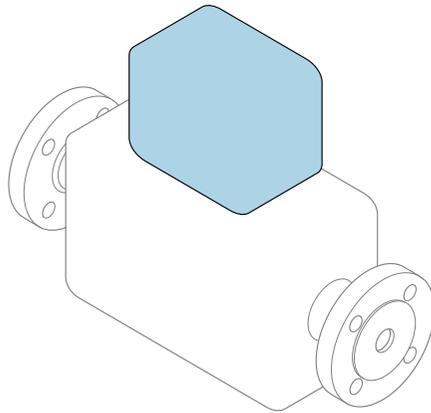


Brief Operating Instructions

Proline 800

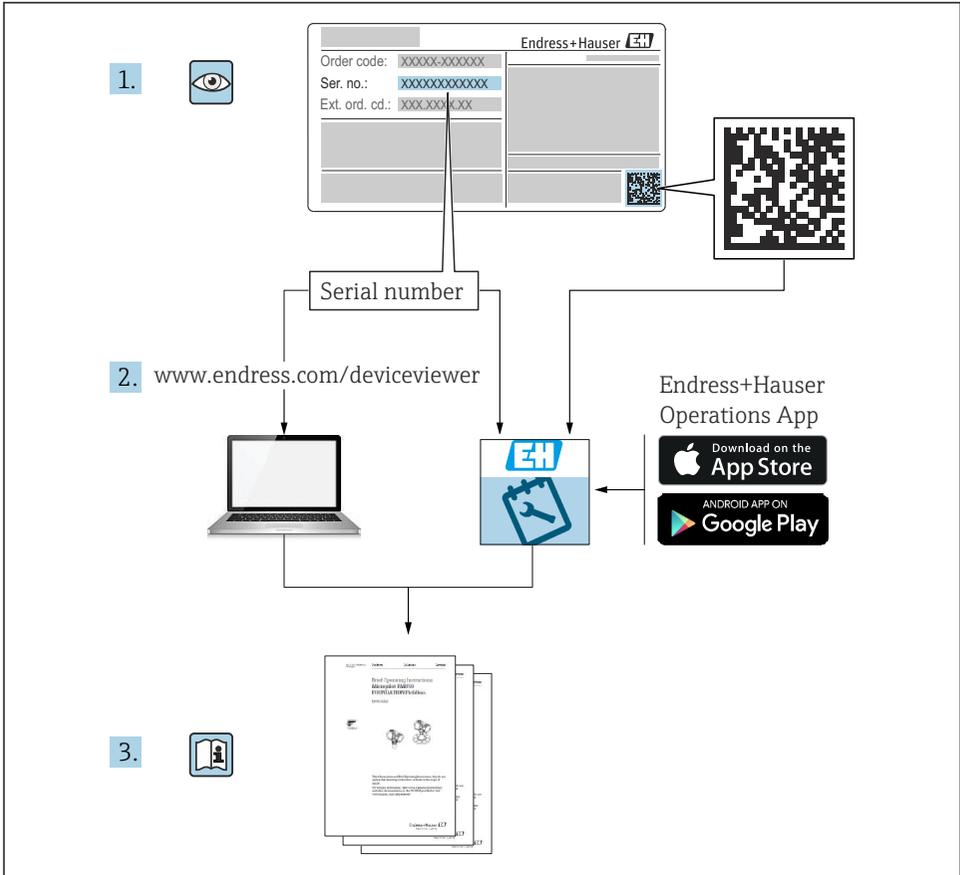
with electromagnetic sensor
Modbus RS485



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

Brief Operating Instructions part 2 of 2: Transmitter
Contain information about the transmitter.

Brief Operating Instructions part 1 of 2: Sensor →  3



A0023555

Brief Operating Instructions for flowmeter

The device consists of a transmitter and a sensor.

The process of commissioning these two components is described in two separate manuals that together form the Brief Operating Instructions for the flowmeter:

- Brief Operating Instructions Part 1: Sensor
- Brief Operating Instructions Part 2: Transmitter

Please refer to both parts of the Brief Operating Instructions when commissioning the device, as the contents of the manuals complement one another:

Brief Operating Instructions Part 1: Sensor

The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device.

- Incoming acceptance and product identification
- Storage and transport
- Installation

Brief Operating Instructions Part 2: Transmitter

The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value).

- Product description
- Installation
- Electrical connection
- Operation options
- System integration
- Commissioning
- Diagnostic information

Additional device documentation



These Brief Operating Instructions are **Brief Operating Instructions Part 2: Transmitter**.

The "Brief Operating Instructions Part 1: Sensor" are available via:

- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

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

- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

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1 About this document

1.1 Symbols used

1.1.1 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.

1.1.2 Symbols for certain types of information

Symbol	Meaning	Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.		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
	Reference to graphic		Series of steps
	Result of a step		Visual inspection

1.1.3 Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current		Alternating current
	Direct current and alternating current		Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Symbol	Meaning
	<p>Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections.</p> <p>The ground terminals are situated inside and outside the device:</p> <ul style="list-style-type: none"> ▪ Inner ground terminal: Connects the protective earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.

1.1.4 Tool symbols

Symbol	Meaning	Symbol	Meaning
	Torx screwdriver		Flat blade screwdriver
	Cross-head screwdriver		Allen key
	Open-ended wrench		

1.1.5 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,...	Item numbers		Series of steps
A, B, C, ...	Views	A-A, B-B, C-C, ...	Sections
	Hazardous area		Safe area (non-hazardous area)
	Flow direction		

2 Safety instructions

2.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:

- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ▶ Are authorized by the plant owner/operator.
- ▶ Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Follow instructions and comply with basic conditions.

2.2 Designated use

Application and media

The measuring device described in this manual is intended only for the flow measurement of liquids with a minimum conductivity of 20 $\mu\text{S}/\text{cm}$.

Measuring devices for use in applications where there is an increased risk due to process pressure are labeled accordingly on the nameplate.

To ensure that the measuring device remains in proper condition for the operation time:

- ▶ Keep within the specified pressure and temperature range.
- ▶ Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- ▶ Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
- ▶ If the ambient temperature of the measuring device is outside the atmospheric temperature, it is absolutely essential to comply with the relevant basic conditions as specified in the device documentation.
- ▶ Protect the measuring device permanently against corrosion from environmental influences.

Incorrect use

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

WARNING

Danger of breakage due to corrosive or abrasive fluids and ambient conditions!

- ▶ Verify the compatibility of the process fluid with the sensor material.
- ▶ Ensure the resistance of all fluid-wetted materials in the process.
- ▶ Keep within the specified pressure and temperature range.

NOTICE

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 as minute changes in the temperature, concentration or level of contamination in the process can alter the corrosion resistance properties.

Residual risks

WARNING

The electronics and the medium may cause the surfaces to heat up or freeze. This presents a burn hazard!

- ▶ For elevated or low fluid temperatures, ensure protection against contact.

2.3 Workplace safety

For work on and with the device:

- ▶ Wear the required personal protective equipment according to federal/national regulations.

For welding work on the piping:

- ▶ Do not ground the welding unit via the measuring device.

If working on and with the device with wet hands:

- ▶ Due to the increased risk of electric shock, gloves must be worn.

2.4 Operational safety

Risk of injury.

- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

2.5 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 general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

2.6 IT security

Our warranty is valid only 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 settings.

IT security measures, which provide additional protection for the device and associated data transfer, must be implemented by the operators themselves in line with their security standards.

2.7 Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater in-operation safety if used correctly.



For detailed information on device-specific IT security, see the Operating Instructions for the device.

3 Product description

The device consists of a transmitter and a sensor.

Two device versions are available:

- Compact version – transmitter and sensor form a mechanical unit.
- Remote version - transmitter and sensor are mounted in separate locations.



For detailed information on the product description, see the Operating Instructions for the device

4 Installation



For detailed information about mounting the sensor, see the Sensor Brief Operating Instructions →  3

4.1 Mounting the measuring device

4.1.1 Screw tightening torques



For detailed information on the screw tightening torques, see the "Mounting the sensor" section of the Brief Operating Instructions

4.1.2 Mounting the transmitter of the remote version, Proline 800 - Advanced

CAUTION

Ambient temperature too high!

Danger of electronics overheating and housing deformation.

- ▶ Do not exceed the permitted maximum ambient temperature .
- ▶ If operating outdoors: Avoid direct sunlight and exposure to weathering, particularly in warm climatic regions.

CAUTION

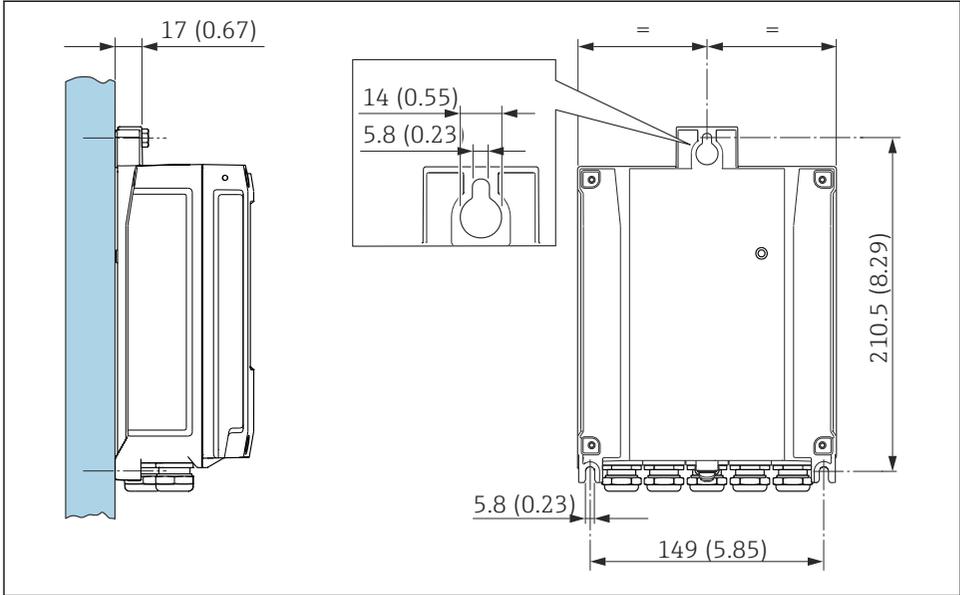
Excessive force can damage the housing!

- ▶ Avoid excessive mechanical stress.

The transmitter of the remote version can be mounted in the following ways:

- Wall mounting
- Pipe mounting

Wall mounting Proline 800 - Advanced



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1 Engineering unit mm (in)

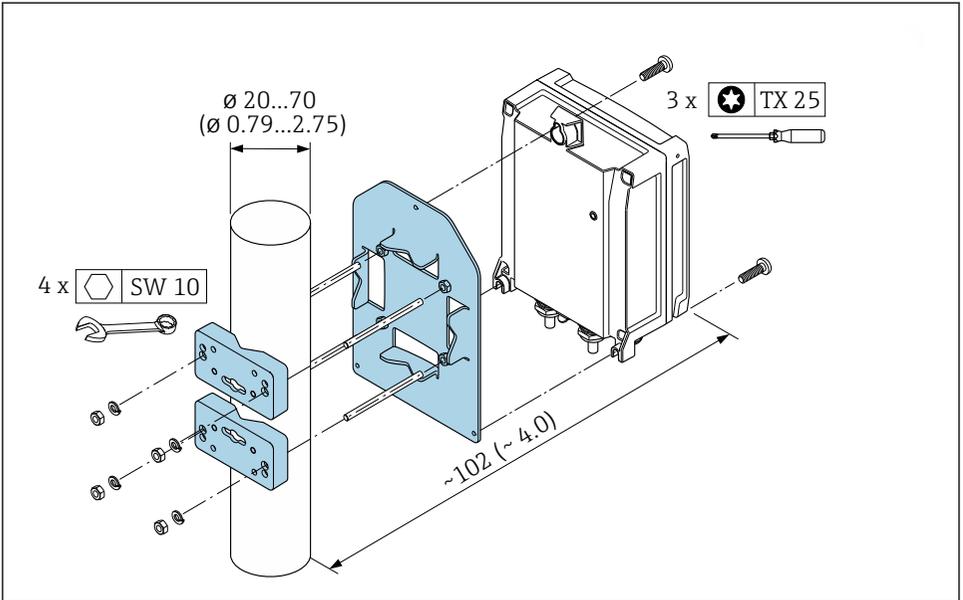
Post mounting Proline 800 - Advanced

⚠ WARNING

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

- ▶ Tighten the fixing screws as per the tightening torque: 2 Nm (1.5 lbf ft)

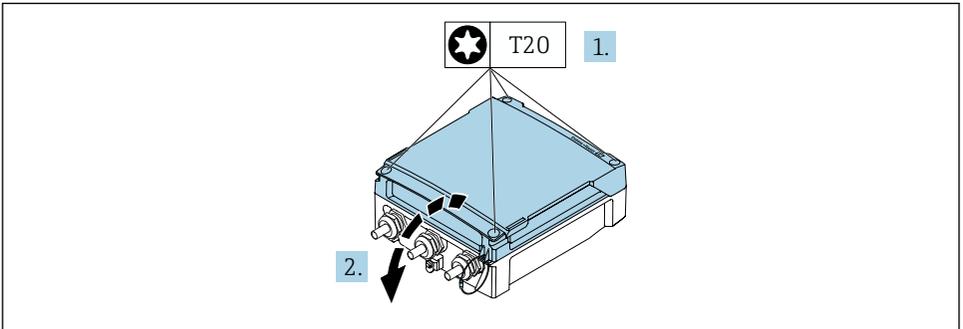


A0029051

2 Engineering unit mm (in)

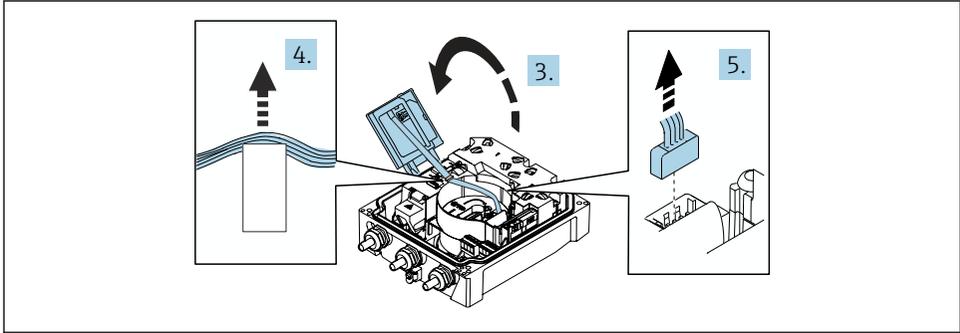
4.1.3 Turning the transmitter housing, Proline 800 - Advanced

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



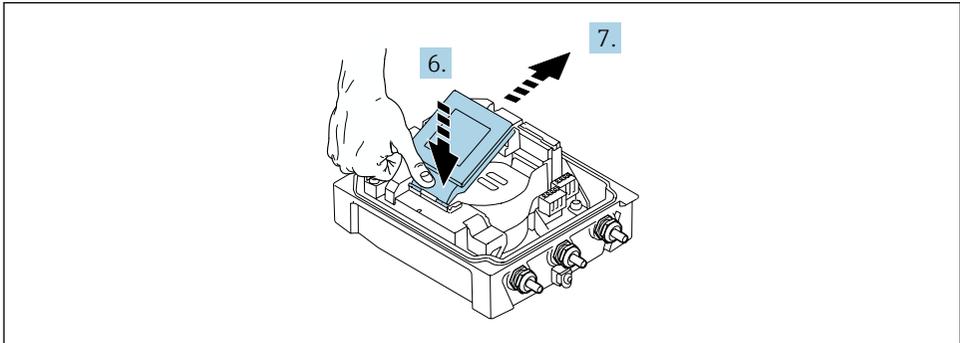
A0044272

1. Loosen the fixing screws of the housing cover (when reassembling, pay attention to the tightening torque → 14).
2. Open the housing cover.



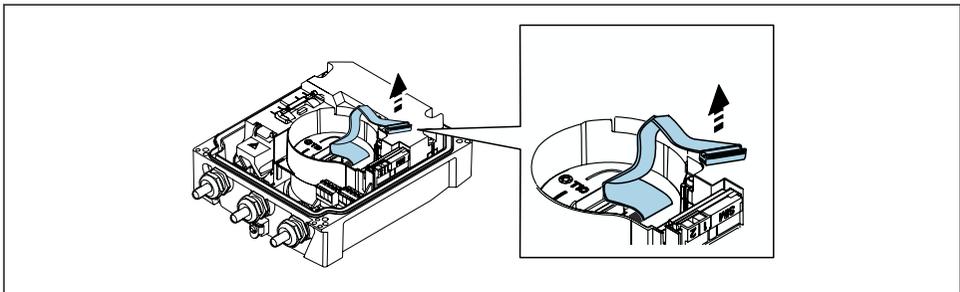
A0044274

- 3. Open the display module.
- 4. Push the ribbon cable out of the holder.
- 5. Disconnect the plug.



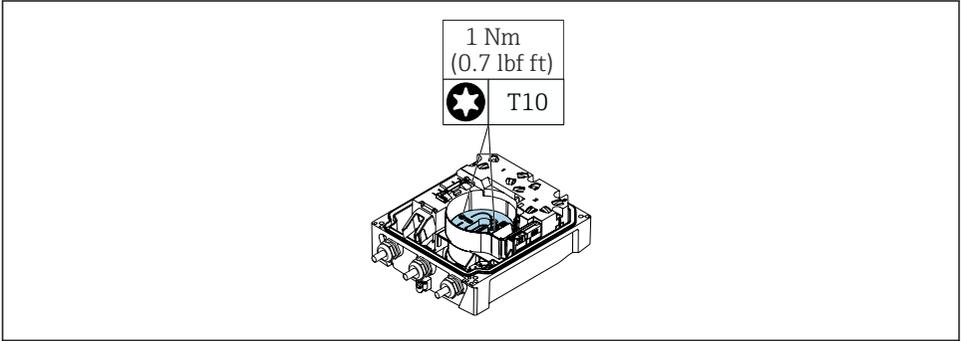
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- 6. Push the display module down gently at the hinge.
- 7. Pull the display module out of the holder.

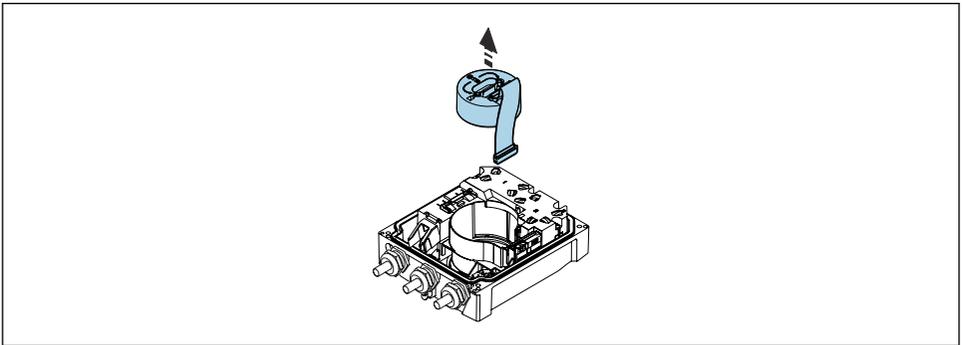


A0043338

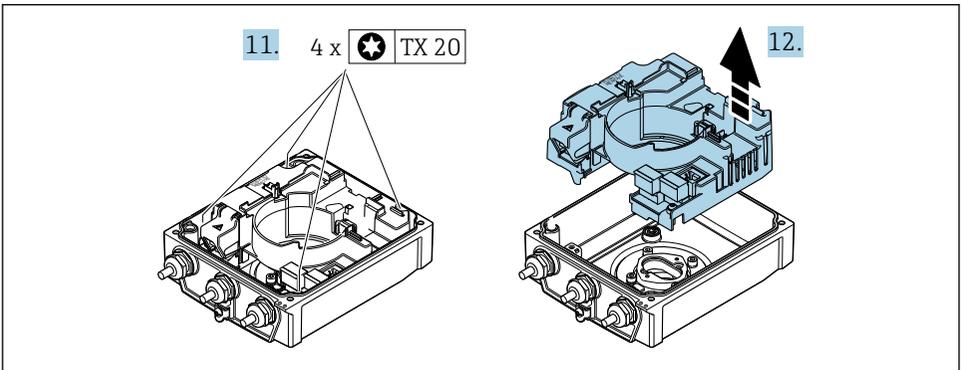
- 8. Disconnect the plug of the electronics module.



9. Release the screws on the electronics module.

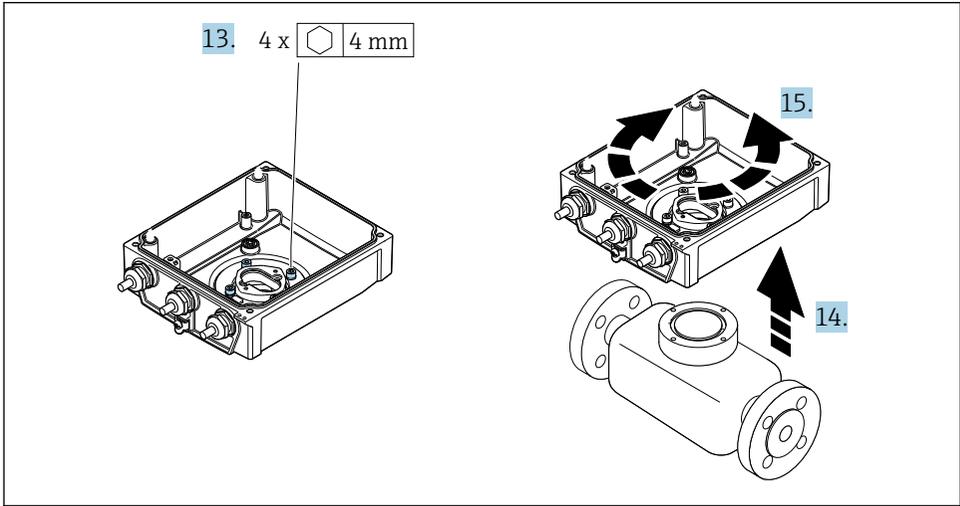


10. Remove the electronics module.



11. Loosen the fixing screws of the main electronics module (when reassembling, pay attention to the tightening torque → 14).

12. Remove the main electronics module.



A0044277

- 13. Loosen the fixing screws of the transmitter housing (when reassembling, pay attention to the tightening torque → 14).
- 14. Lift the transmitter housing.
- 15. Turn the housing to the desired position in increments of 90°.

Reassembling the transmitter housing

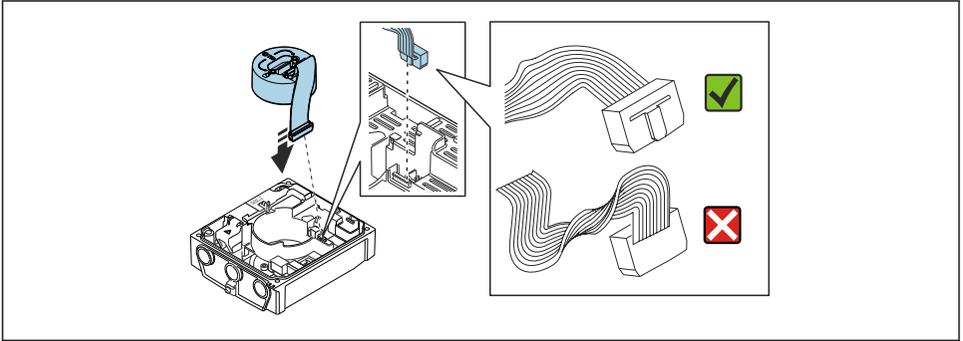
⚠ WARNING

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

► Tighten the fixing screws as per the tightening torque: 2 Nm (1.5 lbf ft)

Step → 11	Fixing screw	Tightening torques
1	Housing cover	1 Nm (0.7 lbf ft)
9	Electronics module	0.6 Nm (0.4 lbf ft)
11	Main electronics module	1.5 Nm (1.1 lbf ft)
13	Transmitter housing	5.5 Nm (4.1 lbf ft)



A0044279

► Reverse the procedure to reassemble the measuring device.

4.1.4 Mounting the external battery pack

The external battery pack is mounted like the transmitter of the remote version → 9.

4.2 Transmitter post-installation check

The post-installation check must always be performed after the following tasks:

- Mounting the transmitter housing:
 - Post mounting
 - Wall mounting
- Turning the transmitter housing

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Turning the transmitter housing: <ul style="list-style-type: none"> ■ Is the securing screw firmly tightened? ■ Is the connection compartment cover screwed on tightly? ■ Is the securing clamp tightened correctly? 	<input type="checkbox"/>
Post and wall mounting: Are the securing screws tightened securely?	<input type="checkbox"/>

5 Electrical connection

NOTICE

In the device versions with a mains connection (order code for "Power supply" option K or S), the device does not have an internal circuit breaker to disconnect from the power supply network.

- ▶ For this reason, assign the measuring device a switch or power-circuit breaker so that the power supply line can be easily disconnected from the mains.
- ▶ Although the measuring device is equipped with a fuse, additional overcurrent protection (maximum 16 A) should be integrated into the system installation.

5.1 Electrical safety

In accordance with applicable federal/national regulations.

5.2 Connection conditions

5.2.1 Required tool

- Torque wrench
- For cable entries: use appropriate tool
- Wire stripper
- When using stranded cables: crimper for wire end ferrule
- For removing cables from terminal: flat blade screwdriver ≤ 3 mm (0.12 in)

5.2.2 Requirements for connecting cable

The connecting cables provided by the customer must fulfill the following requirements.

Permitted temperature range

- The installation guidelines that apply in the country of installation must be observed.
- The cables must be suitable for the minimum and maximum temperatures to be expected.

Power supply cable (incl. conductor for the inner ground terminal)

Standard installation cable is sufficient.

Signal cable

Pulse/switch output

Standard installation cable is sufficient.

Modbus RS485

The EIA/TIA-485 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.



For detailed information about the specification of the connecting cable, see the Operating Instructions for the device.

Connecting cable for remote version

The remote version is connected via an electrode cable and a coil current cable.



For detailed information about the specification of the connecting cables, see the Operating Instructions for the device.

Armored connecting cable

Armored connecting cables with an additional, reinforcing metal braid should be used:

- When laying the cable directly in the ground
- Where there is a risk of damage from rodents
- If using the device below IP68 degree of protection

Operation in areas with strong electrical interference

Grounding is by means of the ground terminal provided for the purpose inside the connection housing. The stripped and twisted lengths of cable shield to the ground terminal must be as short as possible.

Cable diameter

- Cable glands supplied:
 - For standard cable: M20 × 1.5 with cable ϕ 6 to 12 mm (0.24 to 0.47 in)
 - For reinforced cable: M20 × 1.5 with cable ϕ 9.5 to 16 mm (0.37 to 0.63 in)
- (Plug-in) spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

5.2.3 Terminal assignment

In addition to the inputs and outputs available, information on the terminal assignment for the electrical connection can be found on the connection nameplate on the main electronics module.

5.2.4 Shielding and grounding

Shielding and grounding concept

1. Maintain electromagnetic compatibility (EMC).
2. Take explosion protection into consideration.
3. Pay attention to the protection of persons.
4. Comply with national installation regulations and guidelines.
5. Observe cable specifications .
6. Keep the stripped and twisted lengths of cable shield to the ground terminal as short as possible.
7. Shield cables fully.

Grounding of the cable shield

NOTICE

In systems without potential matching, the multiple grounding of the cable shield causes mains frequency equalizing currents!

Damage to the bus cable shield.

- ▶ Only ground the bus cable shield to either the local ground or the protective ground at one end.
- ▶ Insulate the shield that is not connected.

To comply with EMC requirements:

1. Ensure the cable shield is grounded to the potential matching line at multiple points.
2. Connect every local ground terminal to the potential matching line.

5.2.5 Requirements for the supply unit

Supply voltage

Order code "Power supply"	Terminal numbers	Terminal voltage		Frequency range
Option K Option S (wide range power unit)	1 (L+/L), 2 (L-/N)	DC 24 V	-20 to +25 %	-
		AC 100 to 240 V	-15 to +10 %	50/60 Hz, ±3 Hz

5.2.6 Preparing the measuring device

Carry out the steps in the following order:

1. Mount the sensor and transmitter.
2. Connection housing, sensor: Connect connecting cable.
3. Transmitter: Connect connecting cable.
4. Transmitter: Connect signal cable and cable for supply voltage.

NOTICE

Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.

- ▶ Use suitable cable glands corresponding to the degree of protection.

1. Remove dummy plug if present.
2. If the measuring device is supplied without cable glands:
Provide suitable cable gland for corresponding connecting cable.
3. If the measuring device is supplied with cable glands:
Observe requirements for connecting cables .

5.2.7 Preparing the connecting cable for the remote version

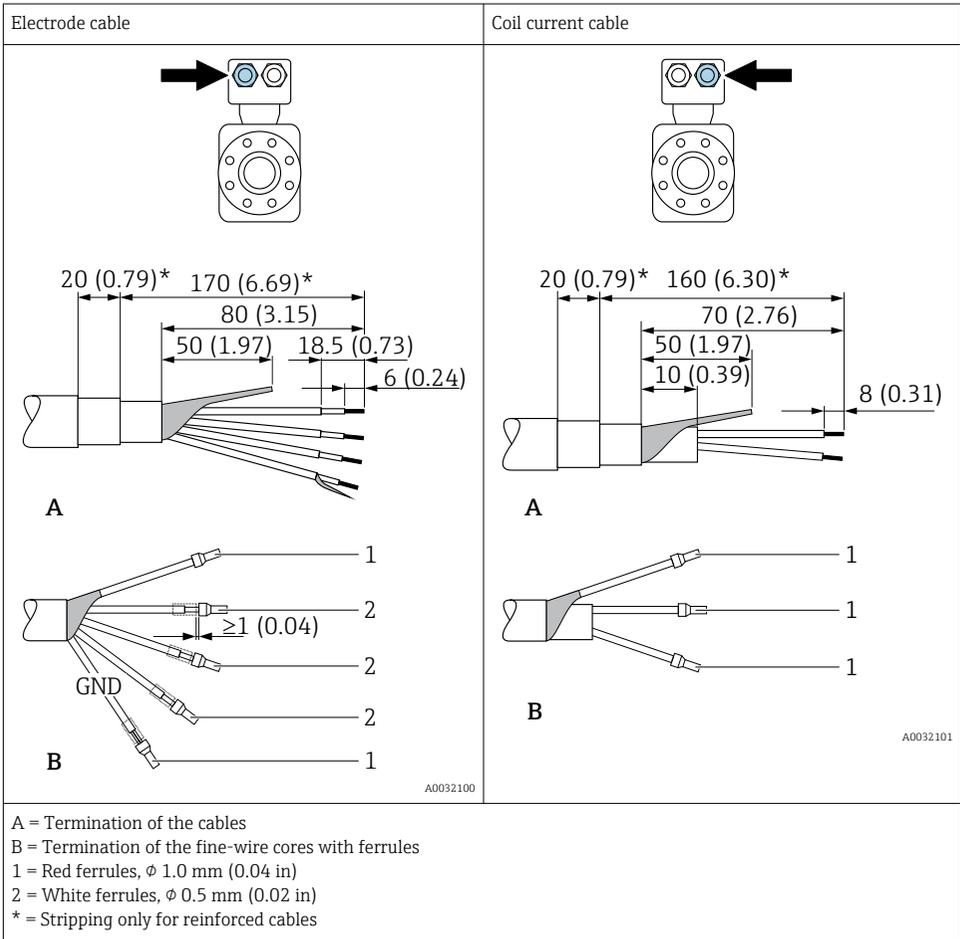
When terminating the connecting cable, pay attention to the following points:

1. In the case of the electrode cable:
Make sure that the ferrules do not touch the core shields on the sensor side. Minimum distance = 1 mm (exception: green "GND" cable)
2. In the case of the coil current cable:
Insulate one core of the three-core cable at the level of the core reinforcement. You only require two cores for the connection.
3. For cables with fine-wire cores (stranded cables):
Fit the cores with ferrules.

Transmitter

Electrode cable	Coil current cable
<p style="text-align: center;">A</p> <p style="text-align: center;">B</p> <p style="text-align: center;">Engineering unit mm (in)</p> <p style="text-align: center;">3</p>	<p style="text-align: center;">A</p> <p style="text-align: center;">B</p> <p style="text-align: center;">Engineering unit mm (in)</p> <p style="text-align: center;">4</p>
<p>A = Termination of the cables B = Termination of the fine-wire cores with ferrules 1 = Red ferrules, ϕ 1.0 mm (0.04 in) 2 = White ferrules, ϕ 0.5 mm (0.02 in) * = Stripping only for reinforced cables</p>	

Sensor



5.3 Connecting the measuring device

⚠ WARNING

Risk of electric shock! Components carry dangerous voltages!

- ▶ Have electrical connection work carried out by correspondingly trained specialists only.
- ▶ Observe applicable federal/national installation codes and regulations.
- ▶ Comply with local workplace safety regulations.
- ▶ Observe grounding concept of the plant.
- ▶ Never mount or wire the measuring device while it is connected to the supply voltage.
- ▶ Before the supply voltage is applied, connect the protective ground to the measuring device.

5.3.1 Connecting the remote version

⚠ WARNING

Risk of damaging the electronic components!

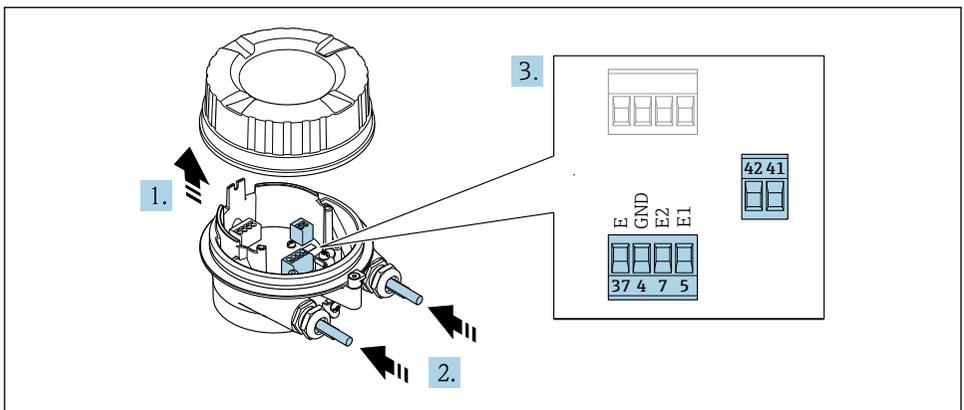
- ▶ Connect the sensor and transmitter to the same potential equalization.
- ▶ Only connect the sensor to a transmitter with the same serial number.
- ▶ Ground the connection housing of the sensor via the external screw terminal.

The following procedure (in the action sequence given) is recommended for the remote version:

1. Mount the sensor and transmitter.
2. Connect the connecting cable for the remote version.
3. Connect the transmitter.

Attaching the connecting cable to the sensor connection housing

Promag W



A0032103

5 Sensor: connection module

1. Loosen the securing clamp of the housing cover.
2. Unscrew and lift off the housing cover.
3. **NOTICE**

For conduit extensions:

- ▶ Fit O-ring on cable and push it back sufficiently. When inserting the cable, the O-ring must be located outside the conduit extension.

Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.

4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules → **19**.
5. Connect the cable in accordance with the terminal assignment .

6. Firmly tighten the cable glands.

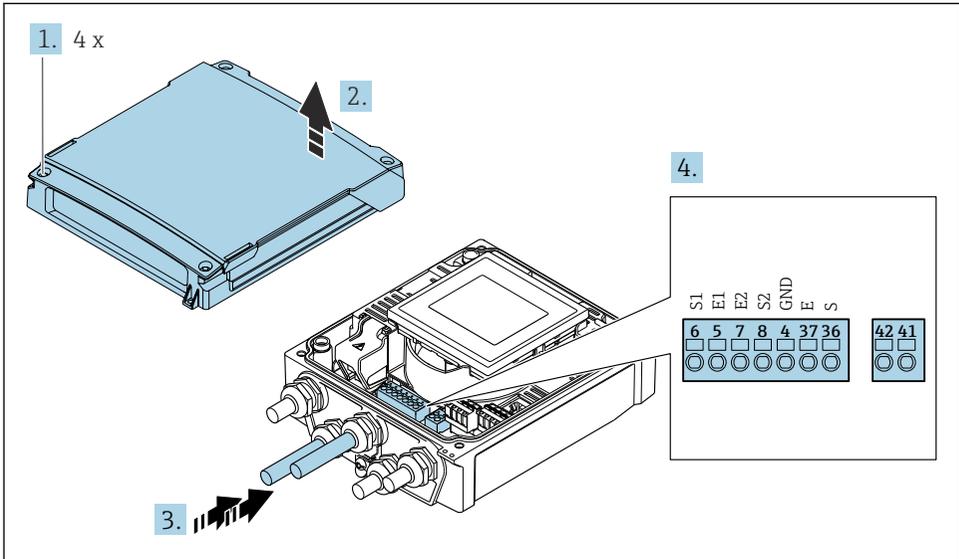
7. **⚠ WARNING**

Housing degree of protection may be voided due to insufficient sealing of the housing.

- ▶ Screw in the screw without using any lubricant. The threads on the cover are coated with a dry lubricant.

Reverse the procedure to reassemble the sensor.

Attaching the connecting cable to the transmitter



A0044280

6 Transmitter: main electronics module with terminals

1. Loosen the 4 fixing screws on the housing cover.
2. Open the housing cover.
3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules → 19.
5. Connect the cable in accordance with the terminal assignment .
6. Firmly tighten the cable glands.

7. ⚠ WARNING

Housing degree of protection may be voided due to insufficient sealing of the housing.

- ▶ Screw in the screw without using any lubricant.

Reverse the removal procedure to reassemble the transmitter.

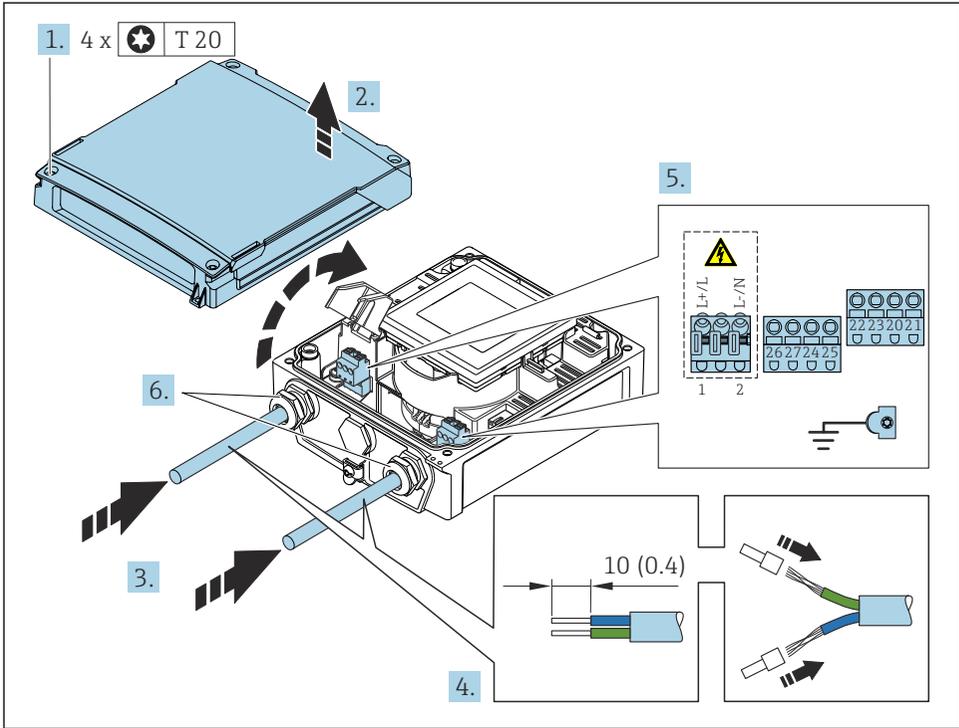
5.3.2 Connecting the transmitter**⚠ WARNING**

Housing degree of protection may be voided due to insufficient sealing of the housing.

- ▶ Screw in the screw without using any lubricant. The threads on the cover are coated with a dry lubricant.

Tightening torques for plastic housing

Housing cover fixing screw	1.3 Nm
Cable entry	4.5 to 5 Nm
Ground terminal	2.5 Nm



A0044281

7 Connecting the supply voltage and Modbus RS485

1. Loosen the 4 fixing screws on the housing cover.
2. Open the housing cover.
3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
5. Connect the cable in accordance with the terminal assignment . For supply voltage: open the shock protection cover.
6. Firmly tighten the cable glands.

Reassembling the transmitter

1. Close the shock protection cover.
2. Close the housing cover.

3. ⚠ WARNING

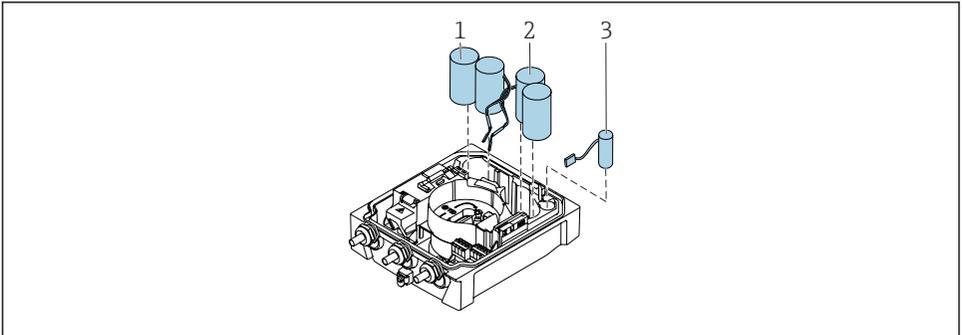
Housing degree of protection may be voided due to insufficient sealing of the housing.

- ▶ Screw in the screw without using any lubricant.

Tighten the 4 fixing screws on the housing cover.

5.4 Power supply via battery packs, Proline 800 - Advanced

5.4.1 Battery pack arrangement

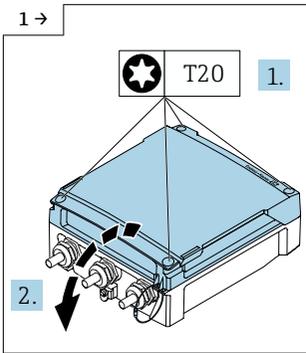


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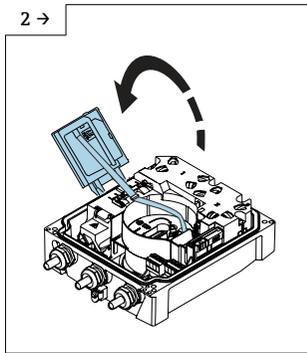
- 1 Battery pack 1
- 2 Battery pack 2
- 3 Buffer capacitor

5.4.2 Inserting and connecting buffer capacitors and battery packs

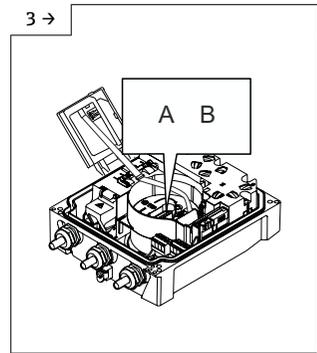
- i** The device is delivered either with the batteries already installed, or enclosed separately, depending on national standards and guidelines. If the batteries are ready installed and connected when the device is delivered, make sure that the "B" switch is set to "On" and the ribbon cable is connected to the electronics module in order to operate the device.
- i** The device starts once the buffer capacitor is connected. After 15 seconds, a measured value appears on the display.
- i** Connect the battery pack immediately once the buffer capacitor has been connected.



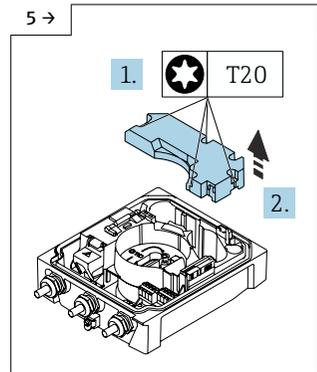
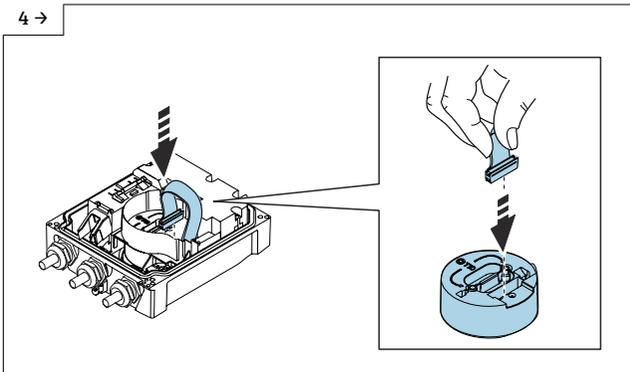
- ▶ Open the connection compartment cover.



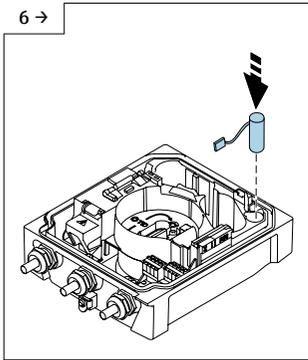
- ▶ Open the display module.



- ▶ Set switch "B" to "ON".

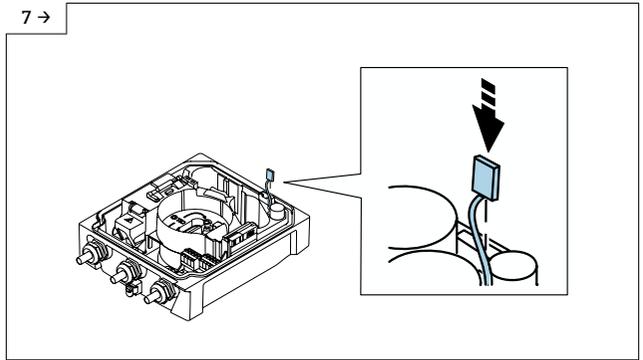


- ▶ Remove the cover of the battery pack.



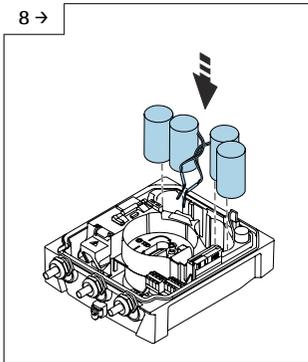
A0043734

- ▶ Insert the buffer capacitor.



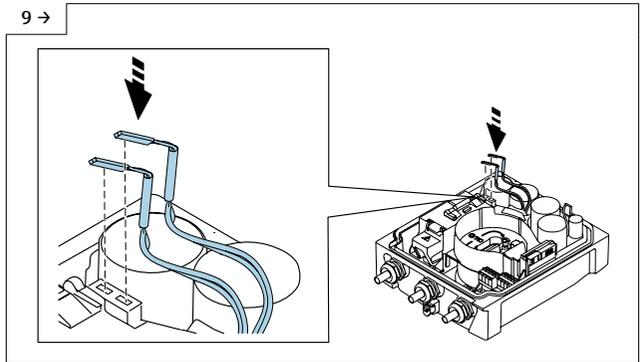
A0043735

- ▶ Plug the buffer capacitor into connector 3.
- ▶ The device switches on. After 15 seconds, a measured value appears on the display.



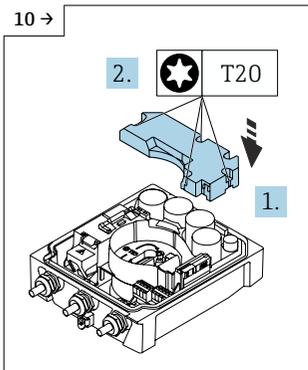
A0043732

- ▶ Insert battery packs 1 and 2.



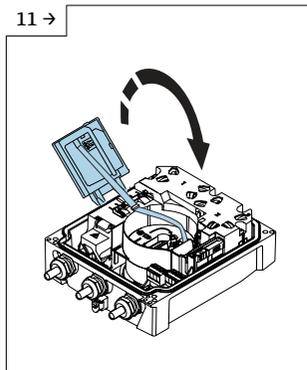
A0043733

- ▶ Plug the connector of battery pack 1 into connector 1.
- ▶ Plug the connector of battery pack 2 into connector 2.



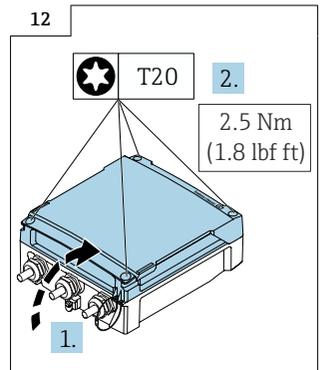
A0043736

- ▶ Mount the cover of the battery pack.



A0043737

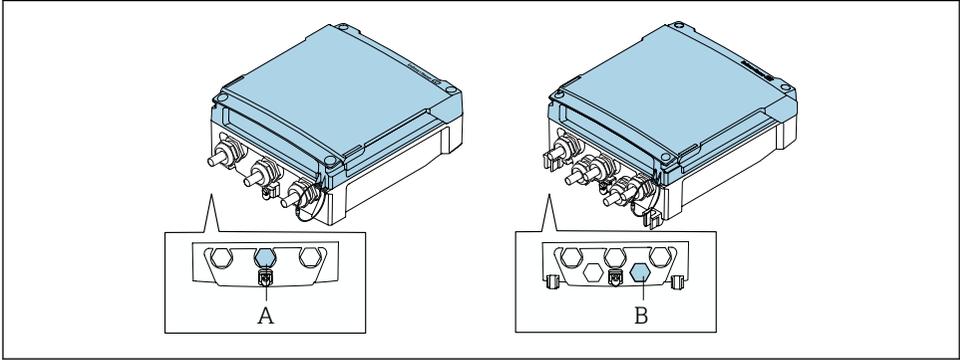
- ▶ Close the display module.



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- ▶ Close the connection compartment cover.

5.5 Connecting the pressure sensor



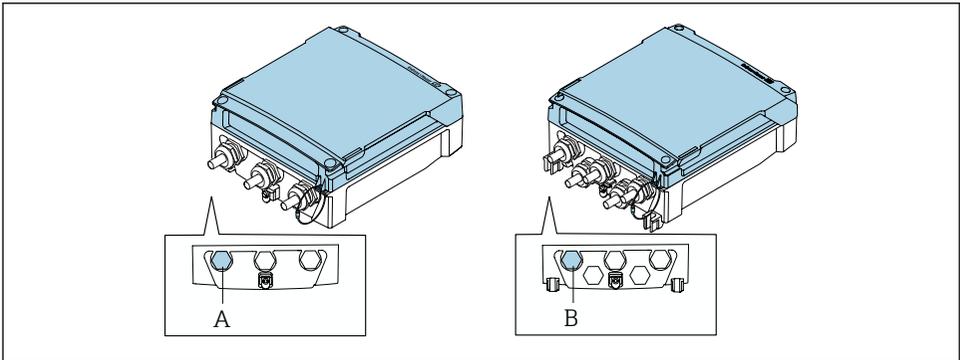
A0044314

- A Plug for the pressure sensor on the housing of the compact transmitter
 B Plug for the pressure sensor on the housing of the remote transmitter

- Connect the pressure sensor to the plug indicated.

5.6 Power supply via the external battery pack, Proline 800 - Advanced

5.6.1 Connecting the external battery pack



A0044313

- A Plug for the external battery pack on the housing of the compact transmitter
 B Plug for the external battery pack on the housing of the remote transmitter

- Connect the external battery pack to the plug indicated.

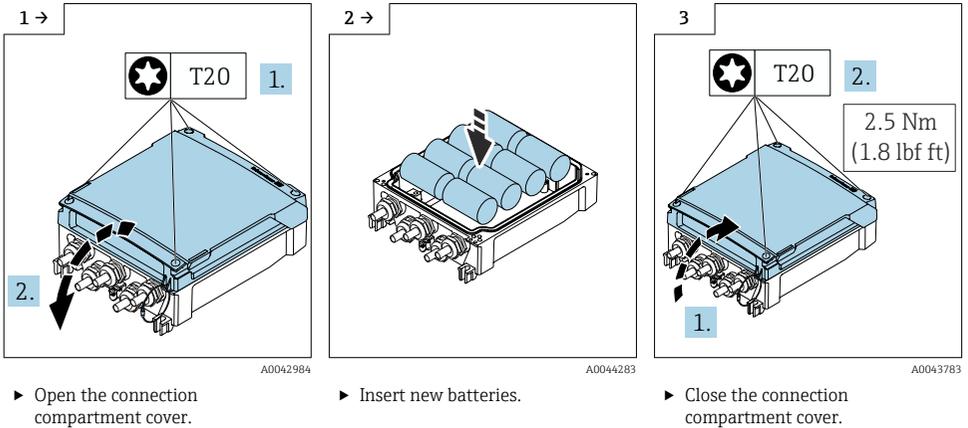
5.6.2 Inserting batteries into the external battery pack

⚠ WARNING

Batteries may explode if not handled properly!

- ▶ Do not recharge batteries.
- ▶ Do not take batteries apart.
- ▶ Do not expose batteries to naked flame.

i Observe the specified temperature range of the batteries.



5.7 Ensuring potential equalization

⚠ CAUTION

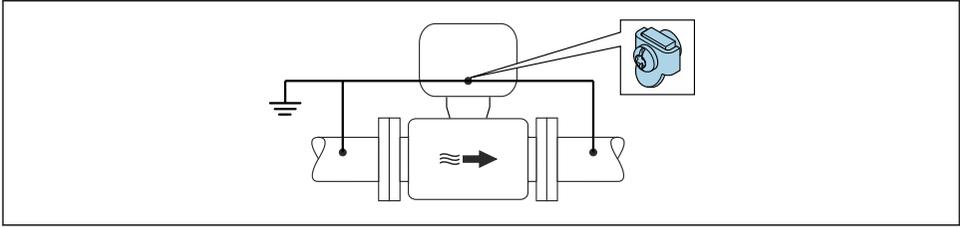
Insufficient or faulty potential equalization.

May destroy the electrodes and thus result in the complete failure of the device!

- ▶ Pay attention to in-house grounding concepts
- ▶ Take account of operating conditions like the pipe material and grounding
- ▶ Connect the medium, sensor and transmitter to the same electrical potential
- ▶ Use a ground cable with a minimum cross-section of 6 mm^2 (0.0093 in^2) for potential matching connections

5.7.1 Connection example, standard scenario

Metal, grounded pipe



A004266

8 Potential equalization via measuring tube

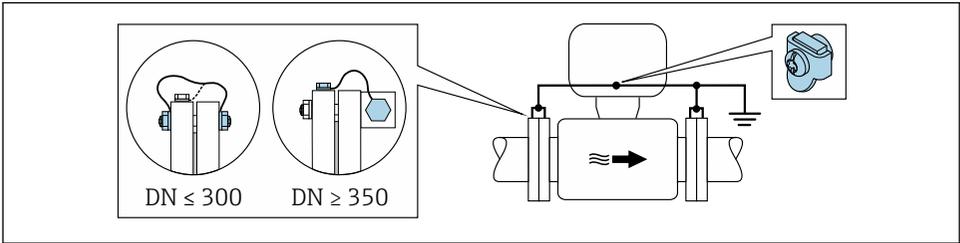
5.7.2 Connection example in special situations

Unlined and ungrounded metal pipe

This connection method also applies in situations where:

- The customary potential equalization is not used
- Equalizing currents are present

Ground cable	Copper wire, at least 6 mm ² (0.0093 in ²)
---------------------	---



A0029338

9 Potential equalization via ground terminal and pipe flanges

1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.
2. If $DN \leq 300$ (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
3. If $DN \geq 350$ (14"): Mount the ground cable directly on the metal transport bracket. Observe screw tightening torques: see the Sensor Brief Operating Instructions.

4. Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for the purpose.

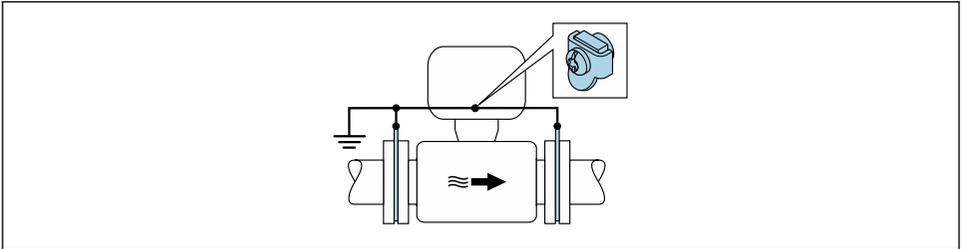


For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

Pipe with insulating liner or plastic pipe

This connection method also applies in situations where:

- Standard company potential equalization cannot be guaranteed
- Equalizing currents can be expected



A0029339

10 Potential equalization via ground terminal and ground disks ($PE = P_{FL} = P_M$)

1. Connect the ground disks to the ground terminal via the ground cable.
2. Connect the ground disks to ground potential.

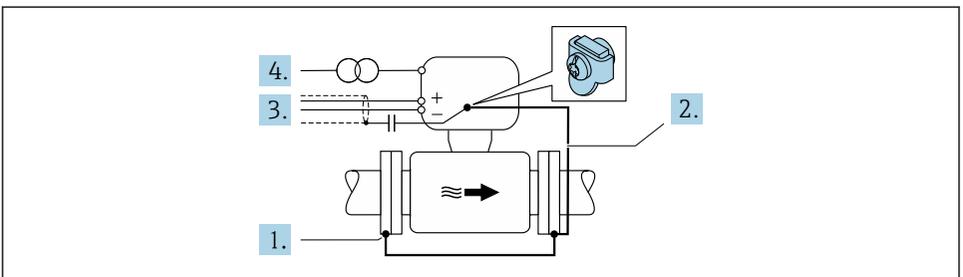
↳ $PE = P_{FL} = P_M$

Pipe with a cathodic protection unit

This connection method is only used if the following two conditions are met:

- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the personal protection equipment

Ground cable	Copper wire, at least 6 mm ² (0.0093 in ²)
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Prerequisite: The sensor is installed in the pipe in a way that provides electrical insulation.

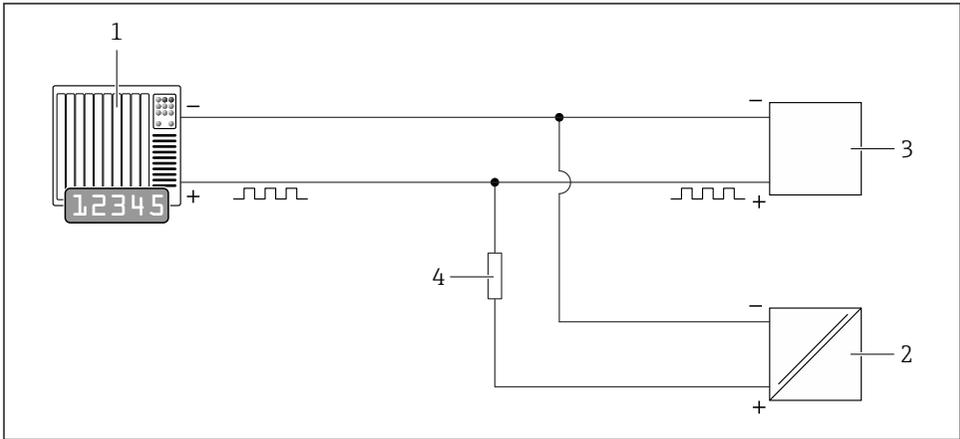
1. Connect the two flanges of the pipe to one another via a ground cable.
2. Connect the flange to the ground terminal via the ground cable.
3. Route the signal line shielding via a capacitor (recommended value 1.5 $\mu\text{F}/50\text{ V}$).
4. Connect the device to the optional power supply such that it is floating in relation to the ground potential (PE), (this step is not necessary if using a power supply without ground potential (PE)).
↳ $\text{PE} \neq \text{P}_{\text{FL}} = \text{P}_{\text{M}}$

 For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

5.8 Special connection instructions

5.8.1 Connection examples

Pulseoutput

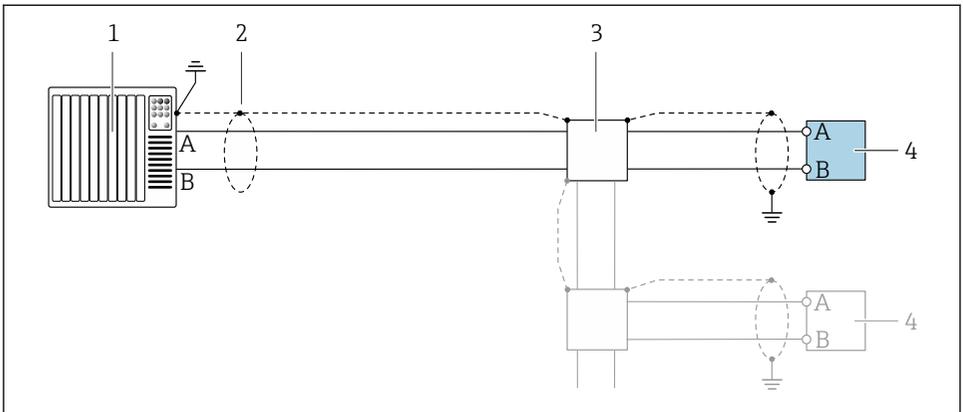


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 11 Connection example for pulse output (passive)

- 1 Automation system with pulse input (e.g. PLC)
- 2 External DC power supply (e.g. 24 VDC)
- 3 Open-collector pulse input of transmitter: Observe input values
- 4 Pull-up resistor (e.g. 10 kOhm)

Modbus RS485



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12 Connection example for Modbus RS485, non-hazardous area

- 1 Control system (e.g. PLC)
- 2 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 3 Distribution box
- 4 Transmitter

5.9 Ensuring the degree of protection

5.9.1 Degree of protection IP68, Type 6P enclosure, with "Cust-potted" option, Proline 800 - Advanced (remote version)

Depending on the version, the sensor meets all the requirements of IP68 degree of protection, Type 6P enclosure and can be used as a remote version .

The degree of protection of the transmitter is always only IP66/67, Type 4X enclosure and the transmitter must therefore be treated accordingly → 34.

To guarantee IP68 degree of protection, Type 6P enclosure for the "Cust-potted" options, carry out the following steps after the electrical connection:

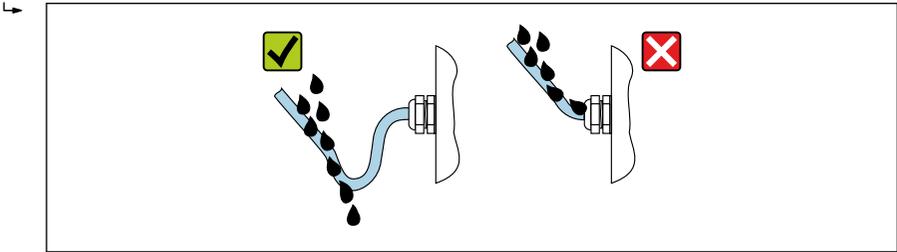
1. Firmly tighten the cable glands (torque: 2 to 3.5 Nm) until there is no gap between the bottom of the cover and the housing support surface.
2. Firmly tighten the union nut of the cable glands.
3. Pot the field housing with a potting compound.
4. Check that the housing seals are clean and fitted correctly. Dry, clean or replace the seals if necessary.
5. Tighten all housing screws and screw covers (torque: 20 to 30 Nm).

5.9.2 Degree of protection IP66/67, Type 4X enclosure, Proline 800 - Advanced

The measuring device fulfills all the requirements for the IP66/67 degree of protection, Type 4X enclosure.

To guarantee IP66/67 degree of protection, Type 4X enclosure, carry out the following steps after the electrical connection:

1. Check that the housing seals are clean and fitted correctly. Dry, clean or replace the seals if necessary.
2. Tighten all housing screws and screw covers.
3. Firmly tighten the cable glands.
4. To ensure that moisture does not enter the cable entry, route the cable so that it loops down before the cable entry ("water trap").



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5. Insert dummy plugs (corresponding to the housing degree of protection) into unused cable entries.

NOTICE

Standard dummy plugs used for transportation do not have the appropriate degree of protection and can result in damage to the device!

- ▶ Use suitable dummy plugs corresponding to the degree of protection.

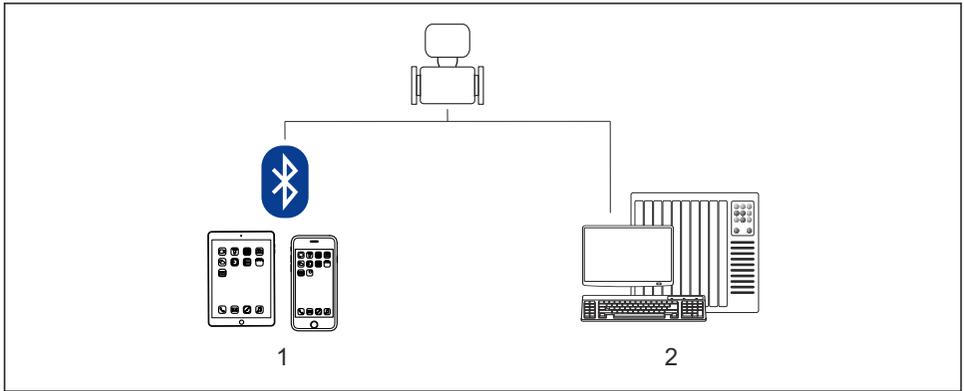
5.10 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables used meet the requirements ?	<input type="checkbox"/>
Do the cables have adequate strain relief?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" ?	<input type="checkbox"/>
Only for remote version: is the sensor connected to the right transmitter? Check the serial number on the nameplate of the sensor and transmitter.	<input type="checkbox"/>
Does the supply voltage match the specifications on the transmitter nameplate ?	<input type="checkbox"/>
Is the terminal assignment correct → 17?	<input type="checkbox"/>
Is the cellular antenna connected correctly?	<input type="checkbox"/>
Is the signal strong enough to connect to a cellular network?	<input type="checkbox"/>
Batteries correctly inserted and secured?	<input type="checkbox"/>
DIP switch in correct position?	<input type="checkbox"/>

If supply voltage is present, do values appear on the display module? If only battery power is available, does information appear on the display module after you touch the module?	<input type="checkbox"/>
Is the potential equalization established correctly ?	<input type="checkbox"/>
Are all housing covers installed and the screws tightened with the correct tightening torque?	<input type="checkbox"/>

6 Operation options

6.1 Overview of operation options



A0039341

- 1 Smartphone/tablet (via SmartBlue)
- 2 Computer (via Modbus)



For custody transfer, once the device has been put into circulation or sealed, its operation is restricted.

6.2 Access to the operating menu via the SmartBlue App

The device can be operated and configured via the SmartBlue App. In this case, the connection is established via the Bluetooth® wireless technology interface.

Supported functions

- Device selection in Live List and access to the device (login)
- Configuration of the device
- Access to measured values, device status and diagnostics information
- Data logger readout
- Certificate management
- Device software update
- Heartbeat report
- Parameter report

The SmartBlue App is available to download free of charge for Android devices (Google Playstore) and iOS devices (iTunes Apple Store): *Endress+Hauser SmartBlue*

Directly to the app with the QR code:



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- i
 - For energy-saving reasons, if the device is not powered by a power unit, it is only visible in the live list for 10 seconds every minute.
 - The device appears immediately in the live list if the local display is touched for 5 seconds.
 - The device with the highest signal strength appears at the very top of the live list.

7 System integration

i For detailed information on system integration, see the Operating Instructions for the device.

- Overview of device description files:
 - Current version data for the device
 - Operating tools
- Compatibility with previous model
- Modbus RS485 information
 - Function codes
 - Response time
 - Modbus data map

8 Commissioning

8.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
 - "Post-installation check" checklist
 - "Post-connection check" checklist → 34

8.2 Preparatory steps

The device can only be operated via the SmartBlue App.

8.2.1 Install the SmartBlue App



Download the SmartBlue App → 36

8.2.2 Connect the SmartBlue App to the device



Log in

8.3 Configuring the measuring device

Complete this wizard to commission the device.

For each parameter, enter the appropriate value or select the appropriate option.

NOTE

If you exit the wizard before completing all required parameters, the changes you made will be saved. For this reason, the device may be in an undefined state!

In this case, a reset to the default settings is recommended.

1. Open the **Guidance** menu.
2. Start the **Commissioning** wizard.
3. Follow the instructions in the **SmartBlue App**.
 - ↳ The configuration is completed.

8.4 Protecting settings from unauthorized access

The following options exist for protecting the configuration of the measuring device from unintentional modification after commissioning:

- Write protection via access code → 37
- Write protection via write protection switch → 38

8.4.1 Write protection via access code

The effects of the user-specific access code are as follows:

Via the SmartBlue App, the parameters for the measuring device configuration are write-protected and their values can no longer be changed.

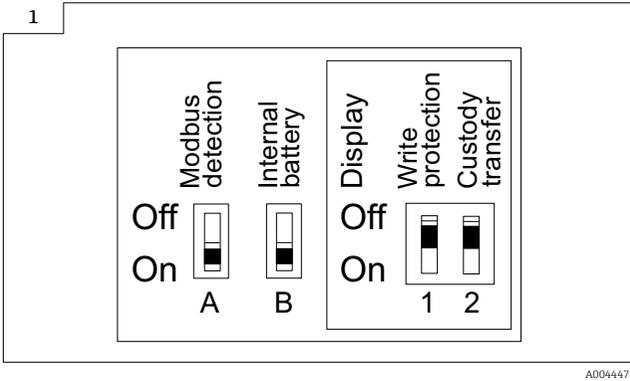
Defining the access code via the SmartBlue App

1. Open the **System** menu.
2. Open the **User management** submenu.
3. Open the **Define access code** wizard.

4. Define a string, consisting of up to 4 numbers, for the access code.
 ↳ The parameters are write-protected.

- If parameter write protection is activated via an access code, it can also only be deactivated via this access code .
- The user role with which the user is currently logged on is indicated by the **Access status** parameter. Navigation path: System → User management → Access status

8.4.2 Write protection via write protection switch



- ▶ ⓘ Information regarding the write protection switch is provided on the connection nameplate in the connection compartment cover.

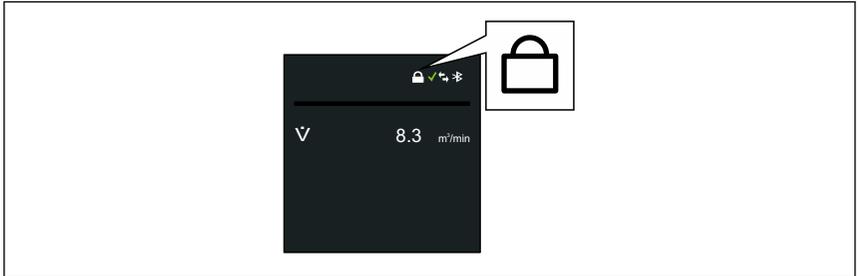
Unlike parameter write protection via a user-specific access code, this allows write access to the entire operating menu to be locked.

The parameter values are now read only and cannot be edited any more.

The following parameters can always be modified even if parameter write protection is activated:

- Enter access code
- Contrast display
- Client ID

1. Set the write protection (WP) switch on the display module to the **ON** position.
 - ↳ Hardware write protection is enabled.
In the **Locking status** parameter, the **Hardware locked** option is displayed.
On the local display, the  symbol appears in the header.



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2.

9 Diagnostic information

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the operational display. The message about remedial measures can be called up from the diagnostic message, and contains important information on the fault.

9.1 Diagnostic message



Maintenance required

- Maintenance required.
- Output signal is still valid.



Out of specification

- Device is operated outside the technical specification limits, e.g. outside the process temperature range.
- Device is operated outside the configuration performed by the user, e.g. maximum flow rate.



Functional test

- Device is in the service mode, e.g. during a simulation.
- Output signal is temporarily invalid.

If two or more diagnostic events are pending simultaneously, only the message of the diagnostic event with the highest priority is shown.



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