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Valid as of version
01.00.zz (Device firmware)

Operating Instructions
Proline Promag W 800

Electromagnetic flowmeter
Cellular radio (Type: DA800C-CRM02.01)

Endress+Hauser
People for Process Automation

- Make sure the document is stored in a safe place such that it is always available when working on or with the device.
- To avoid danger to individuals or the facility, read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser sales organization will supply you with current information and updates to this manual.

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1 About this document

1.1 Document function

These Operating Instructions contain all the information required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 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.

1.2.2 Electrical symbols

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.
⊜	**Potential equalization connection (PE: protective earth)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: ▪ Interior ground terminal: potential equalization is connected to the supply network. ▪ Exterior ground terminal: device is connected to the plant grounding system.

1.2.3 Communication-specific symbols

Symbol	Meaning
	Received signal strength (cellular radio) Displays the received signal strength.
	Bluetooth Wireless data transmission between devices over a short distance.

1.2.4 Tool symbols

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

1.2.5 Symbols for certain types of information

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
	Notice or individual step to be observed
1., 2., 3...	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.6 Symbols in graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
1., 2., 3., ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
	Hazardous area

Symbol	Meaning
	Safe area (non-hazardous area)
	Flow direction

1.3 Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

The following documentation may be available depending on the device version ordered:

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid for your device** The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions (KA)	**Guide that takes you quickly to the 1st measured value** The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Your reference document** These Operating Instructions contain all the information that is required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	**Reference for your parameters** The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.
Safety Instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. The Safety Instructions are a constituent part of the Operating Instructions. Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is a constituent part of the device documentation.

2 Safety requirements

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
- 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.

The operating personnel must fulfill the following requirements:
- Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

2.2 Intended use

Application and media
The measuring instrument described in this manual is intended only for the flow measurement of liquids with a minimum conductivity of 20 µS/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→ 🖹 7.
- 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

⚠ CAUTION

Risk of hot or cold burns! The use of media and electronics with high or low temperatures can produce hot or cold surfaces on the device.

- Mount suitable touch protection.

2.3 Workplace safety

For work on and with the device:

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

2.4 Operational safety

Damage to the device!

- Operate the device in proper technical condition and fail-safe condition only.
- 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.

2.5 Product safety

This state-of-the-art device is designed and tested in accordance with good engineering practice to meet operational safety standards. It 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. The manufacturer confirms this by affixing the CE mark.

2.6 IT security

The manufacturer warranty is valid only if the product is installed and used as described in the Operating Instructions. The product is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the product 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. The following list provides an overview of the most important functions:

2.7.1 Operation via the SmartBlue app

The device can be operated and configured with the SmartBlue App.

- The SmartBlue App must be downloaded onto a mobile device for this purpose
- For information on the compatibility of the SmartBlue App with mobile devices, see **Apple App Store (iOS devices)** or **Google Play Store (Android devices)**
- Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption
- The Bluetooth® function can be deactivated after initial device setup

1 QR code for free Endress+Hauser SmartBlue App

Download and installation:

1. Scan the QR code or enter **SmartBlue** in the search field of the Apple App Store (iOS) or Google Play Store (Android).
2. Install and start the SmartBlue app.
3. For Android devices: enable location tracking (GPS) (not required for iOS devices).
4. Select a device that is ready to receive from the device list displayed.

Login:

1. Enter the user name: admin
2. Enter the initial password: serial number of the device
3. Change the password after logging in for the first time

Notes on the password and reset code

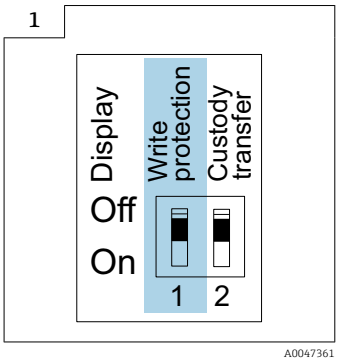
- If the user-defined password is lost, access can be restored via a reset code. The reset code is the serial number of the device in reverse. The original password is once again valid after the reset code has been entered.
- The reset code can also be changed in addition to the password.
- If the user-defined reset code is lost, the password can no longer be reset via the SmartBlue app. Contact Endress+Hauser Service in this case.

2.7.2 Protecting access via hardware write protection

Write access to the device parameters via the operating tool can be disabled by means of a write protection switch (DIP switch on the back of the local display). When hardware write protection is enabled, only read access to the parameters is possible.

Hardware write protection is disabled when the device is delivered → 11.

Write protection via write protection switch



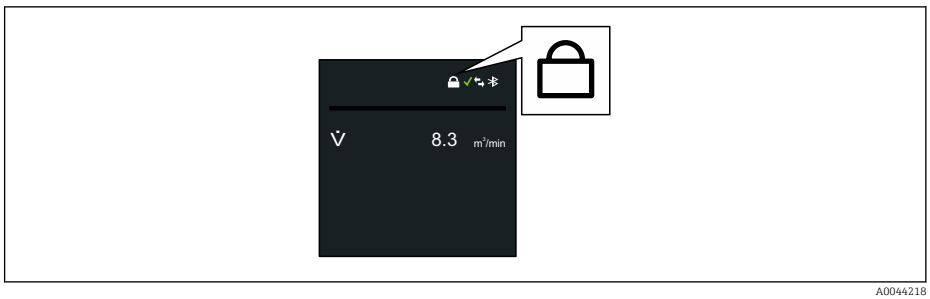
▶ Information regarding the write protection switch is provided on the connection nameplate in the connection compartment cover.

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
- Clientt ID

1. Loosen the 4 fixing screws on the housing cover and open the housing cover.
2. 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.



3. **WARNING**
   Excessive tightening torque applied to the fixing screws!
   Risk of damaging the plastic transmitter.
   ▶ Tighten the fixing screws as per the tightening torque.→ 30.

   Reassemble the transmitter in the reverse order.

2.7.3 Access via Bluetooth® wireless technology

Secure signal transmission via Bluetooth® wireless technology uses an encryption method tested by the Fraunhofer Institute.

- The device is not visible via *Bluetooth*® wireless technology without the SmartBlue app.
- Only one point-to-point connection is established between the device and a smartphone or tablet.
- It is possible to configure the *Bluetooth*® wireless technology interface in such a way that *Bluetooth*® is only active (the device is only then visible) if the display is activated onsite via Wake on Touch.

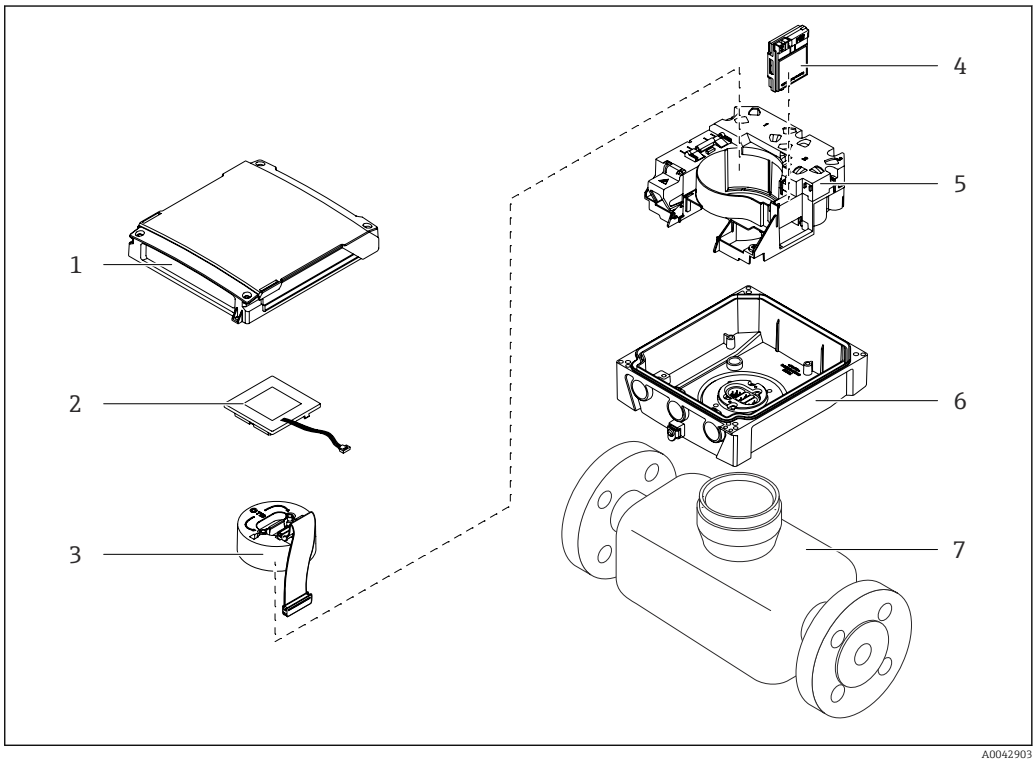
3 Product description

The device consists of a transmitter and a sensor.

Proline Promag 800 - Advanced
Two device versions are available:
- Compact version – transmitter and sensor form a mechanical unit.
- Remote version - transmitter and sensor are mounted in separate locations.

3.1 Product design

3.1.1 Proline Promag 800 - Advanced

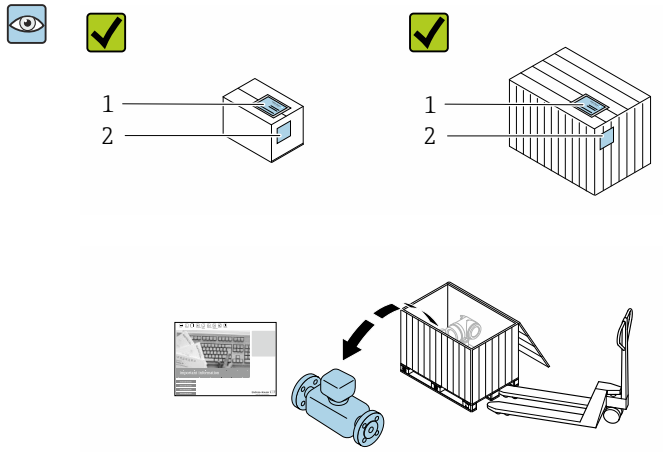


2 *Important components of the compact version*

1 Transmitter housing cover
2 Display module
3 Electronics module
4 Cellular module only with order code for "Output; input", option P "Cellular radio"
5 Electronics board carrier incl. battery compartment
6 Transmitter housing
7 Sensor

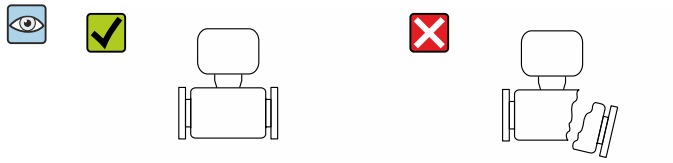
4 Incoming acceptance and product identification

4.1 Incoming acceptance

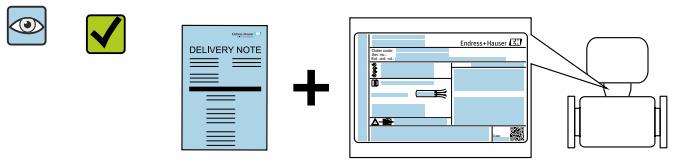


Are the order codes on the delivery note (1) and the product sticker (2) identical?

Are the goods undamaged?



Does the data on the nameplate match the order specifications on the delivery note?



Is the envelope present with accompanying documents?

- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations app*: Product identification→ 15.

4.2 Product identification

The device can be identified in the following ways:
- Nameplate
- Order code with details of the device features on the delivery note
- Enter the serial numbers from the nameplates in the *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.
- Enter the serial numbers from the nameplates into the *Endress+Hauser Operations app* or scan the DataMatrix code on the nameplate with the *Endress+Hauser Operations app*: all the information about the device is displayed.

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The "Additional standard device documentation" → 📄 111 and "Supplementary device-dependent documentation" sections→ 📄 111
- The *Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations app*: Enter the serial number from the nameplate or scan the DataMatrix code on the nameplate.

4.2.1 Transmitter nameplate

- Name of the transmitter
- Manufacturer address/certificate holder
- Order code
- Serial number
- Extended order code
- Firmware version (FW) and device revision (Dev.Rev.) from the factory
- Permitted ambient temperature (T_a)
- FCC-ID (Federal Communications Commission)
- Degree of protection
- Permitted temperature range for cable
- 2-D matrix code
- Date of manufacture: year-month
- FCC mark
- CE mark, RCM-Tick mark
- Electrical connection data, e.g. available inputs and outputs, supply voltage

4.2.2 Sensor nameplate

- Name of sensor
- Manufacturer address/certificate holder
- Order code
- Serial number
- Extended order code
- Nominal diameter of the sensor
- Test pressure of the sensor
- Medium temperature range
- Material of liner and electrodes
- Degree of protection: e.g. IP, NEMA
- Permitted ambient temperature (T_a)
- 2-D matrix code
- CE mark, RCM-Tick mark
- Flow direction
- Date of manufacture: year-month

Order code
The measuring device is reordered using the order code.

Extended order code
- The device type (product root) and basic specifications (mandatory features) are always listed.
- Of the optional specifications (optional features), only the safety and approval-related specifications are listed (e.g. LA). If other optional specifications are also ordered, these are indicated collectively using the # placeholder symbol (e.g. #LA#).
- If the ordered optional specifications do not include any safety and approval-related specifications, they are indicated by the + placeholder symbol (e.g. XXXXXX-ABCDE +).

4.2.3 Symbols on the device

Symbol	Meaning
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. Please consult the documentation for the measuring device to discover the type of potential danger and measures to avoid it.
	Reference to documentation Refers to the corresponding device documentation.
	Protective ground connection A terminal that must be connected to the ground prior to establishing any other connections.

5 Storage and transport

5.1 Storage conditions

Observe the following notes for storage:
- Store in the original packaging to ensure protection from shock.
- Do not remove protective covers or protective caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.
- Protect from direct sunlight. Avoid unacceptably high surface temperatures.
- Select a storage location that excludes the possibility of condensation forming on the measuring device. Fungi and bacteria can damage the liner.
- Store in a dry and dust-free place.
- Do not store outdoors.

Storage temperature → 97

WARNING

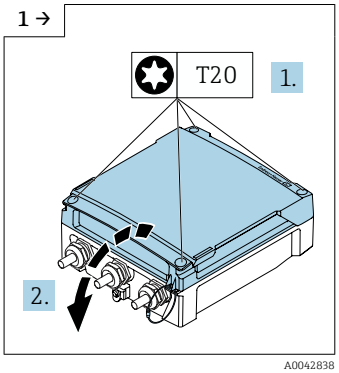
Batteries may explode if not handled properly!
- Do not recharge batteries.
- Do not open batteries.
- Do not expose batteries to naked flame.

5.2 Storing the device

5.2.1 Proline Promag 800 - Advanced

Do not store buffer capacitors individually for longer than 4 months. Long-term storage is possible with battery packs inserted and connected in the device. If the device is stored for longer than 2 months with the batteries inserted and connected, disconnect the battery power supply via the switch.

1 →



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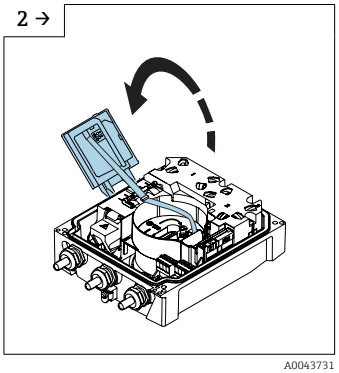
- Open the connection compartment cover.

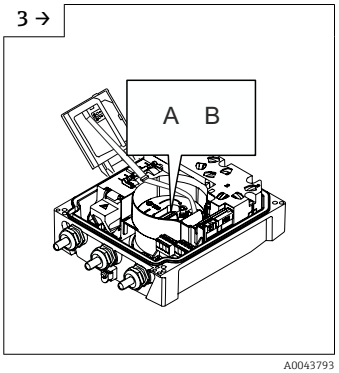
2 →



A0043731

- Open the display module.

3 →



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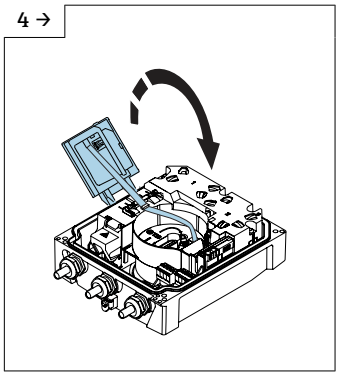
- Set switch "B" to "OFF".



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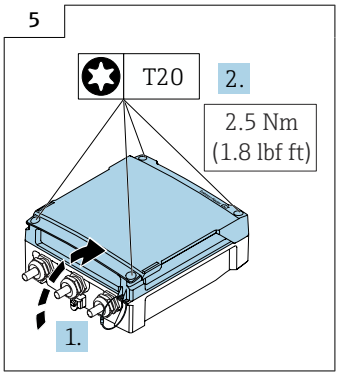
▶ Close the display module.

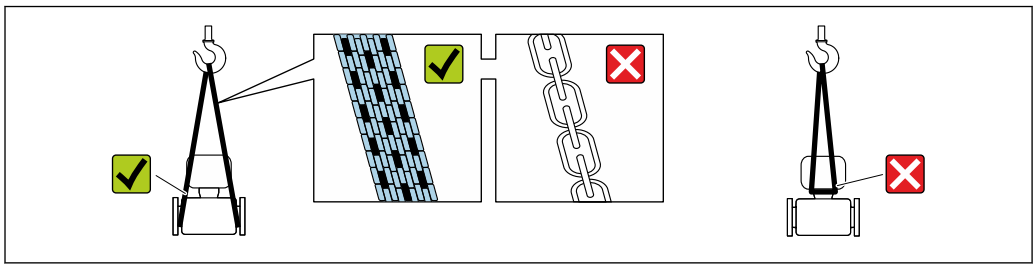


A0042855

▶ Close the connection compartment cover.

5.3 Transporting the product

Transport the measuring device to the measuring point in the original packaging.



A0029252

Do not remove protective covers or caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.

5.3.1 Measuring devices without lifting lugs

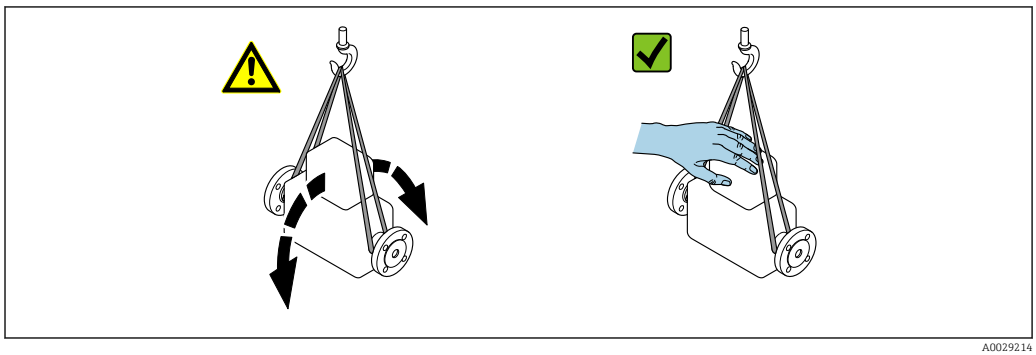
WARNING

Center of gravity of the measuring device is higher than the suspension points of the webbing slings.

Risk of injury if the measuring device slips.

▶ Secure the measuring device against slipping or turning.

▶ Observe the weight specified on the packaging (stick-on label).



A0029214

5.3.2 Measuring devices with lifting lugs

⚠ CAUTION

Special transportation instructions for devices with lifting lugs

- ▶ Only use the lifting lugs fitted on the device or flanges to transport the device.
- ▶ The device must always be secured at two lifting lugs at least.

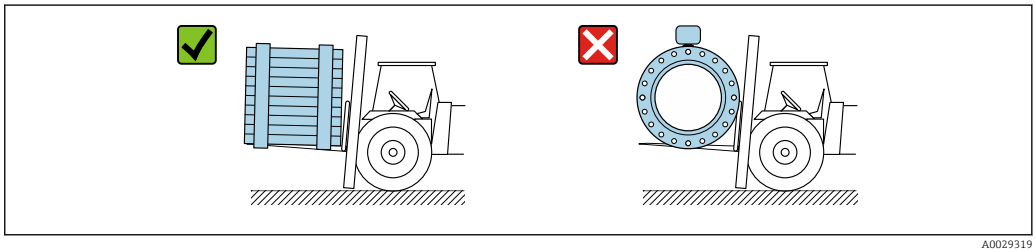
5.3.3 Transporting with a fork lift

If transporting in wood crates, the floor structure enables the crates to be lifted lengthwise or at both sides using a forklift.

⚠ CAUTION

Risk of damaging the magnetic coil!

- ▶ If transporting by forklift, do not lift the sensor by the metal casing.
- ▶ This would buckle the casing and damage the internal magnetic coils.



A0029319

5.4 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

- Outer packaging of device
  Stretch wrap made of polymer in accordance with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wood crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62/EC, recyclability confirmed by Resy symbol
- Transport material and fastening fixtures
  - Disposable plastic pallet
  - Plastic straps
  - Plastic adhesive strips
- Filler material
  Paper pads

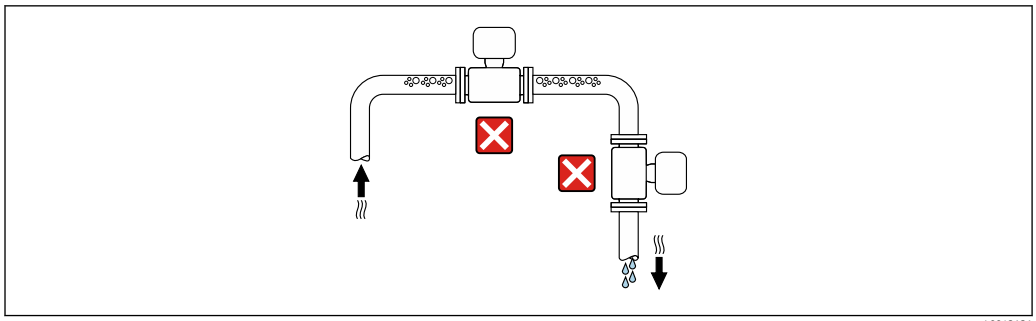
6 Mounting procedure

6.1 Mounting requirements

6.1.1 Mounting position

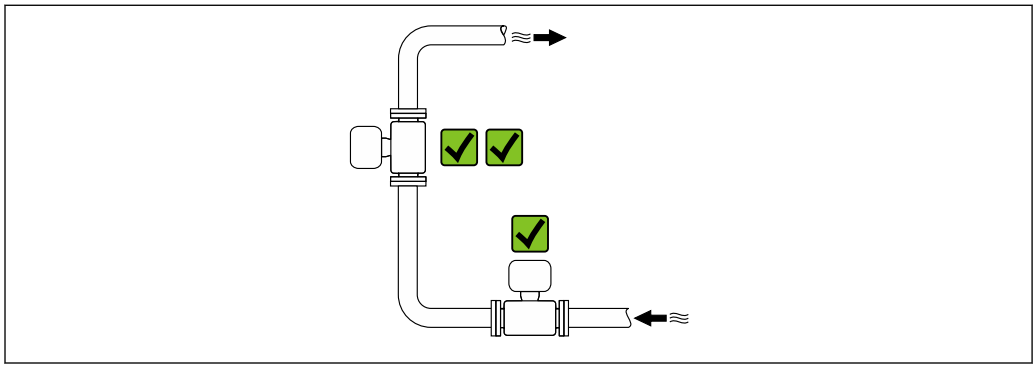
Mounting location

- Do not install the device at the highest point of the pipe.
- Do not install the device upstream from a free pipe outlet in a down pipe.



A0042131

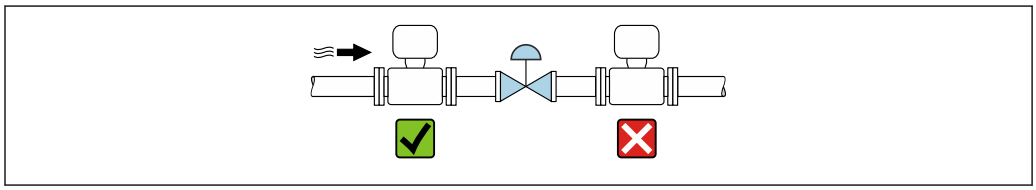
The device should ideally be installed in an ascending pipe.



A0042317

Installation near valves

Install the device in the direction of flow upstream from the valve.



A0041091

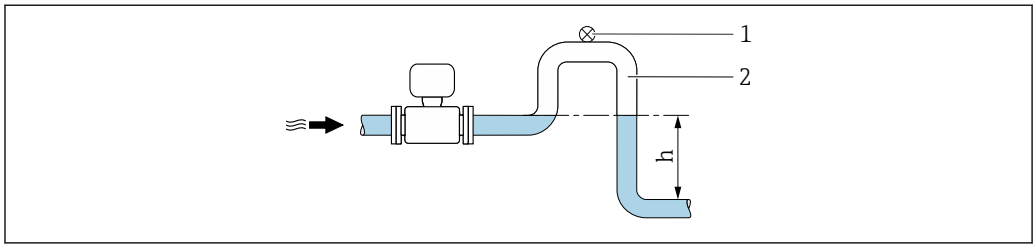
Installation upstream from a down pipe

NOTICE

Negative pressure in the measuring pipe can damage the liner!

- If installing upstream of down pipes whose length h ≥ 5 m (16.4 ft): install a siphon with a vent valve downstream of the device.

This arrangement prevents the flow of liquid stopping in the pipe and air entrainment.

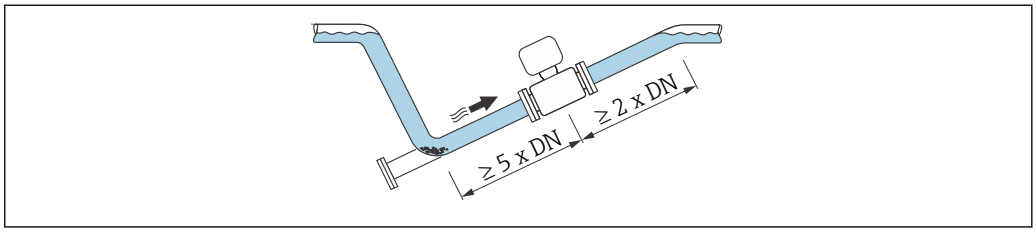


A0028981

1 *Vent valve*
2 *Pipe siphon*
h *Length of down pipe*

Installation with partially filled pipes

- Partially filled pipes with a gradient require a drain-type configuration.
- The installation of a cleaning valve is recommended.



A0041088

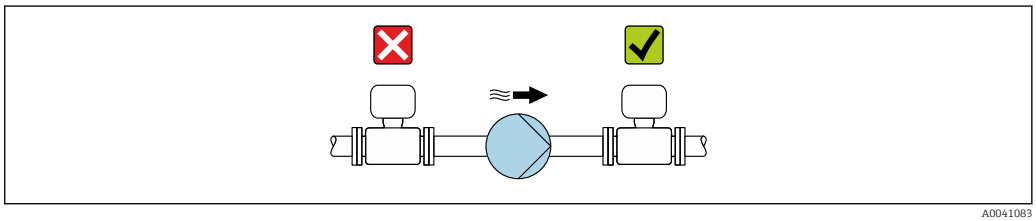
No inlet and outlet runs for devices with the order code for "Design": Option C.

Installation near pumps

NOTICE

Negative pressure in the measuring tube can damage the liner!

- ▶ In order to maintain the system pressure, install the device in the flow direction downstream from the pump.
- ▶ Install pulsation dampers if reciprocating, diaphragm or peristaltic pumps are used.



A0041083

- Information on the liner's resistance to partial vacuum → 99
- Information on the measuring system's resistance to vibration and shock → 98

Installation of very heavy devices

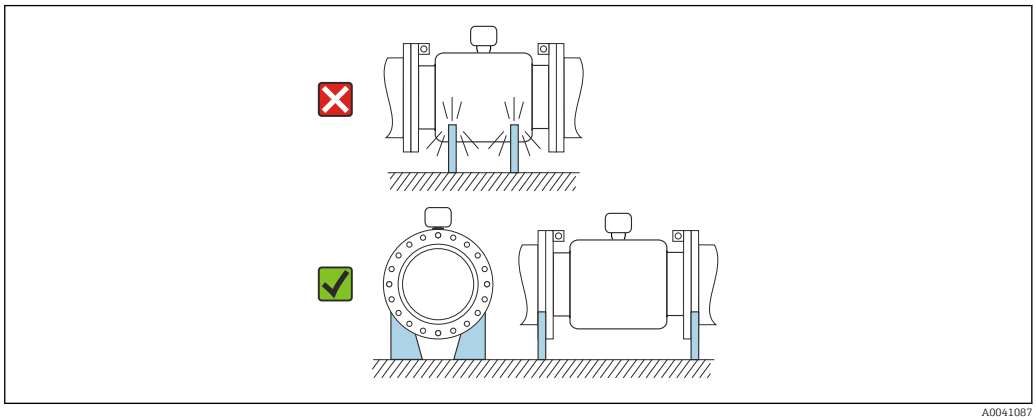
Support required for nominal diameters of DN ≥ 350 mm (14 in).

NOTICE

Damage to the device!

If incorrect support is provided, the sensor housing could buckle and the internal magnetic coils could be damaged.

- ▶ Only provide supports at the pipe flanges.



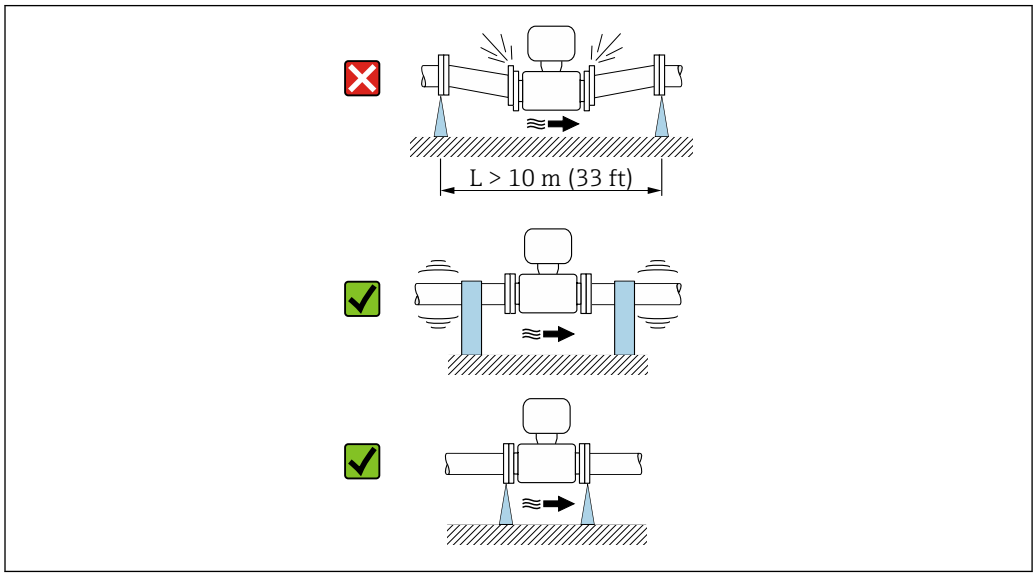
A0041087

Installation in event of pipe vibrations

NOTICE

Pipe vibrations can damage the device!

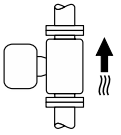
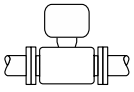
- ▶ Do not expose the device to strong vibrations.
- ▶ Support the pipe and fix it in place.
- ▶ Support the device and fix it in place.

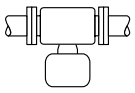
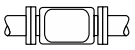


Information on the measuring system's resistance to vibration and shock → 98

Orientation

The direction of the arrow on the nameplate helps you to install the measuring device according to the flow direction (direction of medium flow through the piping).

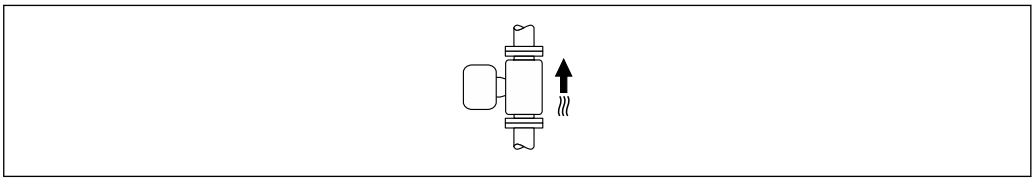
Orientation		Recommendation
Vertical orientation	 A0015591	✓✓
Horizontal orientation, transmitter at top	 A0015589	✓✓ [1]

Orientation		Recommendation
Horizontal orientation, transmitter at bottom	 A0015590	✓✓ 2) 3) ✗ 4)
Horizontal orientation, transmitter at side	 A0015592	✗

1) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
3) To prevent the electronics from overheating in the event of strong heat formation (e.g. CIP or SIP cleaning process), install the device with the transmitter part pointing downwards.
4) With the empty pipe detection function switched on: empty pipe detection only works if the transmitter housing is pointing upwards.

Vertical

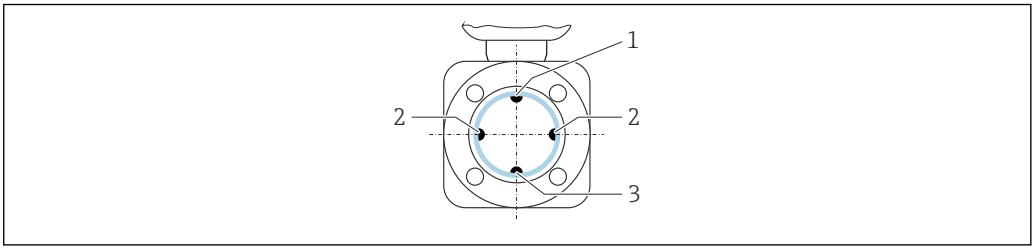
Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.



A0015591

Horizontal

- Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the measuring electrodes by entrained air bubbles.
- Empty pipe detection only works if the transmitter housing is pointing upwards as otherwise there is no guarantee that the empty pipe detection function will actually respond to a partially filled or empty measuring tube.



A0029344

1 EPD electrode for empty pipe detection
2 Measuring electrodes for signal detection
3 Reference electrode for potential equalization

Inlet and outlet runs

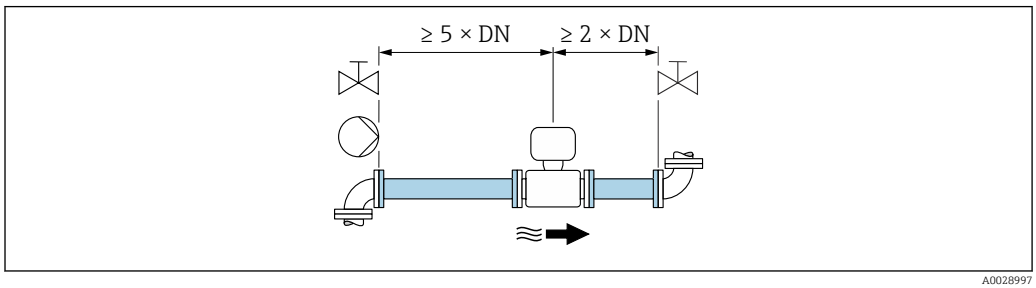
Installation with inlet and outlet runs

Installation requires inlet and outlet runs: devices with the order code for "Design", option E and G.

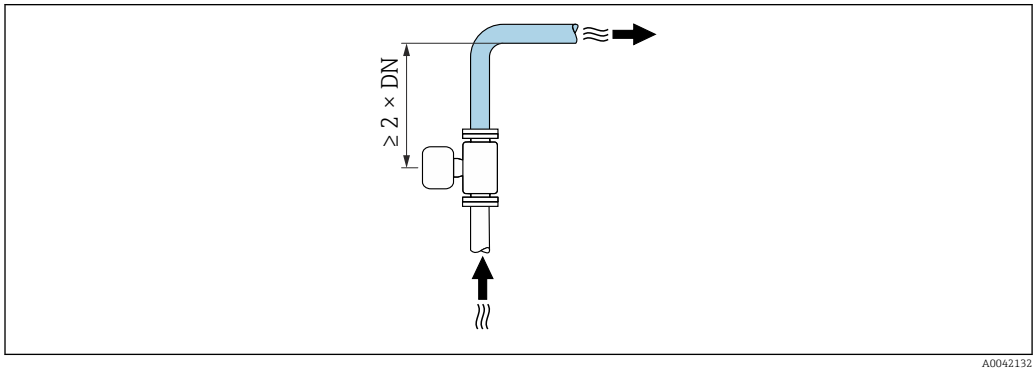
Installation with elbows, pumps or valves

To avoid a vacuum and to maintain the specified level of accuracy, if possible install the device upstream from assemblies that produce turbulence (e.g. valves, T-sections) and downstream from pumps.

Maintain straight, unimpeded inlet and outlet runs.



A0028997



A0042132

Installation without inlet and outlet runs

Depending on the device design and installation location, the inlet and outlet runs can be reduced or omitted entirely.

Maximum measurement error
When the device is installed with the inlet and outlet runs described, a maximum measurement error of ±0.5 % of the reading ±2 mm/s (0.08 in/s) can be guaranteed.

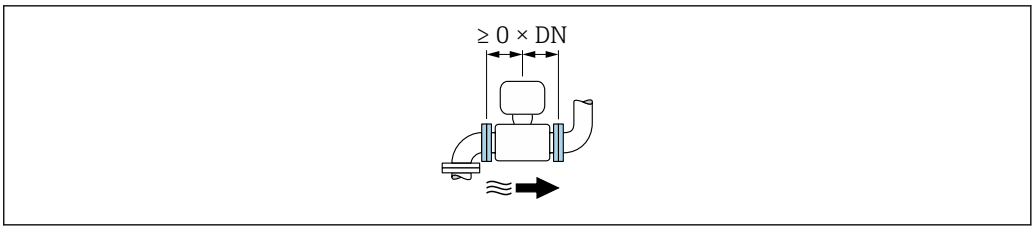
Devices and possible order options

Order code for "Design"		
Option	**Description**	**Design**
C	Fixed flange, constricted measuring tube, 0 x DN inlet/outlet runs	Constricted measuring tube [1]

1) "Constricted measuring tube" stands for a reduction of the internal diameter of the measuring tube. The reduced internal diameter causes a higher flow velocity inside the measuring tube.

Installation before or after bends

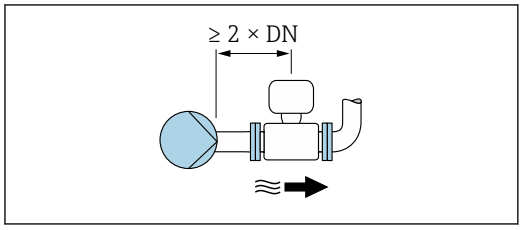
Installation without inlet and outlet runs is possible: devices with the order code for "Design", option C.



Installation downstream of pumps

Installation without inlet and outlet runs is possible: devices with the order code for "Design", option C.

In the case of devices with the order code for "Design", option J and K, an inlet run of only ≥ 2 x DN must be taken into consideration.



Installation upstream of valves

Installation without inlet and outlet runs is possible: devices with the order code for "Design", option C.

Installation downstream of valves

The device can be installed without inlet and outlet runs if the valve is 100% open during operation: devices with the order code for "Design", option C.

Installation dimensions

For the dimensions and installation lengths of the device, see the "Technical Information" document, "Mechanical construction" section → 111

6.1.2 Environmental and process requirements

Ambient temperature range

Transmitter	−25 to +60 °C (−13 to +140 °F)
Local display	−20 to +60 °C (−4 to +140 °F); readability of the local display may be impaired at temperatures outside the temperature range.
Sensor	▪ Process connection material, carbon steel: −10 to +60 °C (+14 to +140 °F) ▪ Process connection material, stainless steel: −40 to +60 °C (−40 to +140 °F)
Liner	Do not exceed or fall below the permitted temperature range of the liner → 99.
External battery pack	Do not exceed or fall below the battery temperature range specified by the manufacturer.

If operating outdoors:
- Measuring device suitable for use in wet environments
- Install the measuring device in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions. Use display protection to provide additional protection from sunlight. → 86
- Avoid direct exposure to weather conditions.

- If the compact version of the device is insulated at low temperatures, the insulation must also include the device neck.
- Protect the display against impact.
- Protect the display from abrasion by sand in desert areas.
- Protect the pressure sensor from icing.

Display guard available as an accessory → 86.

System pressure

Installation near pumps → 21

Vibrations

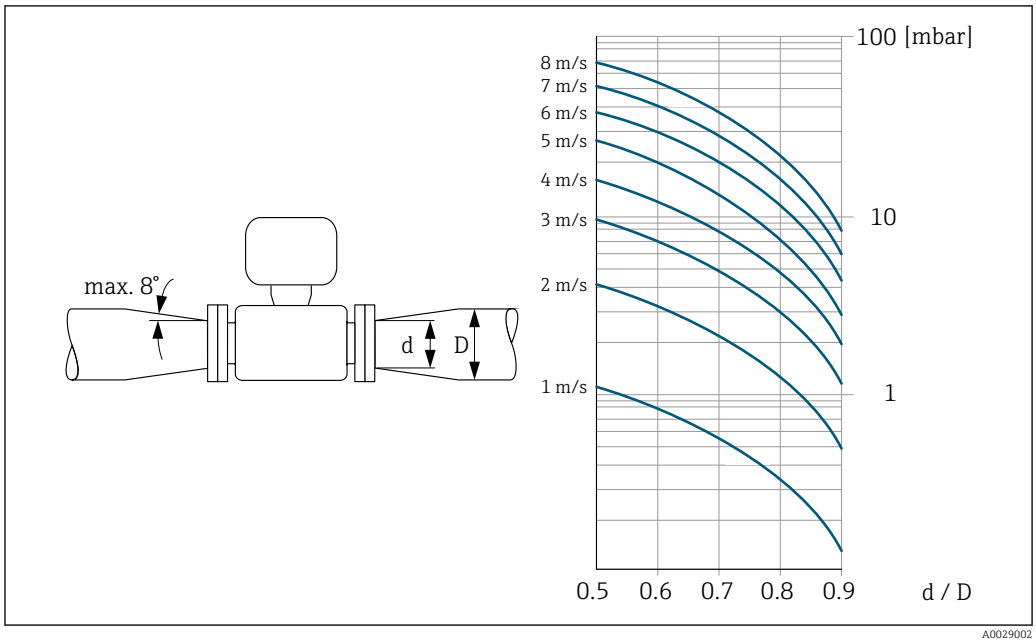
Installation in event of pipe vibrations → 22

Adapters

The sensor can also be installed in larger-diameter pipes with the aid of suitable adapters according to DIN EN 545 (double-flange reducers). The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids. The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders.

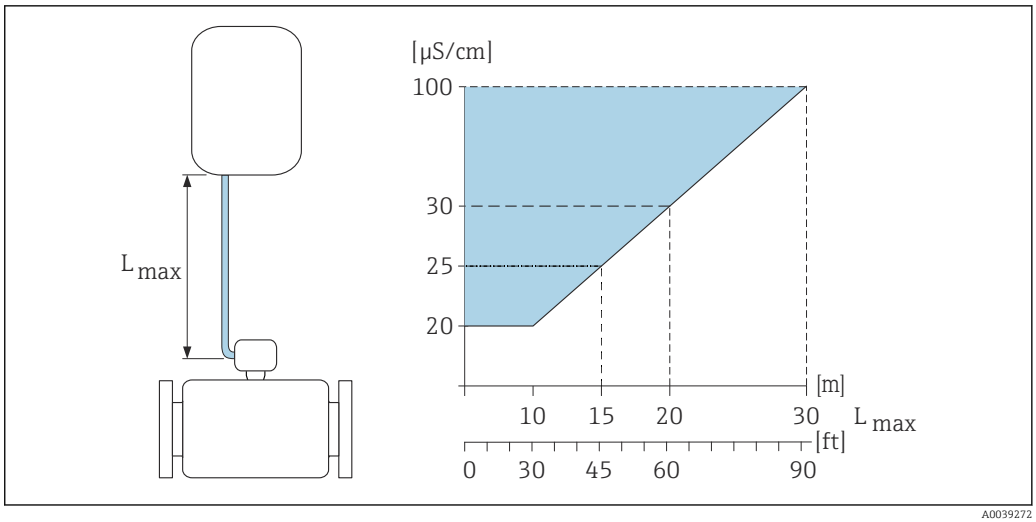
The nomogram only applies to liquids with a viscosity similar to that of water.

1. Calculate the ratio of the diameters d/D.
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



Length of connecting cable

To obtain correct measurement results, observe the permitted connecting cable length of L_{max}. This length is determined by the conductivity of the medium.



3 Permitted length of connecting cable

Colored area = permitted range
L_{max} = length of connecting cable in [m] ([ft])
[µS/cm] = medium conductivity

Corrosive environment

The fully welded remote version of the device can be used permanently in a corrosive (saline) environment.

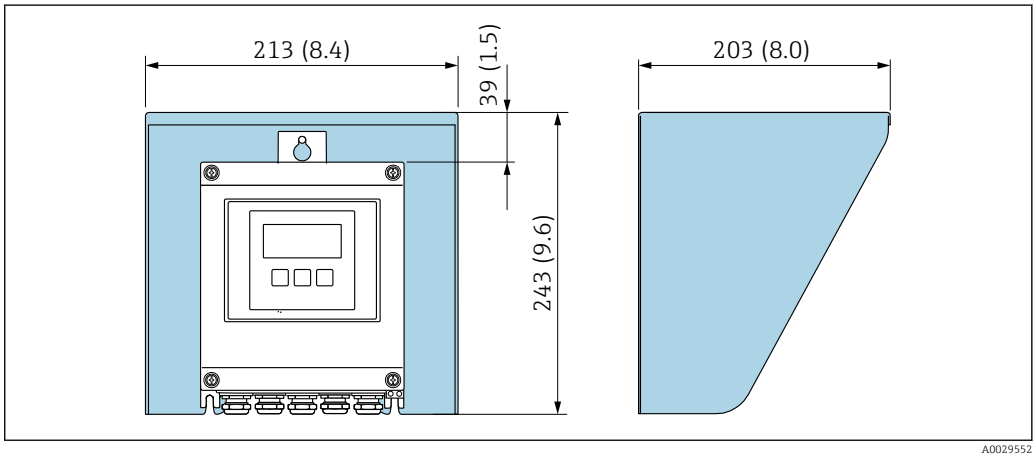
The measuring device satisfies certified corrosion protection in accordance with EN ISO 12944 C5M. The fully welded design and the protective varnish guarantee use in a saline environment.

6.1.3 Special mounting instructions

Display guard

- To ensure that the display guard can be easily opened, maintain the following minimum head clearance: 350 mm (13.8 in)

Weather protection cover



4 Weather protection cover; engineering unit mm (in)

External cellular antenna, Proline 800 - Advanced

▶ Check the signal strength of the cellular network before mounting the external cellular antenna.

For detailed information on "mounting the external cellular antenna", see the Installation Instructions → 111

For immersion in water, Proline 800 - Advanced

- Only the remote version of the device with IP68 protection, type 6P is suitable for underwater use: order code for "Sensor option", options CB, CC, CD, CE and CQ.
- Pay attention to regional installation instructions.

NOTICE

If the maximum water depth and operating duration is exceeded, this can damage the device!

▶ Observe the maximum water depth and operating duration.

Order code for "Sensor option", options CB, CC

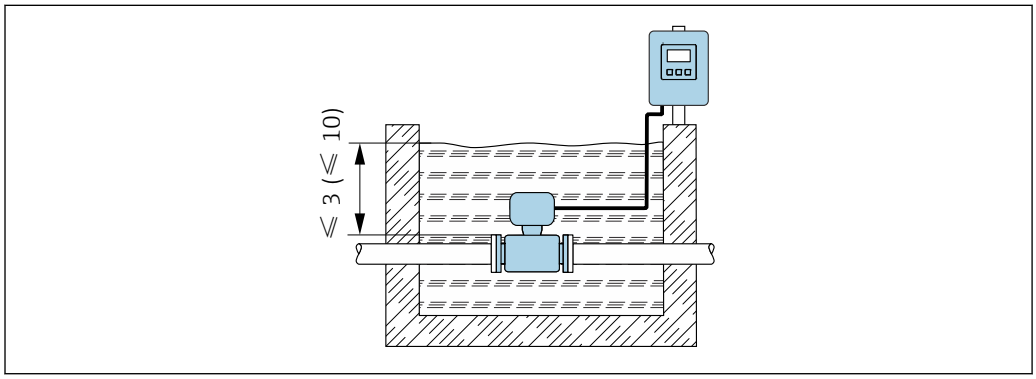
- For the operation of the device under water
- Operating duration at a maximum depth of:
  - 3 m (10 ft): permanent use
  - 10 m (30 ft): maximum 48 hours

Order code for "Sensor option", option CQ "IP68, type 6P, factory encapsulation"

- For permanent use of device under rain or surface water
- Use at a maximum water depth of 3 m (10 ft)

Order code for "Sensor option", options CD, CE

- For the operation of the device under water and in saline water
- Operating duration at a maximum depth of:
  - 3 m (10 ft): permanent use
  - 10 m (30 ft): maximum 48 hours



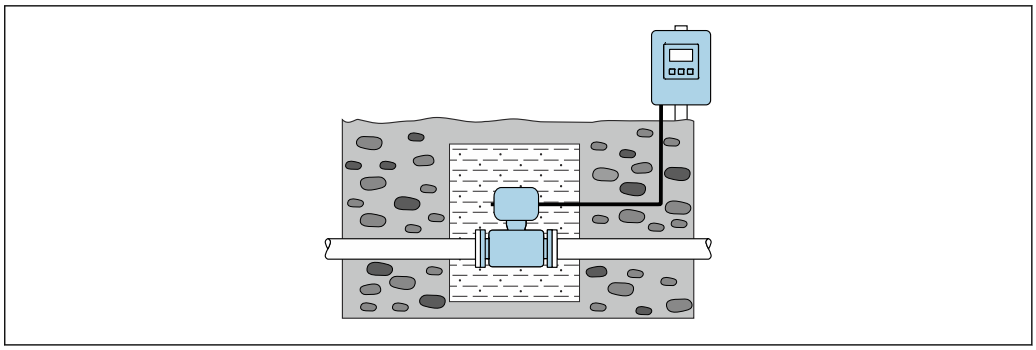
5 *Installation for permanent immersion in water*

For use in buried applications, Proline 800 - Advanced

- Only the remote version of the device with IP68 protection is suitable for use in buried applications: order code for "Sensor option", options CD and CE.
- Pay attention to regional installation instructions.

Order code for "Sensor option", options CD, CE

For the use of the device in buried applications.



A0042646

6.2 Mounting the measuring device

6.2.1 Required tools

For Proline 800 - Advanced transmitter

- Torque wrench
- For wall mounting:
  Open-ended wrench for hexagonal screw max. M5
- For pipe mounting:
  - Open-ended wrench AF 8
  - Phillips head screwdriver PH 2
- For turning the transmitter housing (compact version):
  - Phillips head screwdriver PH 2
  - Torx screwdriver TX 20
  - Open-ended wrench AF 7

For sensor

For flanges and other process connections: Use a suitable mounting tool.

6.2.2 Preparing the measuring device

1. Remove all remaining transport packaging.
2. Remove any protective covers or protective caps present from the sensor.
3. Remove stick-on label on the electronics compartment cover.

6.2.3 Mounting the sensor

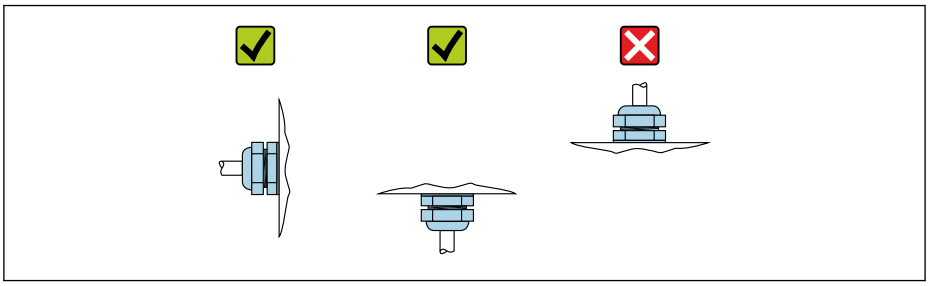
⚠ WARNING

Danger due to improper process sealing!

- ▶ Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
- ▶ Ensure that the seals are clean and undamaged.
- ▶ Secure the seals correctly.

1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.
2. To ensure compliance with device specifications, install the measuring device between the pipe flanges in a way that it is centered in the measurement section.
3. If using ground disks, comply with the Installation Instructions provided.
4. Observe the necessary screw tightening torques → 🖹 30.

5. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



A0029263

Mounting the seals

CAUTION

An electrically conductive layer could form on the inside of the measuring tube!
Risk of measuring signal short circuit.
- ▶ Do not use electrically conductive sealing compounds such as graphite.

Comply with the following instructions when installing seals:

1. Make sure that the seals do not protrude into the piping cross-section.
2. For DIN flanges: only use seals according to DIN EN 1514-1.
3. For a "hard rubber" liner: additional seals are **always** required.
4. For a "polyurethane" liner: additional seals are generally **not** required.

Mounting the ground cable/ground disks

Comply with the information on potential equalization and detailed mounting instructions for the use of ground cables/ground disks → 52.

Screw tightening torques

Note the following points:
- The screw tightening torques listed below apply only to lubricated threads and to pipes not subjected to tensile stress.
- Tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing surface or damage the seal.
- In the case of linings made of hard rubber, seals made of rubber or rubber-like materials are recommended..

Nominal screw tightening torques → 35

NOTICE

Insufficient sealing!
Operational reliability of the measuring device could be compromised. Overtightening the screws can deform or damage the liner in the area of the sealing surface.
- ▶ The values for the screw tightening torques depend on variables such as the seal, screws, lubricants, tightening methods etc. These variables are outside the control of the manufacturer. The values indicated are therefore guideline values only.

Maximum screw tightening torques

Maximum screw tightening torques for EN 1092-1 (DIN 2501)

Nominal diameter		Pressure rating	Screws	Flange thickness	Max. screw tightening torque [Nm]		
[mm]	[in]	[bar]	[mm]	[mm]	HR	PUR	PTFE
25	1	PN 40	4 × M12	18	–	15	26
32	–	PN 40	4 × M16	18	–	24	41
40	1 ½	PN 40	4 × M16	18	–	31	52
50	2	PN 40	4 × M16	20	48	40	65
65 [1)]	–	PN 16	8 × M16	18	32	27	44
65	–	PN 40	8 × M16	22	32	27	44
80	3	PN 16	8 × M16	20	40	34	53
		PN 40	8 × M16	24	40	34	53
100	4	PN 16	8 × M16	20	43	36	57
		PN 40	8 × M20	24	59	50	79
125	–	PN 16	8 × M16	22	56	48	75
		PN 40	8 × M24	26	83	71	112
150	6	PN 16	8 × M20	22	74	63	99
		PN 40	8 × M24	28	104	88	137
200	8	PN 10	8 × M20	24	106	91	141
		PN 16	12 × M20	24	70	61	94
		PN 25	12 × M24	30	104	92	139
250	10	PN 10	12 × M20	26	82	71	110
		PN 16	12 × M24	26	98	85	132
		PN 25	12 × M27	32	150	134	201
300	12	PN 10	12 × M20	26	94	81	126
		PN 16	12 × M24	28	134	118	179
		PN 25	16 × M27	34	153	138	204
350	14	PN 6	12 × M20	22	111	120	–
		PN 10	16 × M20	26	112	118	–
		PN 16	16 × M24	30	152	165	–
		PN 25	16 × M30	38	227	252	–
400	16	PN 6	16 × M20	22	90	98	–
		PN 10	16 × M24	26	151	167	–
		PN 16	16 × M27	32	193	215	–
		PN 25	16 × M33	40	289	326	–
450	18	PN 6	16 × M20	22	112	126	–
		PN 10	20 × M24	28	153	133	–
		PN 16	20 × M27	40	198	196	–
		PN 25	20 × M33	46	256	253	–
500	20	PN 6	20 × M20	24	119	123	–
		PN 10	20 × M24	28	155	171	–
		PN 16	20 × M30	34	275	300	–
		PN 25	20 × M33	48	317	360	–

Nominal diameter		Pressure rating	Screws	Flange thickness	Max. screw tightening torque [Nm]		
[mm]	[in]	[bar]	[mm]	[mm]	HR	PUR	PTFE
600	24	PN 6	20 × M24	30	139	147	–
		PN 10	20 × M27	28	206	219	–
600	24	PN 16	20 × M33	36	415	443	–
600	24	PN 25	20 × M36	58	431	516	–
700	28	PN 6	24 × M24	24	148	139	–
		PN 10	24 × M27	30	246	246	–
		PN 16	24 × M33	36	278	318	–
		PN 25	24 × M39	46	449	507	–
800	32	PN 6	24 × M27	24	206	182	–
		PN 10	24 × M30	32	331	316	–
		PN 16	24 × M36	38	369	385	–
		PN 25	24 × M45	50	664	721	–
900	36	PN 6	24 × M27	26	230	637	–
		PN 10	28 × M30	34	316	307	–
		PN 16	28 × M36	40	353	398	–
		PN 25	28 × M45	54	690	716	–
Abbreviations (liner): HR = hard rubber, PUR = polyurethane							

1) Sizing as per EN 1092-1 (not DIN 2501)

Maximum screw tightening torques for ASME B16.5

Nominal diameter		Pressure rating	Screws	Max. screw tightening torque			
				HR		PUR	
[mm]	[in]	[psi]	[in]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
25	1	Class 150	4 × ½	–	–	7	5
25	1	Class 300	4 × 5/8	–	–	8	6
40	1 ½	Class 150	4 × ½	–	–	10	7
40	1 ½	Class 300	4 × ¾	–	–	15	11
50	2	Class 150	4 × 5/8	35	26	22	16
50	2	Class 300	8 × 5/8	18	13	11	8
80	3	Class 150	4 × 5/8	60	44	43	32
80	3	Class 300	8 × ¾	38	28	26	19
100	4	Class 150	8 × 5/8	42	31	31	23
100	4	Class 300	8 × ¾	58	43	40	30
150	6	Class 150	8 × ¾	79	58	59	44
150	6	Class 300	12 × ¾	70	52	51	38
200	8	Class 150	8 × ¾	107	79	80	59
250	10	Class 150	12 × 7/8	101	74	75	55
300	12	Class 150	12 × 7/8	133	98	103	76
350	14	Class 150	12 × 1	135	100	158	117
400	16	Class 150	16 × 1	128	94	150	111

Nominal diameter		Pressure rating	Screws	Max. screw tightening torque			
				HR		PUR	
[mm]	[in]	[psi]	[in]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
450	18	Class 150	16 × 1 1/8	204	150	234	173
500	20	Class 150	20 × 1 1/8	183	135	217	160
600	24	Class 150	20 × 1 ¼	268	198	307	226
Abbreviations (liner): HR = hard rubber, PUR = polyurethane							

Maximum screw tightening torques for JIS B2220

Nominal diameter	Pressure rating	Screws	Max. screw tightening torque [Nm]	
[mm]	[bar]	[mm]	HR	PUR
25	10K	4 × M16	–	19
25	20K	4 × M16	–	19
32	10K	4 × M16	–	22
32	20K	4 × M16	–	22
40	10K	4 × M16	–	24
40	20K	4 × M16	–	24
50	10K	4 × M16	40	33
50	20K	8 × M16	20	17
65	10K	4 × M16	55	45
65	20K	8 × M16	28	23
80	10K	8 × M16	29	23
80	20K	8 × M20	42	35
100	10K	8 × M16	35	29
100	20K	8 × M20	56	48
125	10K	8 × M20	60	51
125	20K	8 × M22	91	79
150	10K	8 × M20	75	63
150	20K	12 × M22	81	72
200	10K	12 × M20	61	52
200	20K	12 × M22	91	80
250	10K	12 × M22	100	87
250	20K	12 × M24	159	144
300	10K	16 × M22	74	63
300	20K	16 × M24	138	124
Abbreviations (liner): HR = hard rubber, PUR = polyurethane				

Maximum screw tightening torques for AWWA C207, Class D

Nominal diameter		Screws	Max. screw tightening torque			
[mm]	[in]	[in]	HR		PUR	
			[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
700	28	28 × 1 ¼	247	182	292	215
750	30	28 × 1 ¼	287	212	302	223
800	32	28 × 1 ½	394	291	422	311
900	36	32 × 1 ½	419	309	430	317
Abbreviations (liner): HR = hard rubber, PUR = polyurethane						

Maximum screw tightening torques for AS 2129, Table E

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	HR	PUR
50	4 × M16	32	–
80	4 × M16	49	–
100	8 × M16	38	–
150	8 × M20	64	–
200	8 × M20	96	–
250	12 × M20	98	–
300	12 × M24	123	–
350	12 × M24	203	–
400	12 × M24	226	–
450	16 × M24	226	–
500	16 × M24	271	–
600	16 × M30	439	–
700	20 × M30	355	–
750	20 × M30	559	–
800	20 × M30	631	–
900	24 × M30	627	–
Abbreviations (liner): HR = hard rubber, PUR = polyurethane			

Maximum screw tightening torques for AS 4087, PN 16

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	HR	PUR
50	4 × M16	32	–
80	4 × M16	49	–
100	4 × M16	76	–
150	8 × M20	52	–
200	8 × M20	77	–
250	8 × M20	147	–
300	12 × M24	103	–
350	12 × M24	203	–

Nominal diameter [mm]	Screws [mm]	Max. screw tightening torque [Nm]	
		HR	PUR
375	12 × M24	137	–
400	12 × M24	226	–
450	12 × M24	301	–
500	16 × M24	271	–
600	16 × M27	393	–
700	20 × M27	330	–
750	20 × M30	529	–
800	20 × M33	631	–
900	24 × M33	627	–
Abbreviations (liner): HR = hard rubber, PUR = polyurethane			

Nominal screw tightening torques

Nominal screw tightening torques for JIS B2220

Nominal diameter [mm]	Pressure rating [bar]	Screws [mm]	Nom. screw tightening torque [Nm]	
			HR	PUR
350	10K	16 × M22	109	109
	20K	16 × M30×3	217	217
400	10K	16 × M24	163	163
	20K	16 × M30×3	258	258
450	10K	16 × M24	155	155
	20K	16 × M30×3	272	272
500	10K	16 × M24	183	183
	20K	16 × M30×3	315	315
600	10K	16 × M30	235	235
	20K	16 × M36×3	381	381
700	10K	16 × M30	300	300
750	10K	16 × M30	339	339
Abbreviations (liner): HR = hard rubber, PUR = polyurethane				

6.2.4 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. → 🖹 25
- ▶ If operating outdoors: Avoid direct sunlight and exposure to weathering, particularly in warm climatic regions.

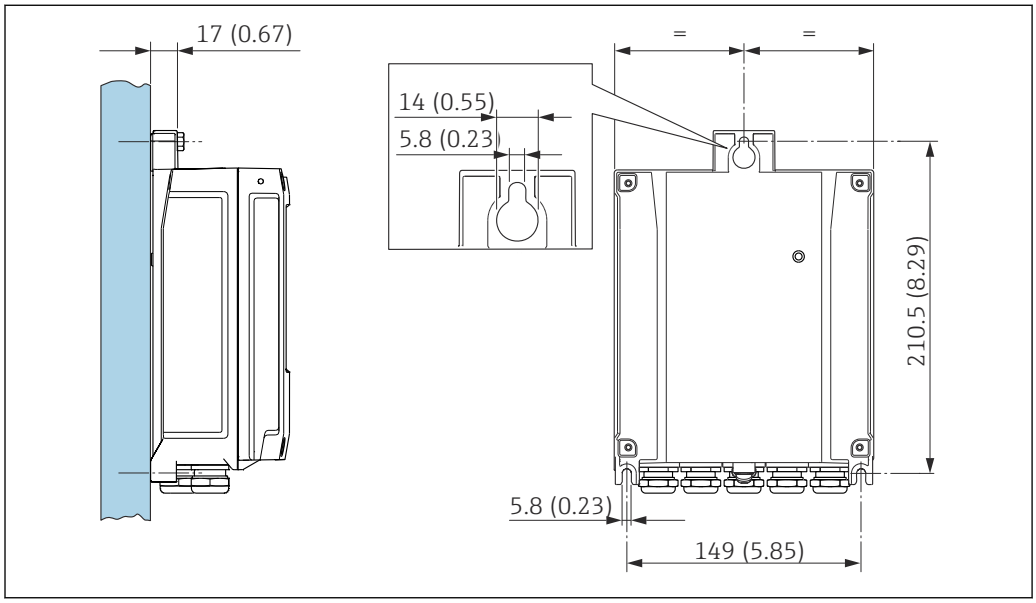
⚠ CAUTION

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



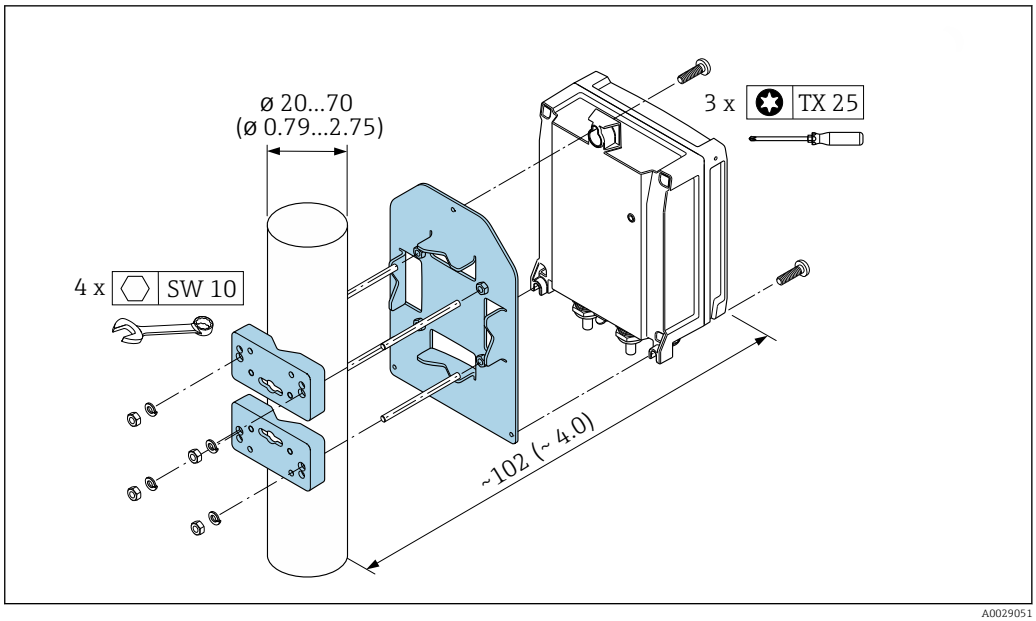
6 *Unit mm (in)*

1. Drill the holes.
2. Insert wall plugs into the drilled holes.
3. Lightly screw in the securing screws.
4. Fit the transmitter housing over the securing screws and hook into place.
5. Tighten the securing screws.
6. Mount the antenna directly on the wall using the antenna bracket.

Post mounting Proline 800 - Advanced

NOTICE

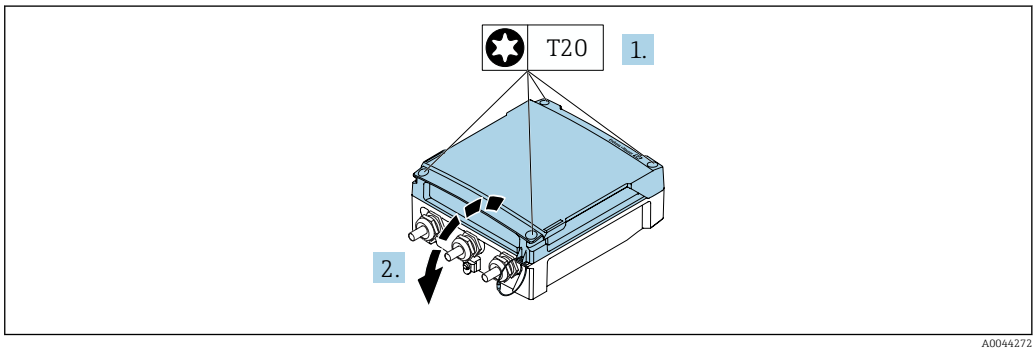
Excessive tightening torque applied to the fixing screws!
Risk of damaging the plastic transmitter.
- ▶ Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)
- ▶ Mount the antenna on the post using the antenna bracket.



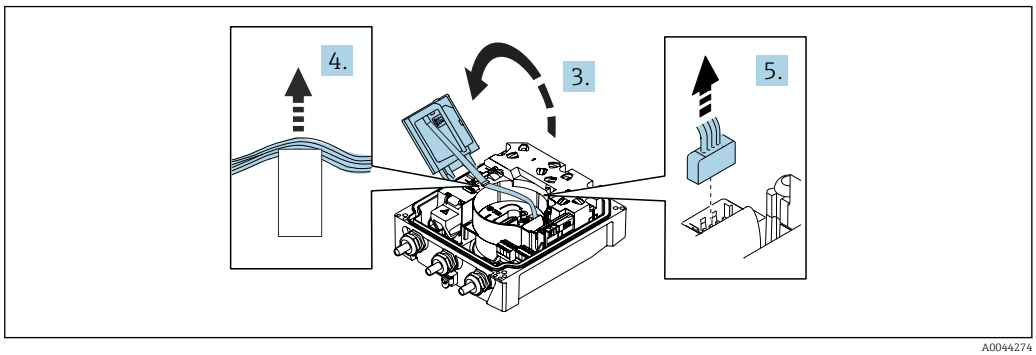
7 *Unit mm (in)*

6.2.5 Turning the transmitter housing, Proline 800 - Advanced

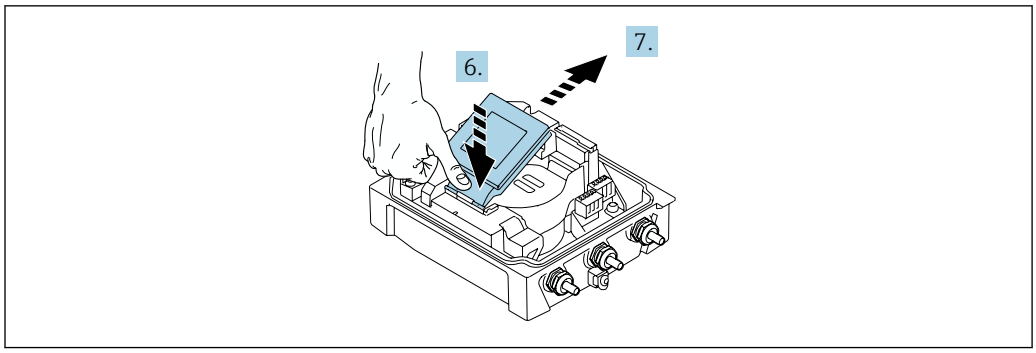
To provide easier access to the connection compartment or display module, the transmitter housing can be turned.



1. Loosen the fixing screws of the housing cover (when reassembling, pay attention to the tightening torque → 39).
2. Open the housing cover.

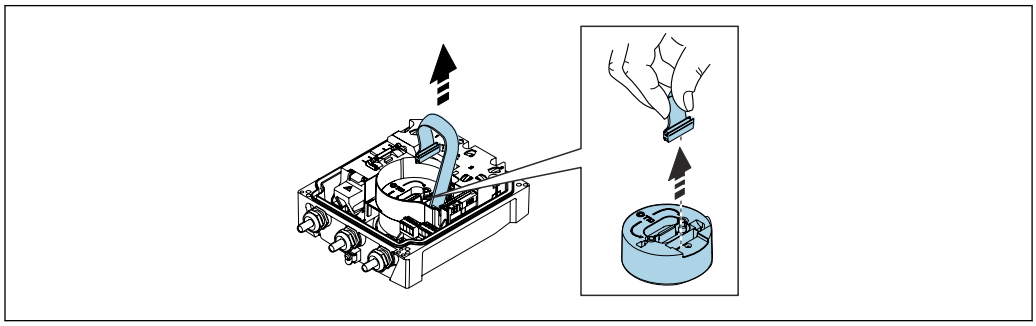


3. Open the display module.
4. Push the ribbon cable out of the holder.
5. Disconnect the plug.



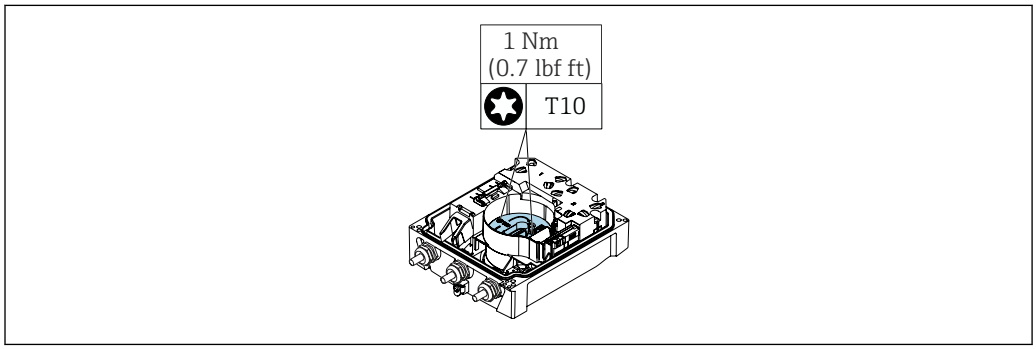
A0044273

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



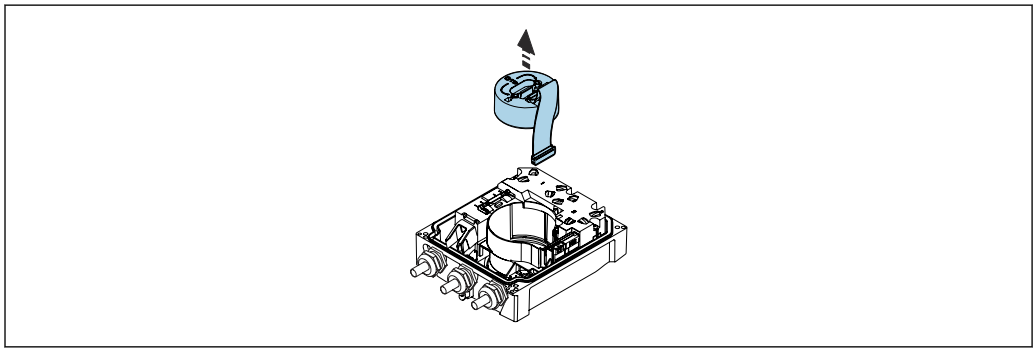
A0043338

8. Disconnect the plug of the electronics module.



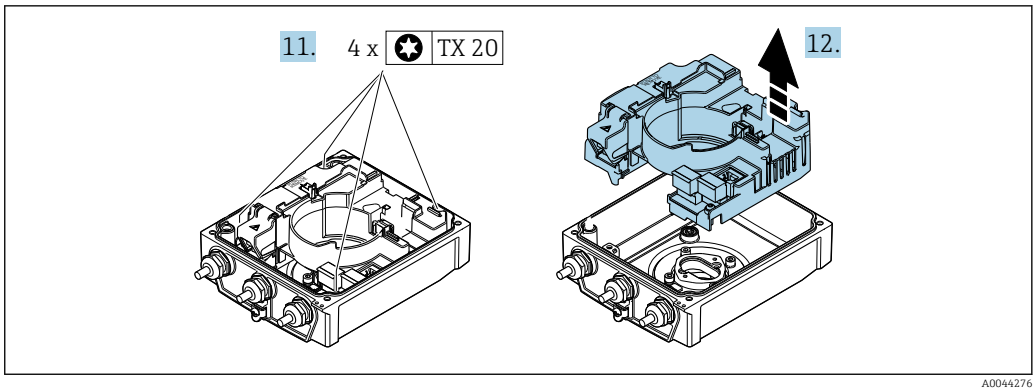
A0042853

9. Release the screws on the electronics module.



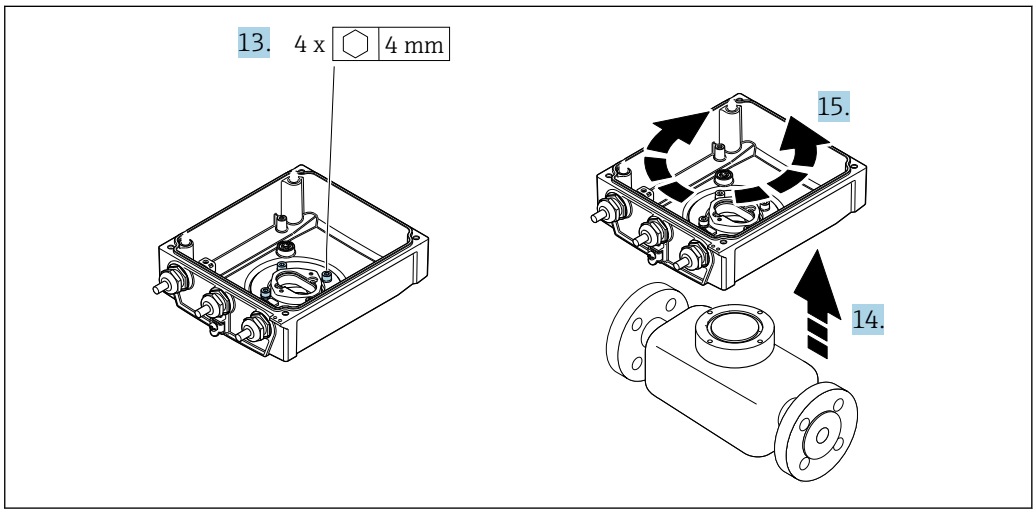
A0042843

10. Remove the electronics module.



A0044276

11. Loosen the fixing screws of the main electronics module (when reassembling, pay attention to the tightening torque → 39).
12. Remove the main electronics module.



A0044277

13. Loosen the fixing screws of the transmitter housing (when reassembling, pay attention to the tightening torque → 39).
14. Lift the transmitter housing.
15. Turn the housing to the desired position in increments of 90°.

Reassembling the transmitter housing

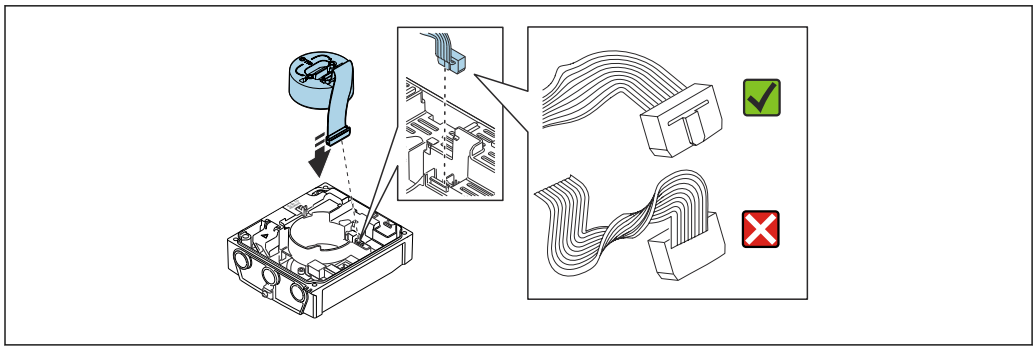
NOTICE

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

- ▶ Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)
- ▶ Mount the antenna on the post using the antenna bracket.

Step → 37	Fixing screw	Tightening torques
1	Housing cover	2.5 Nm (1.8 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)



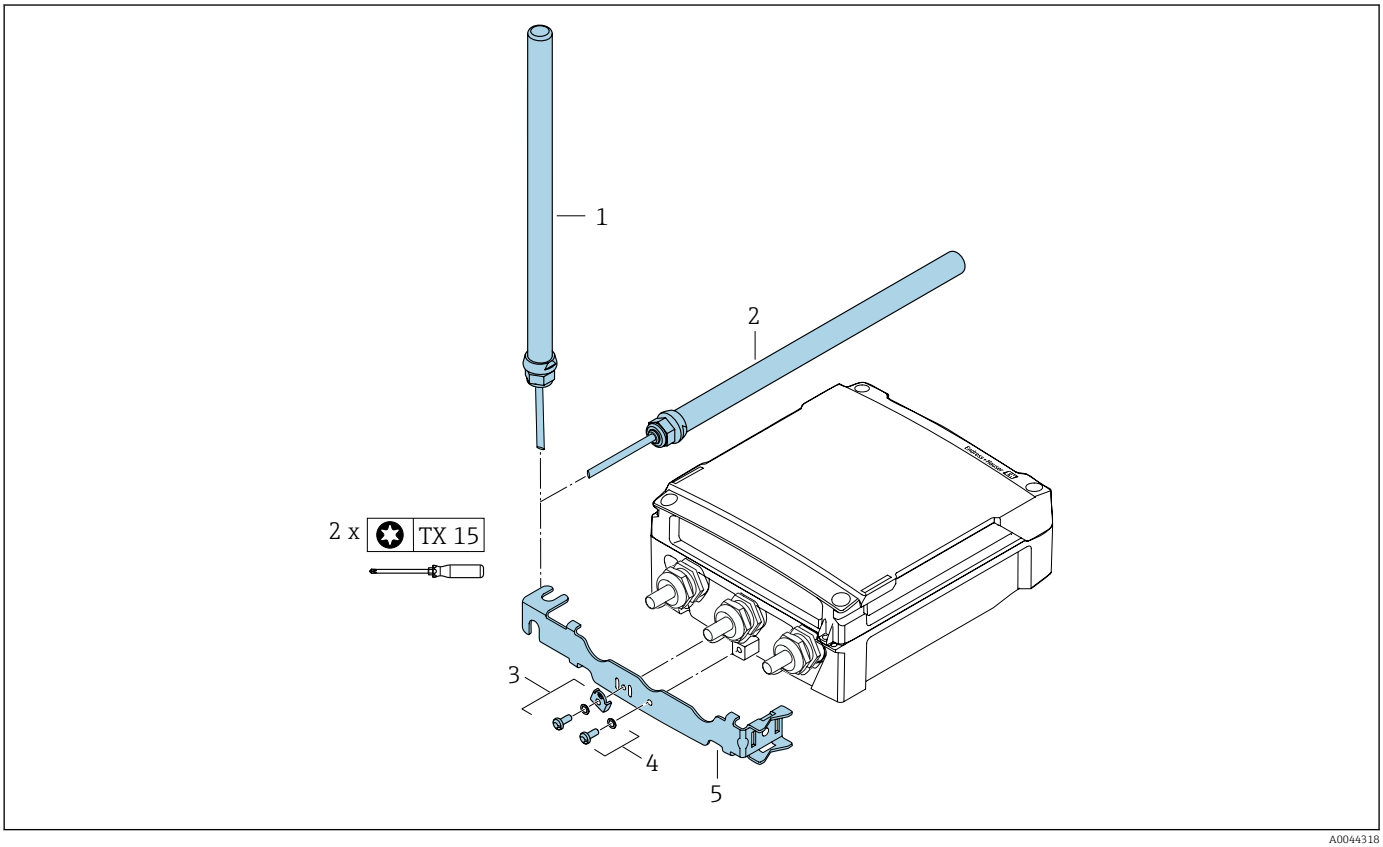
A0044279

▶ Reverse the procedure to reassemble the measuring device.

6.2.6 Mounting the external cellular antenna

If the signal is too weak, mount the external cellular antenna in a separate location.

Do not mount the external cellular antenna on the sensor. Mount the antenna to the wall or post together with the antenna bracket.



A0044318

1 = Antenna (vertical installation, maximum torque for mounting the antenna: 15 Nm)
2 = Antenna (horizontal installation, maximum torque for mounting the antenna: 15 Nm)
3 = Grounding lug with Torx screw and washer
4 = Torx screw with washer
5 = Antenna holder

6.2.7 Mounting the external battery pack

The external battery pack is mounted in the same way as the remote version of the transmitter → 35.

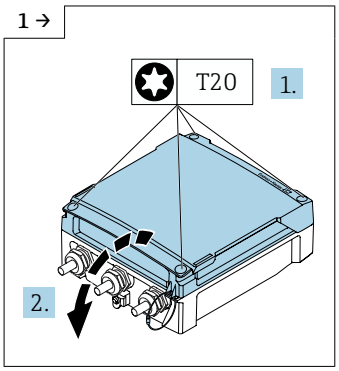
6.2.8 Inserting the SIM card

The device is equipped with an Endress+Hauser eSIM. The device automatically recognizes an additional SIM card that has been inserted.

The additionally inserted SIM card may not be protected by a PIN.

Only 1.8 V 4FF Nano SIM cards are recognized. SIM cards with M2M [1] functionality should preferably be used.

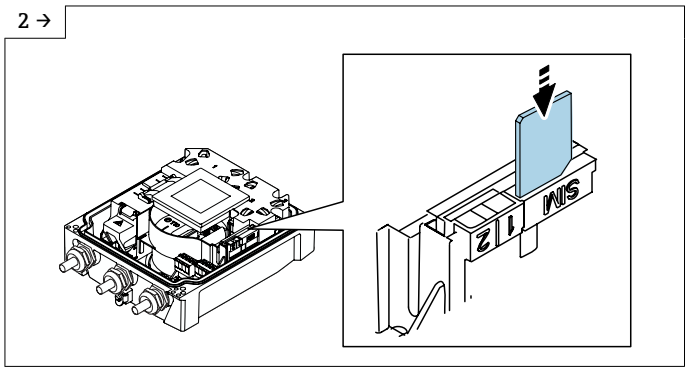
1 →



A0042838

- Open the connection compartment cover.

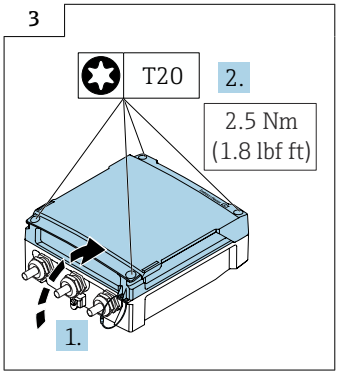
2 →



A0044342

- Remove the plastic cover of the SIM card slot.
- Insert the SIM card.
- Refit the plastic cover of the SIM card slot.

3



A0042855

- Close the connection compartment cover.

6.3 Post-mounting check

Is the device undamaged (visual inspection)?	❑
Does the measuring device conform to the measuring point specifications? For example: ▪ Process temperature → 🖹 99 ▪ Pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document. → 🖹 111 ▪ Ambient temperature → 🖹 25 ▪ Measuring range → 🖹 88	❑
Has the correct orientation been selected for the sensor → 🖹 22 ? ▪ According to sensor type ▪ According to medium temperature ▪ According to medium properties (outgassing, with entrained solids)	❑

1) Machine-to-Machine

Does the arrow on the sensor nameplate match the actual direction of flow of the fluid through the piping → 🖹 22?	❑
Are the measuring point identification and labeling correct (visual inspection)?	❑
Is the device adequately protected against precipitation and direct sunlight?	❑
Have the fixing screws been tightened with the correct tightening torque?	❑

7 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.

7.1 Electrical safety

In accordance with applicable national regulations.

7.2 Connecting requirements

7.2.1 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.

Connecting cable for remote version

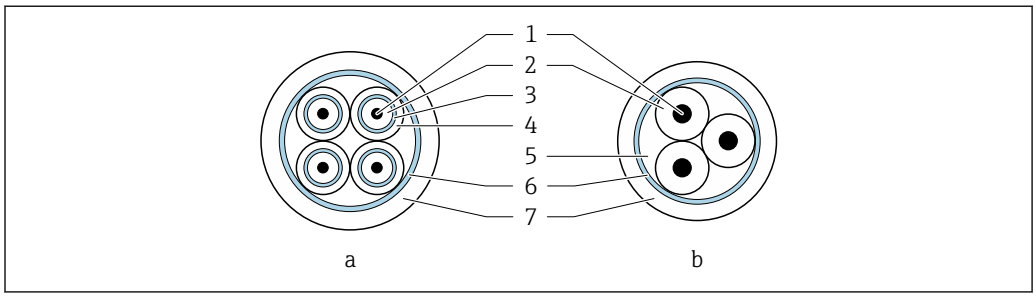
Electrode cable

Standard cable	3 ×0.38 mm² (20 AWG) with common, braided copper shield (ϕ ~9.5 mm (0.37 in)) and individual shielded cores
Cable for empty pipe detection (EPD)	4 ×0.38 mm² (20 AWG) with common, braided copper shield (ϕ ~9.5 mm (0.37 in)) and individual shielded cores
Conductor resistance	≤50 Ω/km (0.015 Ω/ft)
Capacitance: core/shield	≤420 pF/m (128 pF/ft)
Operating temperature	–25 to +70 °C (–13 to +158 °F)

Coil current cable

Standard cable	3 ×0.75 mm² (18 AWG) with common, braided copper shield (ϕ ~9 mm (0.35 in))
Conductor resistance	≤37 Ω/km (0.011 Ω/ft)

Capacitance: core/core, shield grounded	≤120 pF/m (37 pF/ft)
Operating temperature	−25 to +70 °C (−13 to +158 °F)
Test voltage for cable insulation	≤ AC 1433 V rms 50/60 Hz or ≥ DC 2026 V



8 Cable cross-section

a Electrode cable
b Coil current cable
1 Core
2 Core insulation
3 Core shield
4 Core jacket
5 Core reinforcement
6 Cable shield
7 Outer jacket

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 environments with strong electrical interference

The measuring system meets the general safety requirements → 109 and EMC specifications → 98.

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.

The selection of a sensor with a steel housing is recommended for use in the vicinity of electrical power supply lines with strong currents.

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)

7.2.2 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)

7.2.3 Terminal assignment, Proline 800 - Advanced

Transmitter

Connection methods available		Possible options for order code
Outputs	**Power supply**	
Terminals	Terminals	**"Electrical connection"** ▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"

Supply voltage

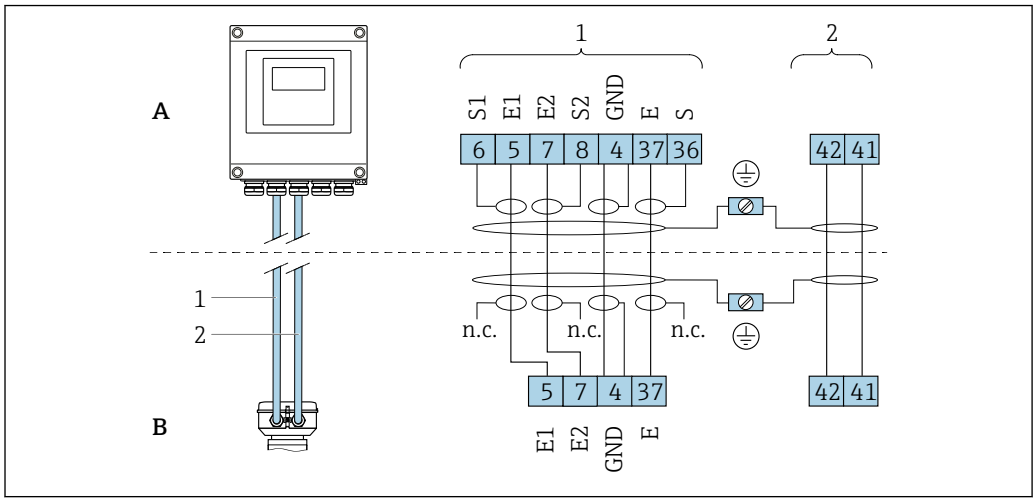
Order code for "Power supply"	Terminal numbers	Terminal voltage		Frequency range
Option **K**, **S**	1 (L+/L), 2 (L-/N)	DC 24 V	−20 to +25 %	–
		AC 100 to 240 V	−15 to +10 %	50/60 Hz, ±3 Hz

Order code for "Output" and "Input"	Terminal numbers			
	20	21	22	23
Option **I, K, M, N, P**	Pulse-/ switch output 2	Pulse-/ switch output 3	Pulse-/ switch output 1	Common reference potential (COM)

If a status input is also connected, the following terminals must be assigned, which are located on the second terminal block of the IO board:

Order code for "Output" and "Input"	Terminal numbers	
	24	25
Option **I, M, P**	Positive terminal status input	Negative terminal status input

Remote version



9 *Remote version terminal assignment*

A Transmitter wall-mount housing
B Sensor connection housing
1 Electrode cable
2 Coil current cable
n.c. Not connected, insulated cable shields

Terminal No. and cable colors: 6/5 = brown; 7/8 = white; 4 = green; 36/37 = yellow

7.2.4 Shielding and grounding

Shielding and grounding concept

1. Maintain electromagnetic compatibility (EMC).
2. Pay attention to the protection of persons.
3. Comply with national installation regulations and guidelines.
4. Observe cable specifications → 📄 43.
5. Keep the stripped and twisted lengths of cable shield to the ground terminal as short as possible.
6. 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.

7.2.5 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

7.2.6 Preparing the measuring device

Carry out the steps in the following order:

1. Mount the sensor and transmitter.
2. Sensor connection housing: 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.

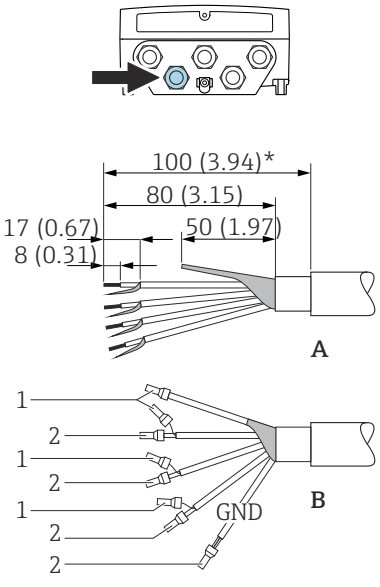
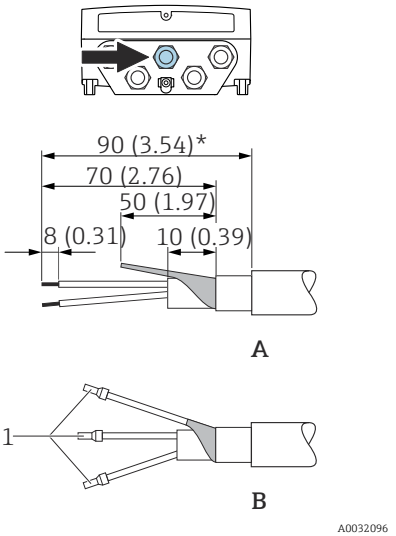
1. Remove dummy plug if present.
2. If the measuring device is supplied without cable glands:
   Provide suitable cable gland for corresponding connecting cable.
3. If the measuring device is supplied with cable glands:
   Observe requirements for connecting cables → 🖹 43.

7.2.7 Preparing the connecting cable for the remote version

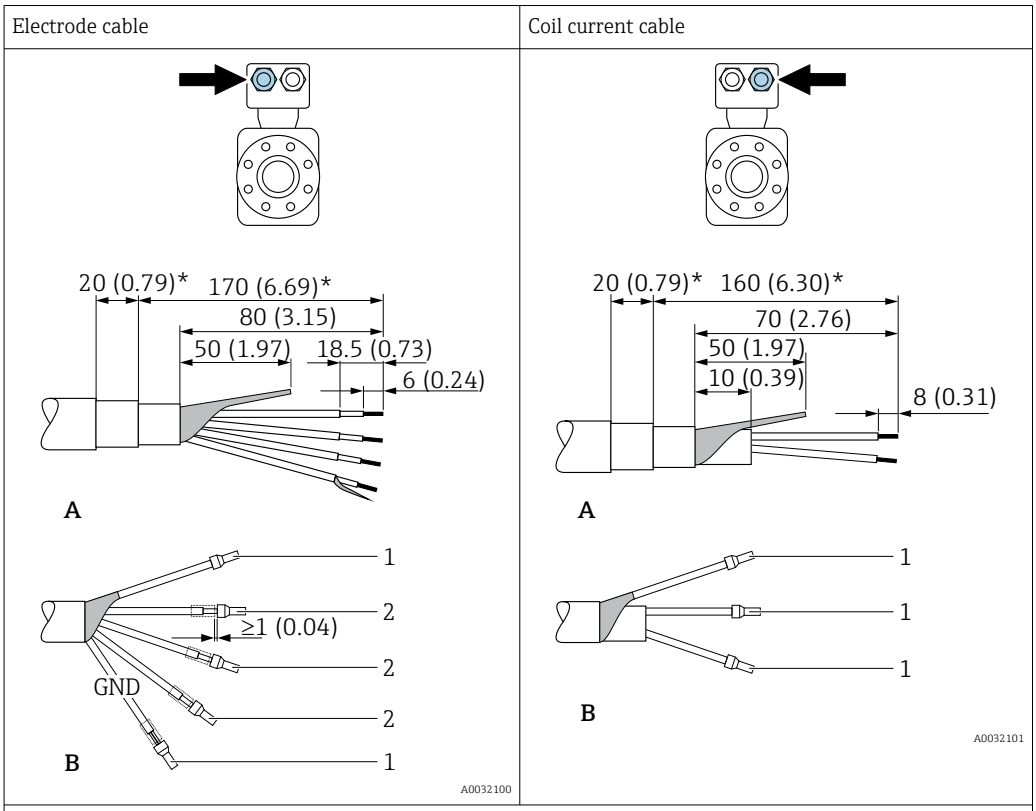
When terminating the connecting cable, pay attention to the following points:

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
 *10 Engineering unit mm (in)*	 *11 Engineering unit mm (in)*
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	

Sensor



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

7.3 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.

7.3.1 Connecting the remote version

⚠ WARNING

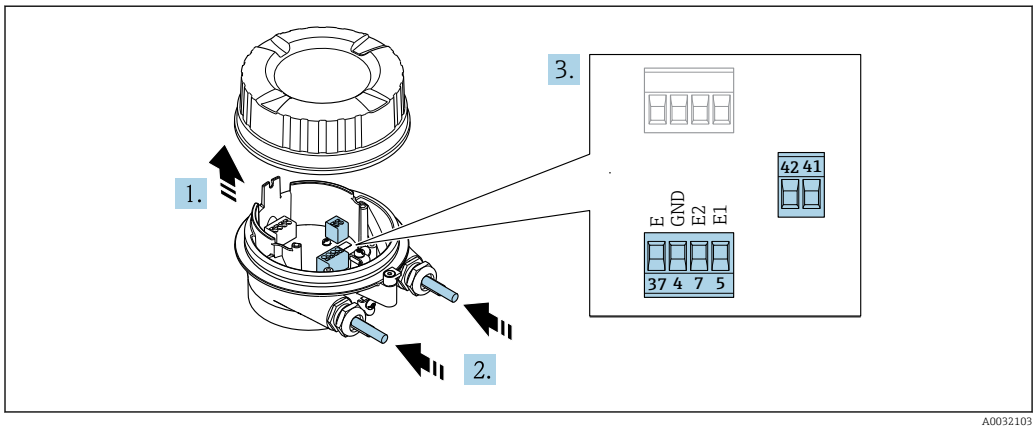
Risk of damaging electronic components!

- 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 sequence of steps is recommended for the remote version:

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

Connecting the connecting cable to the sensor connection housing



12 *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.

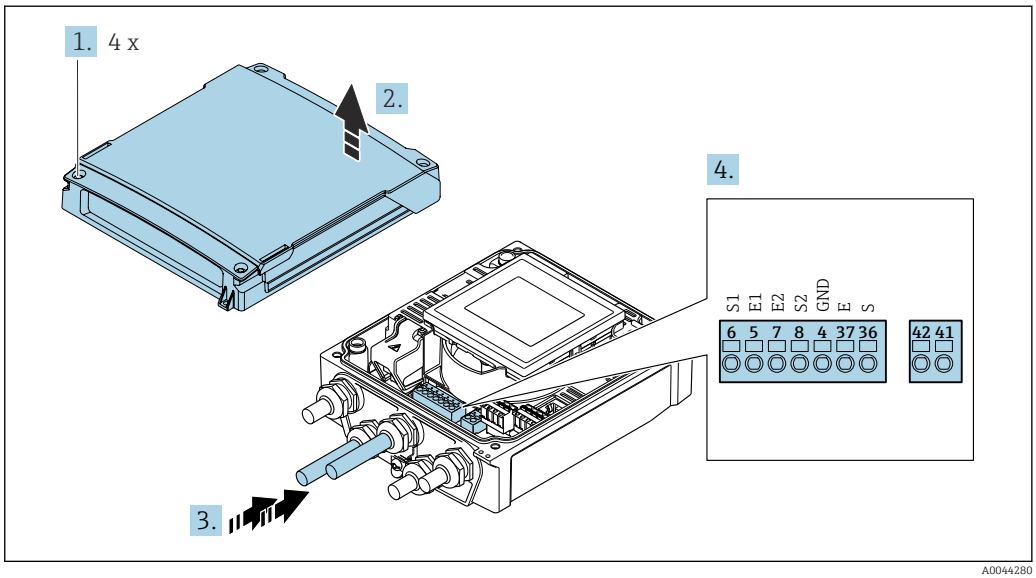
   Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules . → 47
5. Connect the cable according to the terminal assignment . → 46
6. Firmly tighten the cable 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.

Connecting the connecting cable to the transmitter



13 *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 . → 47
5. Connect the cable according to the terminal assignment . → 46
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.

   Reassemble the transmitter in the reverse order.

7.3.2 Connecting the transmitter

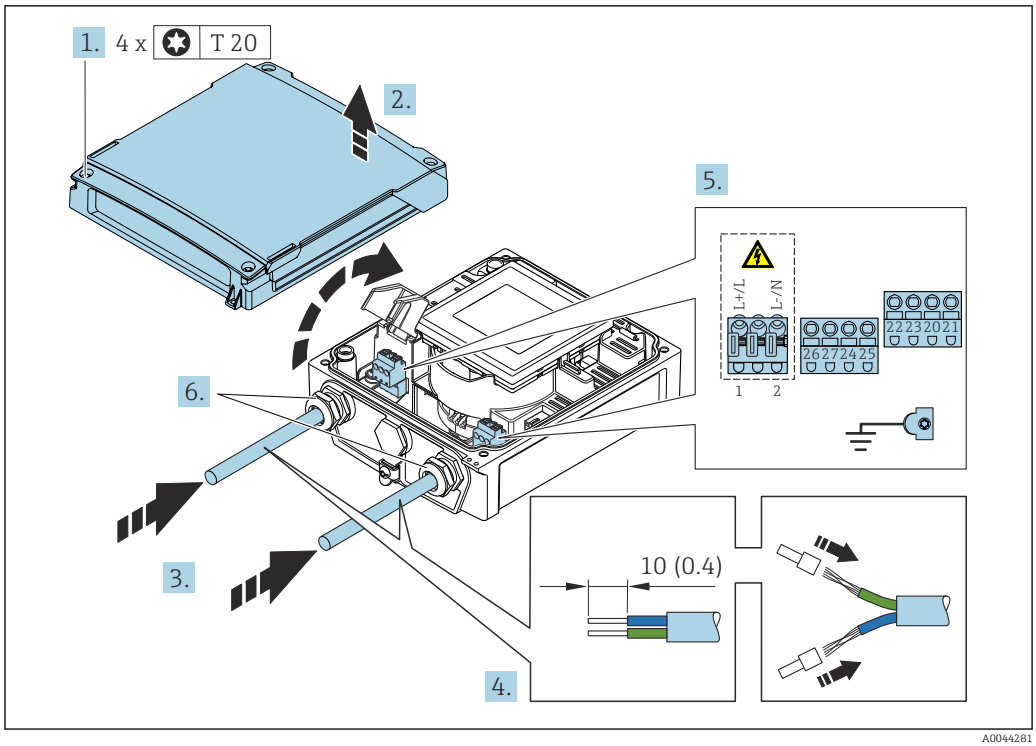
WARNING

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



14 *Connecting the supply voltage*

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 . → 47
5. Connect the cable according to 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.

7.3.3 Ensuring potential equalization

Introduction

Correct potential equalization (equipotential bonding) is a prerequisite for stable and reliable flow measurement. Inadequate or incorrect potential equalization can result in device failure and present a safety hazard.

The following requirements must be observed to ensure correct, trouble-free measurement:
- The principle that the medium, the sensor and the transmitter must be at the same electrical potential applies.
- Take in-company grounding guidelines, materials and the grounding conditions and potential conditions of the pipe into consideration.
- The necessary potential equalization connections must be established using a ground cable with a minimum cross-section of 6 mm^2 (0.0093 in^2) and a cable lug.
- In the case of remote device versions, the ground terminal in the example always refers to the sensor and not to the transmitter.

You can order accessories such as ground cables and ground disks directly from Endress+Hauser → 86

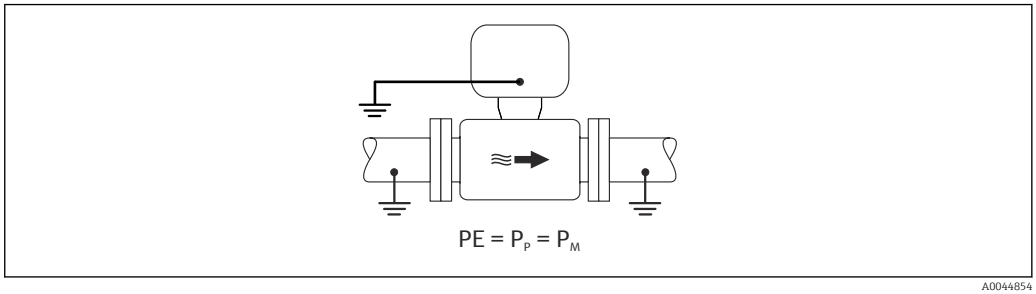
Abbreviations used
- PE (Protective Earth): potential at the protective earth terminals of the device
- P_P (Potential Pipe): potential of the pipe, measured at the flanges
- P_M (Potential Medium): potential of the medium

Connection examples for standard situations

Unlined and grounded metal pipe

- Potential equalization is via the measuring pipe.
- The medium is set to ground potential.

Starting conditions:
- Pipes are correctly grounded on both sides.
- Pipes are conductive and at the same electrical potential as the medium



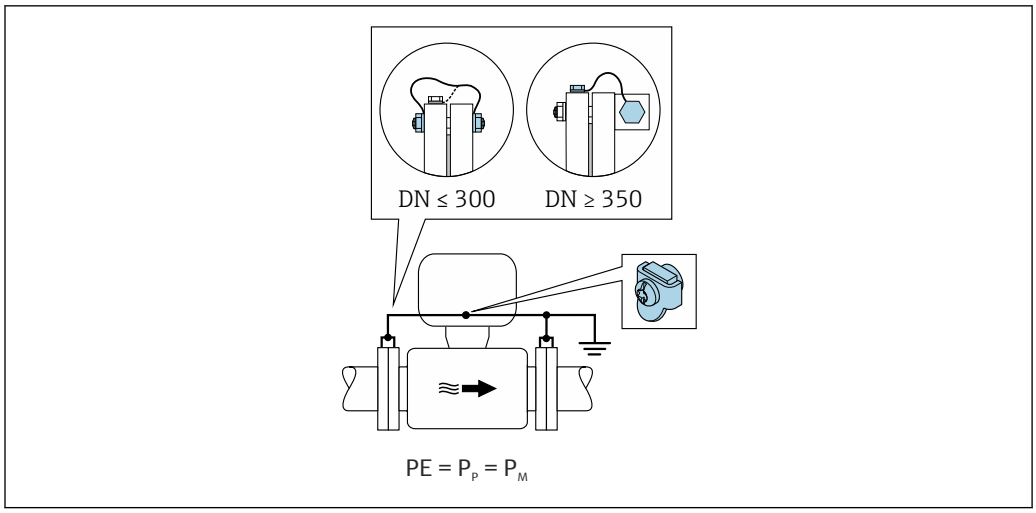
A0044854

▶ Attach the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for this purpose.

Metal pipe without liner

- Potential equalization is via the ground terminal and pipe flanges.
- The medium is set to ground potential.

Starting conditions:
- Pipes are not sufficiently grounded.
- Pipes are conductive and at the same electrical potential as the medium



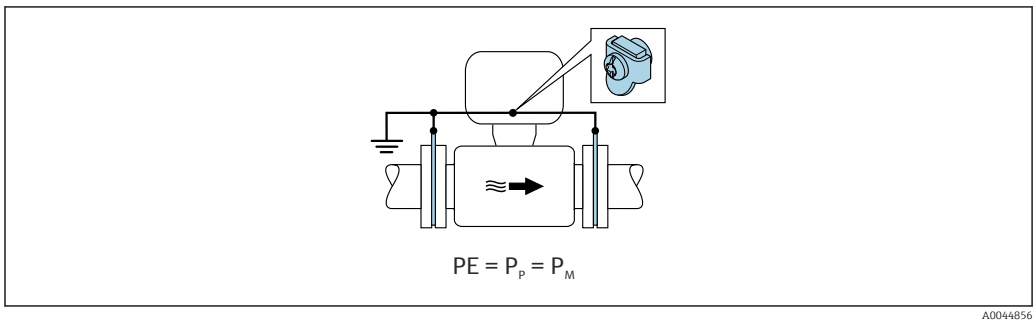
A0042089

1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.
2. Attach the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for this purpose.
3. For DN ≤ 300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
4. For DN ≥ 350 (14"): Mount the ground cable directly on the metal transport bracket. Observe the screw tightening torques: see the Brief Operating Instructions for the sensor.

Plastic pipe or pipe with insulating liner

- Potential equalization is via the ground terminal and ground disks.
- The medium is set to ground potential.

Starting conditions:
- The pipe has an insulating effect.
- Low-impedance medium grounding close to the sensor is not guaranteed.
- Equalizing currents through the medium cannot be ruled out.



A0044856

1. Connect the ground disks to the ground terminal of the transmitter or sensor connection housing via the ground cable.
2. Connect the connection to ground potential.

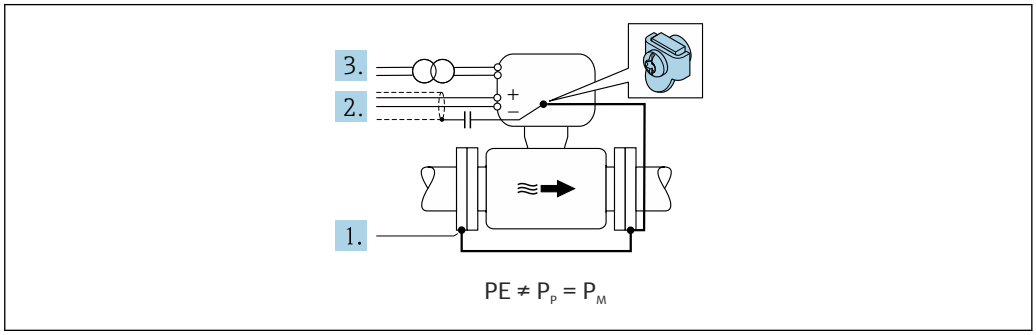
Connection example with the potential of medium not equal to protective ground

In these cases, the medium potential can differ from the potential of the device.

Metal, ungrounded pipe

The sensor and transmitter are installed in a way that provides electrical insulation from PE, e.g. applications for electrolytic processes or systems with cathodic protection.

Starting conditions:
- Unlined metal pipe
- Pipes with an electrically conductive liner

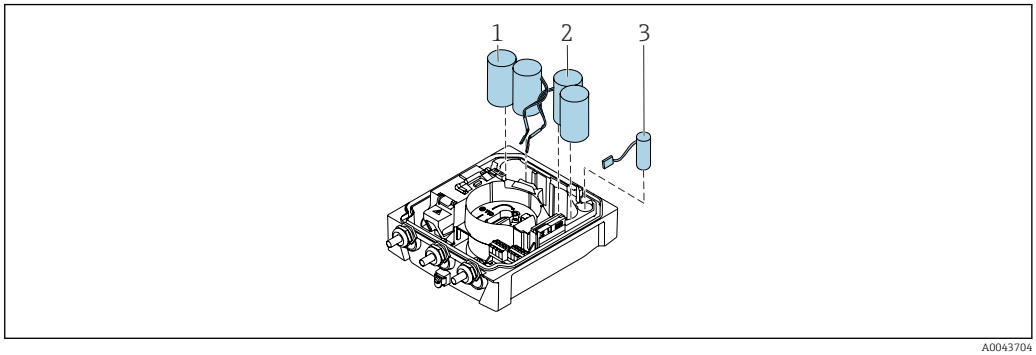


A0042253

1. Connect the pipe flanges and transmitter via the ground cable.
2. Route the shielding of the signal lines via a capacitor (recommended value 1.5µF/ 50V).
3. Device connected to power supply such that it is floating in relation to the protective earth (isolation transformer). This measure is not required in the case of 24V DC supply voltage without PE (= SELV power unit).

7.4 Power supply via battery packs, Proline 800 - Advanced

7.4.1 Battery pack arrangement



A0043704

1 Battery pack 1
2 Battery pack 2
3 Buffer capacitor

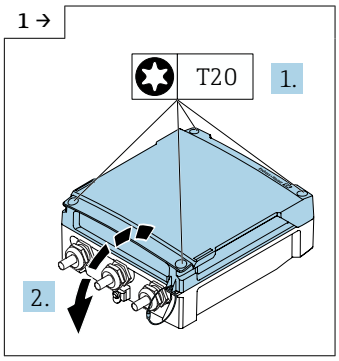
7.4.2 Inserting and connecting buffer capacitors and battery packs

The device is delivered either with the batteries already installed, or enclosed separately, depending on national standards and guidelines. If the batteries are inserted and connected upon delivery, to operate the device it is important to ensure that switch "B" is set to "ON" and the ribbon cable is connected to the electronics module.

The device starts once the buffer capacitor is connected. After 15 seconds, a measured value appears on the display.

Connect the battery packs immediately once the buffer capacitor has been connected.

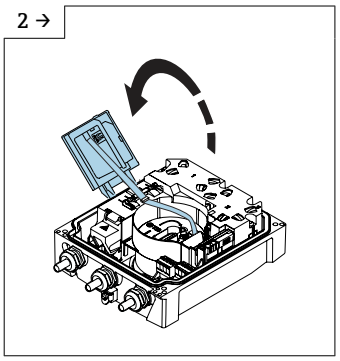
1 →



A0042838

▶ Open the connection compartment cover.

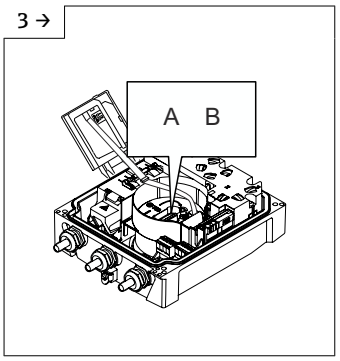
2 →



A0043731

▶ Open the display module.

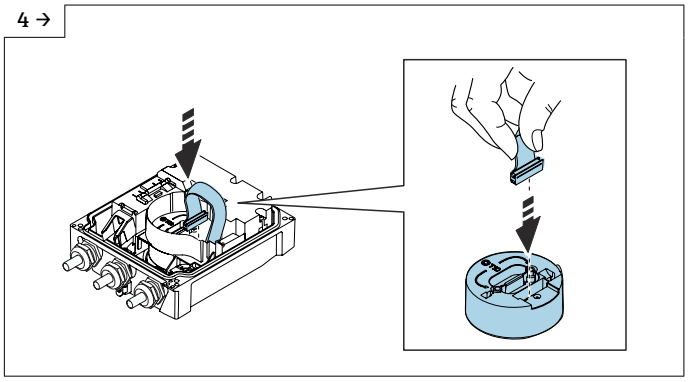
3 →



A0043793

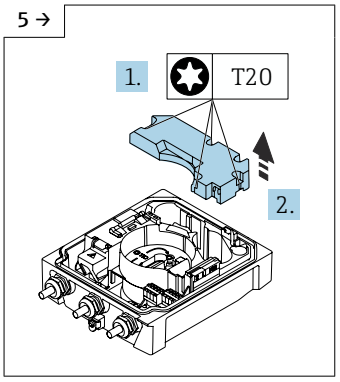
▶ Set switch "B" to "ON".

4 →



A0044382

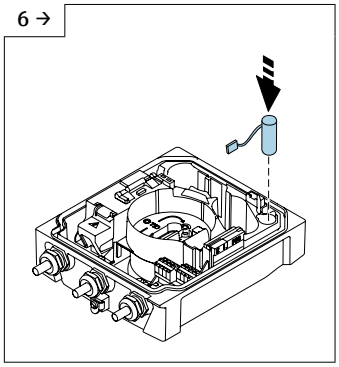
5 →



A0043823

▶ Remove the cover of the battery pack.

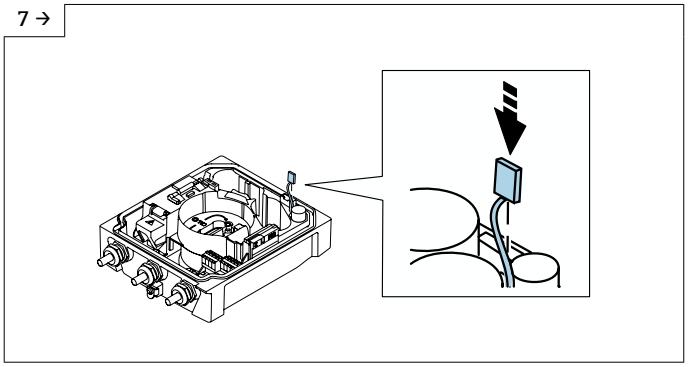
6 →



A0043734

▶ Insert the buffer capacitor.

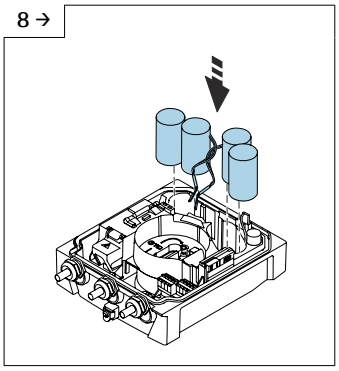
7 →



A0043735

▶ Plug the buffer capacitor into connector 3.

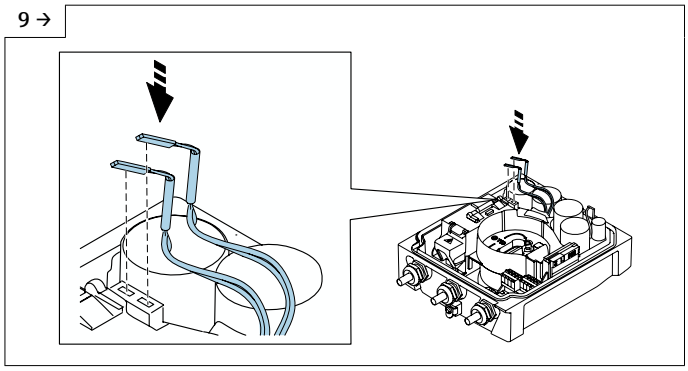
8 →



A0043732

- Insert battery packs 1 and 2.

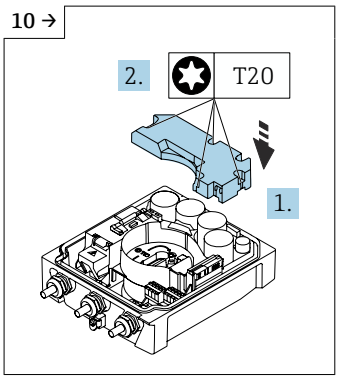
9 →



A0043733

- Plug the connector of battery pack 1 into connector 1.
- Plug the connector of battery pack 2 into connector 2.
- The device switches on.
- After 15 seconds, a measured value appears on the display.

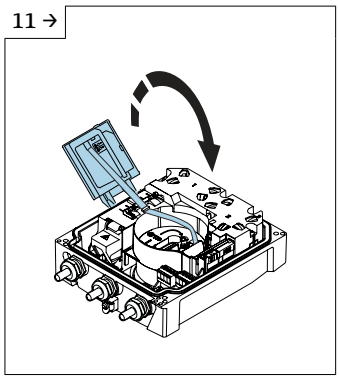
10 →



A0043736

- Mount the cover of the battery pack.

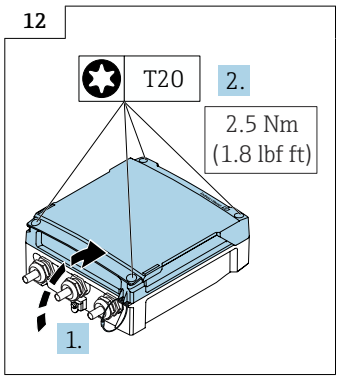
11 →



A0043737

- Close the display module.

12



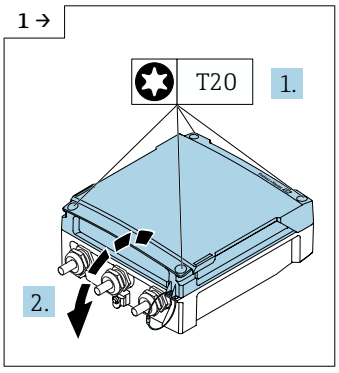
A0042855

- Close the connection compartment cover.

7.5 Connect the cellular antenna

If the signal is too weak, mount the external cellular antenna in a separate location.

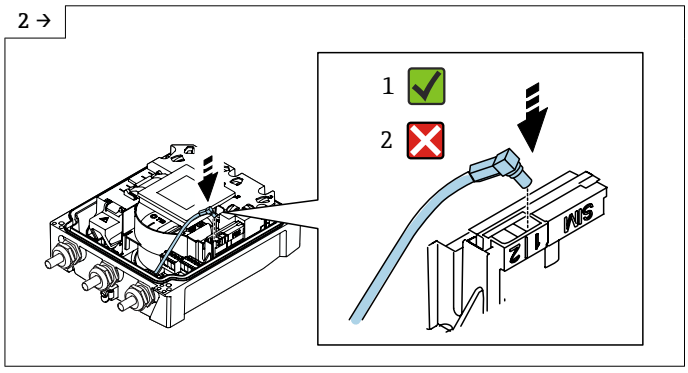
1 →



A0042838

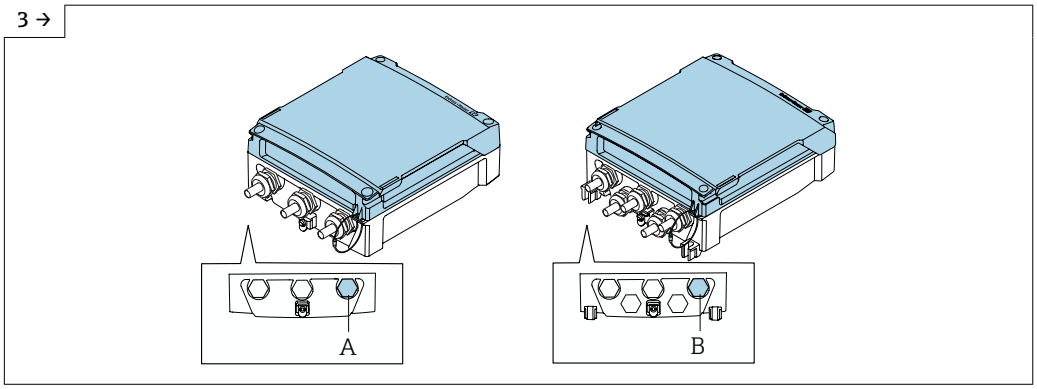
- Open the connection compartment cover.

2 →

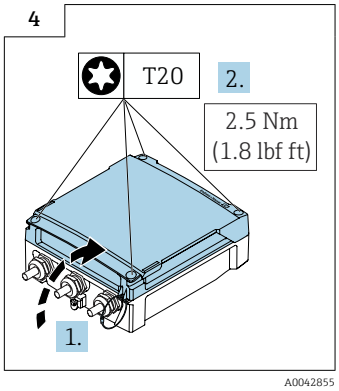


A0044338

- Plug in the antenna connector.

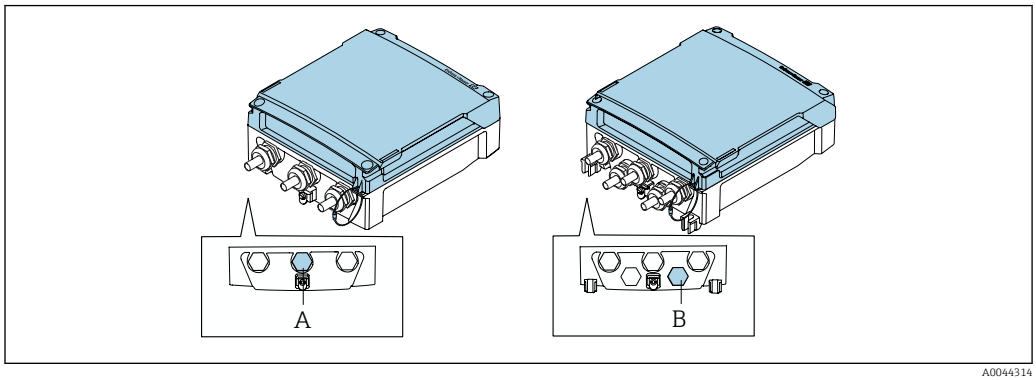


- Guide the cable of the cellular antenna through the cable gland indicated.
- Connect the cable of the cellular antenna to the cable of the antenna connector.



- Close the connection compartment cover.

7.6 Connecting the pressure sensor, Proline 800 - Advanced

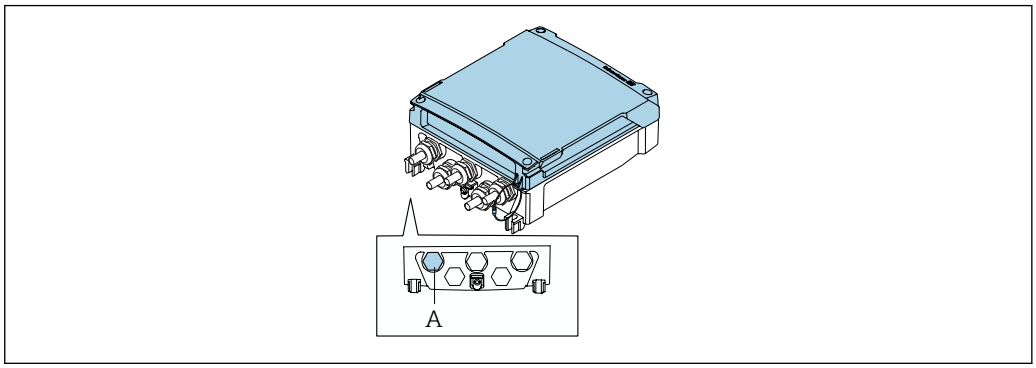


A Plug for the pressure sensor on the housing of the compact transmitter
B Plug for the pressure sensor on the housing of the remote transmitter

- Connect the pressure sensor to the plug indicated.

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

7.7.1 Connecting the external battery pack



A0044313

A Plug for the external battery pack

- Connect the external battery pack to the plug indicated.

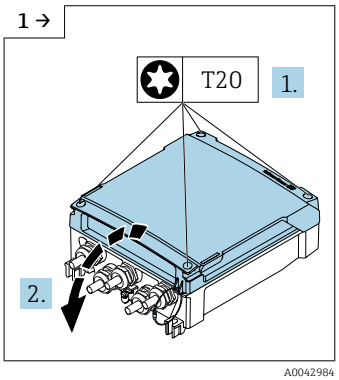
7.7.2 Inserting batteries into the external battery pack

WARNING

Batteries may explode if not handled properly!

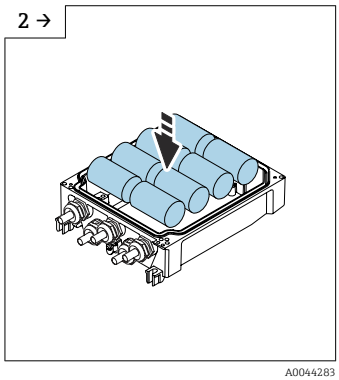
- Do not recharge batteries.
- Do not open batteries.
- Do not expose batteries to naked flame.

Observe the specified temperature range of the batteries.



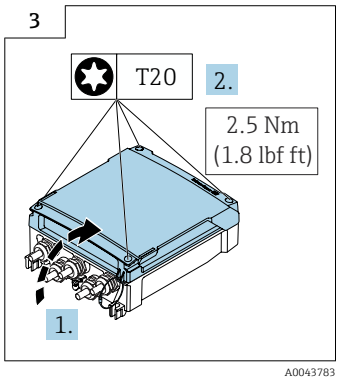
A0042984

- Open the connection compartment cover.



A0044283

- Insert new batteries.



A0043783

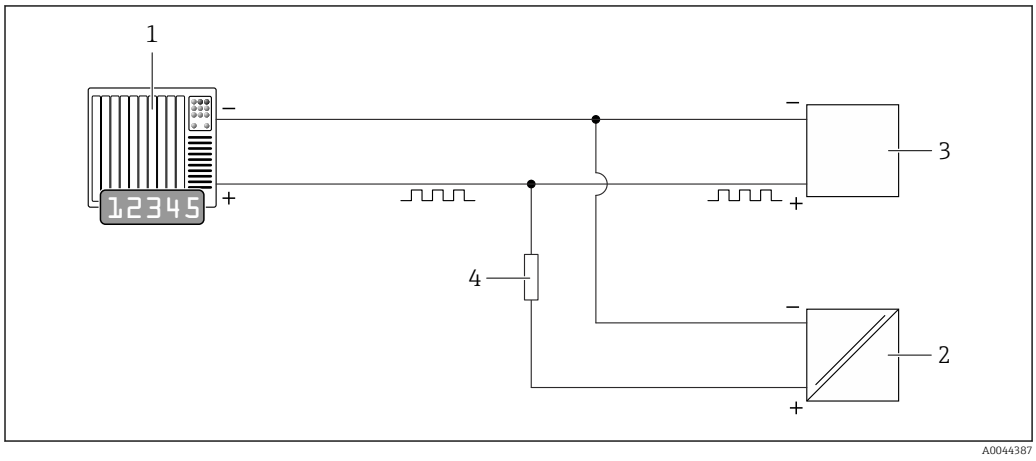
- Close the connection compartment cover.

The device does not display the remaining capacity of the external batteries. The value on the display refers exclusively to the batteries fitted internally. If internal and external batteries are connected, the external batteries are used first of all, and then the internal batteries are used.

7.8 Special connection instructions

7.8.1 Connection examples

Pulseoutput



15 *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 → 90*
4 *Pull-up resistor (e.g. 10 kOhm)*

7.9 Ensuring the degree of protection

7.9.1 Degree of protection IP68, type 6P enclosure, with "Cust-potted" option, Proline 800 - Advanced (separate version)

Depending on the version, the sensor meets all the requirements of IP68 protection, type 6P enclosure and can be used as a remote device version → 27.

The degree of protection of the transmitter is always only IP66/67, type 4X enclosure and the transmitter must be treated accordingly → 60.

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

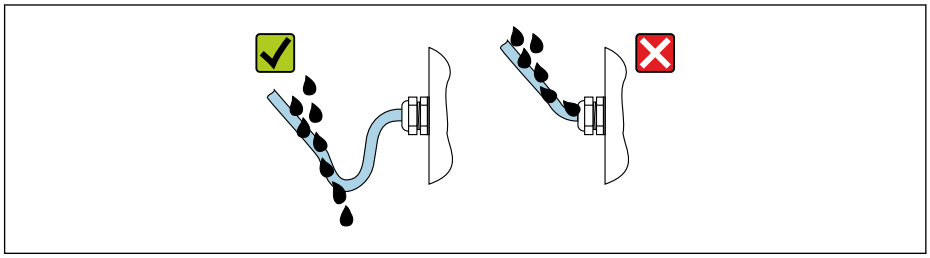
1. Firmly tighten the cable glands (torque: 2 to 3.5 Nm) until there is no gap between the bottom of the cover and the housing support surface.
2. Firmly tighten the union nut of the cable glands.
3. Pot the field housing with a potting compound.
4. Check that the housing seals are clean and fitted correctly.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

7.9.2 Degree of protection IP66/67, type 4X enclosure, Proline 800 - Advanced

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

To guarantee IP66/67 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!

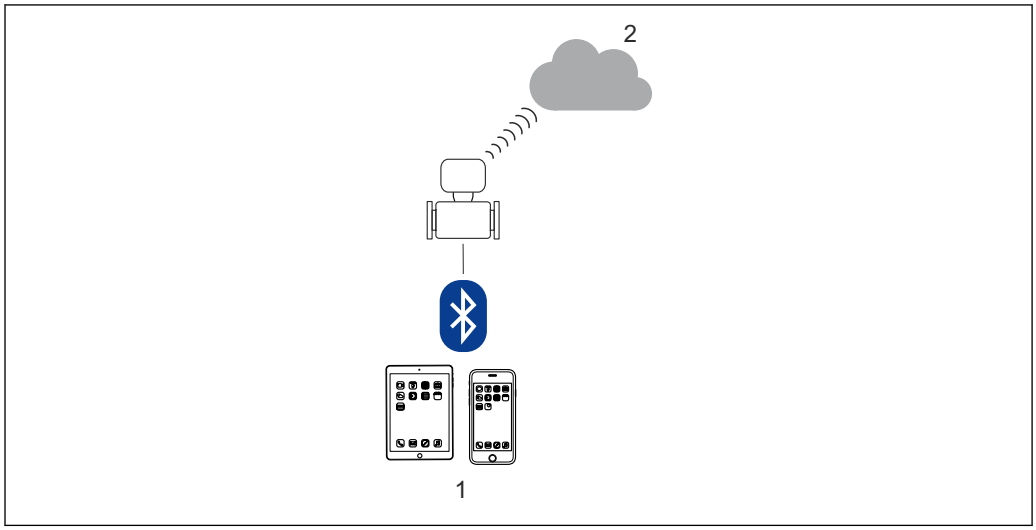
▶ Use suitable dummy plugs corresponding to the degree of protection.

7.10 Post-connection check

Are cables or the device undamaged (visual inspection)?	❑
Do the cables used comply with the requirements?	❑
Are the mounted cables relieved of tension?	❑
Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 🖹 60?	❑
Only for remote version: is the sensor connected to the right transmitter? Check the serial number on the nameplate of the sensor and transmitter.	❑
Does the supply voltage match the specifications on the transmitter nameplate?	❑
Is the terminal assignment correct ?	❑
Is the terminal assignment or the pin assignment of the device plug correct?	❑
Is the cellular network antenna connected correctly?	❑
Is the signal strong enough to connect to a cellular network?	❑
Batteries correctly inserted and secured?	❑
DIP switch in correct position?	❑
If supply voltage is present, do values appear on the display module? If power is supplied exclusively via the battery: does information appear on the display module when the module is touched?	❑
Is the potential equalization established correctly → 🖹 52?	❑
Are all housing covers installed and the screws tightened with the correct tightening torque?	❑

8 Operation options

8.1 Overview of operation options



1 *Smartphone/tablet (via SmartBlue)*
2 *Netilion/OPC-UA (via cellular radio)*

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

8.2 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 diagnostic 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:

Downloading the SmartBlue app:

1. Install and start the SmartBlue app.
   ↳ A Live List shows all the devices available.
   The list displays the devices with the configured tag name. The default setting of the device tag is **EH_5W8C_XXYYZZ** (XXYYZZ = the first 6 characters of the device serial number).
2. For Android devices, activate GPS positioning (not necessary for devices with IOS)
3. Select the device from the Live List.
   ↳ The Login dialog box opens.

- 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.

Logging in:

4. Enter the user name: **admin**
5. Enter the initial password: serial number of the device, (pay attention to lower/upper case).
   ↳ When you log in for the first time, a message is displayed advising you to change the password.
6. Confirm your entry.
   ↳ The main menu opens.
7. Optional: Change Bluetooth® password: System → Connectivity → Bluetooth configuration → Change Bluetooth password

Forgotten your password: contact Endress+Hauser Service.

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

For an overview of the various firmware versions for the device → 78

9.1.2 Operating tools

The suitable device description file for the individual operating tools is listed in the table below, along with information on where the file can be acquired.

SmartBlue app	ANDROID APP ON Google Play Download on the App Store A0033202
DeviceCare	▪ www.endress.com → Downloads area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)

9.2 Establishing a Netilion connection

Only with order code for "Output; Input", option P "Cellular radio"

For detailed information on "Establishing a Netilion connection", see the "Quick reference guide" Special Documentation. → 111

9.3 Establishing an OPC-UA connection

Only with order code for "Input; Output", option P "Cellular radio"

For detailed information on "Establishing an OPC-UA connection", see the "OPC-UA" Special Documentation.→ 111

10 Commissioning

10.1 Post-mounting and post-connection check

Before commissioning the device:

▶ Make sure that the post-installation and post-connection checks have been performed successfully.

- Checklist for "Post-mounting" check→ 41
- Checklist for "Post-connection check" → 61

10.2 Preparatory steps

The device can only be operated via the SmartBlue App.

10.2.1 Install the SmartBlue App

Download the SmartBlue App → 62

10.2.2 Connect the SmartBlue App to the device

Log in → 63

10.3 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 have made will be saved. For this reason, the device may then 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.

10.4 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 → 65
- Write protection via write protection switch → 11

10.4.1 Write protection via access code

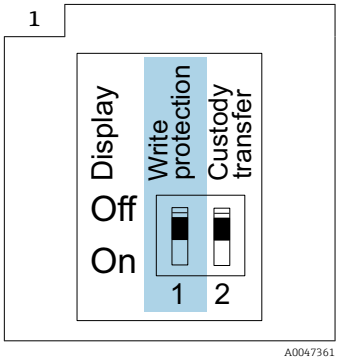
The effects of the user-specific access code are as follows:
Via the SmartBlue App, the parameters for the measuring device configuration are write-protected and their values can no longer be changed.

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

10.4.2 Write protection via write protection switch



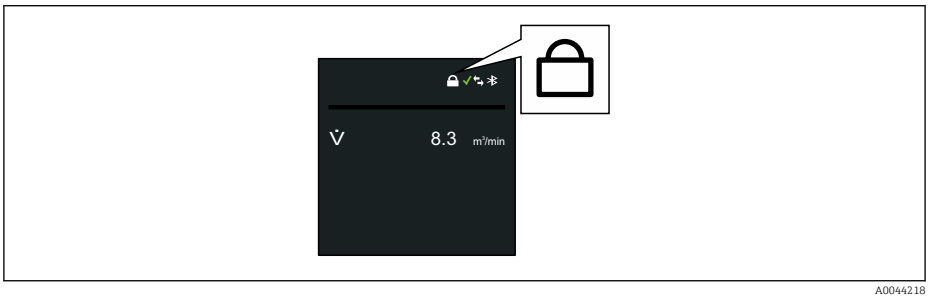
▶ Information regarding the write protection switch is provided on the connection nameplate in the connection compartment cover.

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
- Clientt ID

1. Loosen the 4 fixing screws on the housing cover and open the housing cover.
2. 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.



3. **⚠ WARNING**

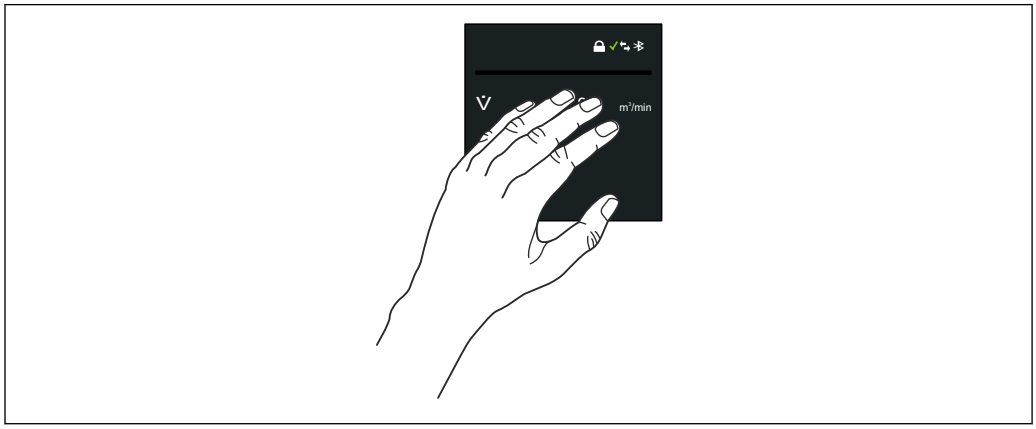
Excessive tightening torque applied to the fixing screws!
Risk of damaging the plastic transmitter.
▶ Tighten the fixing screws as per the tightening torque → 🖹 30.

Reassemble the transmitter in the reverse order.

11 Operation

11.1 Wake on Touch

If you touch the display for 5 seconds the device shows measured values and status information.



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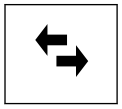
Locking status
The device is locked via the hardware.

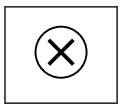
Bluetooth
Bluetooth function is enabled.



Device communication

Device communication is enabled.

Received signal strength (cellular radio)
Displays the received signal strength.



Failure

- A device error has occurred.
- Output signal is no longer valid.

Maintenance required

- Maintenance required.
- Output signal is still valid.

Out of specification

- Device is being 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.

Diagnosis enabled

Output signal is valid.

Function check

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

11.2 Adapting the measuring device to the process conditions

To do so, users can choose from the following menus:
- Guidance
- Application

Detailed information on "**Guidance** menu" and "**Application** menu": Device parameters → 111

11.3 Performing a totalizer reset

Navigation
"Application" menu → Totalizers → Totalizer handling → Reset all totalizers

Parameter overview with brief description

Parameter	Description	Selection
Reset all totalizers	Reset all totalizers to 0 and start.	▪ Cancel ▪ Reset + totalize

11.4 Disabling the Bluetooth interface

The disabling of the interface can only be undone using Wake on Touch → 68.

Navigation
"System" menu → Connectivity → Bluetooth configuration → Bluetooth

Parameter overview with brief description

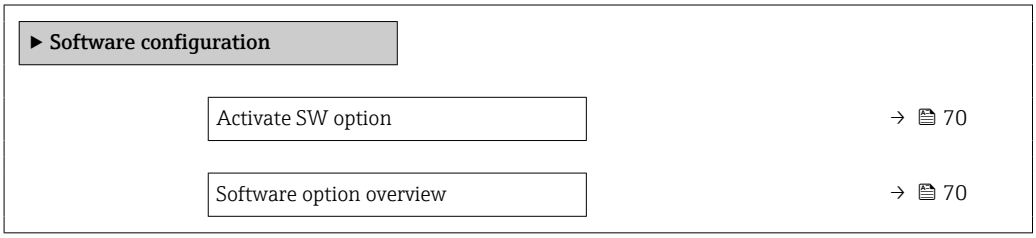
Parameter	Description	Selection
Bluetooth	Enable or disable Bluetooth function.	▪ Enable ▪ On touch ▪ Not available *

* Visibility depends on order options or device settings

11.5 Enabling the software option

11.5.1 "Software configuration" submenu

Navigation
"System" menu → Software configuration



Parameter overview with brief description

Parameter	Description	User entry / User interface
Activate SW option	Enter the application package code or code of another re-ordered functionality to enable it.	Positive integer
Software option overview	Shows all enabled software options.	▪ Extended data logger ▪ Extended HistoROM ▪ Heartbeat Verification ▪ Custody transfer ▪ Heartbeat Monitoring

11.6 Updating the firmware

Firmware updates are available in the Download Area of the Endress+Hauser website: www.endress.com → Downloads

Specify the following details for the "Device driver":
- Type: "Firmware Flash File"
- Product root: "5W8C"
- Process communication: "Modbus RS485"
- Device type: "0x6463 (Promag 800)"
- Select device version
- Start the search

1. Extract the ZIP file.
2. Save the extracted "Firmware Flash File" to the mobile device.
   ↳ iOS: Files → SmartBlue → UpdatePackages
   Android: Internal memory → SmartBlue → Firmware
3. Connect to the measuring device via the SmartBlue app.
4. In the SmartBlue app, open: System → Software configuration → Firmware update.
5. Wait until the firmware is loaded.
6. Start the firmware update and let it run through to the end.
7. Wait until the measuring device is restarted.

The new firmware has been successfully installed.

11.7 Checking, verifying or calibrating the measuring device

The measuring device is set as follows when checked, verified or calibrated.

For devices with a power supply unit which are operated with an external power supply, the measuring interval is automatically switched to the minimum value.

1. Connect to the measuring device via the SmartBlue app.
2. In the SmartBlue app: Application → Sensor → Sensor adjustment → Open measurement interval value.
3. Set the value to 0.25 s.
   ↳ This minimizes the measurement times required on the calibration rig.
4. Once the measurements are complete, the measuring interval must be reset to 15 s (factory setting) to preserve the battery life.

12 Diagnosis and troubleshooting

12.1 General troubleshooting

For local display

Fault	Possible causes	Remedial action
Local display remains dark for longer than 5 seconds when touched.	Supply voltage does not match the voltage specified on the nameplate.	Apply the correct supply voltage → 🖹 51.
	Supply voltage has incorrect polarity.	Reverse polarity of supply voltage.
	The connecting cables are not connected correctly.	Check the cable connection and correct if necessary.
	No battery pack inserted or connected. No buffer capacitor inserted or connected.	Insert or connect battery pack. Insert or connect buffer capacitor.
	Device is not powered from the mains.	Touch the display for 5 seconds → 🖹 68.

For output signals

Error	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖹 84.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Parameter configuration error	Check and adjust parameter configuration.
Device measures incorrectly.	Configuration error or device is operated outside the application.	1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data".
Measuring device not in smartphone or tablet live list	Bluetooth communication set to "on touch"	1. Check whether the Bluetooth logo is visible on the local display or not. 2. Touch the display for 5 seconds so that a measured value is displayed.
Device not responding via SmartBlue app	No Bluetooth connection	Enable Bluetooth function on smartphone or tablet. The device is already connected to another smartphone/tablet.
Login via SmartBlue app not possible	Device is being put into operation for the first time	Enter initial password (device serial number) and change.
Device cannot be operated via SmartBlue app	Incorrect password entered	Enter correct password.
	Password forgotten	Contact Endress+Hauser Service.
No write access to parameters	Hardware write protection enabled	▪ Check user role ▪ Enter the correct customer-specific access code ▪ Hardware write protection via DIP switch

For access

Error	Possible causes	Remedial action
Write access to parameter not possible.	Hardware write protection is enabled.	Set the write protection switch on the back of the display to the **ON** position → 🖹 11.
Write access to parameter not possible.	Current user role has limited access authorization.	1. Check user role . 2. Enter correct customer-specific access code .

SmartBlue operation with Bluetooth®

Error	Possible causes	Remedial action
Device is not visible in the live list	No Bluetooth connection	Enable Bluetooth in the device
	Bluetooth signal outside range	Reduce distance between device and smartphone/tablet
	Geopositioning is not enabled on Android devices or is not permitted for the SmartBlue app	Enable/permit the geopositioning service on Android device for the SmartBlue app
Device appears in the live list but a connection cannot be established	The device is already connected with another smartphone/tablet via Bluetooth. Only one point-to-point connection is permitted	Disconnect the smartphone/tablet from the device
	Incorrect user name and password	The standard user name is "admin" and the password is the device serial number indicated on the device nameplate (only if the password was not changed by the user beforehand) If the password has been forgotten, contact Endress+Hauser Service (www.addresses.endress.com)
Connection via SmartBlue not possible	Incorrect password entered	Enter the correct password, paying attention to lower/upper case
	Password forgotten	contact Endress+Hauser Service (www.addresses.endress.com)
No communication with device via SmartBlue	No Bluetooth connection	Enable the Bluetooth function on the smartphone, tablet and device
	The device is already connected to another smartphone/tablet.	Disconnect the device from the other smartphone/tablet
	Ambient conditions (e.g. walls/ tanks) disturbing the Bluetooth connection	Establish direct line-of-sight connection
Device cannot be operated via SmartBlue	**Operator** option has no authorization	Switch to the **Maintenance** option

12.2 Diagnostic information on local display

12.2.1 Diagnostic message

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the operational display.

Maintenance required

- Maintenance required.
- Output signal is still valid.

Out of specification

- Device is being 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.

Function check

- Device is in 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.

Status signals

The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

The status signals are categorized according to VDI/VDE 2650 and NAMUR Recommendation NE 107: F = Failure, C = Function Check, S = Out of Specification, M = Maintenance Required

Symbol	Meaning
F	**Failure** An operating error has occurred. The measured value is no longer valid.
C	**Function check** The device is in simulation mode.
S	**Out of specification** The device is being operated: ▪ Outside its technical specification limits (e.g. outside the process temperature range) ▪ Outside the configuration performed by the user (e.g. outside the maximum output frequency of the pulse output).

Diagnostic behavior

Diagnostic message	Meaning
	Alarm ▪ Measurement is interrupted. ▪ Signal outputs and totalizers assume the defined alarm condition. ▪ A diagnostic message is generated.
	Function check Process measured values are simulated to test the outputs/wiring. ▪ Overload I/O 1, I/O 2 ▪ Flow override is active
	Warning ▪ Measurement is resumed. ▪ Measuring operation with limited accuracy ▪ The signal outputs and totalizers are not affected. ▪ A diagnostic message is generated.

Diagnostic behavior of outputs

Output	Diagnostic behavior
Switch output	▪ The output is switched off (fail-safe) if events with the status signal F occur ▪ No further response to events with other status signals
Pulse output	▪ Pulse output stops if events with the status signal F occur ▪ No further response to events with other status signals
Totalizer	▪ Totalizer stops if events with the status signal F occur ▪ No further response to events with other status signals

12.3 Adapting the diagnostic information

12.3.1 Adapting the diagnostic behavior

Each item of diagnostic information is assigned a specific diagnostic behavior at the factory. The user can change this assignment for specific diagnostic information in the **Diagnostic settings** submenu.

Diagnostics → Diagnostic settings

You can assign the following options to the diagnostic number as the diagnostic behavior:

Options	Description
Alarm	The device stops measurement. The measured value output and totalizer assume the defined alarm condition. A diagnostic message is generated and the event with the highest priority is shown in alternation with the primary variable on the local display.
Warning	The device continues to measure. The measured value output and the totalizer are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is displayed only in the **Event logbook** submenu and is not displayed in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

12.4 Overview of diagnostic information

The amount of diagnostic information and the number of measured variables affected increase if the measuring device has one or more application packages.

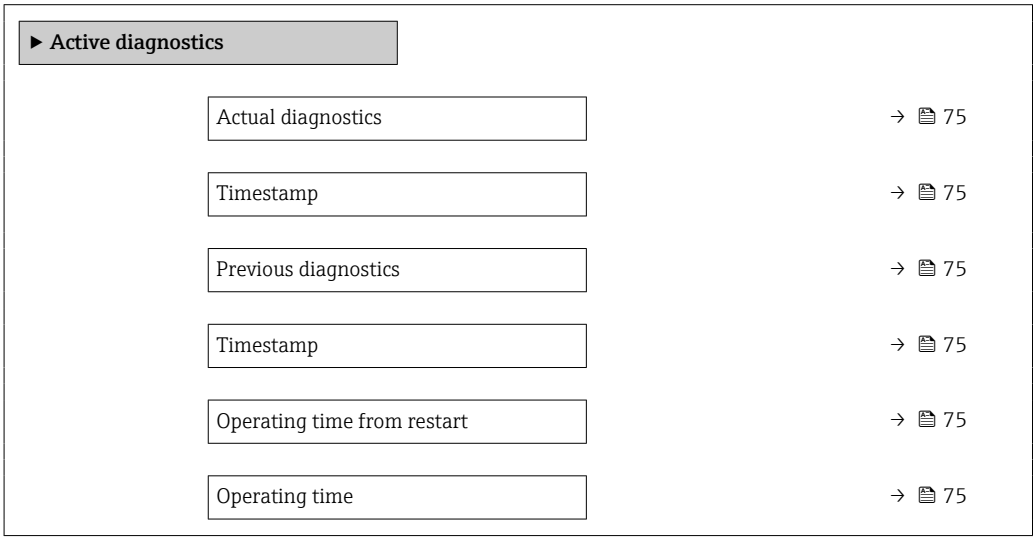
12.5 Pending diagnostic events

The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

To call up the measures to rectify a diagnostic event:
Via SmartBlue App

Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 📄 75.

Navigation
"Diagnostics" menu → Active diagnostics



Parameter overview with brief description

Parameter	Description	User interface
Actual diagnostics	Shows the current occured diagnostic event along with its diagnostic information.	Positive integer
Timestamp	Displays the timestamp for the currently active diagnostic message.	Days (d), hours (h), minutes (m), seconds (s)
Previous diagnostics	Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information.	Positive integer
Timestamp	Shows the timestamp of the previous diagnostic message.	Days (d), hours (h), minutes (m), seconds (s)
Operating time from restart	Shows the time the device has been in operation since the last device restart.	Days (d), hours (h), minutes (m), seconds (s)
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m), seconds (s)

12.6 Diagnostics list

Up to 5 currently pending diagnostic events can be displayed in the **Diagnostic list** submenu along with the associated diagnostic information. If more than 5 diagnostic events are pending, the events with the highest priority are shown on the display.

Navigation path
Diagnostics → Diagnostic list

To call up the measures to rectify a diagnostic event:
Via SmartBlue App

12.7 Event logbook

12.7.1 Reading out the event logbook

A chronological overview of the event messages that have occurred is provided in the **Events list** submenu.

Navigation path
Diagnostics menu → **Event logbook** submenu → Events list

100 event messages can be displayed in chronological order.

The event history includes entries for:
- Diagnostic events → 📄 74
- Information events → 📄 76

In addition to the operating time when the event occurred, each event is also assigned a symbol that indicates whether the event has occurred or is finished:
- Diagnostics event
  - ⊕: Occurrence of the event
  - ⊖: End of the event
- Information event
  ⊕: Occurrence of the event

To call up the measures to rectify a diagnostic event:
Via SmartBlue App

For filtering the displayed event messages → 📄 76

12.7.2 Filtering the event logbook

Using the **Filter options** parameter you can define which category of event message is displayed in the **Events list** submenu.

Navigation path
Diagnostics → Event logbook → Filter options

Filter categories
- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)

12.7.3 Overview of information events

Unlike a diagnostic event, an information event is displayed in the event logbook only and not in the diagnostic list.

Info number	Info name
I1000	--------(Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I11036	Date/time set successfully
I11068	Device ok
I11095	Device ok

Info number	Info name
I1137	Display module replaced
I1151	History reset
I1155	Reset electronics temperature
I1157	Memory error event list
I1256	Display: access status changed
I1335	Firmware changed
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1444	Device verification passed
I1445	Device verification failed
I1457	Measurement error verification failed
I1459	I/O module verification failed
I1461	Sensor verification failed
I1462	Electronic module verification failed
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1517	Custody transfer active
I1518	Custody transfer inactive
I1622	Calibration changed
I1624	All totalizers reset
I1625	Write protection activated
I1626	Write protection deactivated
I1634	Reset to factory settings
I1635	Reset to delivery settings
I1649	Hardware write protection activated
I1650	Hardware write protection deactivated
I1651	Custody transfer parameter changed
I1725	Electronic module changed

12.8 Resetting the measuring device

The entire device configuration or some of the configuration can be reset to a defined state with the .

Navigation
"System" menu → Device management → Device reset

Parameter overview with brief description

Parameter	Description	Selection
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	▪ Cancel ▪ To delivery settings * ▪ Restart device * ▪ Restore S-DAT backup * ▪ Shut down device ▪ Create T-DAT backup * ▪ Restore T-DAT backup *

* Visibility depends on order options or device settings

12.9 Device information

The **Device information** submenu contains all parameters that display different information for device identification.

Navigation

"System" menu → Information → Device

Parameter overview with brief description

Parameter	Description	User interface
Serial number	Shows the serial number of the measuring device.	Character string comprising numbers, letters and special characters
Order code	Shows the device order code.	Character string comprising numbers, letters and special characters
Firmware version	Shows the device firmware version installed.	Character string comprising numbers, letters and special characters
Extended order code 1	Shows the 1st part of the extended order code.	Character string comprising numbers, letters and special characters
Extended order code 2	Shows the 2nd part of the extended order code.	Character string comprising numbers, letters and special characters
Extended order code 3	Shows the 3rd part of the extended order code.	Character string comprising numbers, letters and special characters
Device name	Shows the name of the transmitter.	Character string comprising numbers, letters and special characters
ENP version	Shows the version of the electronic nameplate (ENP).	Character string comprising numbers, letters and special characters
Manufacturer	Displays the manufacturer.	Character string comprising numbers, letters and special characters

12.10 Firmware history

Release date	Firmware version	Firmware changes	Documentation type	Documentation
03.2021	01.00.zz	Original firmware	Operating instructions	BA02080D/06/EN/01.21

13 Maintenance

13.1 Maintenance work

No special maintenance work is required.

13.1.1 Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing or the gaskets.

⚠ WARNING

Cleaning agents can damage the plastic transmitter housing!

- ▶ Do not use high-pressure steam.
- ▶ Only use the permitted cleaning agents specified.

Permitted cleaning agents for the plastic housing:

- Commercially available household cleaners
- Methyl alcohol or isopropyl alcohol
- Mild soap solutions

13.1.2 Interior cleaning

No interior cleaning is planned for the device.

13.1.3 Replacing the batteries

⚠ WARNING

Batteries may explode if not handled properly!

- ▶ Do not recharge batteries.
- ▶ Do not open batteries.
- ▶ Do not expose batteries to naked flame.

Replacing the battery pack

⚠ WARNING

Batteries may explode if not handled properly!

- ▶ Do not recharge batteries.
- ▶ Do not open batteries.
- ▶ Do not expose batteries to naked flame.

Safety precautions must be taken when storing batteries. Observe the instructions in the safety data sheets for the batteries (MATERIAL SAFETY DATA SHEET).

Replace the battery pack if a diagnostic message is output.

Observe the specified temperature range of the batteries.

If the device is no longer in operation due to a flat battery, the buffer capacitor must be replaced as well as the battery.

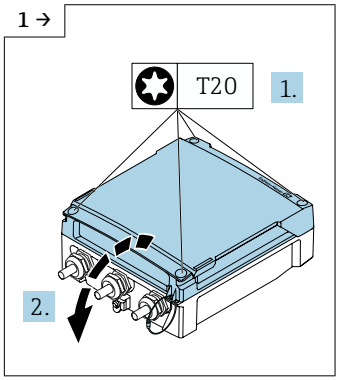
Check the battery charge state via the SmartBlue app

1. Open **System**.
2. Open **Power (battery)**.
3. Open **State of charge battery 1** or **State of charge battery 2**.
4. Switch off the device as described below and replace the empty battery pack.

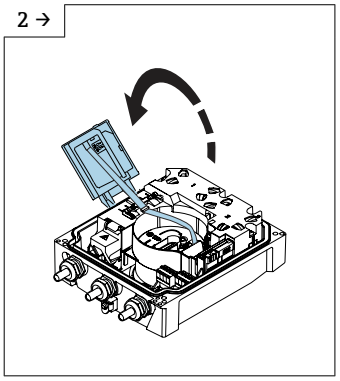
Shut down device

1. Open **System**.
2. Open **Device management**.
3. Open **Device reset**.
4. Select **Shut down device**.
5. Press **OK** to confirm.
   ↳ As soon as **F418** appears on the local display, the device can be disconnected from the power supply by means of DIP switch B without any loss of data.
   If an external power supply (external battery pack) is available, the device does not need to be switched off.
6. Replace the empty battery pack.

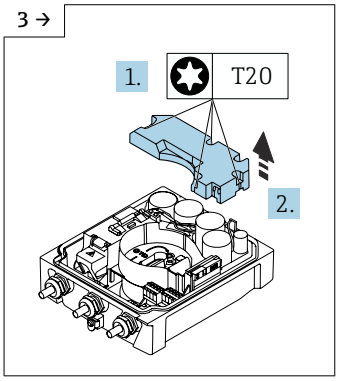
Replacing the empty battery pack - Promag 800 Advanced



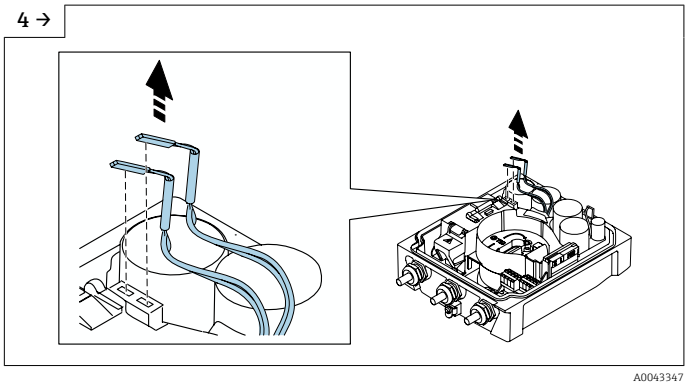
▶ Open the connection compartment cover.



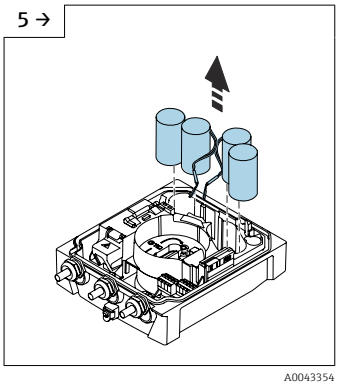
▶ Open the display module.



▶ Remove the cover of the battery pack.

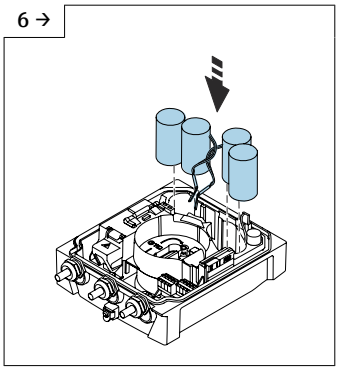


▶ Unplug the empty battery pack.



▶ Remove the empty battery pack.

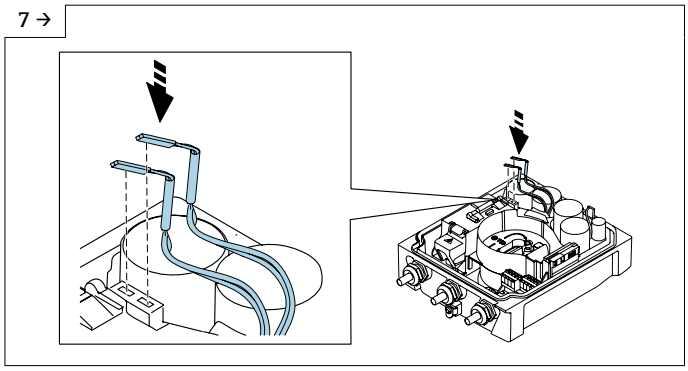
6 →



A0043732

- Insert the new battery pack.

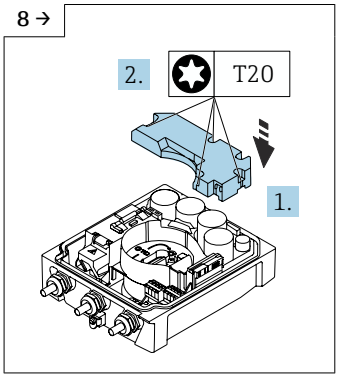
7 →



A0043733

- Plug in the connector of the new battery pack.
- The device switches back on. After 15 seconds, a measured value appears on the display.

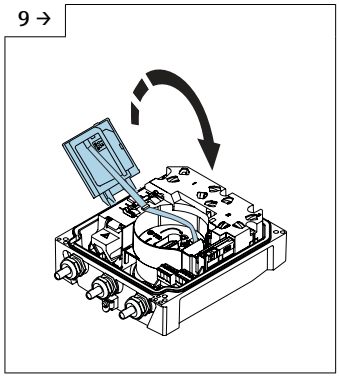
8 →



A0043736

- Mount the cover of the battery pack.

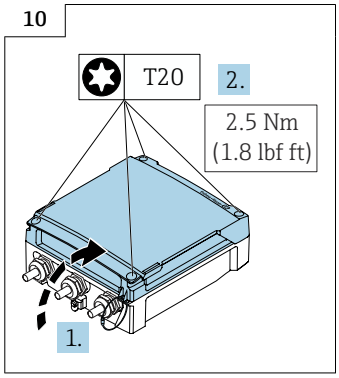
9 →



A0043737

- Close the display module.

10



A0042855

- Close the connection compartment cover.
- Confirm the battery replacement.

Confirm battery replacement

1. Open **System**.
2. Open **Power management**.
3. Open **Confirm battery replacement**.
4. Select the number of the battery pack that was replaced.
5. Press **OK** to confirm.
   ↳ The replacement of the battery pack is complete.

Replacing batteries in the external battery pack

WARNING

Batteries may explode if not handled properly!

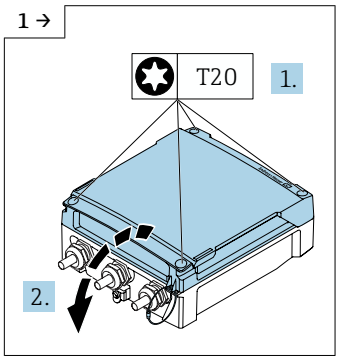
- ▶ Do not recharge batteries.
- ▶ Do not open batteries.
- ▶ Do not expose batteries to naked flame.

The external battery pack can be operated with lithium thionyl chloride 3.6V D batteries and also with alkaline 1.5V D batteries. Only insert batteries of the same type and charge level into the external battery pack.

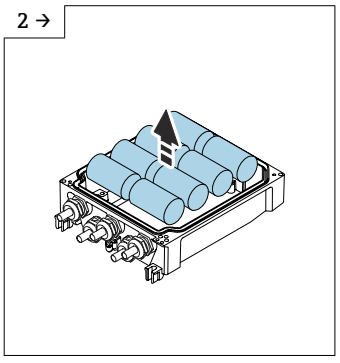
The following lithium thyionyl chloride batteries are recommended by Endress +Hauser:
- Tadiran SL2780
- Saft LS33600
- Eve ER34615
- Tadiran SL2880

The following alkaline batteries are recommended by Endress+Hauser:
- Energizer E95
- Duracell MX1300
- Panasonic LR20XWA
- Varta 4020

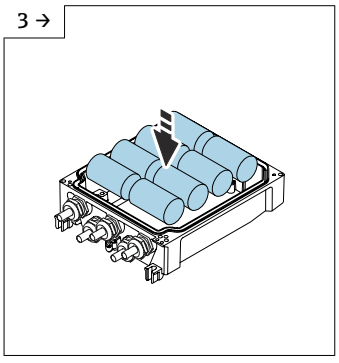
Replacing empty batteries - Promag 800 Advanced



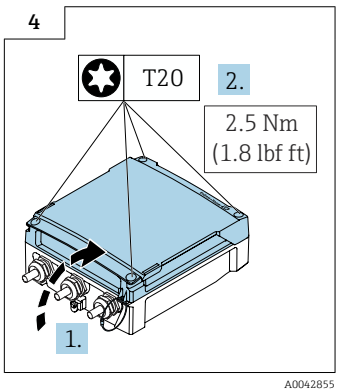
▶ Open the connection compartment cover.



▶ Remove empty batteries.



▶ Insert new batteries.



▶ Close the connection compartment cover.

The device does not display the remaining capacity of the external batteries. The value on the display refers exclusively to the batteries fitted internally. If internal and external batteries are connected, the external batteries are used first of all, and then the internal batteries are used.

13.2 Measuring and test equipment

Endress+Hauser offers a variety of measuring and testing equipment, such as Netilion or device tests.

Your Endress+Hauser Sales Center can provide detailed information on the services.

List of some of the measuring and testing equipment: → 87

13.3 Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests.

Your Endress+Hauser Sales Center can provide detailed information on the services.

14 Repair

14.1 General notes

14.1.1 Repair and conversion concept

The Endress+Hauser repair and conversion concept provides for the following:
- The measuring devices have a modular design.
- Spare parts are grouped into logical kits with the associated Installation Instructions.
- Repairs are carried out by Endress+Hauser Service or by appropriately trained customers.
- Certified devices can only be converted to other certified devices by Endress+Hauser Service or at the factory.

14.1.2 Notes for repair and conversion

For repair and conversion of a measuring device, observe the following notes:
- ▶ Use only original Endress+Hauser spare parts.
- ▶ Carry out the repair according to the Installation Instructions.
- ▶ Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
- ▶ Document all repairs and conversions and enter the details in Netilion Analytics.

14.2 Spare parts

Device Viewer (www.endress.com/deviceviewer):
All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

Measuring device serial number:
- Is located on the nameplate of the device.
- Can be read out via the **Serial number** parameter (→ 78) in the **Device information** submenu.

14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

Your Endress+Hauser Sales Center can provide detailed information on the services.

14.4 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information:
   https://www.endress.com/support/return-material
   ↳ Select the region.
2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

14.5 Disposal

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

14.5.1 Removing the measuring device

1. Switch off the device.

⚠ WARNING

Danger to persons from process conditions!

- Beware of hazardous process conditions such as pressure in the measuring device, high temperatures or aggressive media.

2. Carry out the mounting and connection steps from the "Mounting the measuring device" and "Connecting the measuring device" sections in reverse order. Observe the safety instructions.

14.5.2 Disposing of the measuring device

⚠ WARNING

Danger to personnel and environment from fluids that are hazardous to health.

- Ensure that the measuring device and all cavities are free of fluid residues that are hazardous to health or the environment, e.g. substances that have permeated into crevices or diffused through plastic.

Observe the following notes during disposal:

- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

14.5.3 Battery disposal

Dispose of batteries according to local regulations.

15 Accessories

Various accessories, which can be ordered with the device or subsequently from Endress +Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

15.1 Device-specific accessories

15.1.1 For the Proline 800 - Advanced transmitter

Accessories	Description
Connecting cable for remote version	Coil current and electrode cables, various lengths, reinforced cables available on request.
Ground cable	Set, consisting of two ground cables for potential equalization.
Post mounting kit	Post mounting kit for transmitter.
Weather protection cover	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight. Order number: 71343504 Installation Instructions EA01191D
Application package, Promag 800	Order number: DK5014
1x battery pack, lithium	Order number: DK5016-CA
2x battery pack, lithium	Order number: DK5016-CB

15.1.2 For the sensor

Accessories	Description
Ground disks	Are used to ground the medium in lined measuring tubes to ensure proper measurement. For details, see Installation Instructions EA00070D

15.2 Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Choice of measuring devices for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. ▪ Graphic illustration of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. ▪ Calculation of the expected battery life. Applicator is available: ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ As a downloadable DVD for local PC installation.
Netilion	IIoT ecosystem: Unlock knowledge Endress+Hauser 's Netilion IIoT ecosystem enables you to optimize your plant performance, digitize workflows, share knowledge and improve collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem that enables you to gain useful insights from data. This knowledge can be used to optimize processes, leading to higher plant availability, efficiency and reliability, and ultimately to a more profitable plant. www.netilion.endress.com
Endress+Hauser SmartBlue app	If the device has an optional WLAN interface, it can be operated and configured with the SmartBlue App. *Supported functions* ▪ Access to the device (login) ▪ Configuration of the device ▪ Access to measured values, device status and diagnostic information SmartBlue is available as download for Android devices from the Google Play Store and for iOS devices from the iTunes Store: *Endress+Hauser SmartBlue* Directly to the app with the QR code: ANDROID APP ON Google Play Download on the App Store A0033202 **System requirements** ▪ iOS devices: iPhone 4S or higher from iOS9.0; iPad2 or higher from iOS9.0; iPod Touch 5th generation or higher from iOS9.0 ▪ Devices with Android: from Android 4.4 KitKat and Bluetooth® 4.0

16 Technical data

16.1 Application

The measuring device is intended only for the flow measurement of liquids with a minimum conductivity of 20 µS/cm.

To ensure that the device remains in proper operating condition for its service life, use the measuring device only for media against which the process-wetted materials are sufficiently resistant.

16.2 Function and system design

Measuring principle

Electromagnetic flow measurement on the basis of *Faraday's law of magnetic induction*.

Measuring system

The device consists of a transmitter and a sensor.

Proline Promag 800 - Advanced
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 information on the structure of the measuring device → 🖹 13

16.3 Input

Measured variable

Direct measured variables

- Volume flow (proportional to induced voltage)
- Electrical conductivity
- Pressure (optional)

Measuring range

Typically v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified accuracy

Electrical conductivity: ≥ 20 µS/cm for liquids in general

Flow characteristic values in SI units

Nominal diameter		Recommended Flow rate	Factory settings	
		min./max. full scale value (v ~ 0.3/10 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³]	[m³/h]
25	1	9 to 300 dm³/min	0.5 dm³	1 dm³/min
32	–	15 to 500 dm³/min	1 dm³	2 dm³/min
40	1 ½	25 to 700 dm³/min	1.5 dm³	3 dm³/min
50	2	35 to 1 100 dm³/min	2.5 dm³	5 dm³/min
65	–	60 to 2 000 dm³/min	5 dm³	8 dm³/min
80	3	90 to 3 000 dm³/min	5 dm³	12 dm³/min
100	4	145 to 4 700 dm³/min	10 dm³	20 dm³/min
125	–	220 to 7 500 dm³/min	15 dm³	30 dm³/min

Nominal diameter		Recommended Flow rate	Factory settings	
		min./max. full scale value (v ~ 0.3/10 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³]	[m³/h]
150	6	20 to 600	0.025	2.5
200	8	35 to 1 100	0.05	5
250	10	55 to 1 700	0.05	7.5
300	12	80 to 2 400	0.1	10
350	14	110 to 3 300	0.1	15
375	15	140 to 4 200	0.15	20
400	16	140 to 4 200	0.15	20
450	18	180 to 5 400	0.25	25
500	20	220 to 6 600	0.25	30
600	24	310 to 9 600	0.3	40
700	28	420 to 13 500	0.5	50
750	30	480 to 15 000	0.5	60
800	32	550 to 18 000	0.75	75
900	36	690 to 22 500	0.75	100

Flow characteristic values in US units

Nominal diameter		Recommended Flow rate	Factory settings	
		min./max. full scale value (v ~ 0.3/10 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal]	[gal/min]
1	25	2.5 to 80	0.2	0.25
–	32	4 to 130	0.2	0.5
1 ½	40	7 to 185	0.5	0.75
2	50	10 to 300	0.5	1.25
–	65	16 to 500	1	2
3	80	24 to 800	2	2.5
4	100	40 to 1 250	2	4
–	125	60 to 1 950	5	7
6	150	90 to 2 650	5	12
8	200	155 to 4 850	10	15
10	250	250 to 7 500	15	30
12	300	350 to 10 600	25	45
14	350	500 to 15 000	30	60
15	375	600 to 19 000	50	60
16	400	600 to 19 000	50	60
18	450	800 to 24 000	50	90
20	500	1 000 to 30 000	75	120
24	600	1 400 to 44 000	100	180
28	700	1 900 to 60 000	125	210

Nominal diameter		Recommended Flow rate	Factory settings	
		min./max. full scale value (v ~ 0.3/10 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal]	[gal/min]
30	750	2 150 to 67 000	150	270
32	800	2 450 to 80 000	200	300
36	900	3 100 to 100 000	225	360

Recommended measuring range

Flow limit → 100

For custody transfer, the applicable approval determines the permitted measuring range, the pulse value and the low flow cut off.

Operable flow range

Over 1000 : 1

In the case of custody transfer, the applicable approval determines the permitted operable flow range.

Input signal

Status input

Maximum input values	▪ DC 30 V ▪ 6 mA
Response time	Configurable: 50 to 200 ms
Input signal level	▪ Low signal (low): DC −3 to +5 V ▪ High signal (high): DC 12 to 30 V
Assignable functions	▪ Off ▪ Reset totalizers 1-3 separately ▪ Reset all totalizers ▪ Logbook entry only

Status input, power save mode

To activate the status input, the signal must change from low level to high level with a maximum rise time of 10 ms and the high level must be present for at least the duration of the response time. The input signal can then be set back to "low" again. After this, the status input is ready for another activation.

16.4 Output

Output signal

Status/pulse output

Function	With the order code for "Output; Input", option **P**: cellular radio, 3 outputs can be set either as a pulse output or switch output
Version	Passive, open collector
Maximum input values	▪ DC 30 V ▪ 30 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Pulse output	
Pulse width	Configurable: 0.1 to 500 ms

Maximum pulse rate	100 Impulse/s
Pulse value	Configurable
Assignable measured variables	Volume flow
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s
Number of switching cycles	Unlimited

Assignable functions	▪ Off
	▪ On
	▪ Diagnostic behavior
	▪ Limit value:
	  ▪ Off
	  ▪ VolumeFlow
	  ▪ FlowVelocity
	  ▪ Conductivity
	  ▪ Totalizer 1
	  ▪ Totalizer 2
	  ▪ Totalizer 3
	  ▪ Temperature
	  ▪ Pressure
	  ▪ BatteryLevel
	▪ Flow direction monitoring
	▪ Status
	  ▪ Empty pipe detection
	  ▪ Low flow cut off

Status output, power save mode	
	An active status output is not permanently conductive. Rather, it is only conductive for the length of the pulse width at a repeat rate that corresponds to the device measurement interval.

Cellular radio, Proline 800 - Advanced

For detailed information regarding "cellular radio", see the Special Documentation on the "cellular module" → 111

Signal on alarm

Depending on the interface, failure information is displayed as follows.

Local display

Plain text display	With information on the cause

Interface/protocol

Via digital communication:
- SmartBlue App
- Cellular radio

Plain text display	With information on cause and remedial measures

Low flow cut off

The switch points for low flow cut off are user-selectable.

Galvanic isolation

The following circuits are galvanically isolated from one another:
- Inputs
- Outputs
- Optional power supply with the order code for "Energy supply", option K "100-240VAC/ 19-30VDC, lithium battery" and option S "100-240VAC/19-30VDC, w/o battery"

Data logger

The data logger logs up to 10,000 (optionally 50,000) protocol data records. A log entry consists of a time stamp and the configured values.

The data logger logs the following values:
- Volume flow
- Pressure
- Electrical conductivity
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Battery charge state
- System diagnostics status

The logging cycle (hours:minutes:seconds) applies for all values to be logged. If no logging cycle is selected, the data logger is switched off and does not log any more data.

It is possible to access the data logger locally via the SmartBlue app or via a cloud-based application for data analysis.

16.5 Power supply

Terminal assignment

→ 🖹 45

Supply voltage

Supply voltage via batteries

- 3.6 V DC
- 38 Ah at 25 °C(per battery pack)
- Maximum power: 500 mW

Supply voltage via external battery housing - Proline Promag 800 - Advanced (optional)

Order code for "Accessory enclosed", option "External battery housing without a battery", option "PG".
- Maximum power: 3.5 W
- Interface is designed for connection of an additional external battery supply to increase the service life.
- Two internal battery packs
- The battery life display refers to the internally installed battery packs.

Supply voltage via external power supply - Proline Promag 800 - Advanced (optional)

Order code for "Power supply", options "K", "S"
- 85 to 265 V AC/ 19 to 30 V DC [2)]
- 47 to 63 Hz
- Maximum power: 4 W
- Two battery packs to back up the device supply if the external mains power supply fails

2) These values are absolute minimum and maximum values. No tolerance applies. The DC power unit must be safety-tested (e.g. PELV, SELV) with transients of less than 700 Vp.

Temporary overvoltage	up to the levels of overvoltage category ll
Short-term temporary overvoltages between line and neutral conductor	up to 1200 V for a maximum of 5 s
Permanent temporary overvoltage between line and earth	up to 500 V

Battery concept

Battery configuration options

The following configurations of power sources are possible:

Proline Promag 800 - Advanced
2 LTC [3] battery packs and 1 buffer capacitor [4], order code for "Power supply", option H and K

LTC battery specifications

- High-power lithium-thionyl chloride battery (size D)
- 3.6 V DC
- Not rechargeable
- 38 Ah nominal capacity at 25 °C (per battery pack)

High-power lithium-thionyl chloride batteries are listed under Hazard Class 9: Miscellaneous Hazardous Materials.

Observe the hazardous materials regulations described in the Safety Datasheet.

The Safety Datasheet can be requested from any Endress+Hauser sales organization.

Buffer capacitor specifications

- Lithium hybrid layer capacitor
- 3.7 V DC
- 155 mAh nominal capacity at 25 °C

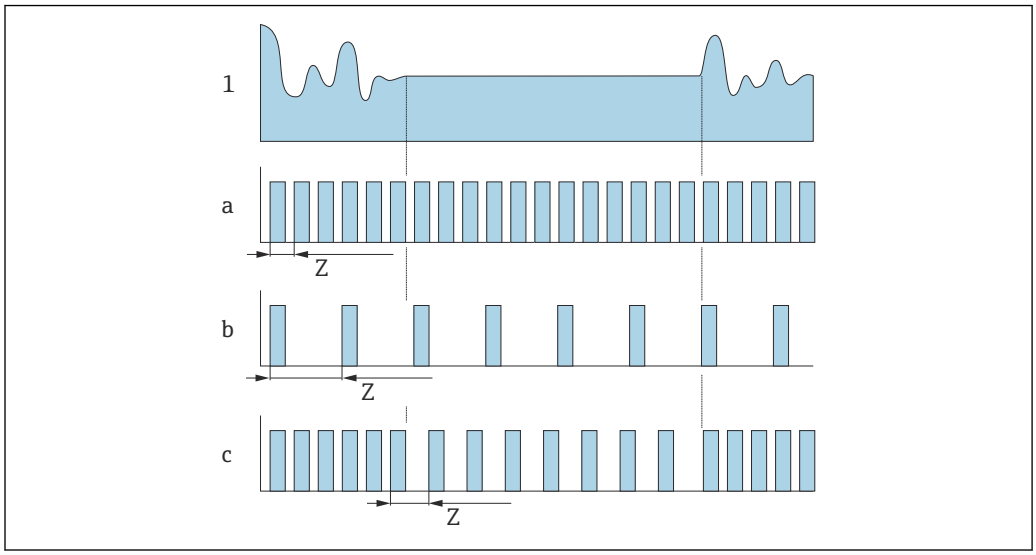
Lithium hybrid layer capacitors are listed under Hazard Class 9: Miscellaneous Hazardous Materials.

Observe the hazardous materials regulations described in the Safety Datasheet.

The Safety Datasheet can be requested from any Endress+Hauser sales organization.

3) Lithium thionyl chloride
4) Lithium hybrid layer capacitor

Estimated battery lifetime



16 *Operating principle of various data logging methods*

1 Flow profile
a Minimum measuring interval value (external power supply)
b Fixed measuring interval value between the sensor-dependent minimum and 60 seconds
c Intelligent adaptation
Z Measuring interval value

With an external power supply, the device operates in continuous measuring mode. The measurement interval value is automatically set to the minimum value that is technically possible.

Measuring interval value

The measuring interval is specified in the "Measuring interval value" parameter. This option is recommended to optimize battery lifetime.

Enter the value for the measuring interval. Additional information: To increase battery life, set as long an interval as possible. To optimize the measuring result, set as short an interval as possible.

Intelligent adaptation

Under normal process conditions, the measuring device measures according to the measuring interval specified in the "Measuring interval value" parameter. If the process conditions change, the measuring device measures in shorter intervals according to the usage rate specified in the "Energy budget intelligent adaption" parameter. This option is recommended to optimize the measuring result.

To calculate the estimated battery life, use the Applicator → 87.

Nominal estimated battery lifetime - Proline 800 Advanced

DN 15 to 300	10 years
DN 350 to 600	8 years
DN 700 to 1200	5 Jahre

Test conditions:
- Two full battery packs
- EFM measuring interval: 15 seconds (for a fixed measuring interval value. For intelligent adaptation: consider the influence of the settings in the Applicator.)
- Display: 60s @ 1 day, background lighting 30%

- An active pulse output with 2 Hz @ 5 ms
- RF module transmission interval: 1 day
- Data logger interval: 15 minutes
- External pressure sensor
- Ambient temperature: 25 °C (77 °F)

The battery lifetime is significantly shortened by:
- Shortening the EFM measuring interval
- Frequently activating the display
- Increasing the setting for the background lighting
- Decreasing the pulse value of the pulse outputs
- Increasing the pulse width of the pulse outputs
- Shortening the RF module transmission interval
- Shortening the data logger interval
- Operating at ambient temperatures < 0 °C (32 °F) and > 40 °C (104 °F)
- Poor cellular network reception

Power consumption

Switch-on current:
- Maximum 30 A (< 5 ms) at 230 V_{AC}
- Maximum 3 A (< 5 ms) at 24 V_{DC}

Current consumption

Order code for "Power supply"	Maximum current consumption
Option **K**: 100-240VAC/19-30VDC, lithium battery	300 mADC
Option **S**: 100-240VAC/19-30VDC, w/o lithium battery	

Device fuse

Fine-wire fuse (slow-blow) T1A

Power supply failure

The batteries act as a power supply back-up if the measuring device is being powered externally and a power failure occurs.

Electrical connection

→ 49

Potential equalization

→ 52

Terminals

Spring terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)

Cable entries

Cable entry thread
- NPT ½"
- G ½"

Cable gland
- For standard cable: M20 × 1.5 with cable ⌀6 to 12 mm (0.24 to 0.47 in)
- For armored cable: M20 × 1.5 with cable ⌀9.5 to 16 mm (0.37 to 0.63 in)

If metal cable entries are used, use a grounding plate.

Cable specification

→ 43

16.6 Performance characteristics

Reference operating conditions

- Error limits following DIN EN 29104, in future ISO 20456
- Water, typically: +15 to +45 °C (+59 to +113 °F); 0.5 to 7 bar (73 to 101 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025

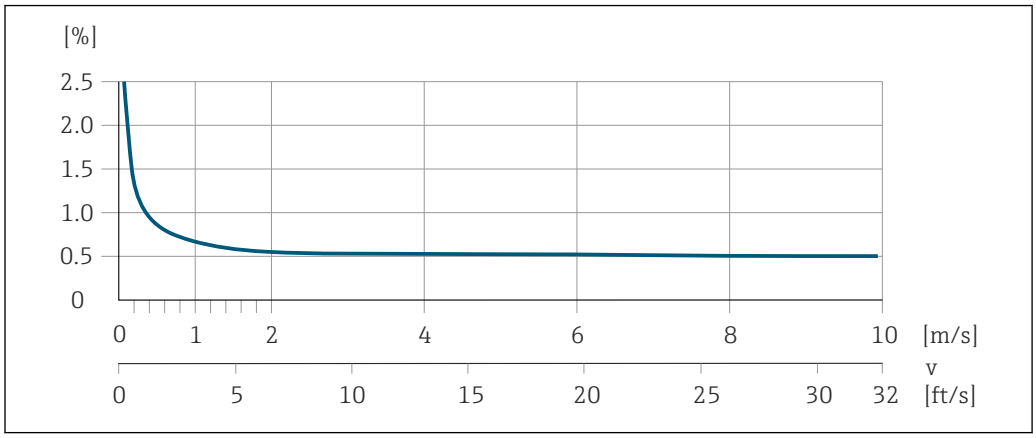
Maximum measurement error

Error limits under reference operating conditions

o.r. = of reading

Volume flow
±0.5 % o.r. ± 2 mm/s (0.08 in/s)

Fluctuations in the supply voltage do not have any effect within the specified range.



17 *Maximum measurement error in % o.r.*

Electrical conductivity
Maximum measurement error not specified.

Pressure
- Pressure range, absolute [bar (psi)]
  0.01 (0.1) ≤ p ≤ 8 (116)
  8 (116) ≤ p ≤ 40 (580)
- Measurement error, absolute
  ±0.5 % of 8 bar (116 psi)
  ±0.5 % o.r.

Repeatability

o.r. = of reading

Volume flow
Max. ±0.2 % o.r. ± 2 mm/s (0.08 in/s)

Electrical conductivity
Max. ±5 % o.r.

Influence of ambient temperature

Pulse output

Temperature coefficient	No additional effect. Included in accuracy.

16.7 Mounting

Mounting requirements	→ 19

16.8 Environment

Ambient temperature range	→ 25
Storage temperature	The storage temperature corresponds to the operating temperature range of the transmitter and the sensor → 25. ▪ Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures. ▪ Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner. ▪ If protection caps or protective covers are mounted these should never be removed before installing the measuring device.
Relative humidity	The device is suitable for use outdoors and indoors with a relative humidity of 4 to 95 %.
Operating height	According to EN 61010-1 ▪ ≤ 2 000 m (6 562 ft) ▪ > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)
Atmosphere	If a plastic transmitter housing is permanently exposed to certain steam and air mixtures, this can damage the housing. In cases of doubt, please contact the Sales Center.

Degree of protection	**Transmitter**
	▪ Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
	▪ When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
	An inserted mating connector or a fitted protection cap is accepted as a prerequisite for maintaining the specified degree of protection.
	Proline Promag 800 - Advanced sensor
	▪ Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
	▪ Optionally available for remote version:
	  ▪ IP66/67, type 4X enclosure; fully welded, with protective varnish EN ISO 12944 C5-M. Suitable for use in corrosive atmospheres.
	  ▪ IP68, type 6P enclosure; fully welded, with protective varnish as per EN ISO 12944 C5-M. Suitable for permanent immersion in water ≤ 3 m (10 ft) or up to 48 hours at depths ≤ 10 m (30 ft).
	  ▪ IP68, type 6P enclosure; fully welded, with protective varnish as per EN ISO 12944 Im1/Im2/Im3. Suitable for permanent immersion in saline water ≤ 3 m (10 ft) or up to 48 hours at depths ≤ 10 m (30 ft) or in buried applications.

Accessories
Optional:
- External battery power supply: IP66/IP67, Type 4X enclosure
- Pressure measurement: IP68, 48 h under water 3 m (10 ft) with order code for "Accessory enclosed", option PJ
- Pressure measurement: IP67 with order code for "Accessory enclosed", option PI

Vibration-resistance and shock-resistance

Proline 800 - Advanced

Mount external mobile communications antenna remotely for any measuring points that are subject to vibration.

Vibration sinusoidal, in accordance with IEC 60068-2-6

Compact version
- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

Remote version
- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

Vibration broad-band random, according to IEC 60068-2-64

Compact version
- 10 to 200 Hz, 0.01 g^2/Hz
- 200 to 2 000 Hz, 0.003 g^2/Hz
- Total: 2.70 g rms

Remote version
- 10 to 200 Hz, 0.01 g^2/Hz
- 200 to 2 000 Hz, 0.003 g^2/Hz
- Total: 2.70 g rms

Shock half-sine, according to IEC 60068-2-27

- Compact version; order code for "Housing", option D "Compact IP68,type 6P, polycarbonate"
  6 ms 50 g
- Compact version; order code for "Housing", option M "Compact, polycarbonate"
  6 ms 50 g
- Remote version; order code for "Housing", option N "Remote, polycarbonate"
  6 ms 50 g

Rough handling shocks according to IEC 60068-2-31

Mechanical load

Transmitter housing:
- Protect against mechanical effects, such as shock or impact
- Do not use as a ladder or climbing aid

Electromagnetic compatibility (EMC)

Details are provided in the Declaration of Conformity.

This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

The selection of a sensor with a steel housing is recommended for use in the vicinity of electrical power supply lines with strong currents.

Cellular network reception

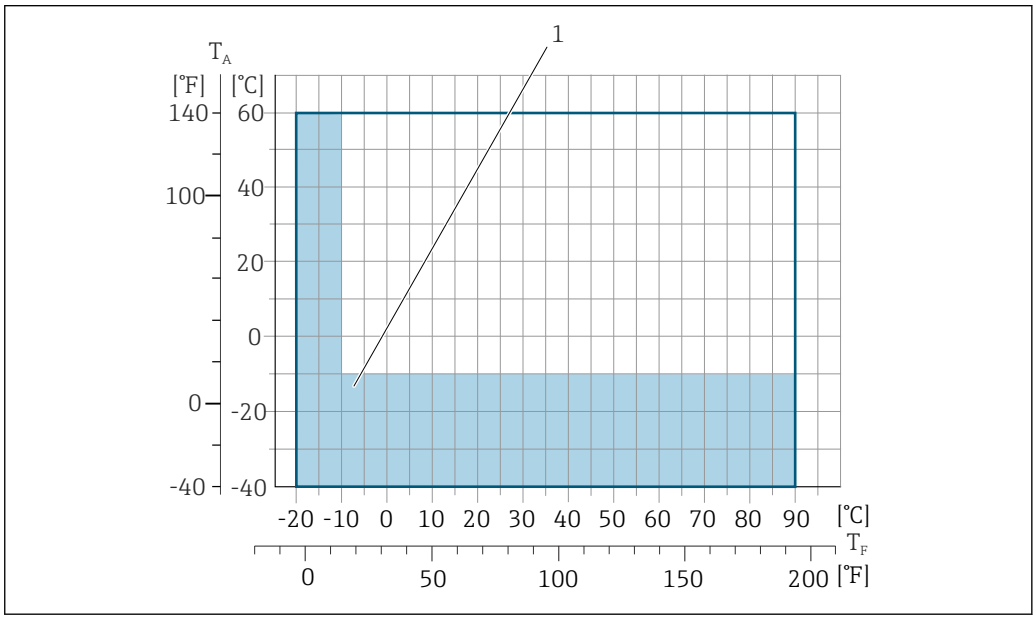
Make sure that the signal of the cellular network is strong enough.

16.9 Process

Medium temperature range

- 0 to +70 °C (+32 to +158 °F) for hard rubber, DN 50 to 900 (2 to 36")
- −20 to +50 °C (−4 to +122 °F) for polyurethane, DN 25 to 900 (1 to 36")
- −20 to +70 °C (−4 to +158 °F) for PTFE, DN 25 to 300 (1 to 12")

Hard rubber	DN 50 to 900 (2 to 36")	0 to +70 °C (+32 to +158 °F)
Polyurethane	DN 25 to 900 (1 to 36")	−20 to +50 °C (−4 to +122 °F)
PTFE	DN 25 to 300 (1 to 12")	−20 to +70 °C (−4 to +158 °F)



T_A *Ambient temperature*
T_F *Medium temperature*
1 *Colored area: The ambient temperature range of −10 to −40 °C (+14 to −40 °F) and the medium temperature range of −10 to −20 °C (+14 to −4 °F) only apply for stainless flanges.*

For detailed information regarding the medium temperature in custody transfer, see the Special Documentation → 111.

Conductivity

≥20 µS/cm for liquids in general.

Remote version
The necessary minimum conductivity also depends on the length of the connecting cable → 26.

Pressure-temperature ratings

For an overview of the pressure-temperature ratings for the process connections, see the Technical Information → 111

Pressure tightness

Liner: hard rubber

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:		
[mm]	[in]	+25 °C (+77 °F)	+50 °C (+122 °F)	+70 °C (+158 °F)
50 … 900	2 … 36	0 (0)	0 (0)	0 (0)

Liner: polyurethane

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:	
[mm]	[in]	+25 °C (+77 °F)	+50 °C (+122 °F)
25 … 900	1 … 36	0 (0)	0 (0)

Liner: PTFE

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:	
[mm]	[in]	+25 °C (+77 °F)	+70 °C (+158 °F)
25	1	0 (0)	0 (0)
40	2	0 (0)	0 (0)
50	2	0 (0)	0 (0)
65	2 ½	0 (0)	40 (0.58)
80	3	0 (0)	40 (0.58)
100	4	0 (0)	135 (2.0)
125	5	135 (2.0)	240 (3.5)
150	6	135 (2.0)	240 (3.5)
200	8	200 (2.9)	290 (4.2)
250	10	330 (4.8)	400 (5.8)
300	12	400 (5.8)	500 (7.3)

Flow limit

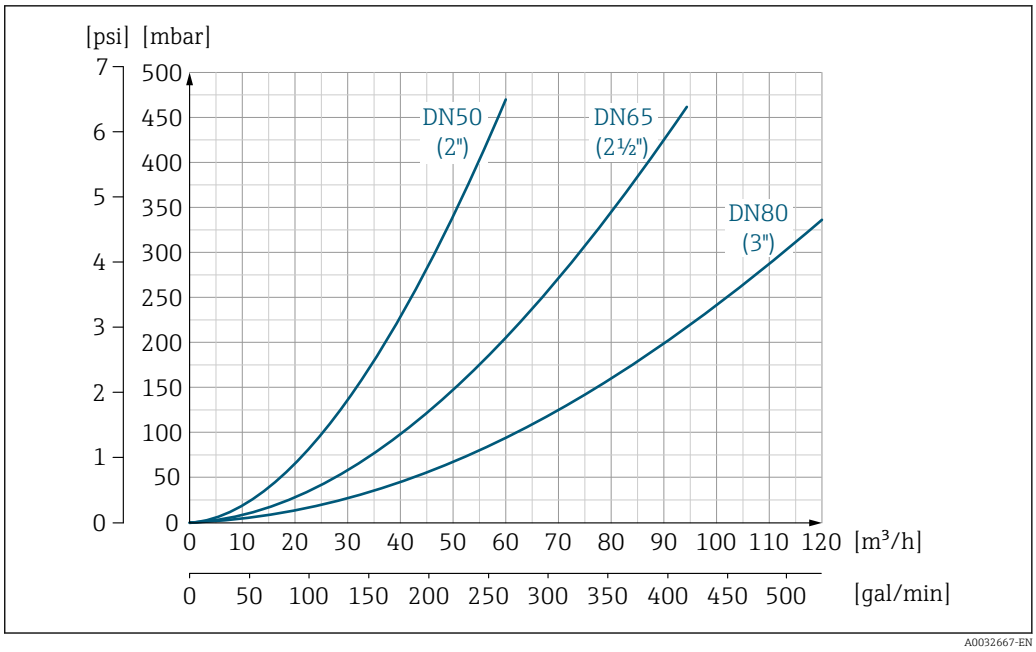
The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s).

A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.

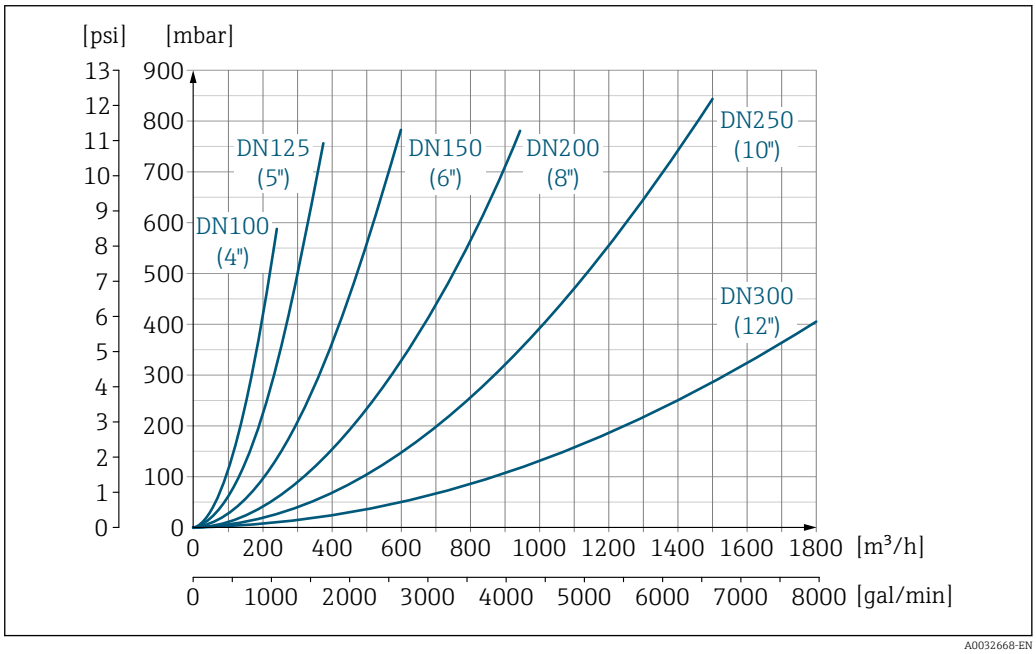
For custody transfer, the applicable approval determines the permitted measuring range.

Pressure loss

- No pressure loss occurs if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 → 26



18 *Pressure loss DN 50 to 80 (2 to 3") for order code for "Design", option C "Fixed flange, constricted measuring tube", 0 x DN inlet/outlet runs"*



19 *Pressure loss DN 100 to 300 (4 to 12") for order code for "Design", option C "Fixed flange, constricted measuring tube", 0 x DN inlet/outlet runs"*

System pressure → 26

Vibrations → 26

16.10 Mechanical construction

Design, dimensions For the dimensions and installation lengths of the device, see the "Technical Information" document, "Mechanical construction" section → 111

Weight

All values (weight exclusive of packaging material) refer to devices with flanges of the standard pressure rating.
The weight may be lower than indicated depending on the pressure rating and design.

Weight in SI units

Order code for "Design", option C, D, E : DN 25 to 400 mm (1 to 16 in)			
Nominal diameter		Reference values EN (DIN), AS, JIS	
[mm]	[in]	Pressure rating	[kg]
25	1	PN 40	10
32	–	PN 40	11
40	1 ½	PN 40	12
50	2	PN 40	13
65	–	PN 16	13
80	3	PN 16	15
100	4	PN 16	18
125	–	PN 16	25
150	6	PN 16	31
200	8	PN 10	52
250	10	PN 10	81
300	12	PN 10	95
350	14	PN 6	106
375	15	PN 6	121
400	16	PN 6	121

Order code for "Design", option G: DN 450 to 900 mm (18 to 36 in)		
Nominal diameter		Reference values EN (DIN) (PN 6)
[mm]	[in]	[kg]
450	18	161
500	20	156
600	24	208
700	28	304
–	30	–
800	32	357
900	36	485

Weight in US units

Order code for "Design", option C, D, E: DN 1 to 16 in (25 to 400 mm)		
Nominal diameter		Reference values ASME (Class 150)
[mm]	[in]	[lb]
25	1	11
32	–	–
40	1 ½	15
50	2	20
65	–	–
80	3	31
100	4	42
125	–	–
150	6	73
200	8	115
250	10	198
300	12	284
350	14	379
375	15	–
400	16	448

Order code for "Design", option G: DN 18 to 36 in (450 to 900 mm)		
Nominal diameter		Reference values ASME (Class 150)
[mm]	[in]	[lb]
450	18	562
500	20	628
600	24	893
700	28	882
–	30	1014
800	32	1213
900	36	1764

Measuring tube specification

The values are reference values and can vary depending on the pressure rating, design and order option.

Measuring tube specification in SI units

HR = hard rubber, PUR = polyurethane, PTFE = polytetrafluorethylene

Nominal diameter		Pressure rating				Measuring tube internal diameter		
		EN (DIN)	ASME	AS 2129 AS 4087	JIS	HR	PUR	PTFE
[mm]	[in]					[mm]	[mm]	[mm]
25	1	PN 40	Class 150	–	20K	–	24	25
32	–	PN 40	–	–	20K	–	32	34
40	1 ½	PN 40	Class 150	–	20K	–	38	40
50	2	PN 40	Class 150	Table E, PN 16	10K	50	50	52
50 [1]	2	PN 40	Class 150	Table E, PN 16	10K	32	–	–
65	–	PN 16	–	–	10K	66	66	68
65 [1]	–	PN 16	–	–	10K	38	–	–
80	3	PN 16	Class 150	Table E, PN 16	10K	79	79	80
80 [1]	3	PN 16	Class 150	Table E, PN 16	10K	50	–	–
100	4	PN 16	Class 150	Table E, PN 16	10K	101	104	104
100 [1]	4	PN 16	Class 150	Table E, PN 16	10K	66	–	–
125	–	PN 16	–	–	10K	127	130	129
125 [1]	–	PN 16	–	–	10K	79	–	–
150	6	PN 16	Class 150	Table E, PN 16	10K	155	158	156
150 [1]	6	PN 16	Class 150	Table E, PN 16	10K	102	–	–
200	8	PN 10	Class 150	Table E, PN 16	10K	204	207	202
200 [1]	8	PN 16	Class 150	Table E, PN 16	10K	127	–	–
250	10	PN 10	Class 150	Table E, PN 16	10K	258	261	256
250 [1]	10	PN 16	Class 150	Table E, PN 16	10K	156	–	–
300	12	PN 10	Class 150	Table E, PN 16	10K	309	312	306
300 [1]	12	PN 16	Class 150	Table E, PN 16	10K	204	–	–
350	14	PN 10	Class 150	Table E, PN 16	10K	337	340	–
375	15	–	–	PN 16	10K	389	392	–
400	16	PN 10	Class 150	Table E, PN 16	10K	387	390	–
450	18	PN 10	Class 150	–	10K	436	439	–
500	20	PN 10	Class 150	Table E, PN 16	10K	487	490	–
600	24	PN 10	Class 150	Table E, PN 16	10K	585	588	–
700	28	PN 10	Class D	Table E, PN 16	10K	694	697	–
750	30	–	Class D	Table E, PN 16	10K	743	746	–
800	32	PN 10	Class D	Table E, PN 16	–	794	797	–
900	36	PN 10	Class D	Table E, PN 16	–	895	898	–

1) Order code for "Design", option C

Measuring tube specification in US units

HR = hard rubber, PUR = polyurethane, PTFE = polytetrafluorethylene

Nominal diameter		Pressure rating	Measuring tube internal diameter		
		ASME	HR	PUR	PTFE
[mm]	[in]		[in]	[in]	[in]
25	1	Class 150	–	0.93	1.00
40	1 ½	Class 150	–	1.51	1.57
50	2	Class 150	1.98	1.98	2.04
50 [1]	2	Class 150	1.26	–	–
80	3	Class 150	3.11	3.11	3.15
80 [1]	3	Class 150	1.97	–	–
100	4	Class 150	3.99	4.11	4.09
100 [1]	4	Class 150	2.60	–	–
150	6	Class 150	6.11	6.23	6.15
150 [1]	6	Class 150	4.02	–	–
200	8	Class 150	8.02	8.14	7.96
200 [1]	8	Class 150	5.00	–	–
250	10	Class 150	10.14	10.26	10.09
250 [1]	10	Class 150	6.14	–	–
300	12	Class 150	12.15	12.26	12.03
300 [1]	12	Class 150	8.03	–	–
350	14	Class 150	13.3	13.4	–
375	15	–	15.3	15.4	–
400	16	Class 150	15.2	15.4	–
450	18	Class 150	17.2	17.3	–
500	20	Class 150	19.2	19.3	–
600	24	Class 150	23.0	23.1	–
700	28	Class D	27.3	27.4	–
750	30	Class D	29.3	29.4	–
800	32	Class D	31.3	31.4	–
900	36	Class D	35.2	35.4	–

1) Order code for "Design", option C

Materials

Transmitter housing

Compact version

- Housing material:
  Polycarbonate
- Window material:
  Polycarbonate

Remote version (wall-mount housing)

- Housing material:
  Polycarbonate
- Window material:
  Polycarbonate

Sensor connection housing

- Aluminum, AlSi10Mg, coated
- Polycarbonate plastic (only in conjunction with order code for "Sensor option", options CB ... CE)

Cable entries/cable glands

Compact and remote versions and sensor connection housing

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Plastic
Remote version: cable gland M20 × 1.5 Option of armored connecting cable	▪ Sensor connection housing: Nickel-plated brass ▪ Transmitter wall-mount housing: Plastic
Adapter for cable entry with female thread G ½" or NPT ½"	Nickel-plated brass

Connecting cable for remote version

Electrode and coil current cable:
- Standard cable: PVC cable with copper shield
- Armored cable: PVC cable with copper shield and additional steel wire braided jacket

Sensor housing

- DN 25 to 300 (1 to 12")
  - Aluminum half-shell housing, aluminum, AlSi10Mg, coated
  - Fully welded carbon steel housing with protective varnish
- DN 350 to (14 to ")
  Fully welded carbon steel housing with protective varnish

Measuring tubes

- DN 25 to 600 (1 to 24")
  Stainless steel: 1.4301, 1.4306, 304, 304L
- DN 700 to 9003000 (28 to 36120")
  Stainless steel: 1.4301, 304

Liner

- DN 25 to 300 (1 to 12"): PTFE
- DN 25 to 900 (1 to 36"): polyurethane
- DN 50 to 900 (2 to 36"): hard rubber

Electrodes

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)

Process connections

For flanges made of carbon steel:
- DN ≤ 300 (12"): with Al/Zn protective coating or protective varnish
- DN ≥ 350 (14"): protective varnish

All carbon steel lap joint flanges are supplied with a hot-dip galvanized finish.

EN 1092-1 (DIN 2501)

Fixed flange
- Carbon steel:
  - DN ≤ 300: S235JRG2, S235JR+N, P245GH, A105, E250C
  - DN 350 to 900: P245GH, S235JRG2, A105, E250C
- Stainless steel:
  - DN ≤ 300: 1.4404, 1.4571, F316L
  - DN 350 to 600: 1.4571, F316L, 1.4404
  - DN 700 to 900: 1.4404, F316L

Lap joint flange
- Carbon steel DN ≤ 300: S235JRG2, A105, E250C
- Stainless steel DN ≤ 300: 1.4306,1.4404, 1.4571, F316L

Lap joint flange, stamped plate
- Carbon steel DN ≤ 300: S235JRG2 similar to S235JR+AR or 1.0038
- Stainless steel DN ≤ 300: 1.4301 similar to 304

ASME B16.5

Fixed flange, lap joint flange
Carbon steel: A105

JIS B2220

Carbon steel: A105, A350 LF2

AS 2129

Carbon steel: A105, E250C, P235GH, P265GH, S235JRG2

AS 4087

Carbon steel: A105, P265GH, S275JR

Seals

As per DIN EN 1514-1, form IBC

Accessories

Ground disks

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)

Fitted electrodes	Measurement, reference and empty pipe detection electrodes available as standard with: - 1.4435 (316L) - Alloy C22, 2.4602 (UNS N06022)

Process connections

- EN 1092-1 (DIN 2501)
- ASME B16.5
- JIS B2220
- AS 2129 Table E
- AS 4087 PN 16

For information on the different materials used in the process connections → 107

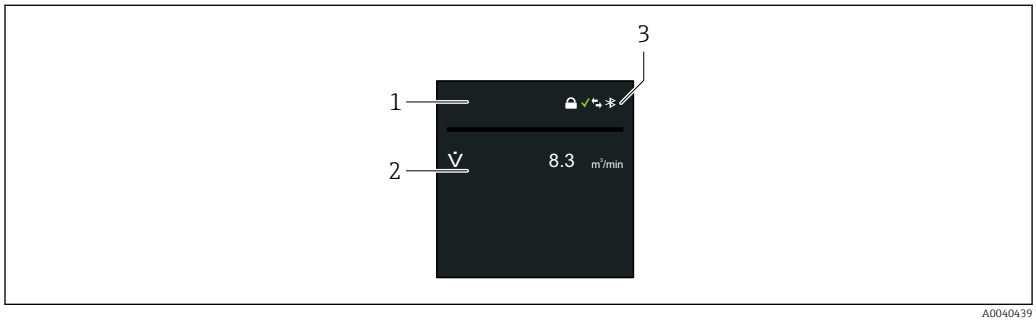
Surface roughness

Electrodes with 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022): < 0.5 µm (19.7 µin)

(All data refer to parts in contact with the medium)

16.11 Operability

Local display



1 *Tag name (configurable)*
2 *Measured variable 1 to 4 (configurable) with sign*
3 *Bluetooth connection active, device status, locking status, battery status, cellular network reception*

Operation

Via Bluetooth® wireless technology

Digital communication

MQTT (Cloud) (Proline 800 - Advanced)

SmartBlue app

The device has a *Bluetooth*® wireless technology interface and can be operated and configured using the SmartBlue app.

- The range under reference conditions is 10 m (33 ft).
- Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption.

16.12 Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

UKCA marking	The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark. Contact address Endress+Hauser UK: Endress+Hauser Ltd. Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com
Drinking water approval	▪ ACS ▪ KTW/W270 ▪ NSF 61 ▪ WRAS BS 6920
Radio approval	The measuring device has radio approval. For detailed information on the radio approval, see the Special Documentation → 111
Pressure Equipment Directive	▪ With the marking a) PED/G1/x (x = category) or b) PESR/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or b) Schedule 2 of Statutory Instruments 2016 No. 1105. ▪ Devices not bearing this marking (without PED or PESR) are designed and manufactured according to sound engineering practice. They meet the requirements of a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105. The scope of application is indicated a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105.
Measuring instrument approval	The measuring device is (optionally) approved as a cold water meter (MI-001) for volume measurement in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2014/32/EU (MID). The measuring device is qualified according to OIML R49: 2013.
External standards and guidelines	▪ EN 60529 Degrees of protection provided by enclosure (IP code) ▪ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements ▪ IEC/EN 61326-2-3 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). ▪ ANSI/ISA-61010-1 (82.02.01) Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements

- CAN/CSA-C22.2 No. 61010-1-12
  Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements
- ETSI EN 300 328
  Guidelines for 2.4 GHz radio components.
- EN 301489
  Electromagnetic compatibility and radio spectrum matters (ERM).

16.13 Application packages

Many different application packages are available to enhance the functionality of the device. Such packages might be needed to address safety aspects or specific application requirements.

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Diagnostics functions

Order code for "Application package", option EM "Extended data logger"

Comprises extended functions concerning the event log and the activation of the measured value memory.

Event log:
Memory volume is extended from 10 000 message entries (standard version) to 50 000 entries.

For detailed information, see the Operating Instructions for the device.

Heartbeat Technology

Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Heartbeat Verification
Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".
- Functional testing in the installed state.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk assessment.

Heartbeat Monitoring
Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:
- Draw conclusions - using these data and other information - about the impact process influences (e.g. buildup, interference from the magnetic field) have on the measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality .

For detailed information, see the Special Documentation for the device.

16.14 Accessories

Overview of accessories available to order → 86

16.15 Supplemental documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

Standard documentation

Technical Information

Measuring device	Documentation code
Promag W 800	TI01523D

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring device	Documentation code
Proline Promag W	KA01266D

Brief Operating Instructions for transmitter

Measuring device	Documentation code
Proline 800	KA01495D

Description of Device Parameters

Measuring device	Documentation code
Proline 800	GP01154D

Supplementary device-dependent documentation

Special documentation

Content	Documentation code
Heartbeat Technology	SD02694D
Cellular Module	SD02562D
Display with Bluetooth interface	SD02655D
Using Open Source Software Licenses	SD02658D
Quick Reference Guide	SD02659D
OPC-UA	SD02663D
Information on Custody Transfer Measurement	SD02038D

Installation instructions

Contents	Note
Installation instructions for spare part sets and accessories	▪ Access the overview of all the available spare part sets via *Device Viewer* → 🖹 84 ▪ Accessories available for order with Installation Instructions → 🖹 110

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