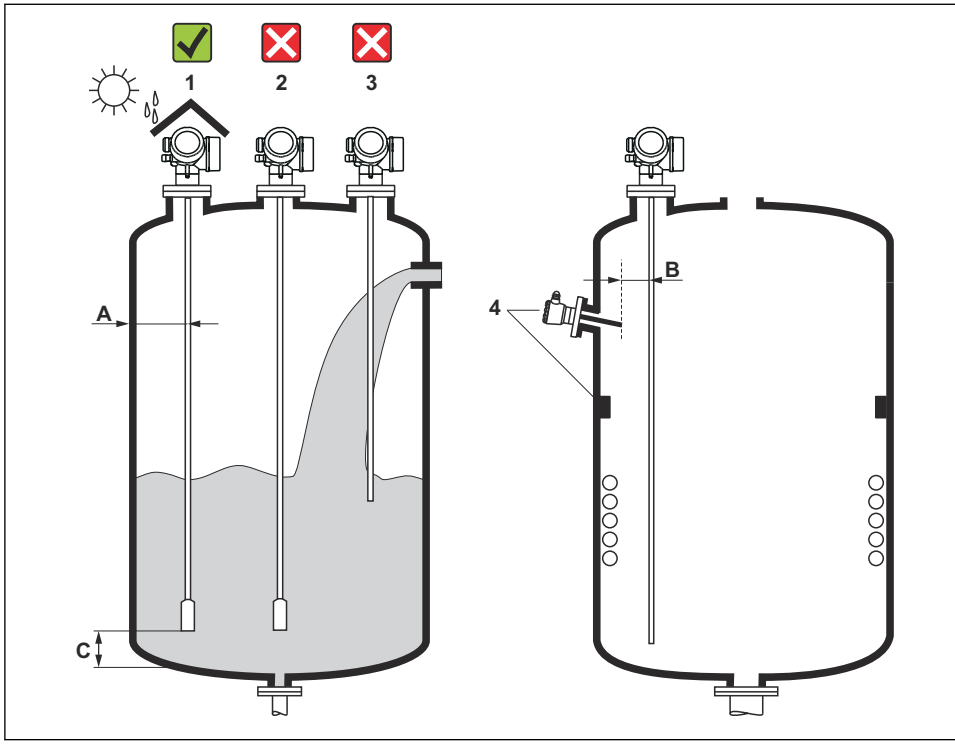
5 Mounting

5.1 Mounting requirements

5.1.1 Suitable mounting position



1 *Installation conditions for Levelflex*

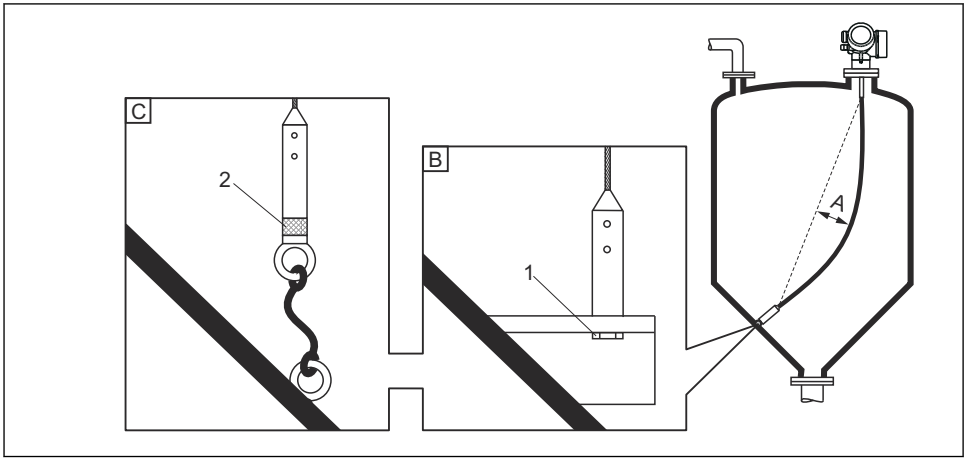
Spacing requirements when mounting

- Distance (A) between the vessel wall and rod and rope probes:
  - For smooth metallic walls: > 50 mm (2 in)
  - For plastic walls: > 300 mm (12 in) to metallic parts outside the vessel
  - For concrete walls: > 500 mm (20 in), otherwise the permitted measuring range may be reduced.
- Distance (B) between rod probes and internal fittings (3): > 300 mm (12 in)
- When using more than one Levelflex:
  Minimum distance between the sensor axes: 100 mm (3.94 in)
- Distance (C) from the end of the probe to the bottom of the vessel:
  - Rope probe: > 150 mm (6 in)
  - Rod probe: > 10 mm (0.4 in)
  - Coax probe: > 10 mm (0.4 in)

Coax probes can be mounted at any distance to the wall and internal fixtures.

5.1.2 Securing the probe

Securing rope probes



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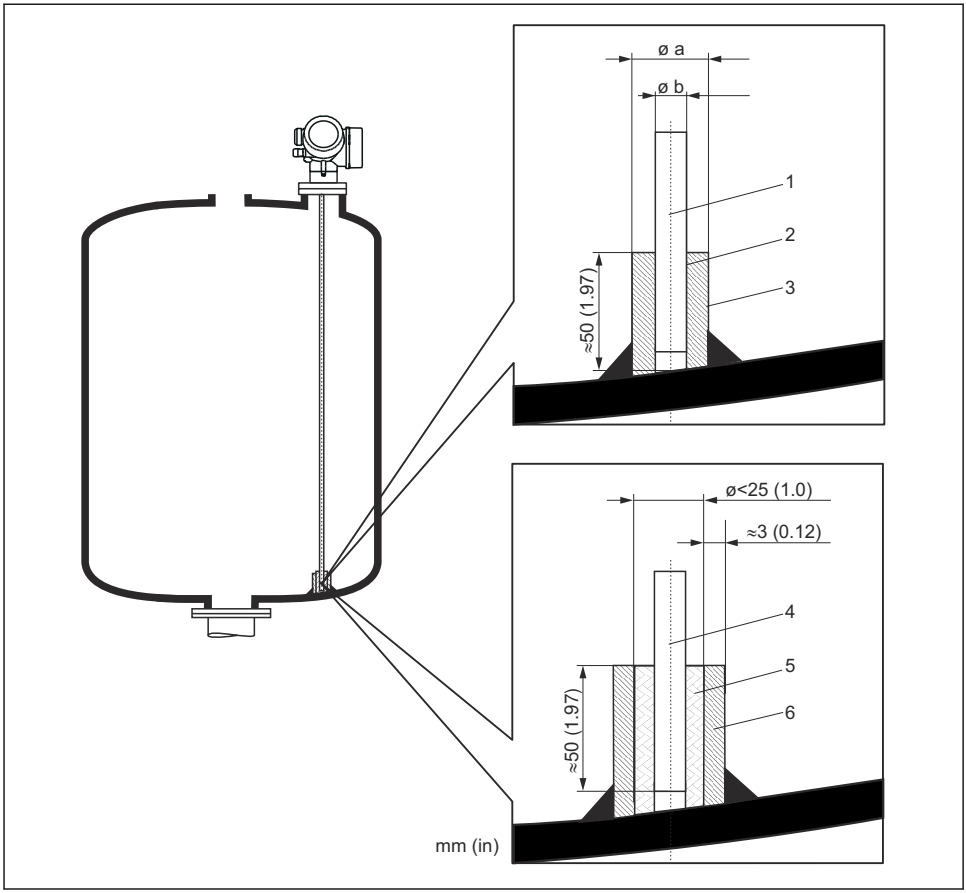
A Rope sag: ≥ 10 mm/(1 m probe length) [0.12 in/(1 ft probe length)]
B Reliably grounded end of probe
C Reliably insulated end of probe
1 Fastener in female thread of probe end weight
2 Insulated fastening kit

- The end of the rope probe must be secured (fixed down) under the following conditions:
  If the probe would otherwise temporarily come into contact with the vessel wall, the cone, internal fittings/beams or another part of the installation
- A female thread is provided in the probe weight to secure the end of the probe:
  Rope 4 mm (1/6"), 316: M 14
- When fixed down, the end of the probe must be either reliably grounded or reliably insulated. Use an insulated fastening kit if it is not otherwise possible to secure the probe with a reliably insulated connection.
- To prevent an extremely high tensile load (e.g. due to thermal expansion) and the risk of the rope breaking, the rope must be slack. Required sag: ≥ 10 mm/(1 m rope length) | 0.12 in/(1 ft rope length)|.
  Pay attention to the tensile loading capacity of rope probes.

Securing rod probes

- In the case of WHG approval: a support is required for probe lengths ≥ 3 m (10 ft).
- In general, rod probes must be secured in the event of horizontal flow (e.g. from an agitator) or strong vibrations.
- Only secure rod probes directly at the end of the probe.



Unit of measurement mm (in)

1 *Probe rod, uncoated*
2 *Sleeve with narrow bore to ensure electrical contact between the sleeve and the rod.*
3 *Short metal pipe, e.g. welded in place*
4 *Probe rod, coated*
5 *Plastic sleeve, e.g. PTFE, PEEK, PPS*
6 *Short metal pipe, e.g. welded in place*

Probe Ø 8 mm (0.31 in)
- a < Ø 14 mm (0.55 in)
- b = Ø 8.5 mm (0.34 in)

Probe Ø 12 mm (0.47 in)
- a < Ø 20 mm (0.78 in)
- b = Ø 12.5 mm (0.52 in)

Probe Ø 16 mm (0.63 in)
- a < Ø 26 mm (1.02 in)
- b = Ø 16.5 mm (0.65 in)

NOTICE

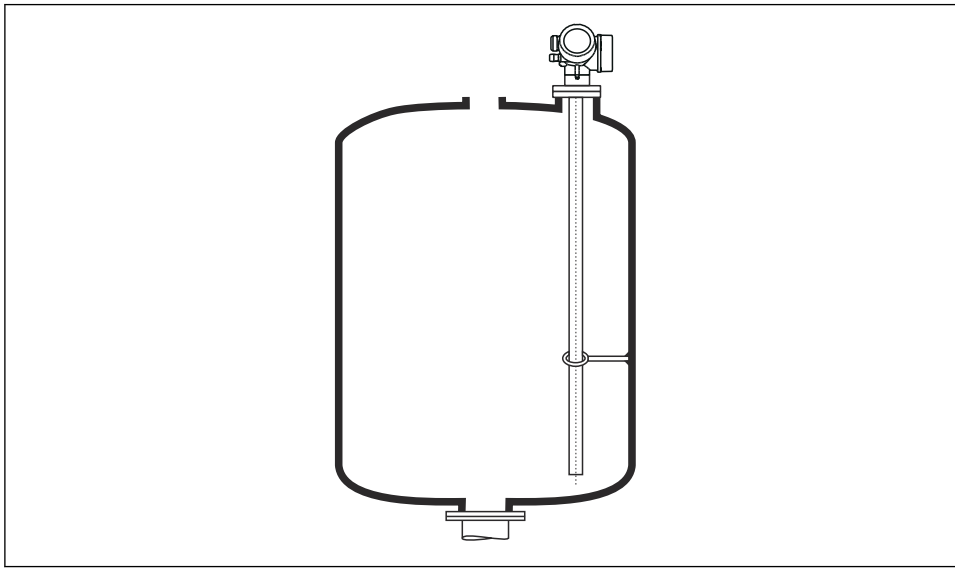
Poor grounding of the probe end may cause incorrect measurements.
- ▶ Use a sleeve with a narrow bore to ensure good electrical contact between the sleeve and the probe rod.

NOTICE

Welding can damage the main electronics module.
- ▶ Before welding: Ground the probe rod and remove the electronics.

Securing coax probes

For WHG approval: a support is required for probe lengths ≥ 3 m (10 ft).



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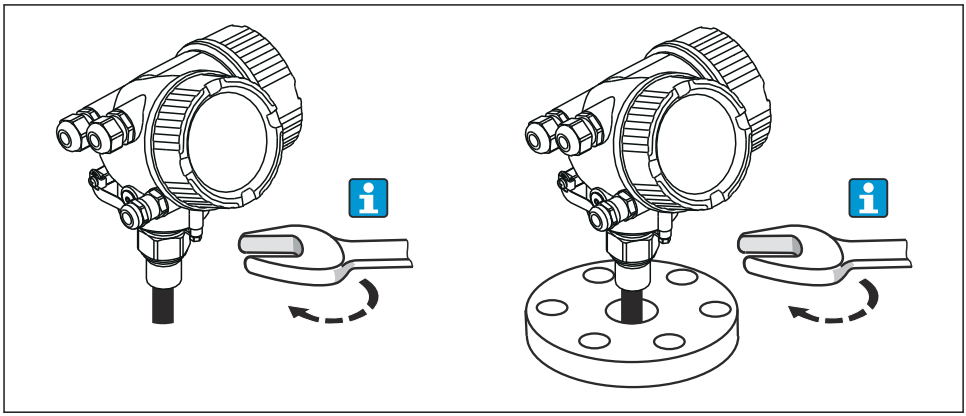
Coax probes can be secured (fixed) at any point in the ground tube.

5.1.3 Shortening the probe

See Operating Instructions.

5.2 Mounting the device

5.2.1 Mounting devices with a threaded connection



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Screw the device with the threaded connection into a sleeve or flange and then secure it to the process vessel via the sleeve/flange.

- When screwing into place, turn by the hex bolt only:
  - Thread 3/4": 36 mm
  - Thread 1-1/2": 55 mm
- Maximum permissible tightening torque:
  - Thread 3/4": 45 Nm
  - Thread 1-1/2": 450 Nm
- Recommended torque when using the supplied aramid fiber seal and a process pressure of 40 bar (only FMP51, no seal is included with FMP54):
  - Thread 3/4": 25 Nm
  - Thread 1-1/2": 140 Nm
- When installing in metal vessels, ensure there is good metal contact between the process connection and the vessel.

5.2.2 Mounting devices with a flange

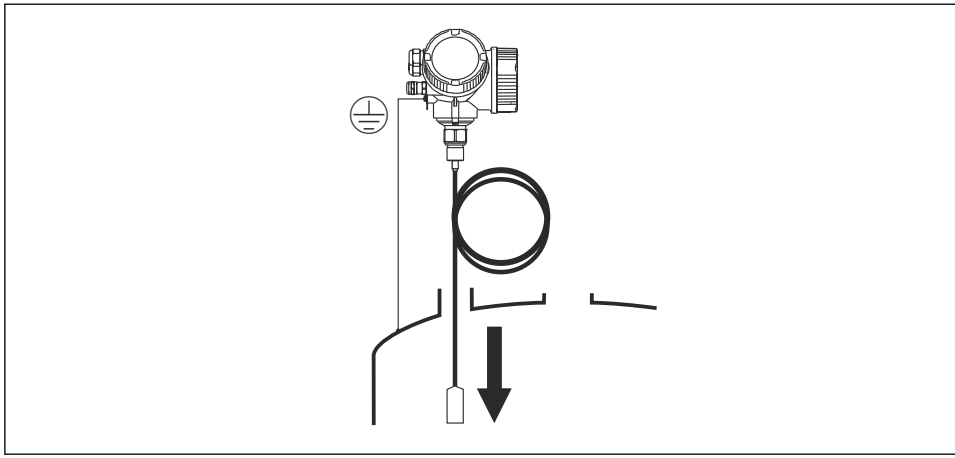
If a seal is used to mount the device, use uncoated metal screws to ensure good electrical contact between the process flange and the probe flange.

5.2.3 Mounting rope probes

NOTICE

Electrostatic discharge can damage the electronics.

▶ Ground the housing before lowering the rope probe into the vessel.



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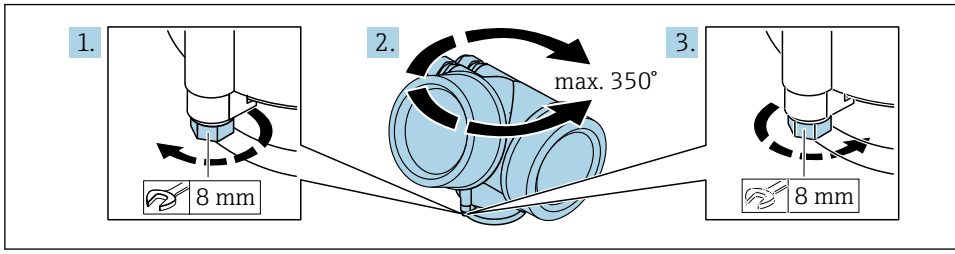
Pay attention to the following when introducing the rope probe into the vessel:

- Uncoil the rope slowly and lower it carefully into the vessel.
- Make sure the rope does not bend or buckle.
- Avoid uncontrolled swinging of the weight, as this could damage internal fittings in the vessel.

5.2.4 Turning the transmitter housing

To provide easier access to the connection compartment or display module, the transmitter housing can be turned:



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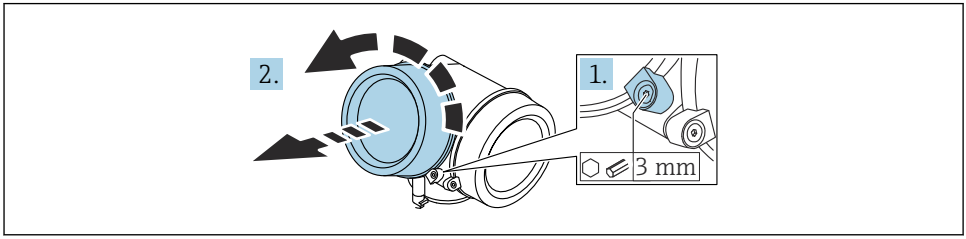
1. Unscrew the securing screw using an open-ended wrench.
2. Rotate the housing in the desired direction.
3. Tighten the securing screw (1.5 Nm for plastic housing; 2.5 Nm for aluminum or stainless steel housing).

5.2.5 Turning the display

Opening the cover



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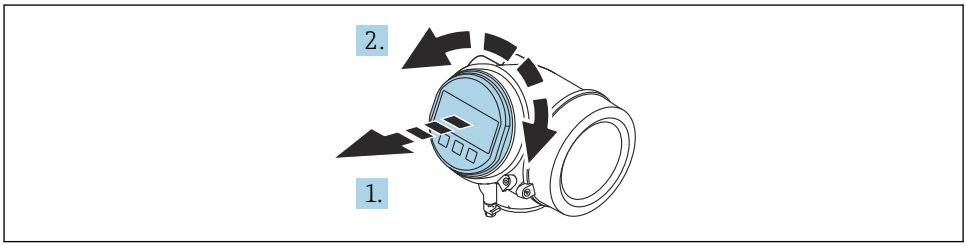
1. Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key (3 mm) and turn the clamp 90 ° counterclockwise.
2. Unscrew the electronics compartment cover and check the cover seal; replace it if necessary.

Turning the display module



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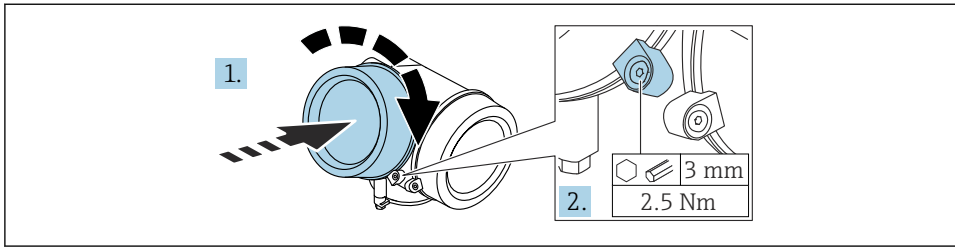
1. Pull out the display module with a gentle rotational movement.
2. Turn the display module to the desired position: Max. 8 × 45 ° in each direction.
3. Feed the coiled cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.

Closing the cover of the electronics compartment



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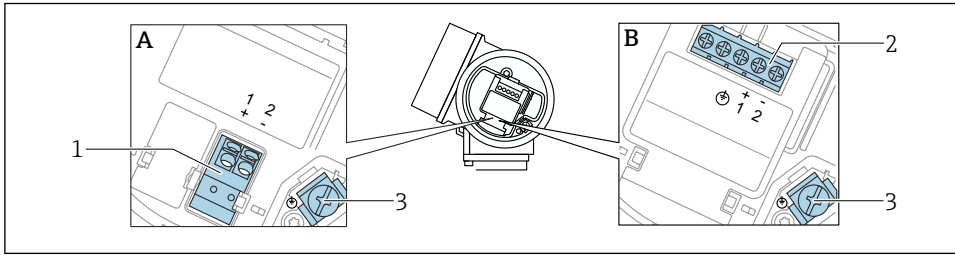
1. Screw down the cover of the electronics compartment.
2. Turn the securing clamp 90 ° in the clockwise direction and, using an Allen key (3 mm), tighten the screw of the securing clamp on the electronics compartment cover with 2.5 Nm.

6 Electrical connection

6.1 Connecting requirements

6.1.1 Terminal assignment

Terminal assignment, 2-wire: 4 to 20 mA HART



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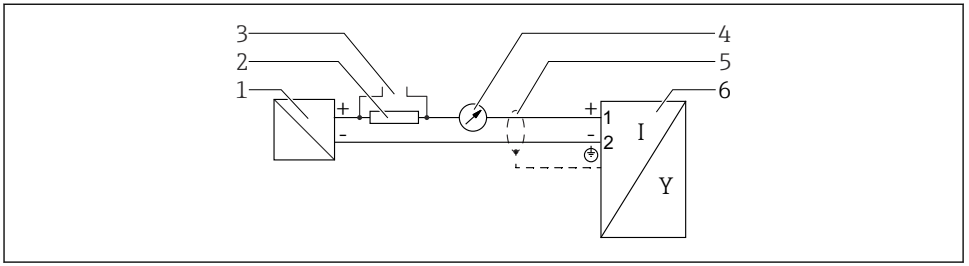
2 *Terminal assignment, 2-wire: 4 to 20 mA HART*

A Without integrated overvoltage protection
B With integrated overvoltage protection
1 Connection 4 to 20 mA, HART passive: terminals 1 and 2, without integrated overvoltage protection
2 Connection 4 to 20 mA, HART passive: terminals 1 and 2, with integrated overvoltage protection
3 Terminal for cable shield

Block diagram, 2-wire: 4 to 20 mA HART



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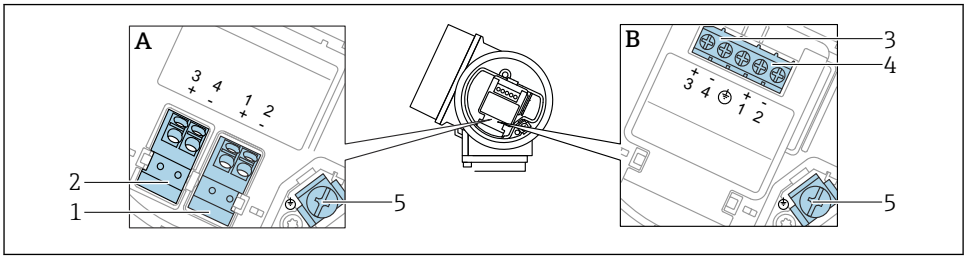
3 Block diagram, 2-wire: 4 to 20 mA HART

1 Active barrier for power supply (e.g. RN221N); observe terminal voltage
2 Resistor for HART communication (≥ 250 Ω); observe maximum load
3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
4 Analog display unit; observe maximum load
5 Cable screen; observe cable specification
6 Measuring device

Terminal assignment, 2-wire: 4 to 20 mA HART, switch output



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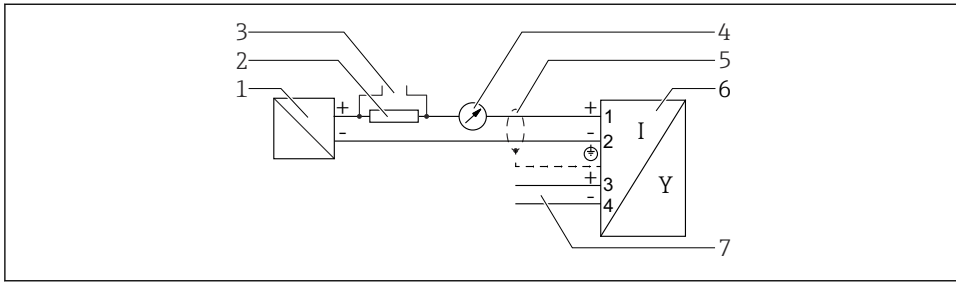
4 Terminal assignment, 2-wire: 4 to 20 mA HART, switch output

A Without integrated overvoltage protection
B With integrated overvoltage protection
1 Connection 4 to 20 mA, HART passive: terminals 1 and 2, without integrated overvoltage protection
2 Connection, switch output (open collector): terminals 3 and 4, without integrated overvoltage protection
3 Connection, switch output (open collector): terminals 3 and 4, with integrated overvoltage protection
4 Connection 4 to 20 mA, HART passive: terminals 1 and 2, with integrated overvoltage protection
5 Terminal for cable shield

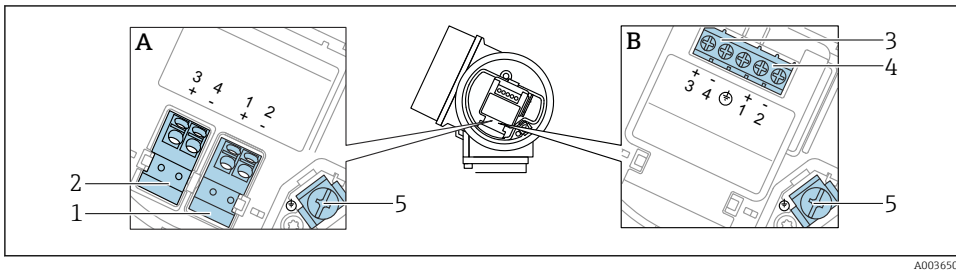
Block diagram, 2-wire: 4 to 20 mA HART, switch output



5 Block diagram, 2-wire: 4 to 20 mA HART, switch output

1 *Active barrier for power supply (e.g. RN221N); observe terminal voltage*
2 *Resistor for HART communication (≥ 250 Ω); observe maximum load*
3 *Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)*
4 *Analog display unit; observe maximum load*
5 *Cable screen; observe cable specification*
6 *Measuring device*
7 *Switch output (open collector)*

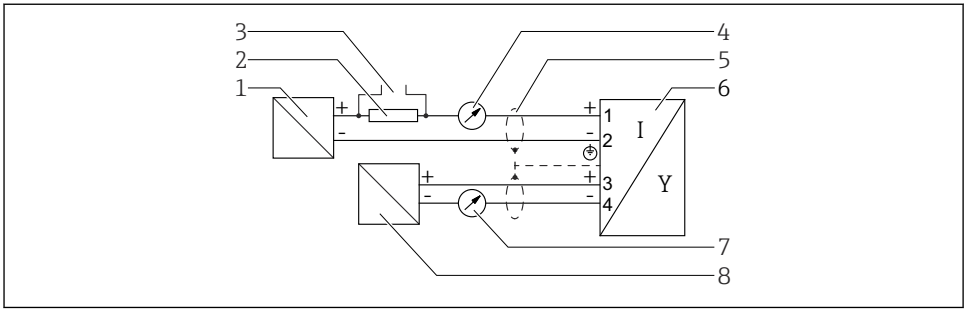
Terminal assignment, 2-wire: 4 to 20 mA HART, 4 to 20 mA



6 Terminal assignment, 2-wire: 4 to 20 mA HART, 4 to 20 mA

A *Without integrated overvoltage protection*
B *With integrated overvoltage protection*
1 *Connection current output 1, 4 to 20 mA HART passive: terminals 1 and 2, without integrated overvoltage protection*
2 *Connection current output 2, 4 to 20 mA: terminals 3 and 4, without integrated overvoltage protection*
3 *Connection current output 2, 4 to 20 mA: terminals 3 and 4, with integrated overvoltage protection*
4 *Connection current output 1, 4 to 20 mA HART passive: terminals 1 and 2, with integrated overvoltage protection*
5 *Terminal for cable shield*

Block diagram, 2-wire: 4 to 20 mAHART, 4 to 20 mA



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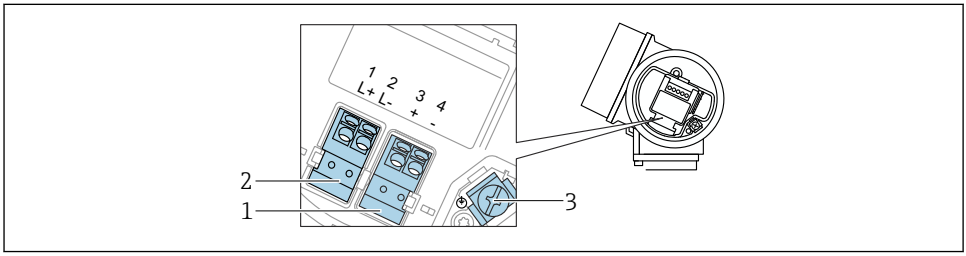
7 Block diagram, 2-wire: 4 to 20 mAHART, 4 to 20 mA

1 *Active barrier for power supply (e.g. RN221N), current output 1; observe terminal voltage*
2 *Resistor for HART communication (≥ 250 Ω); observe maximum load*
3 *Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)*
4 *Analog display unit; observe maximum load*
5 *Cable screen; observe cable specification*
6 *Measuring device*
7 *Analog display unit; observe maximum load*
8 *Active barrier for power supply (e.g. RN221N), current output 2; observe terminal voltage*

Terminal assignment, 4-wire: 4 to 20 mA HART (10.4 to 48 V_{DC})



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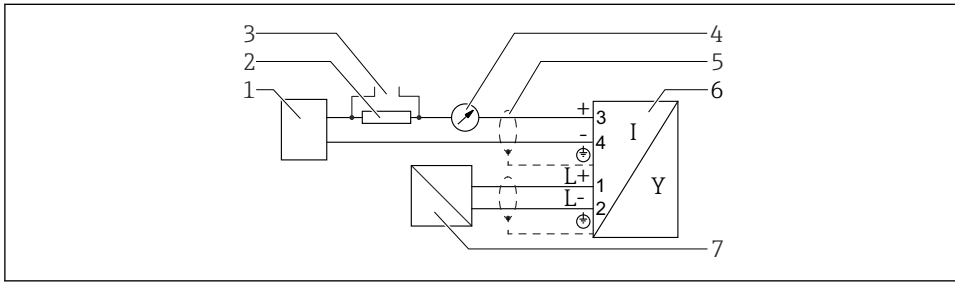
8 Terminal assignment, 4-wire: 4 to 20 mA HART (10.4 to 48 V_{DC})

1 *Connection 4 to 20 mA HART (active): terminals 3 and 4*
2 *Connection, supply voltage: terminals 1 and 2*
3 *Terminal for cable shield*

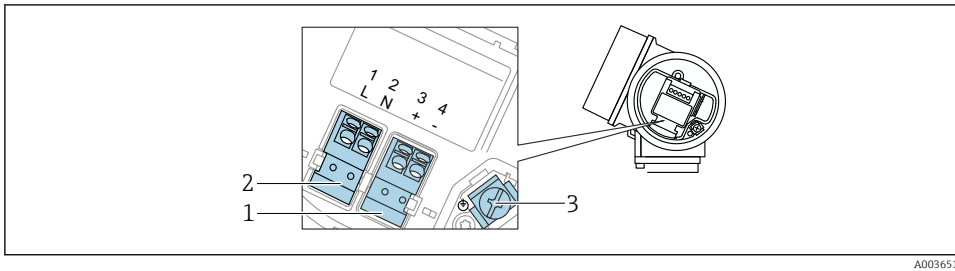
Block diagram, 4-wire: 4 to 20 mA HART (10.4 to 48 V_{DC})



9 *Block diagram, 4-wire: 4 to 20 mA HART (10.4 to 48 V_{DC})*

1 *Evaluation unit, e.g. PLC*
2 *Resistor for HART communication (≥ 250 Ω); observe maximum load*
3 *Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)*
4 *Analog display unit; observe maximum load*
5 *Cable screen; observe cable specification*
6 *Measuring device*
7 *Supply voltage; observe terminal voltage, observe cable specification*

Terminal assignment, 4-wire: 4 to 20 mA HART (90 to 253 V_{AC})



10 *Terminal assignment, 4-wire: 4 to 20 mAHART (90 to 253 V_{AC})*

1 *Connection 4 to 20 mA HART (active): terminals 3 and 4*
2 *Connection, supply voltage: terminals 1 and 2*
3 *Terminal for cable shield*

⚠ CAUTION

To ensure electrical safety:

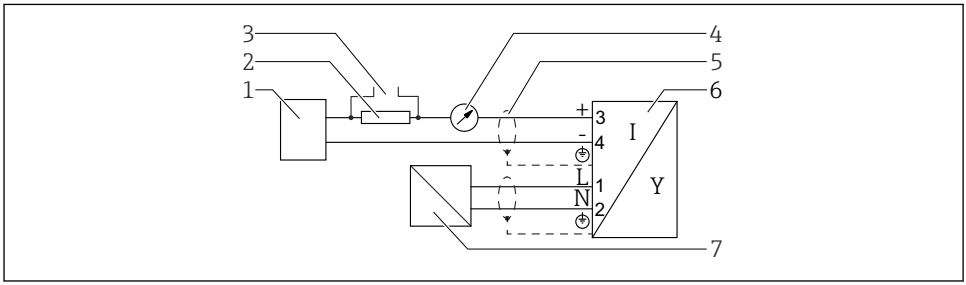
- ▶ Do not disconnect the protective ground connection.
- ▶ Disconnect the device from the supply voltage before disconnecting the protective ground.

Connect protective ground to the inner ground terminal (3) before connecting the supply voltage. If necessary, connect the potential matching line to the outer ground terminal.

In order to ensure electromagnetic compatibility (EMC): do **not** ground the device exclusively via the protective ground conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.

An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnector for the device (IEC/EN61010).

Block diagram, 4-wire: 4 to 20 mA HART (90 to 253 V_{AC})

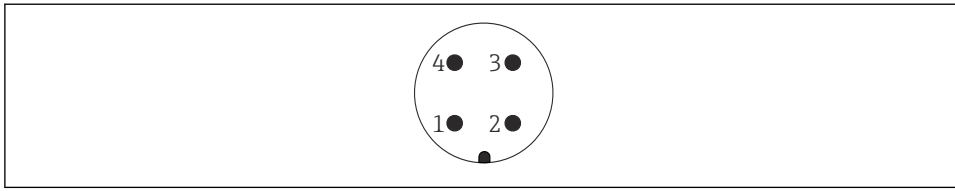


11 Block diagram, 4-wire: 4 to 20 mA HART (90 to 253 V_{AC})

1 *Evaluation unit, e.g. PLC*
2 *Resistor for HART communication (≥ 250 Ω); observe maximum load*
3 *Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)*
4 *Analog display unit; observe maximum load*
5 *Cable screen; observe cable specification*
6 *Measuring device*
7 *Supply voltage; observe terminal voltage, observe cable specification*

6.1.2 Device plug

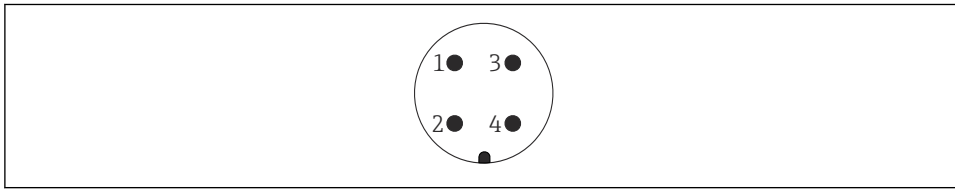
In the case of the device versions with a plug, the housing does not need to be opened to connect the signal cable.



A0011175

12 Pin assignment of M12 plug

1 Signal +
2 Not assigned
3 Signal -
4 Ground



A0011176

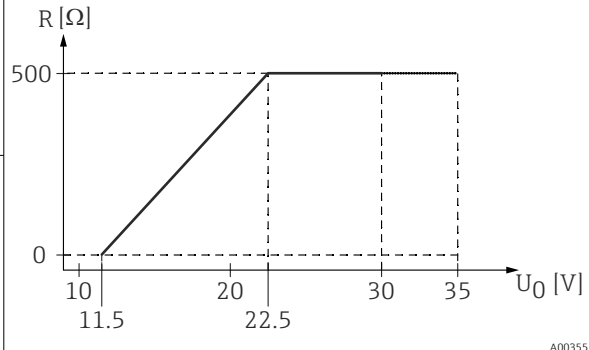
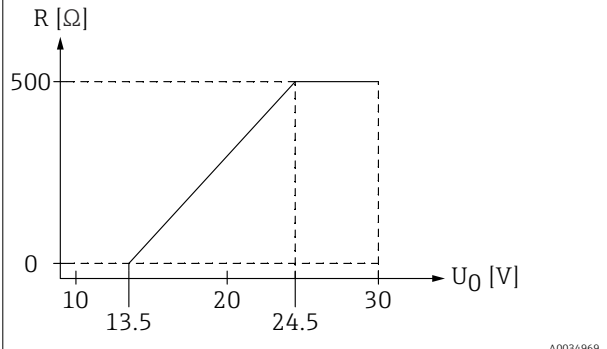
13 Pin assignment of 7/8" plug

1 Signal -
2 Signal +
3 Not assigned
4 Shielding

6.1.3 Supply voltage

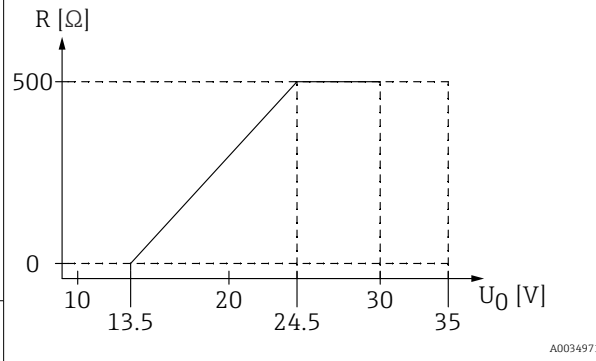
2-wire, 4-20mA HART, passive

2-wire; 4-20mA HART [1)]

"Approval" [2)]	Terminal voltage U at device	Maximum load R, depending on the supply voltage U_0 of the power supply unit
▪ Non-hazardous ▪ Ex nA ▪ Ex ic ▪ CSA GP	11.5 to 35 V [3) 4)]	
Ex ia / IS	11.5 to 30 V [4)]	
▪ Ex d / XP ▪ Ex ic[ia] ▪ Ex tD / DIP	13.5 to 30 V [4) 5)]	

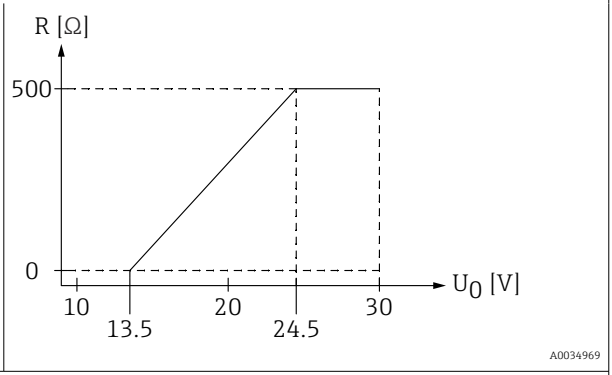
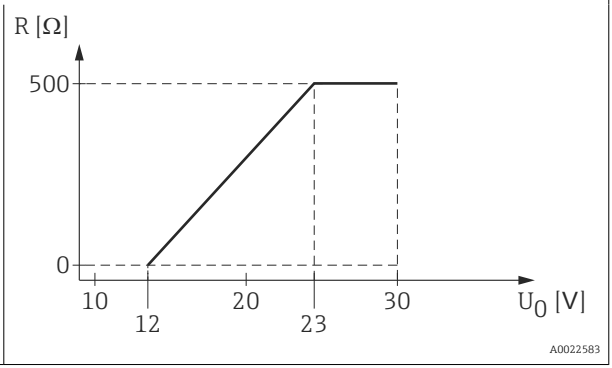
1) Feature 020 of the product structure: option A
2) Feature 010 in the product structure
3) At ambient temperatures $T_a \leq -30$ °C, a terminal voltage U ≥ 14 V is required to start the device with the minimum failure current (3.6 mA). At ambient temperatures $T_a > 60$ °C, a terminal voltage U ≥ 12 V is required to start the device with the minimum failure current (3.6 mA). The start-up current can be configured. If the device is operated with a fixed current I ≥ 4.5 mA (HART Multidrop mode), a voltage U ≥ 11.5 V suffices in the entire ambient temperature range.
4) If the Bluetooth module is used, the minimum supply voltage increases by 2 V.
5) At ambient temperatures $T_a \leq -30$ °C, a terminal voltage U ≥ 16 V is required to start the device with the minimum failure current (3.6 mA).

2-wire; 4-20 mA HART, switch output [1)]

"Approval" [2)]	Terminal voltage U at device	Maximum load R, depending on the supply voltage U_0 of the power supply unit
▪ Non-hazardous ▪ Ex nA ▪ Ex nA(ia) ▪ Ex ic ▪ Ex ic[ia] ▪ Ex d[ia] / XP ▪ Ex ta / DIP ▪ CSA GP	13.5 to 35 V [3) 4)]	
▪ Ex ia / IS ▪ Ex ia + Ex d[ia] / IS + XP	13.5 to 30 V [3) 4)]	

1) Feature 020 of the product structure: option B
2) Feature 010 in the product structure
3) At ambient temperatures $T_a \leq -30$ °C, a terminal voltage U ≥ 16 V is required to start the device with the minimum failure current (3.6 mA).
4) If the Bluetooth module is used, the minimum supply voltage increases by 2 V.

2-wire; 4-20mA HART, 4-20mA [1)]

"Approval" [2)]	Terminal voltage U at device	Maximum load R, depending on the supply voltage U_0 of the power supply unit
All	**Channel 1:**	
	13.5 to 30 V [3) 4) 5)]	
	Channel 2:	
	12 to 30 V	

1) Feature 020 of the product structure: option C
2) Feature 010 in the product structure
3) At ambient temperatures $T_a \leq -30$ °C, a terminal voltage U ≥ 16 V is required to start the device with the minimum failure current (3.6 mA).
4) At ambient temperatures $T_a \leq -40$ °C, the maximum terminal voltage must be limited to U ≤ 28 V.
5) If the Bluetooth module is used, the minimum supply voltage increases by 2 V.

Integrated polarity reversal protection	Yes
Permitted residual ripple with f = 0 to 100 Hz	$U_{SS} < 1$ V
Permitted residual ripple with f = 100 to 10000 Hz	$U_{SS} < 10$ mV

4-wire, 4-20mA HART, active

"Power supply; output" [1]	Terminal voltage U	Maximum load R_{max}
K: 4-wire 90-253VAC; 4-20mA HART	90 to 253 V_{AC} (50 to 60 Hz), overvoltage category II	500 Ω
L: 4-wire 10.4-48VDC; 4-20mA HART	10.4 to 48 V_{DC}	

1) Feature 020 in the product structure

6.1.4 Overvoltage protection

See Operating Instructions.

6.2 Connecting the device

⚠ WARNING

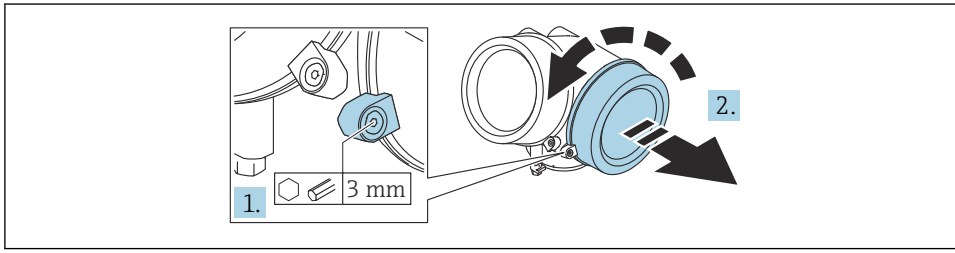
Explosion Hazard!

- ▶ Observe applicable national standards.
- ▶ Comply with the specifications in the Safety Instructions (XA).
- ▶ Use specified cable glands only.
- ▶ Check to ensure that the power supply matches the information on the nameplate.
- ▶ Switch off the power supply before connecting the device.
- ▶ Connect the potential matching line to the outer ground terminal before applying the power supply.

Required tools/accessories:

- For devices with a cover lock: Allen key AF3
- Wire stripper
- When using stranded cables: One ferrule for every wire to be connected.

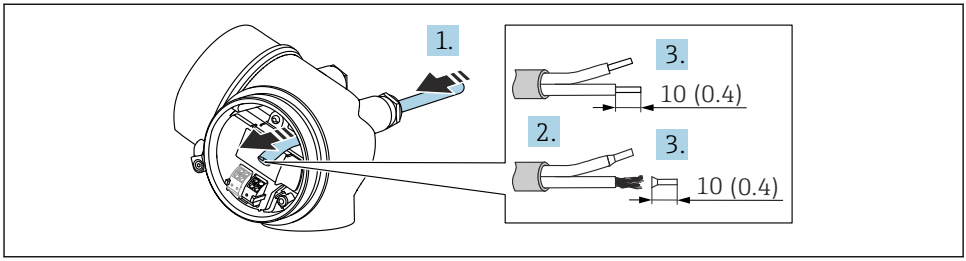
6.2.1 Opening cover



A0021490

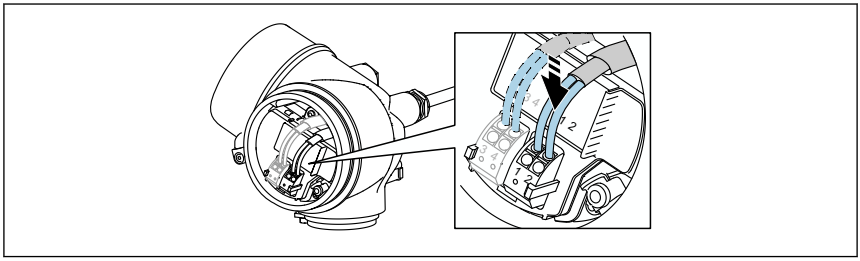
1. Loosen the screw of the securing clamp of the connection compartment cover using an Allen key (3 mm) and turn the clamp 90 ° counterclockwise.
2. Unscrew the connection compartment cover and check the cover seal; replace it if necessary.

6.2.2 Connecting



14 *Engineering unit: mm (in)*

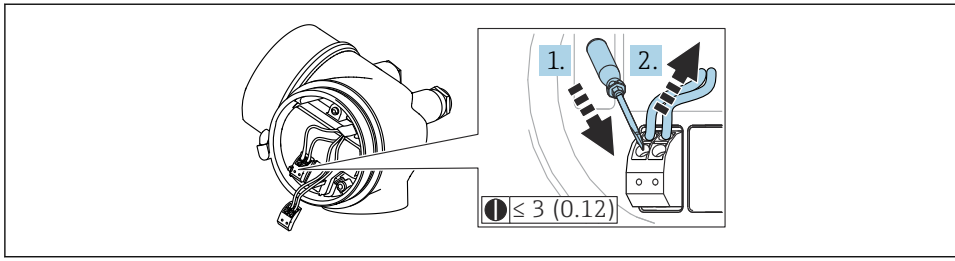
1. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
2. Remove the cable sheath.
3. Strip the cable ends 10 mm (0.4 in). In the case of stranded cables, also fit ferrules.
4. Firmly tighten the cable glands.
5. Connect the cable according to the terminal assignment.



6. If using shielded cables: Connect the cable shield to the ground terminal.

6.2.3 Plug-in spring-force terminals

The electrical connection of device versions without an integrated overvoltage protection is via plug-in spring-force terminals. Rigid conductors or flexible conductors with ferrules can be inserted directly into the terminal without using the lever, and create a contact automatically.

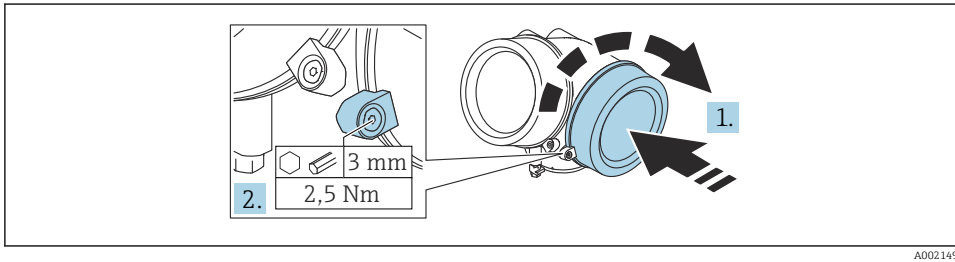


15 *Engineering unit: mm (in)*

To remove the cable from the terminal again:

1. Using a flat-blade screwdriver ≤ 3 mm, press down on the slot between the two terminal holes
2. Simultaneously pull the cable end out of the terminal.

6.2.4 Closing the cover of the connection compartment



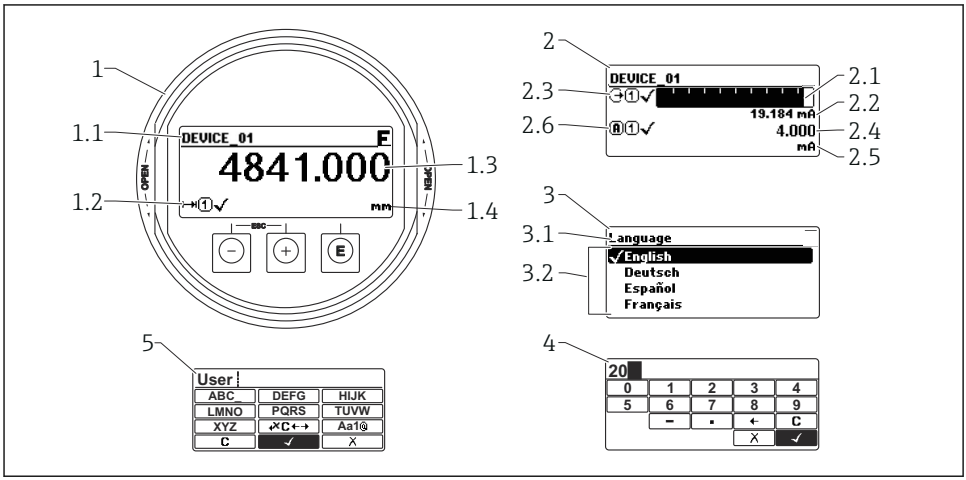
1. Screw down the cover of the connection compartment.
2. Turn the securing clamp 90 ° in the clockwise direction and, using an Allen key (3 mm), tighten the screw of the securing clamp on the connection compartment cover with 2.5 Nm.

7 Operation options

The device can be operated as follows:
- Operation via operating menu (display)
- DeviceCare and Fieldcare, see Operating Instructions
- SmartBlue (app), Bluetooth (optional), see Operating Instructions

7.1 Structure and function of the operating menu

7.1.1 Display



16 Display format on the display and operating module

1 Measured value display (1 value max. size)
1.1 Header containing tag and error symbol (if an error is active)
1.2 Measured value symbols
1.3 Measured value
1.4 Unit
2 Measured value display (bar graph + 1 value)
2.1 Bar graph for measured value 1
2.2 Measured value 1 (including unit)
2.3 Measured value symbols for measured value 1
2.4 Measured value 2
2.5 Unit for measured value 2
2.6 Measured value symbols for measured value 2
3 Visualization of a parameter (here: parameter with picklist)
3.1 Header containing parameter name and error symbol (if an error is active)
3.2 Picklist; ☑ marks the current parameter value.
4 Input matrix for numbers
5 Input matrix for alphanumeric and special characters

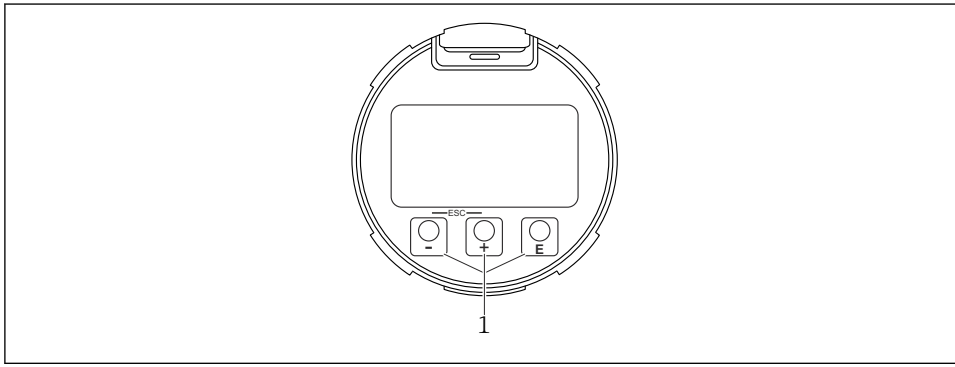
7.1.2 Operating elements

Functions

- Display of measured values and fault and notice messages
- Background lighting, which switches from green to red in the event of an error
- The device display can be removed for easier operation

The device displays are available with the additional option of Bluetooth® wireless technology.

Backlighting is switched on or off depending on the supply voltage and the current consumption.



17 *Display module*

1 Operating keys

Key assignment

- Key ⊞
  - Navigate down in the picklist
  - Edit the numerical values or characters within a function
- Key ⊟
  - Navigate up in the picklist
  - Edit the numerical values or characters within a function
- Key Ⓔ
  - *In the measured value display:* Pressing the key briefly opens the operating menu.
  - Pressing the key for 2 s opens the context menu.
  - *In the menu, submenu:* Pressing the key briefly:
  - Opens the selected menu, submenu or parameter.
  - Pressing the key for 2 s in a parameter:
  - If present, opens the help text for the function of the parameter.
  - *In a text and numeric editor:* Pressing the key briefly:
  - Opens the selected group.
  - Carries out the selected action.
  - Carries out the selected action.

- ⊞ key and ⊟ key (ESC function - press keys simultaneously)
  - *In the menu, submenu:* Pressing the key briefly:
  - Exits the current menu level and takes you to the next higher level.
  - If help text is open, closes the help text of the parameter.
  - Pressing the key for 2 s returns you to the measured value display ("home position").
  - *In a text and numeric editor:* Closes the text or numeric editor without applying changes.
- ⊟ key and Ⓔ key (press keys simultaneously)
  Reduces the contrast (brighter setting).
- ⊞ key and Ⓔ key (press and hold keys simultaneously)
  Increases the contrast (darker setting).

7.2 Access to the operating menu via the local display

Parameter/submenu	Meaning	Description
Language [1]	Defines the operating language of the local display	BA01001F
Setup	Once values have been set for the setup parameters, the measurement should generally be completely configured.	
Setup→Mapping	Mapping of interference echos	
Setup→Advanced setup	Contains additional submenus and parameters ▪ For more customized configuration of the measurement (adaptation to special measuring conditions) ▪ For converting the measured value (scaling, linearization). ▪ For scaling the output signal.	
Diagnostics	Contains the most important parameters for diagnosing the condition of the device	
Expert [2]	Contains all the parameters of the device (including those that are already contained in one of the other menus). This menu is organized according to the function blocks of the device.	GP01000F

1) If you are operating via operating tools (e.g. FieldCare), the Language parameter is located under "Setup→Advanced setup→Display"
2) When you call up the "Expert" menu, you are always asked for an access code. If a customer-specific access code has not been defined, "0000" must be entered.

7.2.1 Opening the context menu

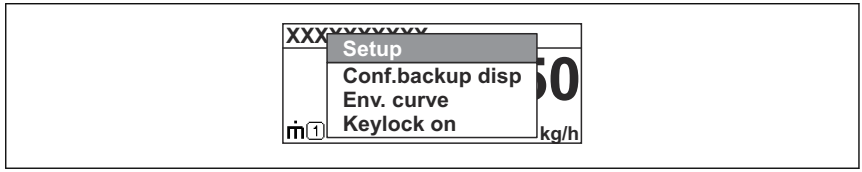
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Envelope curve
- Keylock on

Calling up and closing the context menu

The user is in the operational display.

1. Press E for 2 s.
   ↳ The context menu opens.



A0037872

2. Press − + + simultaneously.
   ↳ The context menu is closed and the operational display appears.

Calling up the menu via the context menu

1. Open the context menu.
2. Press + to navigate to the desired menu.
3. Press E to confirm the selection.
   ↳ The selected menu opens.

8 Commissioning

8.1 Switching on the device

▶ Switch on the mains voltage (fuse box).

The device is switched on.

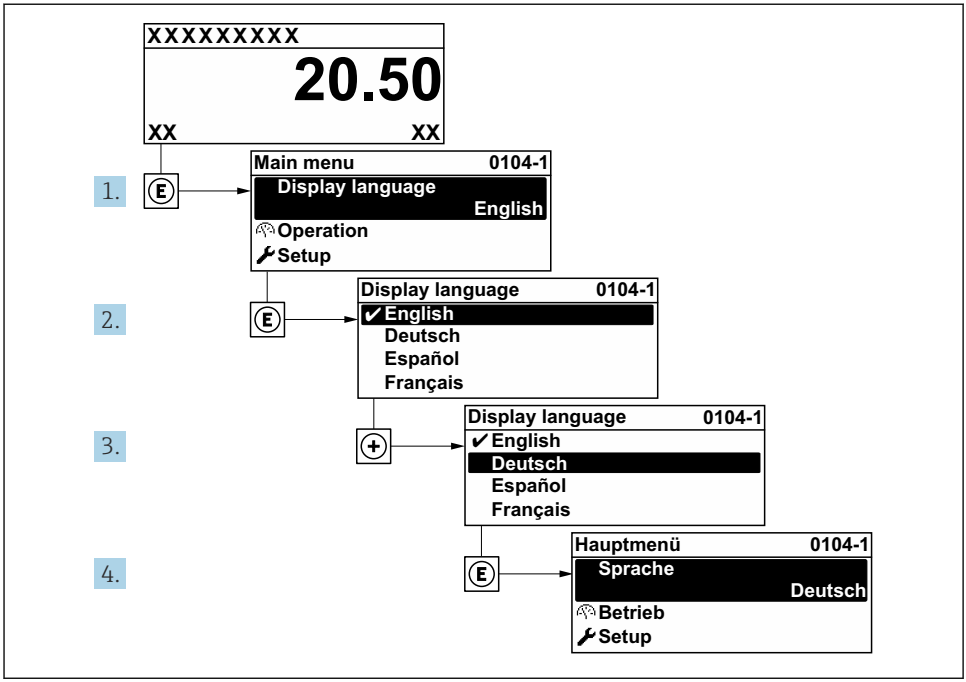
8.1.1 Disabling write protection

If the device is write-protected, write protection must first be disabled.

See the Operating Instructions of the device for this purpose:
BA01001F (FMP51/FMP52/FMP54, HART)

8.2 Setting the operating language

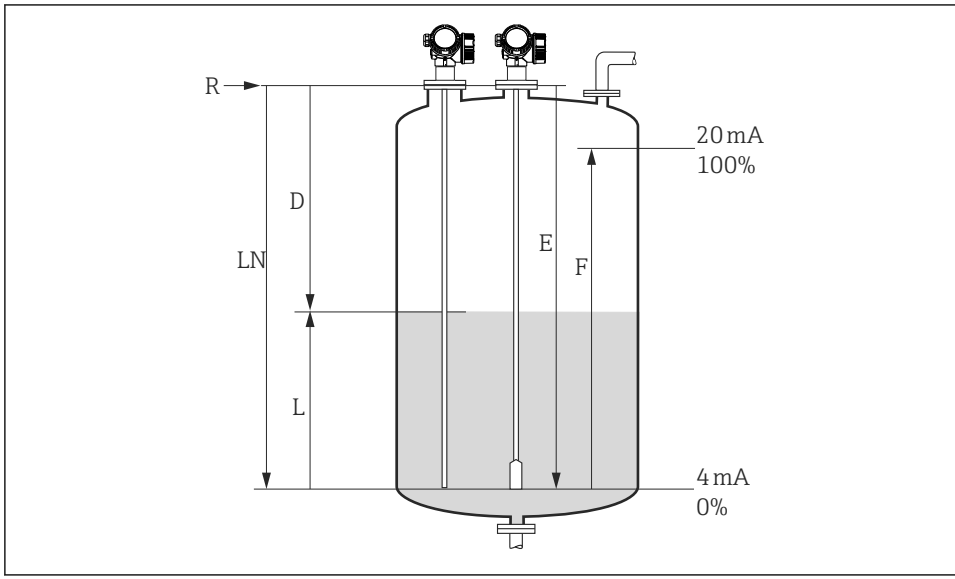
Factory setting: English or ordered local language



18 *Taking the example of the local display*

8.3 Device configuration

8.3.1 Configuring level measurement



19 *Configuration parameters for level measurement in liquids*

LN = Probe length
D = Distance
L = Level
R = Reference point of measurement
E = Empty calibration (= zero point)
F = Full calibration (= span)

1. **Setup → Device tag**
   ↳ Enter device tag.
2. **Setup → Distance unit**
   ↳ Select the length unit.
3. **Setup→Operating mode** [1)]
   ↳ Select **Level** option.
4. **Setup → Tank type**
   ↳ Select tank type.
5. **Setup → Tube diameter** (only for "Tank type" = "Bypass / pipe")
   ↳ Specify the diameter of the bypass or stilling well.

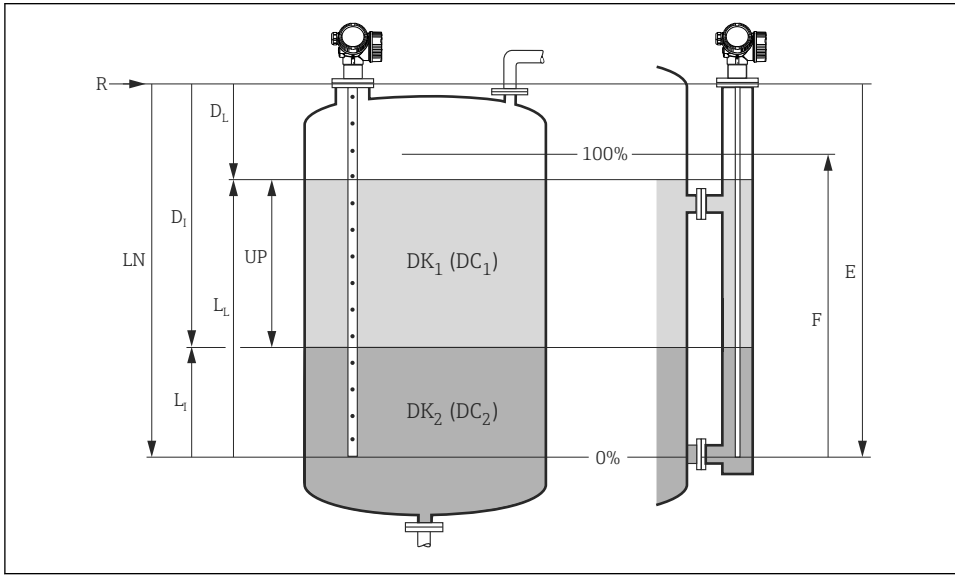
1) Only available in devices with the "Interface measurement" application package

6. **Setup → Medium group**
   ↳ Specify the medium group (**Others** or **Water based (DC >= 4)**)
7. **Setup → Empty calibration**
   ↳ Specify the empty distance E (distance from the reference point R to the 0% mark).
8. **Setup → Full calibration**
   ↳ Specify the full distance F (distance from the 0% mark to the 100% mark).
9. **Setup → Level**
   ↳ Displays the measured level L (for verification purposes).
10. **Setup → Distance**
    ↳ Displays the distance D between the reference point R and the level L (for verification purposes).
11. **Setup → Signal quality**
    ↳ Displays the signal quality of the analyzed level echo (for verification purposes).
12. **Setup → Mapping → Confirm distance**
    ↳ Compare the distance displayed with the actual value in order to start recording an interference echo map [2)].

2) In the case of FMP54 with gas phase compensation (product structure: feature 540 "Application packages", option EF or EG), mapping cannot be performed

8.3.2 Configuring interface measurement

An interface measurement is only possible if the device has the corresponding software option. In the product structure: feature 540 "Application Package", option EB "Interface measurement".



20 *Configuration parameters for interface measurement*

R = Reference point of measurement
E = Empty calibration (= zero point)
F = Full calibration (= span)
LN = probe length
UP = Measured thickness upper layer
D_I = Interface distance (distance from flange to DK_2)
L_I = Interface
D_L = Distance
L_L = Level

1. **Setup → Device tag**
   ↳ Enter device tag.
2. **Setup → Distance unit**
   ↳ Select the length unit.
3. **Setup → Operating mode** [3)]
   ↳ Select **Interface** option.
4. **Setup → Tank type**
   ↳ Select tank type.

3) Only available in devices with the "Interface measurement" application package

5. **Setup → Tube diameter** (only for "Tank type" = "Bypass / pipe")
   ↳ Specify the diameter of the bypass or stilling well.
6. **Setup → Tank level**
   ↳ Specify the filling level (**Partially filled** or **Fully flooded**)
7. **Setup → Distance to upper connection**
   ↳ In bypasses: Specify the distance from the reference point R to the lower edge of the upper outlet; in all other cases, keep the factory setting
8. **Setup → DC value**
   ↳ Specify the dielectric constant of the upper medium
9. **Setup → Empty calibration**
   ↳ Specify the empty distance E (distance from the reference point R to the 0% mark).
10. **Setup → Full calibration**
    ↳ Specify the full distance F (distance from the 0% mark to the 100% mark).
11. **Setup → Level**
    ↳ Displays the measured level L_L.
12. **Setup → Interface**
    ↳ Displays the interface height L_I.
13. **Setup → Distance**
    ↳ Displays the distance D_L between the reference point R and the level L_L.
14. **Setup → Interface distance**
    ↳ Displays the distance D_I between the reference point R and the interface L_I.
15. **Setup → Signal quality**
    ↳ Displays the signal quality of the analyzed level echo.
16. **Setup → Mapping → Confirm distance**
    ↳ Compare the distance displayed with the actual value to start recording an interference echo map.

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