Operating Instructions
Proline Promag W 800

Electromagnetic flowmeter
Modbus RS485

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 Center will supply you with current information and updates to these instructions.

Table of contents

1   About this document

1.1   Document function

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, 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.
⏛	**Protective earth (PE)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: • Inner ground terminal: protective ground is connected to the power supply network. • Outer ground terminal: the device is connected to the grounding system of the facility.

1.2.3   Communication-specific symbols

Symbol	Meaning
ⓑ	**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:
- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the matrix code on the nameplate

Detailed list of the individual documents along with the documentation code → 🕮 128

1.3.1   Standard documentation

Document type	Purpose and content of the document
Technical Information	**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.
Sensor Brief Operating Instructions	**Getting the 1st measured value quickly - Part 1** The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device. • Incoming acceptance and product identification • Storage and transport • Installation
Transmitter Brief Operating Instructions	**Getting the 1st measured value quickly - Part 2** The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value). • Product description • Installation • Electrical connection • Operation options • System integration • Commissioning • Diagnostic information
Description of Device Parameters	**Reference for your parameters** The document provides a detailed explanation of each individual parameter in the operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations. The document provides Modbus-specific information on each individual parameter in the operating menu.

1.3.2   Supplementary device-dependent documentation

Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

1.4   Registered trademarks

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

2   Safety instructions

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 device 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→ 🖹 8.
▶ Protect the measuring device permanently against corrosion from environmental influences.

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

⚠ WARNING

Danger of breakage due to corrosive or abrasive fluids and ambient conditions!
▶ Verify the compatibility of the process fluid with the sensor material.
▶ Ensure the resistance of all fluid-wetted materials in the process.
▶ Keep within the specified pressure and temperature range.

NOTICE

Verification for borderline cases:
▶ For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability as minute changes in the temperature, concentration or level of contamination in the process can alter the corrosion resistance properties.

Residual risks

⚠ WARNING

If the temperature of the media or electronics unit is high or low, this may cause the surfaces of the device to become hot or cold. This poses a risk of burns or frostbite!
▶ In the case of hot or cold medium temperatures, install appropriate protection against contact.

2.3   Workplace safety

For work on and with the device:
▶ Wear the required personal protective equipment according to national regulations.

For welding work on the piping:
▶ Do not ground the welding unit via the measuring device.

If working on and with the device with wet hands:
▶ Due to the increased risk of electric shock, wear suitable gloves.

2.4   Operational safety

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

Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.
▶ If, despite this, modifications are required, consult with Endress+Hauser.

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 repair of an electrical device.
▶ Use original spare parts and accessories from Endress+Hauser only.

2.5   Product safety

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

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

Furthermore, 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

2.6   IT security

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

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

2.7   Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section:

2.7.1   Access via the SmartBlue app

Two access levels (user roles) are defined for the device: the Operator user role and the Maintenance user role. The Maintenance user role is the default setting.

If a user-specific access code is not defined (in the Enter access code parameter), the default setting **0000** continues to apply and the Maintenance user role is automatically enabled. The device's configuration data are not write-protected and can be edited at all times.

If a user-specific access code has been defined (in the Enter access code parameter), all the parameters are write-protected and the device is accessed with the Operator user role. The previously defined access code must first be entered again before the Maintenance user role is enabled and all the parameters can be write-accessed.

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 → 🖹 13.

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 securing 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 securing screws!
   Risk of damaging the plastic transmitter.
   ▶ Tighten the securing screws as per the tightening torque .

   Reverse the removal procedure to reassemble the transmitter.

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
Compact version - transmitter and sensor form a mechanical unit.

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

A0046580
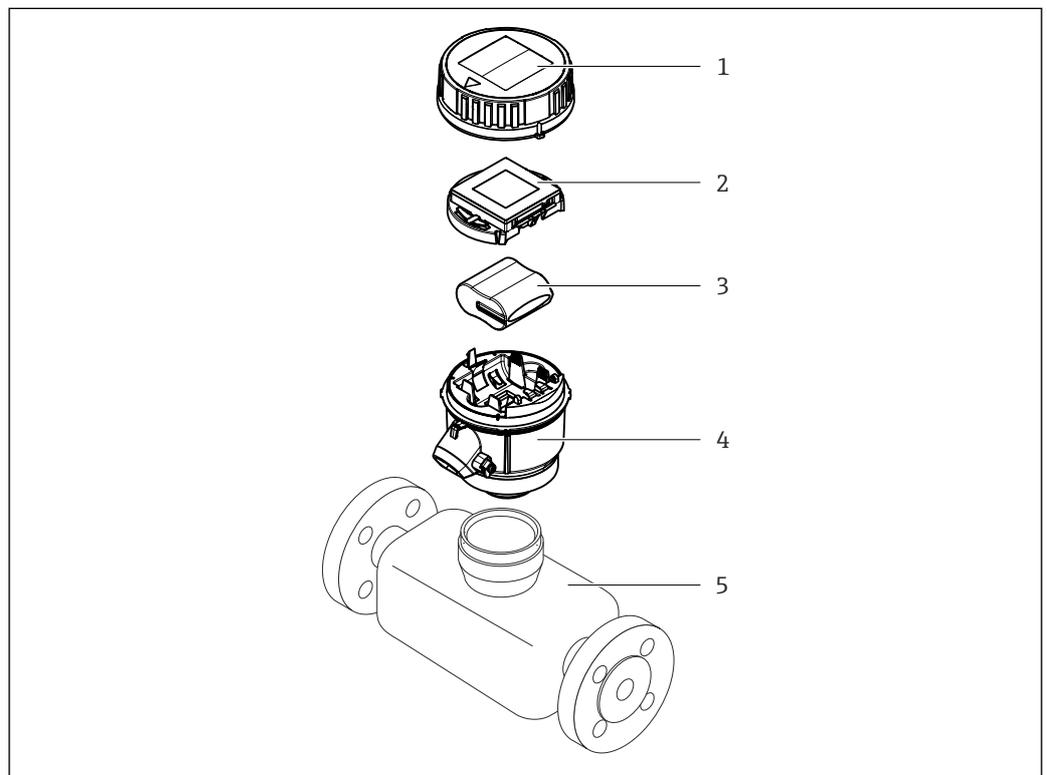
1   Transmitter housing cover
2   Display module
3   Battery pack
4   Transmitter housing
5   Sensor

3.1.2   Proline Promag 800 - Advanced
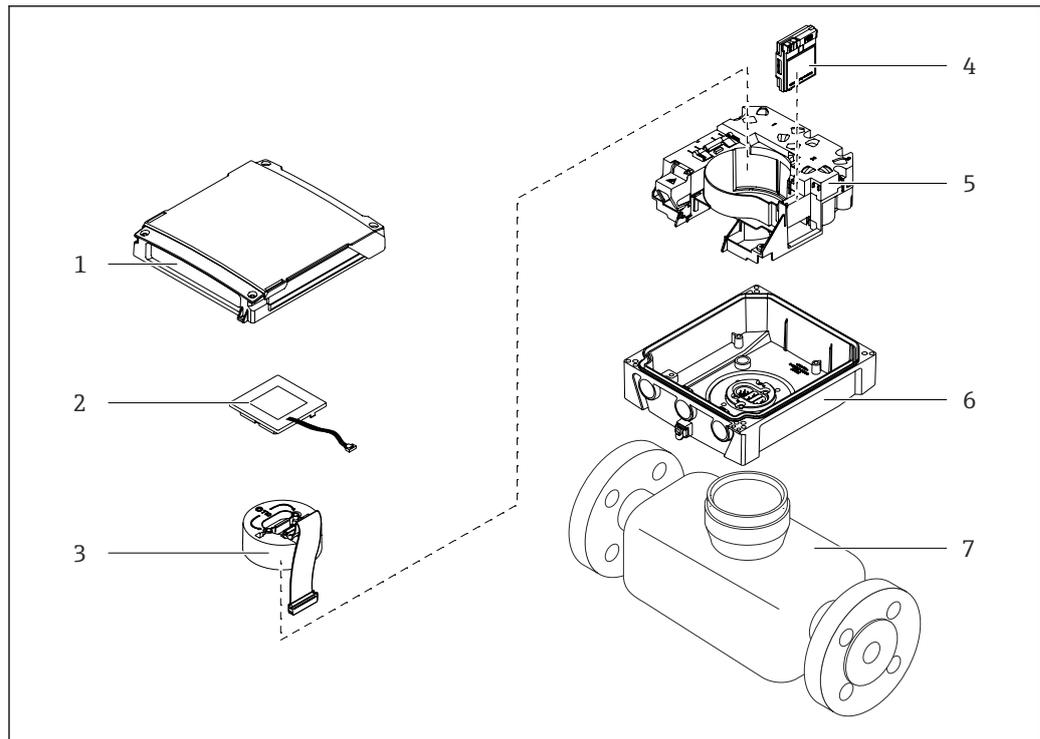
A0042903

⊞ *1   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
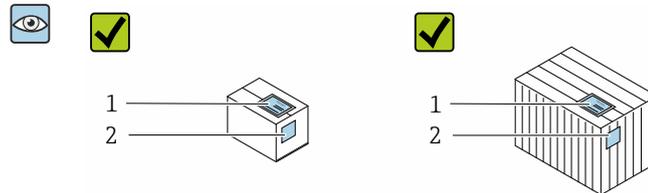
				Are the order codes on the delivery note (1) and the product sticker (2) identical?
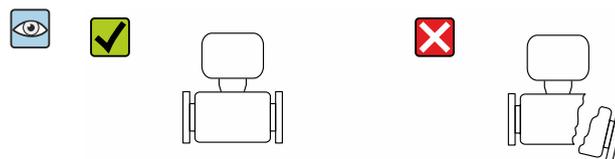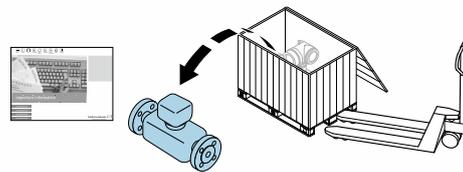
Are the goods undamaged?
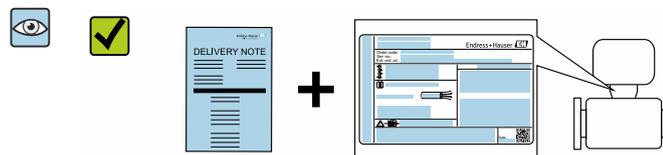
Do the data on the nameplate match the ordering information on the delivery note?

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*, see the "Product identification" section → 🖹 18.

4.2 Product identification

The following options are available for identification of the device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial numbers from the nameplates in *W@M 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 chapters "Additional standard documentation on the device" → 🗎 8 and "Supplementary device-dependent documentation" → 🗎 8
- The *W@M 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
- Place of manufacture
- Order code
- Serial number (Ser. no.)
- Extended order code (Ext. ord. cd.)
- 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
- Place of manufacture
- Order code
- Serial number (Ser. no.)
- Extended order code (Ext. ord. cd.)
- Nominal diameter of 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 measuring device

Symbol	Meaning
⚠	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. To determine the nature of the potential hazard and the measures required to avoid it, consult the documentation accompanying the measuring device.
📖	**Reference to documentation** Refers to the corresponding device documentation.
⏚	**Protective ground connection** A terminal which must be connected to 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 pipe.
- ▶ Protect from direct sunlight to avoid unacceptably high surface temperatures.
- ▶ Select a storage location where moisture cannot collect in the measuring device as fungus and bacteria infestation can damage the liner.
- ▶ Store in a dry and dust-free place.
- ▶ Do not store outdoors.

Storage temperature → 🕮 115

⚠ **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

▶ Turn the cover to the right by a 1/4 turn.
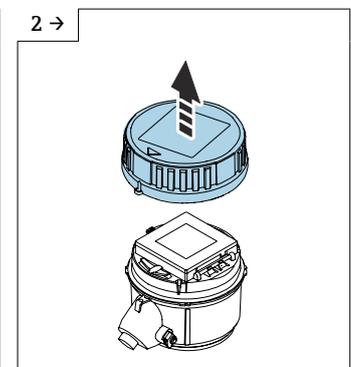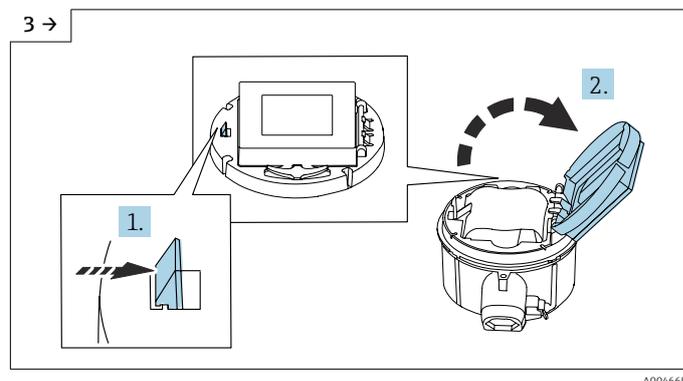
▶ Lift off the cover.

▶ Open the cover of the electronics carrier.

4 →

A0046666

▸ Take the battery out of the battery compartment (it is still attached, however) and disconnect the battery plug.

5 →

A0046671

▸ Now remove the battery from the battery compartment entirely.

6 →

A0046591

▸ Set switch "B" to "OFF".

7 →

A0046733

▸ Insert the battery plug and place the cable in the recess of the battery carrier as shown in the graphic. Place the battery in the battery compartment.

8 →

A0046744

▸ Close the cover of the electronics carrier.

9 →

A0046727

▸ Fit the cover on the transmitter housing.

10 →

A0046655

▸ Turn the cover to the right by a 1/4 turn.

11

A0046735
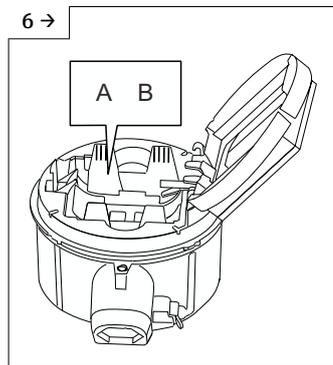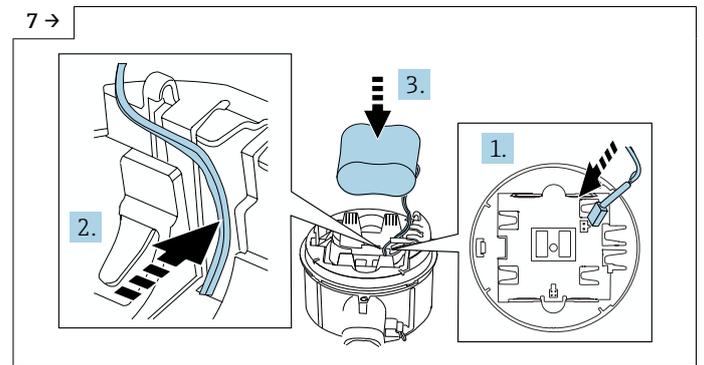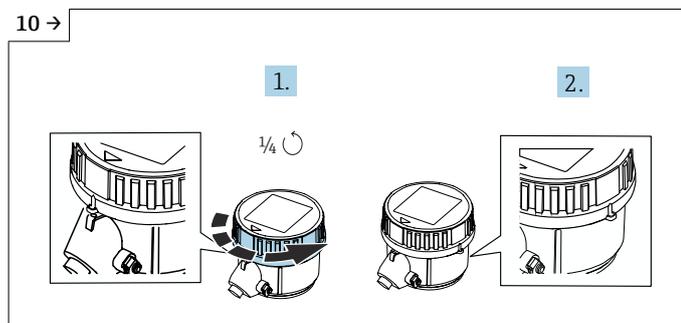
▶ Turn the cover to the left by a 1/4 turn.

5.2.2 Proline Promag 800 - Advanced

Do not store buffer capacitors individually for longer than four 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.
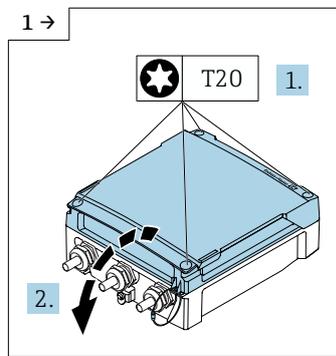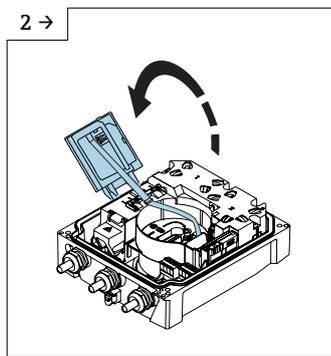
1 →

A0042838

▶ Open the connection compartment cover.

2 →

A0043731

▶ Open the display module.

3 →

A0043793

▶ Set switch "B" to "OFF".

4 →

A0043737

▶ Close the display module.

5

A0042855
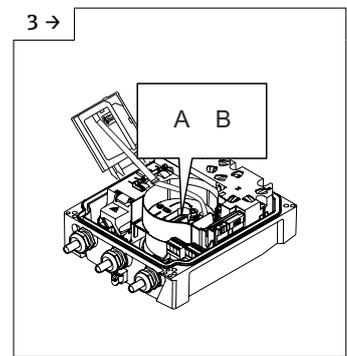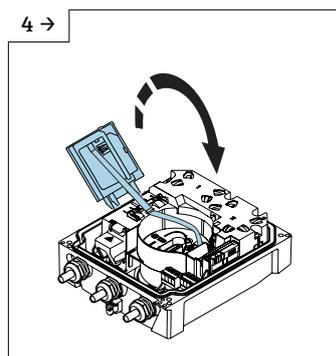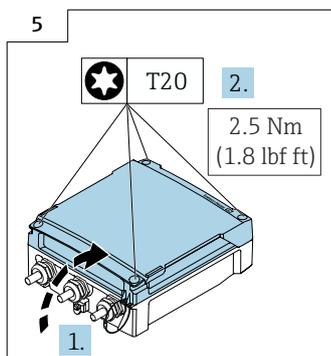
▶ Close the connection compartment cover.

5.3 Transporting the product

Transport the measuring device to the measuring point in the original packaging.
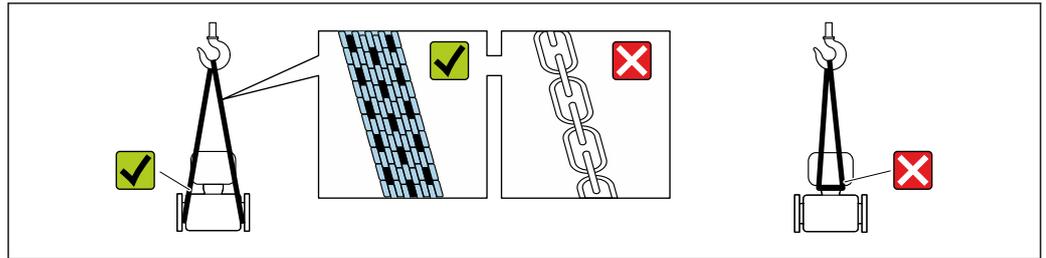
A0029252

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).
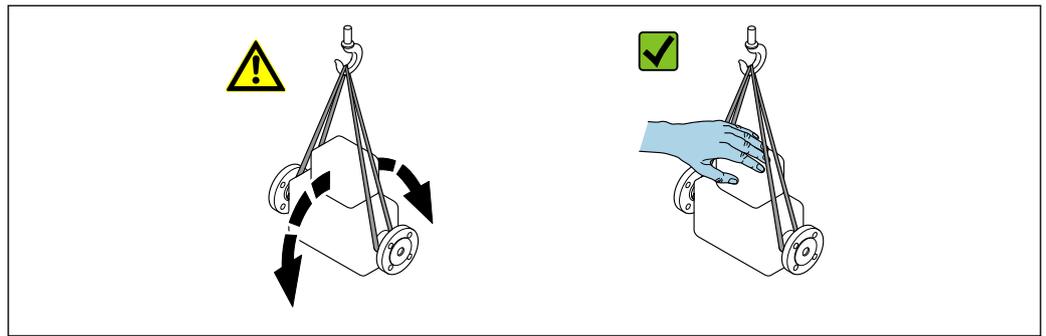
A0029214

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
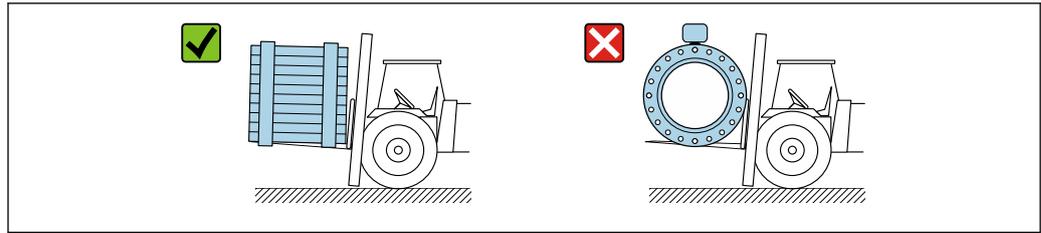
5.4   Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:
- Outer packaging of device
  Polymer stretch wrap, complying with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wooden crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62EC,
    recyclability confirmed by Resy symbol
- Carrying and securing materials
  - Disposable plastic pallet
  - Plastic straps
  - Plastic adhesive strips
- Filler material
  Paper pads

6   Mounting

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
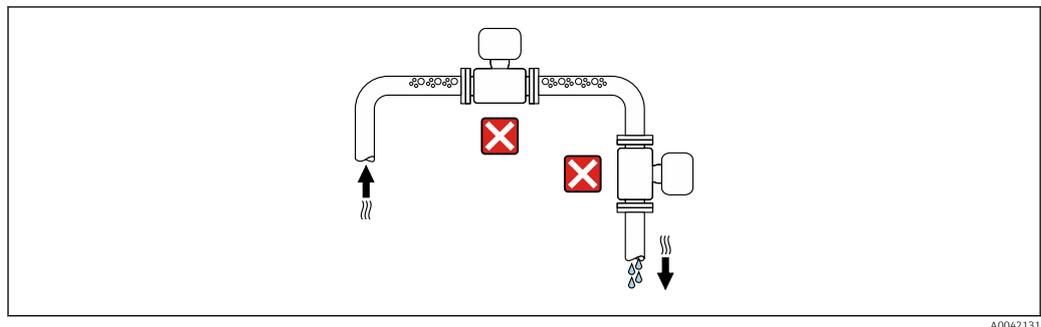
The device should ideally be installed in an ascending pipe.
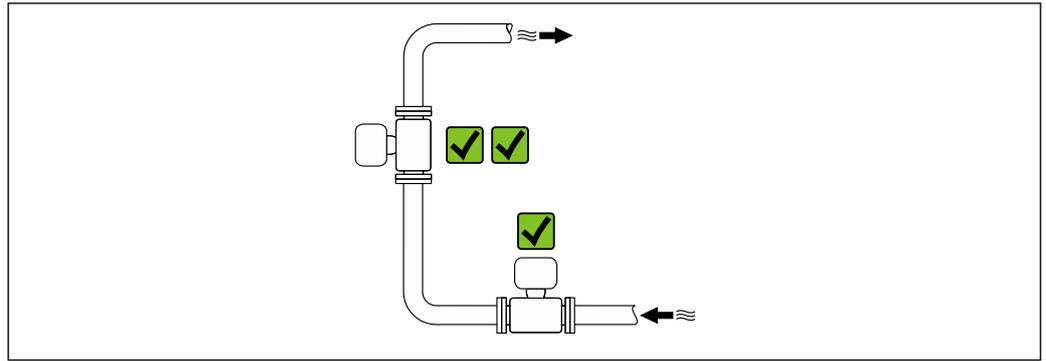
Installation near valves

Install the device in the direction of flow upstream from the valve.
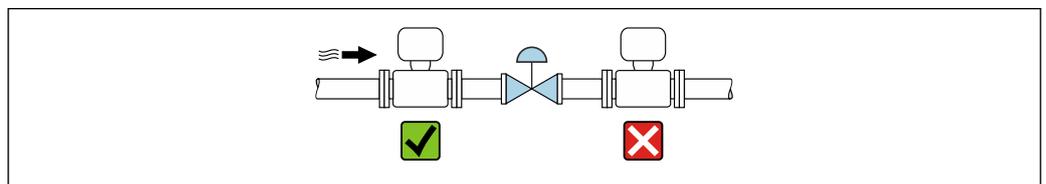
Installation upstream from a down pipe

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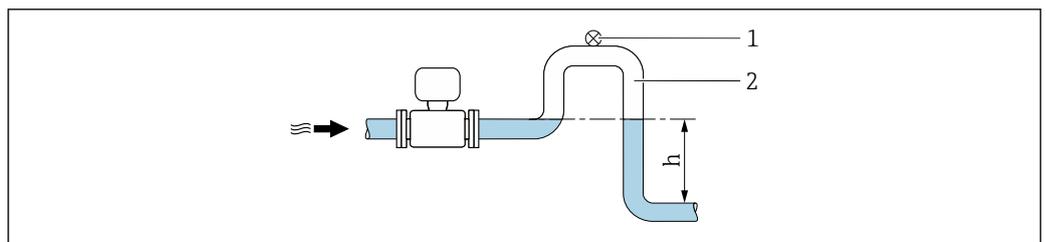
1 Vent valve
2 Pipe siphon
h Length of down pipe

Installation with partially filled pipes

- Partially filled pipes with a gradient require a drain-type configuration.
- The installation of a cleaning valve is recommended.
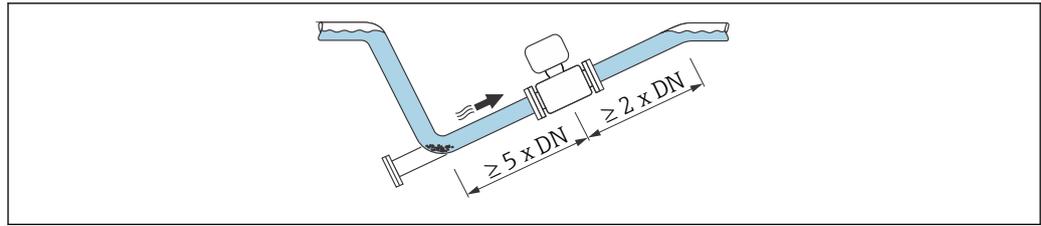
A0041088

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

Installation near pumps

NOTICE

Negative pressure in the measuring pipe 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.
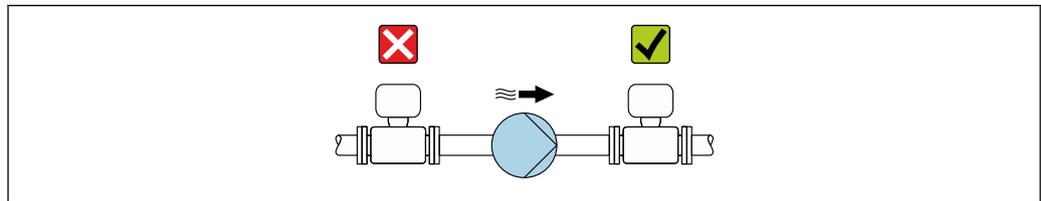
A0041083

ℹ️ • Information on the liner's resistance to partial vacuum → 🕮 117
   • Information on the measuring system's resistance to vibration and shock → 🕮 116

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.
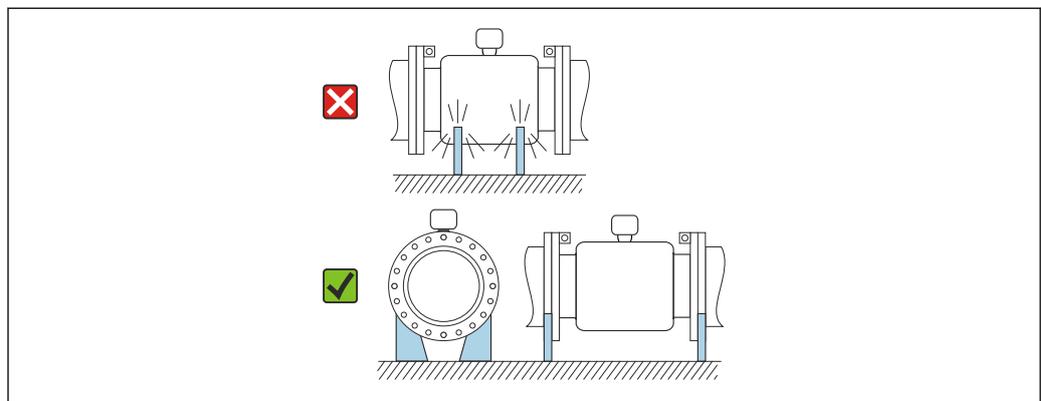
A0041087

Installation in event of pipe vibrations

A remote version is recommended in the event of strong 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.
▶ Mount the sensor and transmitter separately.
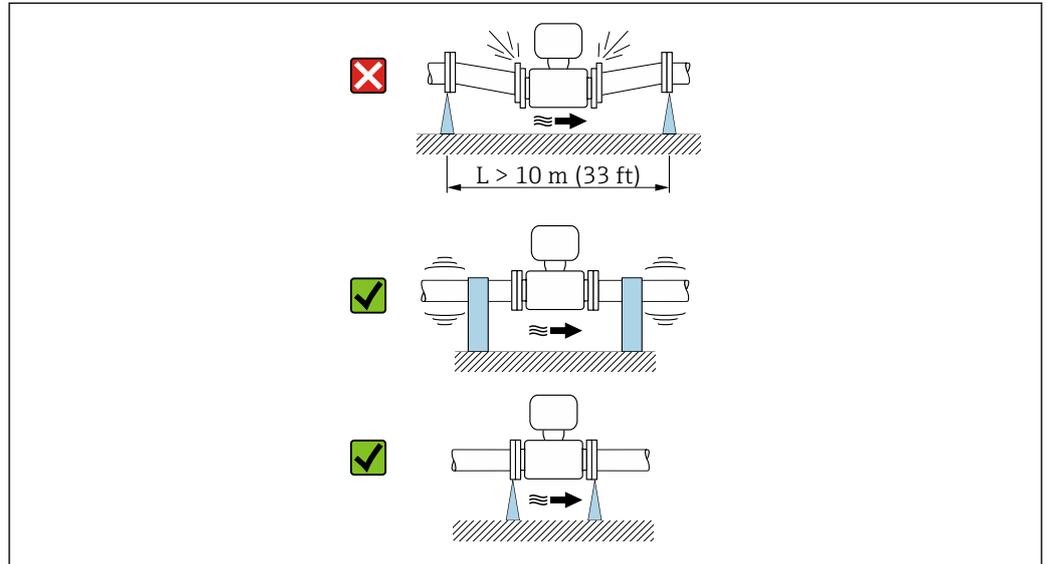
A0041092

ℹ️ Information on the measuring system's resistance to vibration and shock → 🕮 116

Orientation

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

Orientation		Recommendation
Vertical orientation	A0015591	✓✓
Horizontal orientation, transmitter at top	A0015589	✓✓ [1]
Horizontal orientation, transmitter at bottom	A0015590	✗
Horizontal orientation, transmitter at side	A0015592	✗
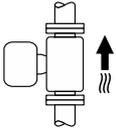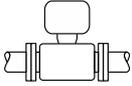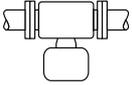
1)   Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.

Vertical

Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.
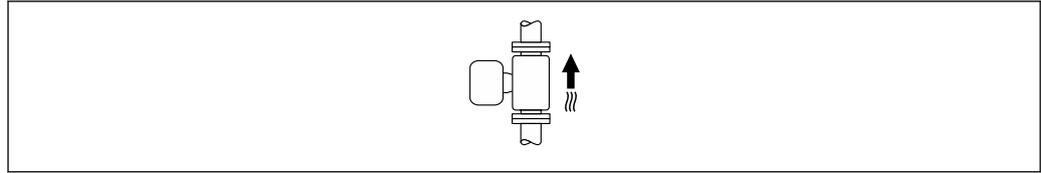
A0015591

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.
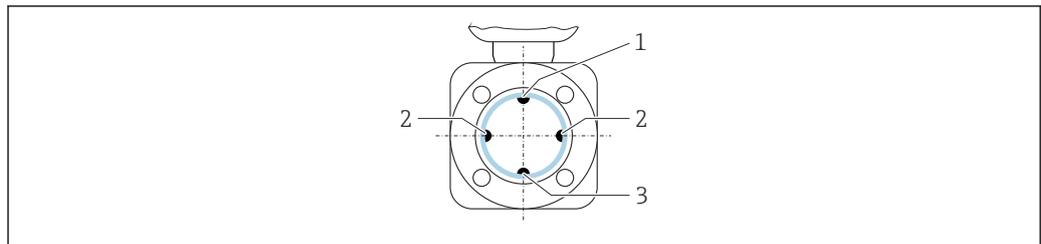
A0029344

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.
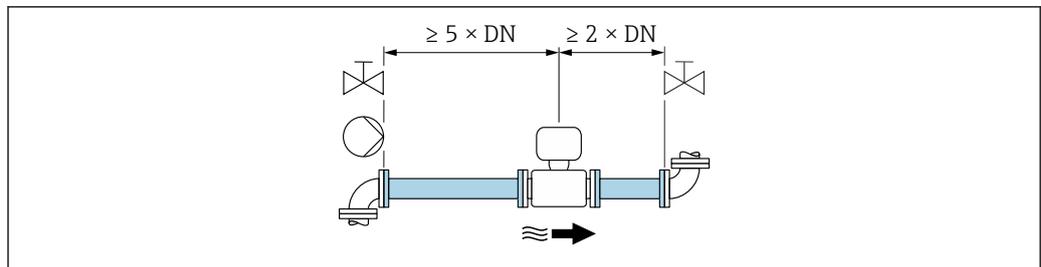
A0028997
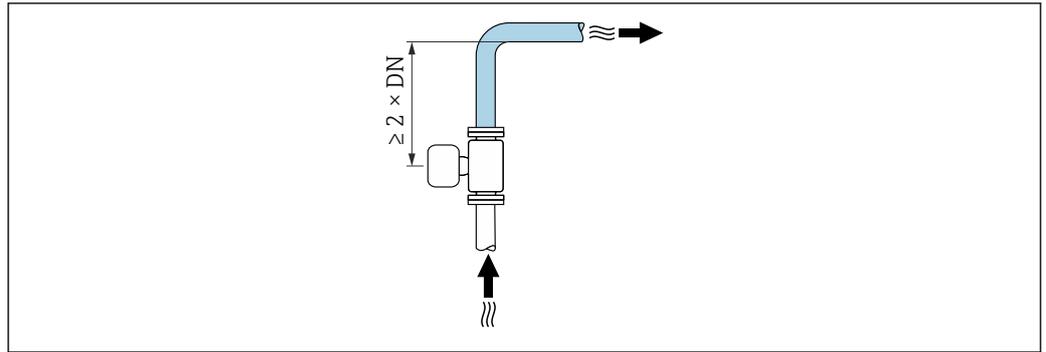
A0042132

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 measured error

When the device is installed with the inlet and outlet runs described, a maximum measured 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.
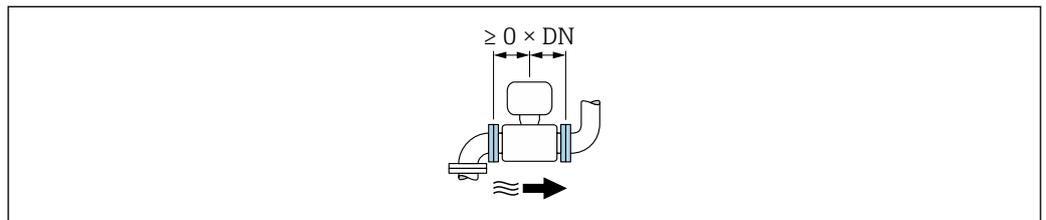
Installation downstream of pumps

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

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.

Dimensions

📖 For the dimensions and installed lengths of the device, see the "Technical Information" document, "Mechanical construction" section

6.1.2 Environment and process-related requirements

Ambient temperature range

Transmitter	−25 to +60 ℃ (−13 to +140 ℉)
Local display	−20 to +60 ℃ (−4 to +140 ℉), the readability of the local display may be impaired at temperatures outside the temperature range.
Sensor	• Process connection material, carbon steel: −10 to +60 ℃ (+14 to +140 ℉) • Process connection material, stainless steel: −40 to +60 ℃ (−40 to +140 ℉)
Liner	Do not exceed or fall below the permitted temperature range of the liner → 🖹 117.
External battery pack	Do not exceed or fall below the battery temperature range specified by the manufacturer.

If operating outdoors:
• Measuring device suitable for wet areas.
• Install the measuring device in a shady location.
• Avoid direct sunlight, particularly in warm climatic regions.
• 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 → 🖹 102.

System pressure

Installation near pumps → 🖹 26

Vibrations

Installation in event of pipe vibrations → 🖹 26

Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. 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.
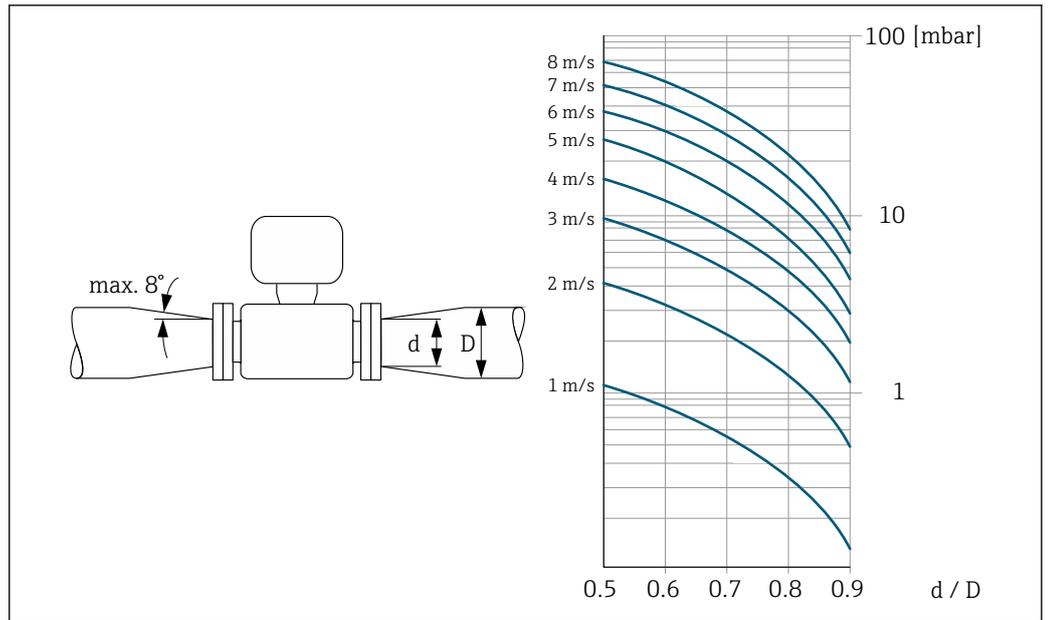
Length of connecting cable

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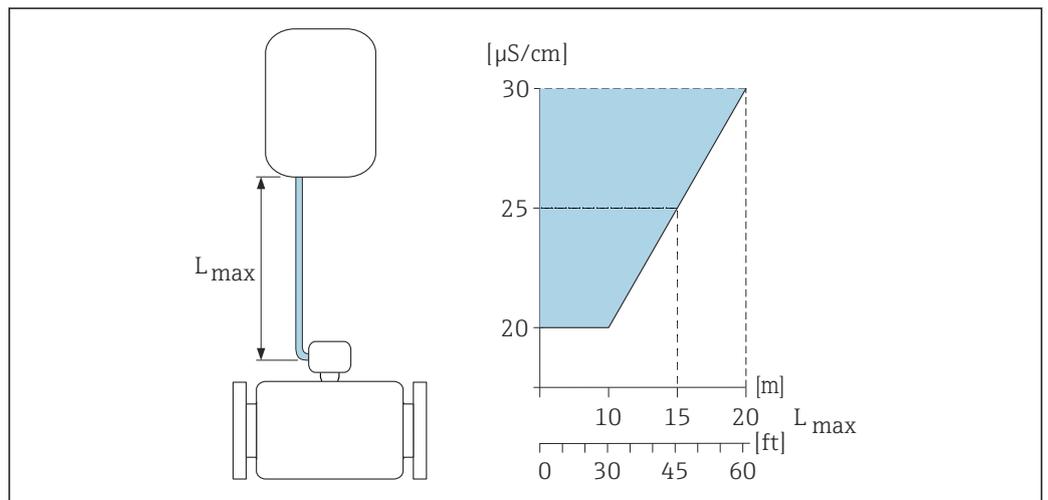
 2   Permitted length of connecting cable

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)

For immersion in water, Proline 800

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", option CQ "Temporarily water-proof "

- For the temporary operation of the device under non-corrosive water
- Operating duration at a maximum depth of:
  3 m (10 ft): maximum 168 hours

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 "Temporarily water-proof "

- For the temporary operation of the device under non-corrosive water
- Operating duration at a maximum depth of:
  3 m (10 ft): maximum 168 hours

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
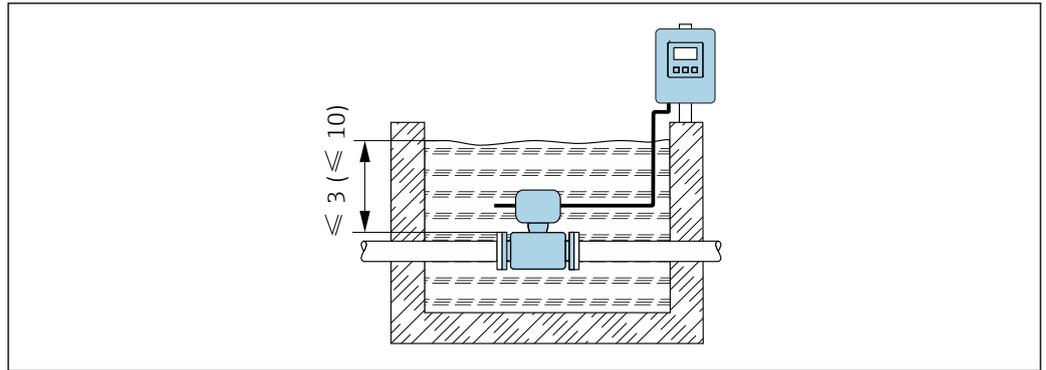
3   Installation for permanent immersion in water

For use in buried applications, Proline 800 - Advanced

ℹ️ • 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.
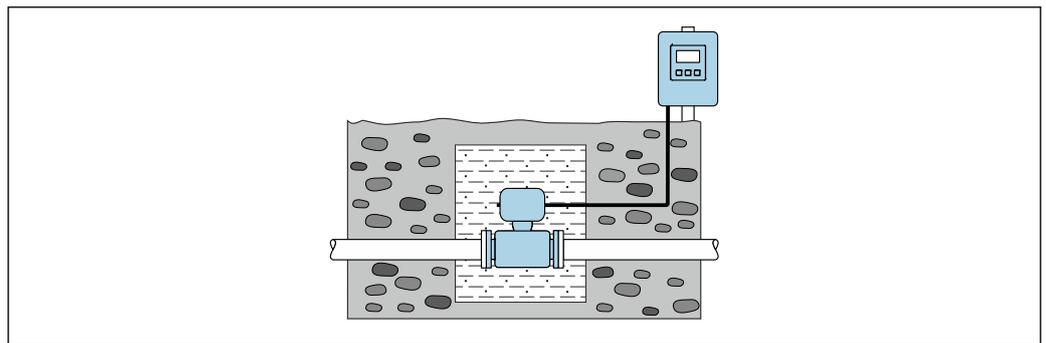
6.2   Mounting the measuring device

6.2.1   Required tools

For Proline 800 transmitter

Torque wrench

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 → 🕮 35.

5. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.
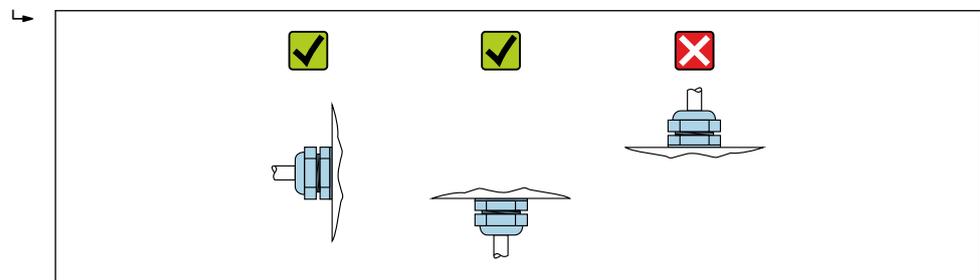
A0029263

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 .

Screw tightening torques

Please note the following:
- 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 surfaces or damage the seals.

Nominal screw tightening torques → 🖹 39

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]	HG	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	–

Nominal diameter		Pressure rating	Screws	Flange thickness	Max. screw tightening torque [Nm]		
[mm]	[in]	[bar]	[mm]	[mm]	HG	PUR	PTFE
		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	–
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	–
1000	40	PN 6	28 × M27	26	218	208	–
		PN 10	28 × M33	34	402	405	–
		PN 16	28 × M39	42	502	518	–
		PN 25	28 × M52	58	970	971	–
1200	48	PN 6	32 × M30	28	319	299	–
		PN 10	32 × M36	38	564	568	–
		PN 16	32 × M45	48	701	753	–

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			
				HG		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

Nominal diameter		Pressure rating	Screws	Max. screw tightening torque			
				HG		PUR	
[mm]	[in]	[psi]	[in]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
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
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

Maximum screw tightening torques for JIS B2220

Nominal diameter	Pressure rating	Screws	Max. screw tightening torque [Nm]	
[mm]	[bar]	[mm]	HG	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

Nominal diameter	Pressure rating	Screws	Max. screw tightening torque [Nm]	
[mm]	[bar]	[mm]	HG	PUR
250	10K	12 × M22	100	87
250	20K	12 × M24	159	144
300	10K	16 × M22	74	63
300	20K	16 × M24	138	124

Maximum screw tightening torques for AWWA C207, Class D

Nominal diameter		Screws	Max. screw tightening torque			
[mm]	[in]	[in]	HG		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
1000	40	36 × 1 ½	420	310	477	352
–	42	36 × 1 ½	528	389	518	382
–	48	44 × 1 ½	552	407	531	392

Maximum screw tightening torques for AS 2129, Table E

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	HG	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	–
1000	24 × M30	634	–
1200	32 × M30	727	–

Maximum screw tightening torques for AS 4087, PN 16

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	HG	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	–
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	–
1000	24 × M33	595	–
1200	32 × M33	703	–

Nominal screw tightening torques

Nominal screw tightening torques for JIS B2220

Nominal diameter	Pressure rating	Screws	Nom. screw tightening torque [Nm]	
[mm]	[bar]	[mm]	HG	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

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 → 🖹 30.
▸ 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
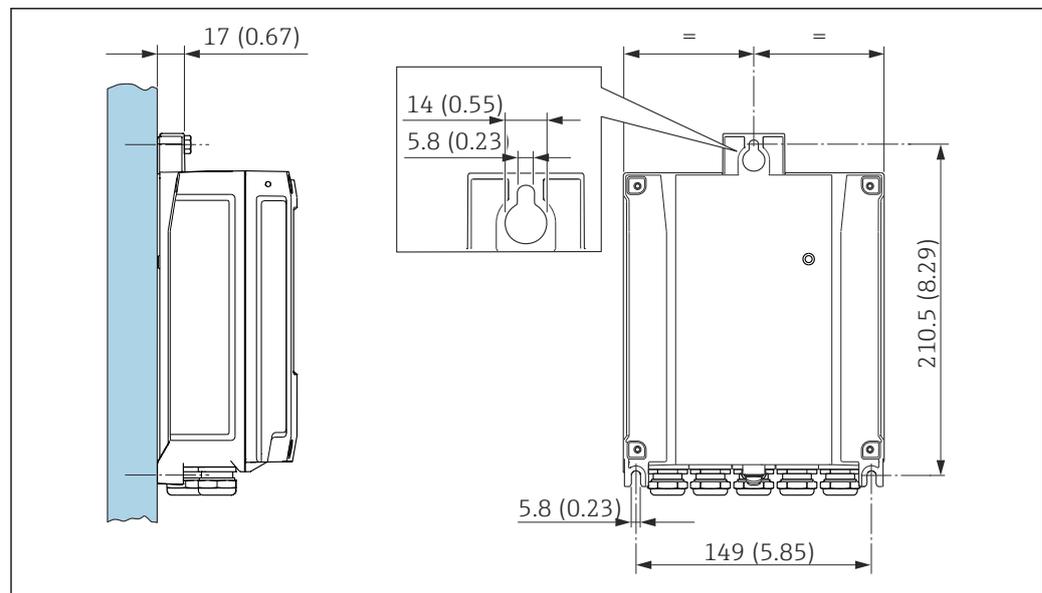
🖻 4   *Engineering unit mm (in)*

1. Drill the holes.

2. Insert wall plugs into the drilled holes.

3. Screw the securing screws in slightly.

4. Fit the transmitter housing over the securing screws and hook into place.

5. Tighten the securing screws.

Post mounting Proline 800 - Advanced

⚠ WARNING

Excessive tightening torque applied to the fixing screws!
Risk of damaging the plastic transmitter.
▸ Tighten the fixing screws as per the tightening torque: 2 Nm (1.5 lbf ft)
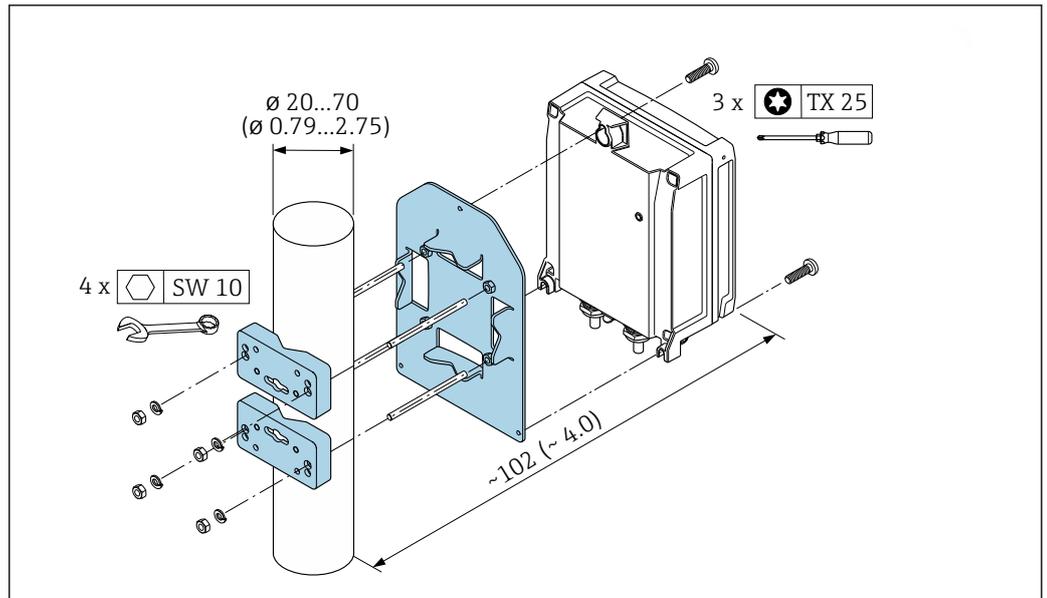
⊞ 5   *Engineering unit mm (in)*

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.
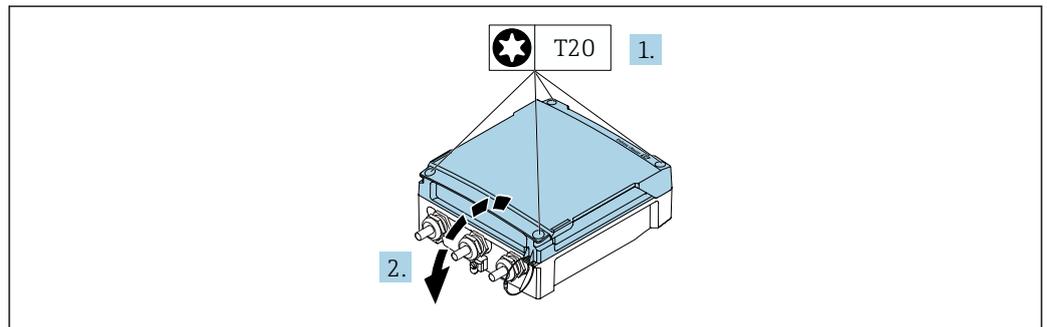
1. Loosen the fixing screws of the housing cover (when reassembling, pay attention to the tightening torque → 🖻 43).

2. Open the housing cover.
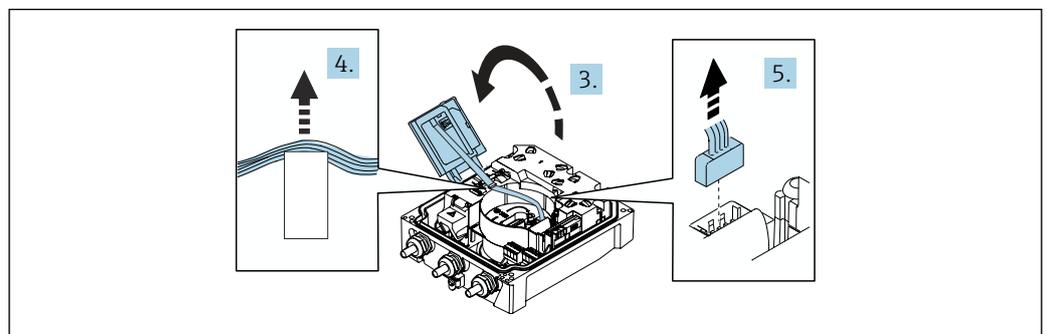
3. Open the display module.

4. Push the ribbon cable out of the holder.

5. Disconnect the plug.
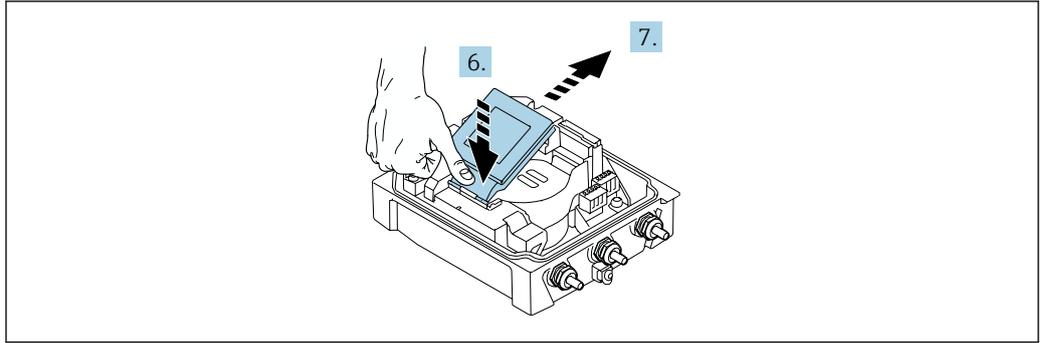
A0044273

6. Push the display module down gently at the hinge.

7. Pull the display module out of the holder.
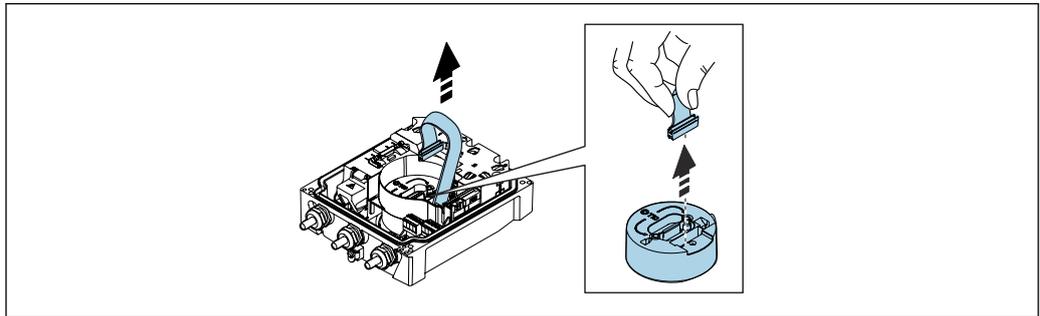
A0043338

8. Disconnect the plug of the electronics module.
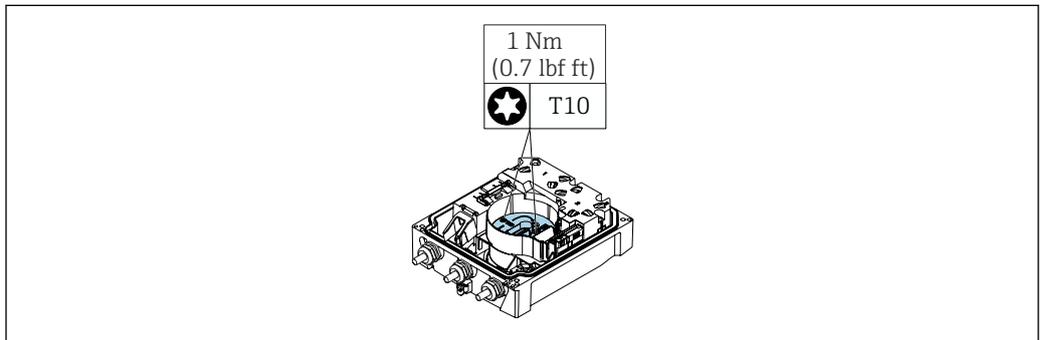
A0042853

9. Release the screws on the electronics module.
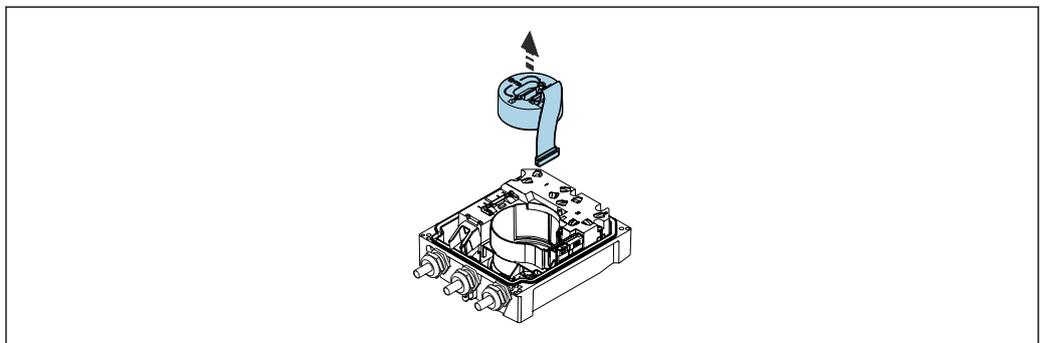
A0042843

10. Remove the electronics module.
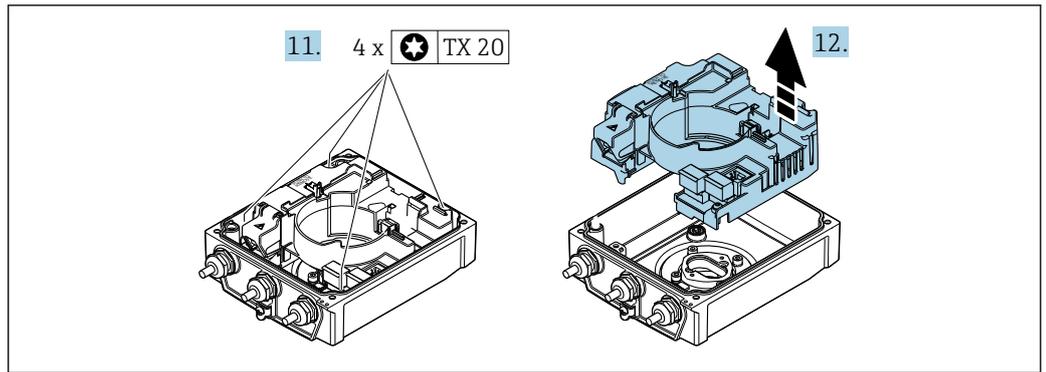
A0044276

11. Loosen the fixing screws of the main electronics module (when reassembling, pay attention to the tightening torque → 🖹 43).

12. Remove the main electronics module.
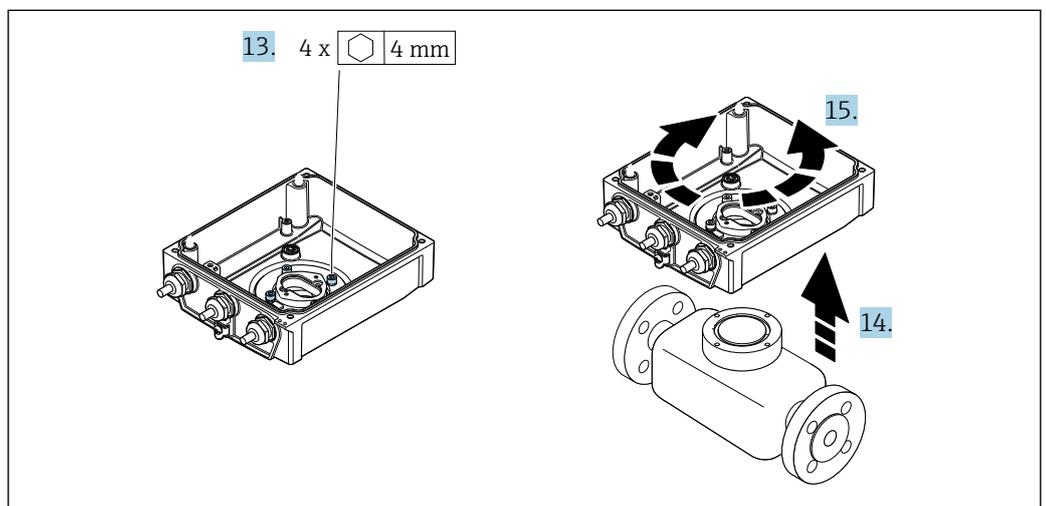
A0044277

13. Loosen the fixing screws of the transmitter housing (when reassembling, pay attention to the tightening torque → 🖹 43).

14. Lift the transmitter housing.

15. Turn the housing to the desired position in increments of 90°.

Reassembling the transmitter housing

⚠ **WARNING**

Excessive tightening torque applied to the fixing screws!
Risk of damaging the plastic transmitter.

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

Step → 🖹 41	Fixing screw	Tightening torques
1	Housing cover	1 Nm (0.7 lbf ft)
9	Electronics module	0.6 Nm (0.4 lbf ft)
11	Main electronics module	1.5 Nm (1.1 lbf ft)
13	Transmitter housing	5.5 Nm (4.1 lbf ft)
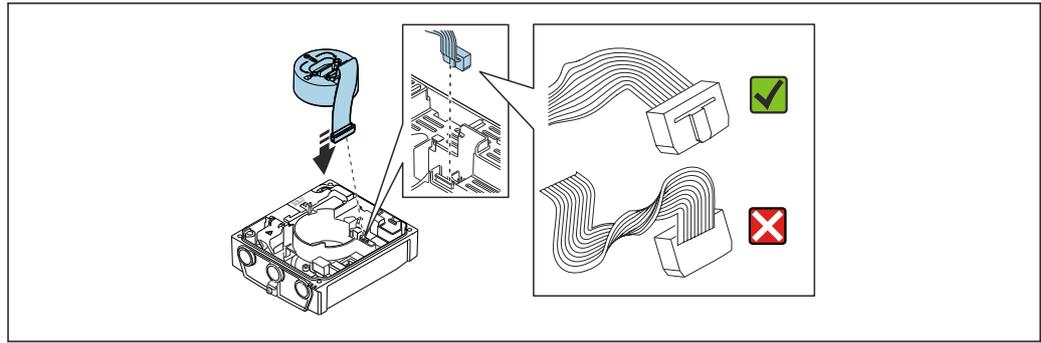
A0044279

▶ Reverse the procedure to reassemble the measuring device.

6.2.6 Mounting the external battery pack

The external battery pack is mounted in the same way as the remote version of the transmitter → 🖹 40.

6.3 Post-installation check

Is the device undamaged (visual inspection)?	❑
Does the measuring device conform to the measuring point specifications? For example: • Process temperature → 🖹 117 • Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document) • Ambient temperature • Measuring range	❑
Has the correct orientation been selected for the sensor → 🖹 27 ? • According to sensor type • According to medium temperature • According to medium properties (outgassing, with entrained solids)	❑
Does the arrow on the sensor nameplate match the actual direction of flow of the fluid through the piping → 🖹 27?	❑
Are the measuring point identification and labeling correct (visual inspection)?	❑
Is the device adequately protected from 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.

Modbus RS485

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

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	< 30 pF/m
Wire cross-section	> 0.34 mm² (22 AWG)
Cable type	Twisted pairs
Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shield	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

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 ℃ (–13 to +158 ℉)

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 ℃ (–13 to +158 ℉)
Test voltage for cable insulation	≤ AC 1433 V rms 50/60 Hz or ≥ DC 2026 V

A0029151
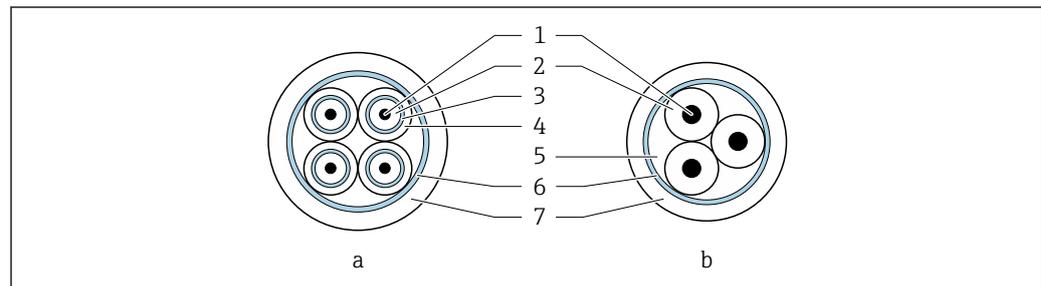
🔲 *6   Cable cross-section*

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 → 🔲 127 and EMC specifications → 🔲 116.

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.

ℹ️ 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 mm^2 (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 Proline 800 pin assignment
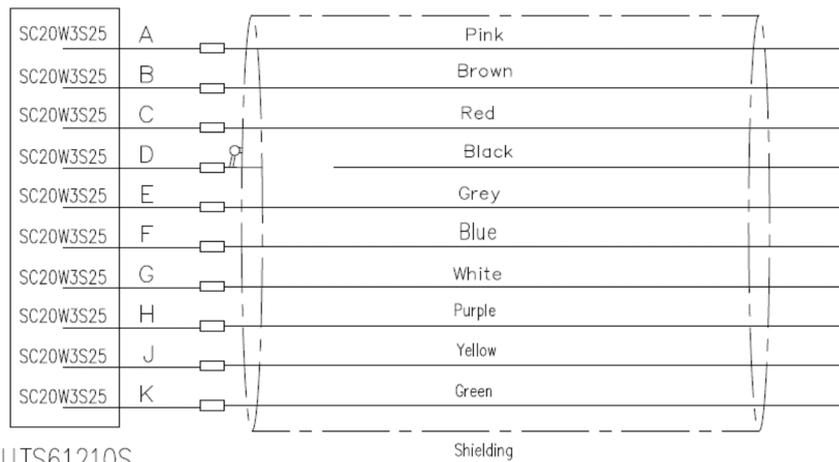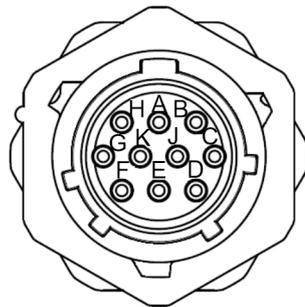
Pin	Function
A	PSO1+ (pulse/status output 1+)
B	COM (reference potential pulse/status outputs)
C	NC (not connected)
D	Earth
E	RS485_+ (Modbus B)

Pin	Function
F	RS485_- (Modbus A)
G	PSO3+ (pulse/status output 3+)
H	PSO2+ (pulse/status output 2+)
J	NC (not connected)
K	NC (not connected)

Connection methods available Outputs	Possible options for order code
Pin	**"Electrical connection"** Option **E**: MIL-DTL-26482 plug ℹ The interconnect solution on the Promag 800 with standard transmitter ensures the IP68 sealing rating level in mated conditions and also unmated conditions on the receptacle side. This plastic interconnect solution is fully intermatable with the MIL-DTL-26482 serie I. Mixing the MIL-DTL-26482 serie I (Metal) and the plastic version won't guarantee the IP68, Type 6P protection.

7.2.4   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

Signal transmission Modbus RS485

Order code for "Output" and "Input"	Terminal numbers	
	26 (+)	27 (−)
Option **M**	B	A

Remote version

A0032059
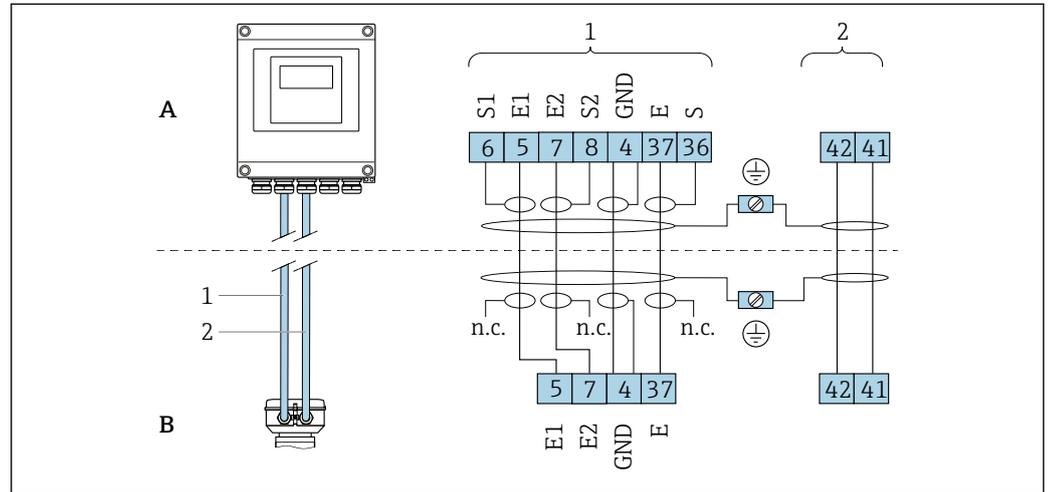
⊞ *7   Remote version terminal assignment*

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

7.2.5   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 .

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.

7.2.6   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

7.2.7   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 .

7.2.8   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
 ⊞ *8* *Engineering unit mm (in)*	 ⊞ *9* *Engineering unit mm (in)*
A = Termination of the cables B = Termination of the fine-wire cores with ferrules 1 = Red ferrules, ⌀ 1.0 mm (0.04 in) 2 = White ferrules, ⌀ 0.5 mm (0.02 in) * = Stripping only for reinforced cables	

Sensor

Electrode cable	Coil current cable

A = Termination of the cables
B = Termination of the fine-wire cores with ferrules
1 = Red ferrules, ⌀ 1.0 mm (0.04 in)
2 = White ferrules, ⌀ 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
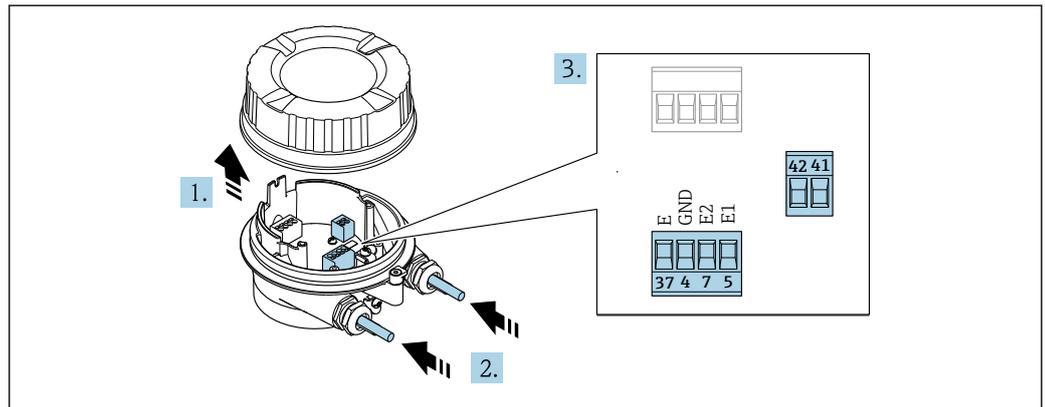
⊞ 10   Sensor: connection module

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 → 🖹 50.

5. Connect the cable according to the terminal assignment → 🖹 49.

6. Firmly tighten the cable glands.

7. **⚠ WARNING**

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

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

Reverse the procedure to reassemble the sensor.

Attaching the connecting cable to the transmitter
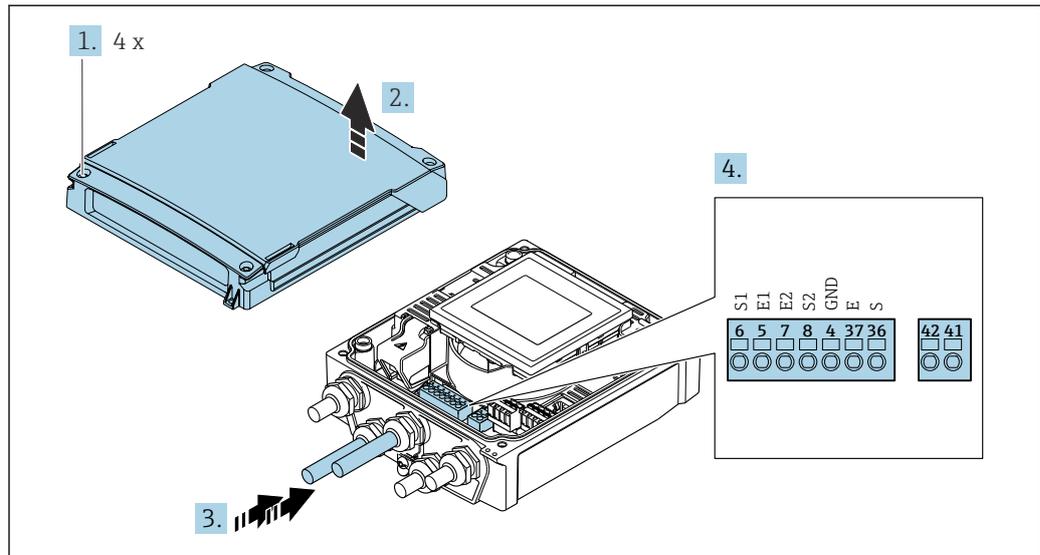
⊞ *11   Transmitter: main electronics module with terminals*

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 → 🖹 50.

5. Connect the cable in accordance with the terminal assignment → 🖹 49.

6. Firmly tighten the cable glands.

7. **⚠ WARNING**

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

    ▸ Screw in the screw without using any lubricant.

    Reverse the removal procedure to reassemble the transmitter.

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
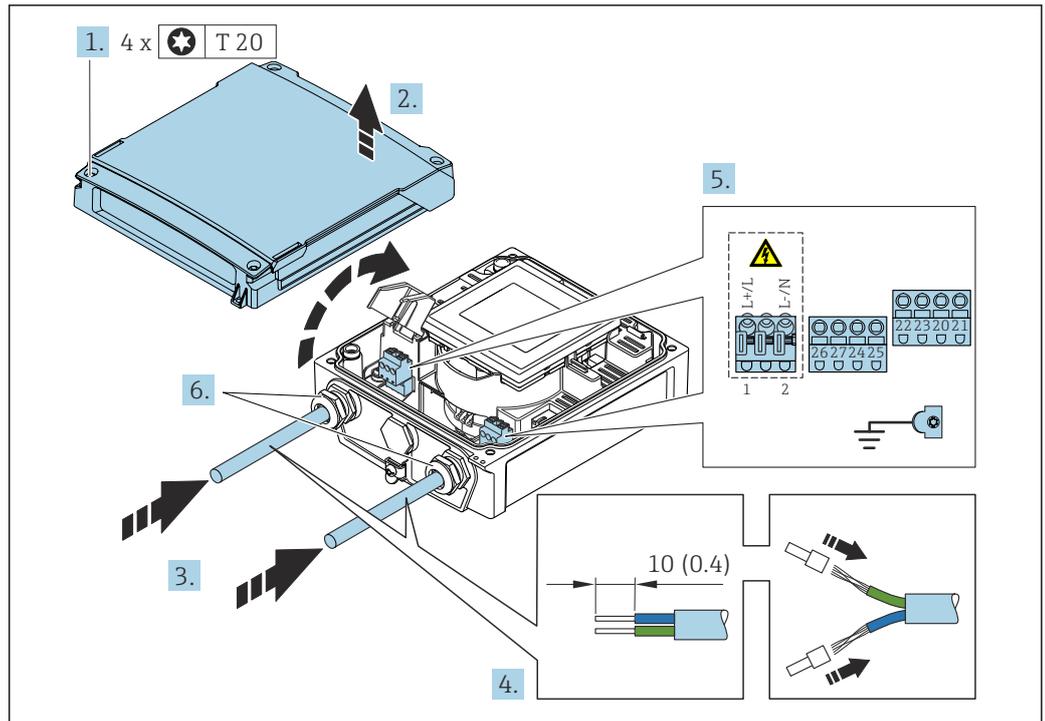
🖭 12   Connecting the supply voltage and Modbus RS485

1. Loosen the 4 fixing screws on the housing cover.

2. Open the housing cover.

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

4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.

5. Connect the cable in accordance with the terminal assignment → 🖹 48 . 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 mm² (0.0093 in²).
- For 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

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
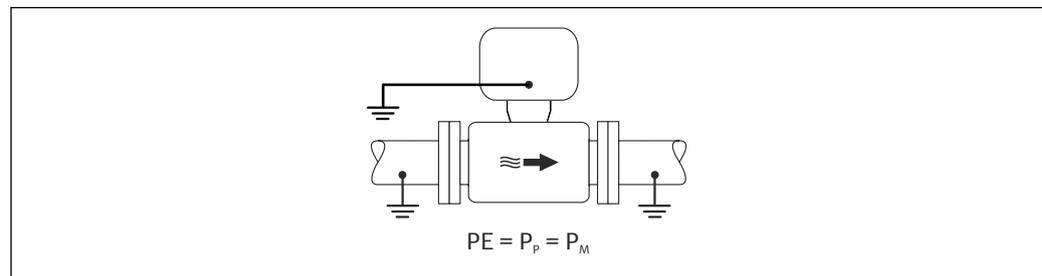
$$PE = P_P = P_M$$

A0044854

▸ Connect the connection housing of the transmitter or sensor to ground potential via 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

DN ≤ 300   DN ≥ 350

$PE = P_P = P_M$
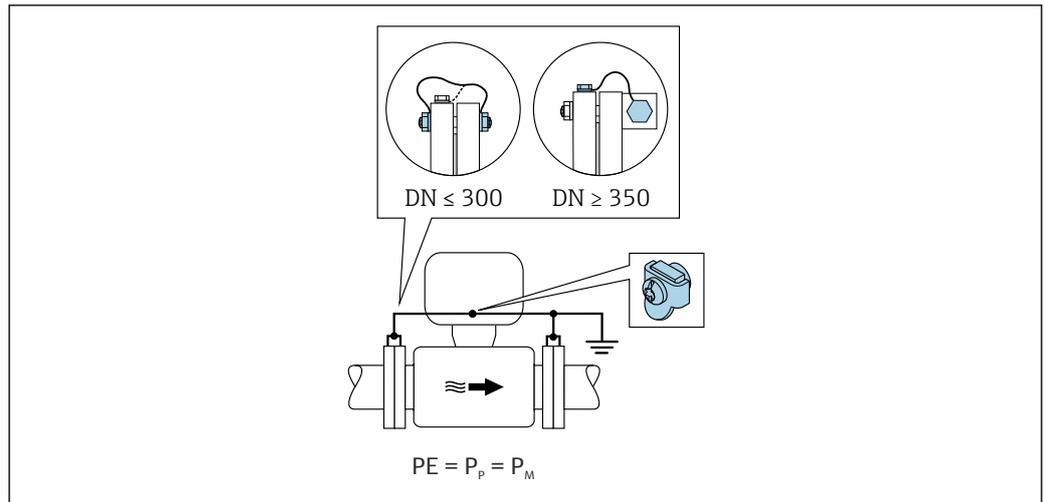
A0042089

1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.

2. Connect the connection housing of the transmitter or sensor to ground potential via the ground terminal provided for this purpose.

- For DN ≤ 300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
- 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.

$PE = P_P = P_M$
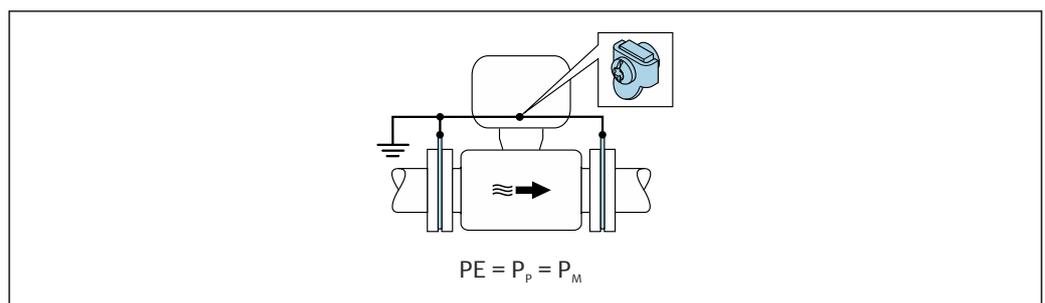
A0044856

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

$$PE \neq P_P = P_M$$

A0042253
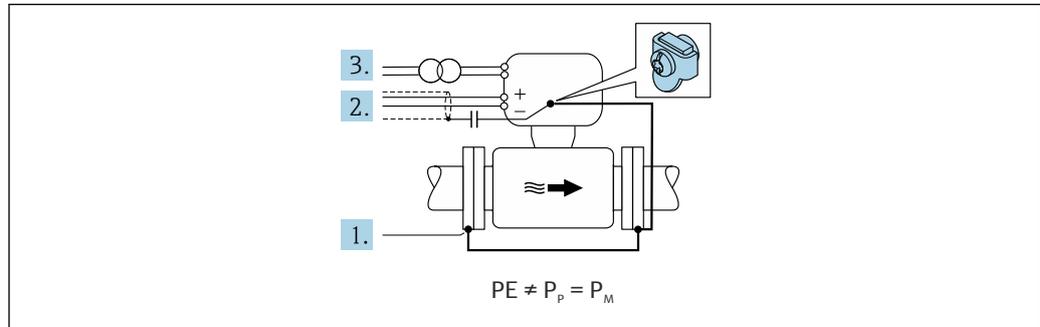
1. Connect the pipe flanges and transmitter via the ground cable.

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

7.4.1   Battery pack arrangement

A0046594
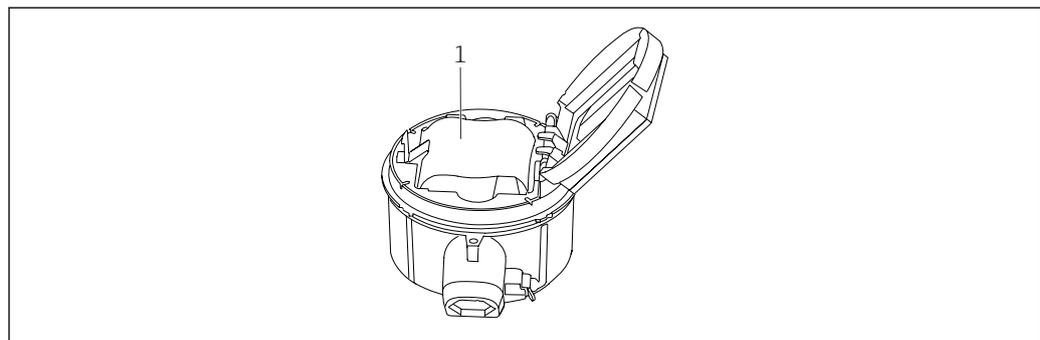
1   Battery pack

7.4.2   Inserting and connecting the battery pack

The device is delivered either with the batteries already installed, or enclosed separately, depending on national standards and guidelines. If the batteries are ready installed and connected when the device is delivered, make sure that the "B" switch is set to "On".
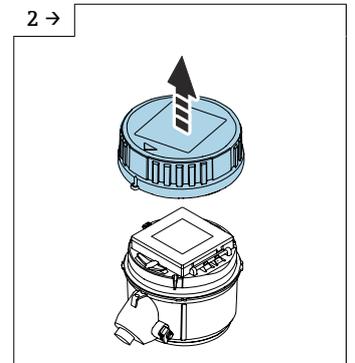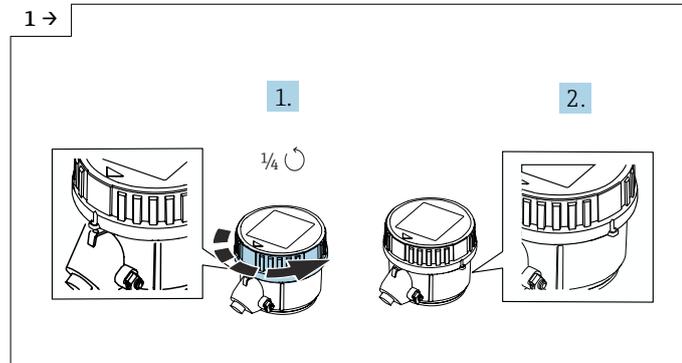
▶ Turn cover 1/4 to the right.

▶ Lift cover.
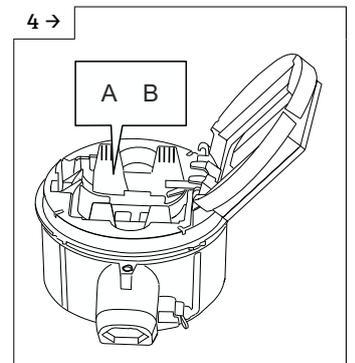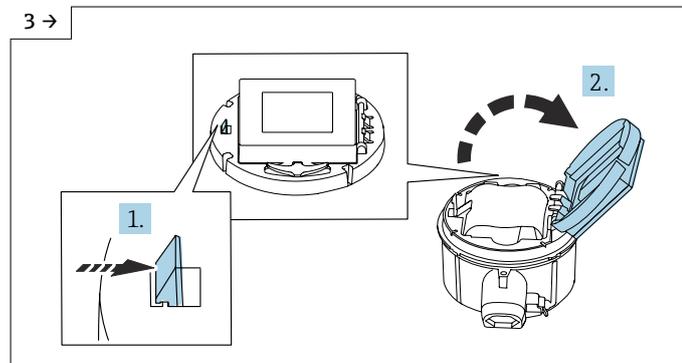
▶ Open electronics carrier cover.

▶ Switch "B" to "ON".
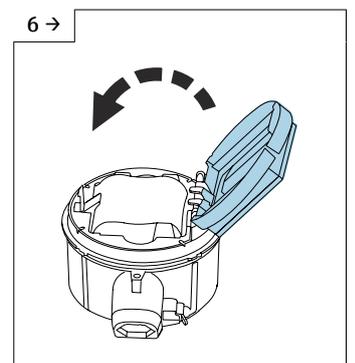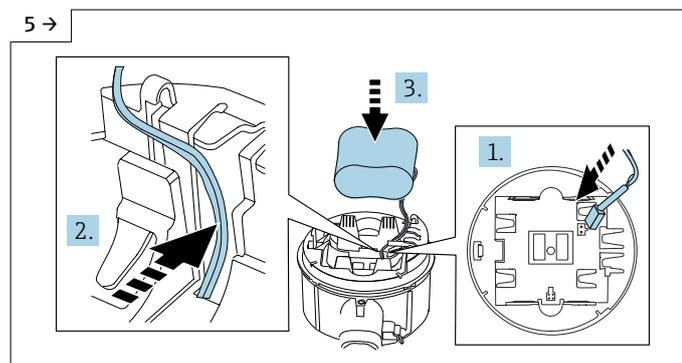
▶ Insert the plug of the battery and place the cable in the slot of the battery carrier, as shown in the graphic. Place battery in battery compartment.

▶ Close the cover of the electronics carrier.

7 →
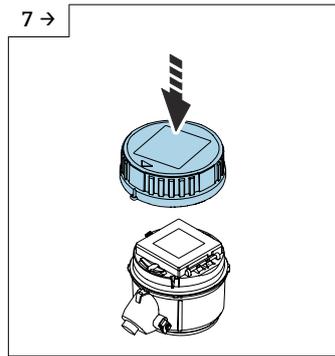
A0046727

▸ Place the cover on the transmitter housinig.

8 →

1.

¼ ↻

2.
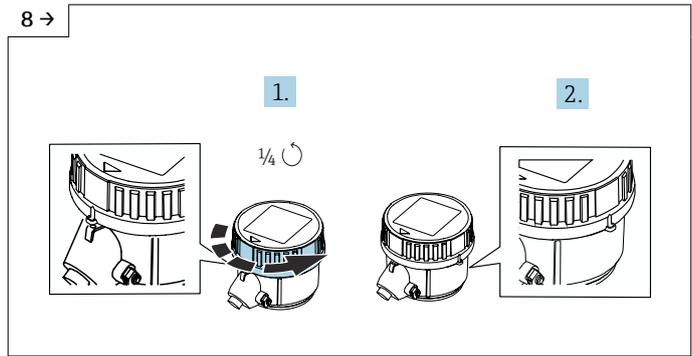
A0046655

▸ Turn cover 1/4 to the right.

9

1.

¼ ↺

2.
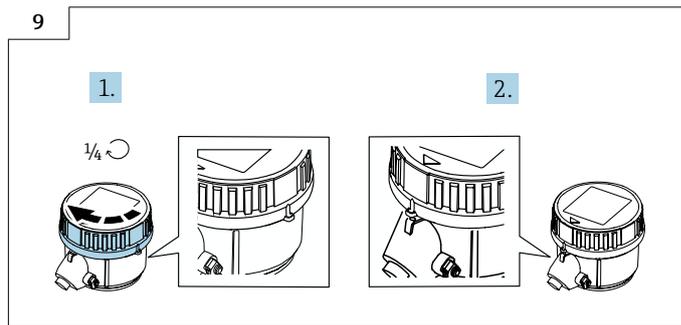
A0046735

▸ Turn cover 1/4 to the left.

7.5 Power supply via battery packs, Proline 800 - Advanced

7.5.1 Battery pack arrangement

1   2   3
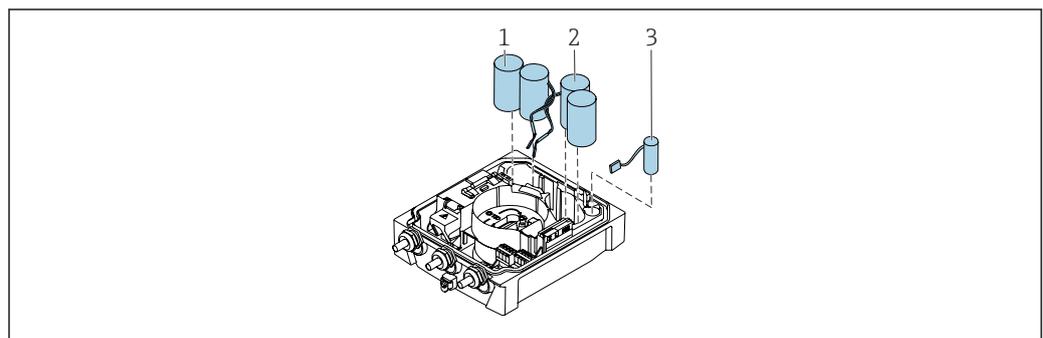
A0043704

1   Battery pack 1
2   Battery pack 2
3   Buffer capacitor

7.5.2   Inserting and connecting buffer capacitors and battery packs

ℹ️ 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.

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

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

A0042838

▶ Open the connection compartment cover.

▶ Open the display module.

▶ Set switch "B" to "ON".

A0044382

A0043823

▶ Remove the cover of the battery pack.

A0043734

A0043735

▶ Insert the buffer capacitor.

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

8 →
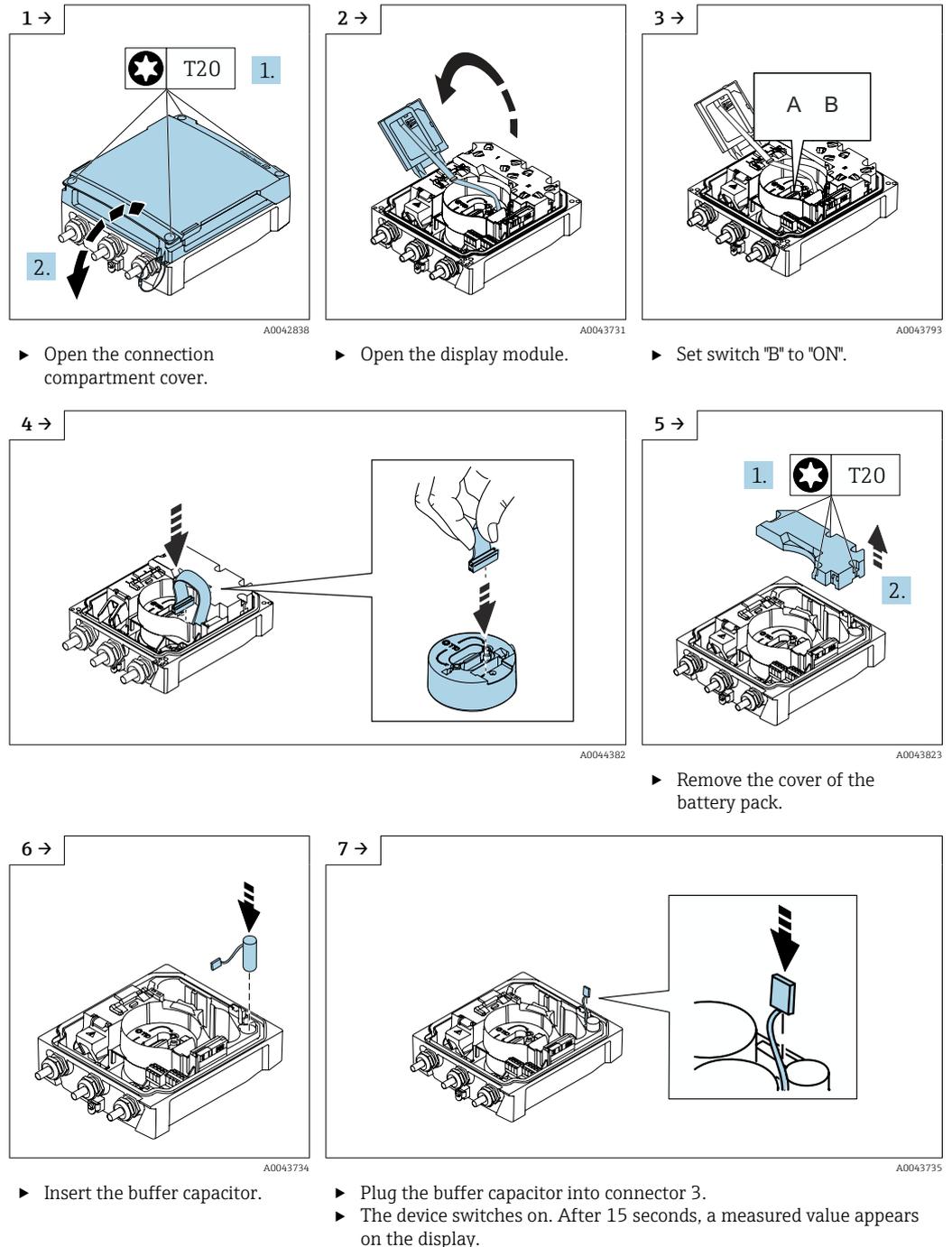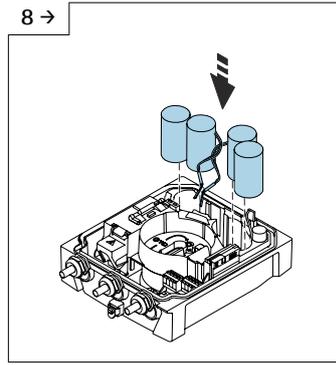
A0043732

▸ Insert battery packs 1 and 2.

9 →
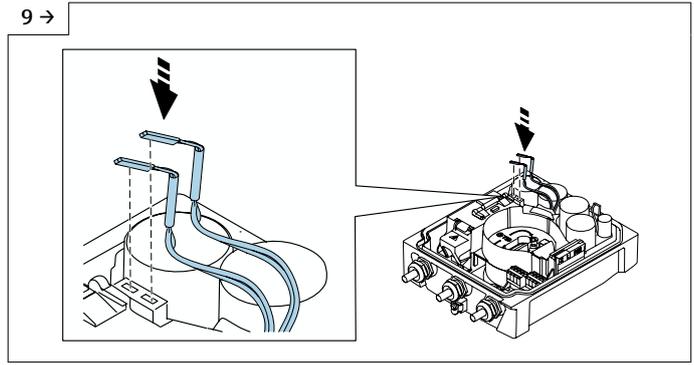
A0043733

▸ Plug the connector of battery pack 1 into connector 1.
▸ Plug the connector of battery pack 2 into connector 2.

10 →

2. ✳ T20

1.
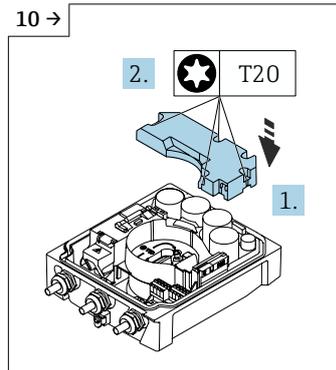
A0043736

▸ Mount the cover of the battery pack.

11 →

A0043737

▸ Close the display module.

12

✳ T20 2.

2.5 Nm (1.8 lbf ft)

1.
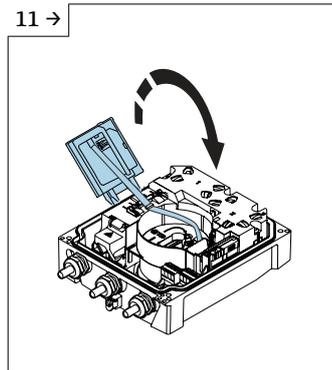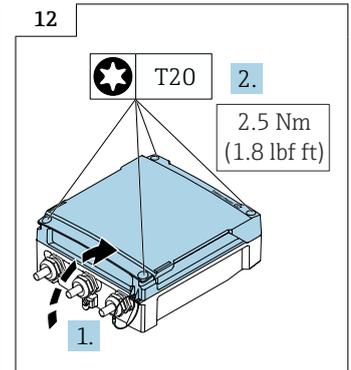
A0042855

▸ Close the connection compartment cover.

7.6   Connecting the pressure sensor, Proline 800 - Advanced
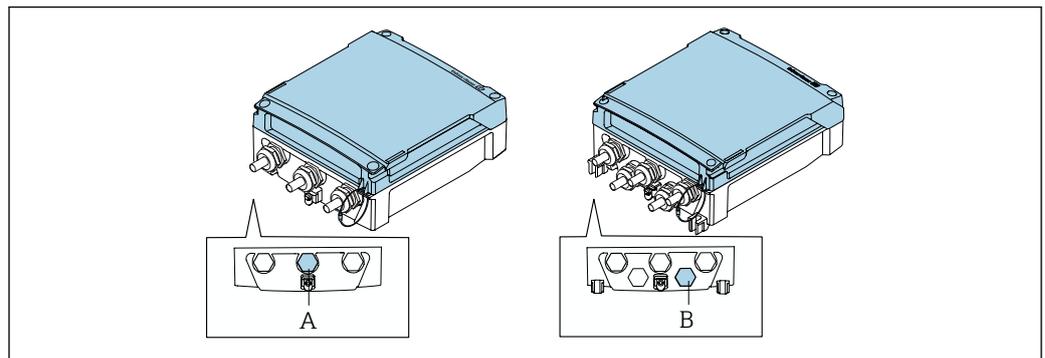
A0044314

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

▸ Connect the pressure sensor to the plug indicated.

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

7.7.1 Connecting the external battery pack

A0044313
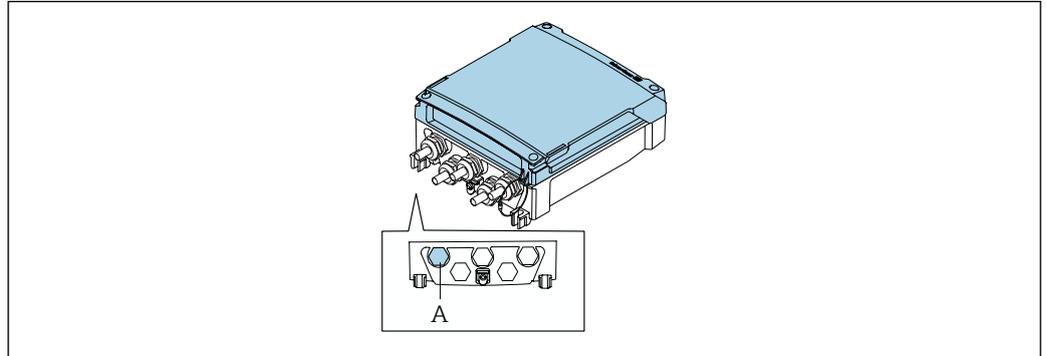
A   Plug for the external battery pack

▶ 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.

ℹ Observe the specified temperature range of the batteries.
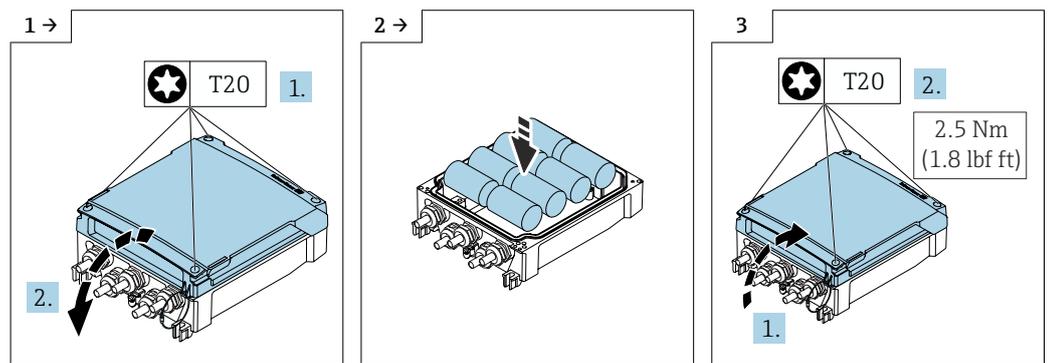
▶ Open the connection compartment cover.

▶ Insert new batteries.

▶ Close the connection compartment cover.

ℹ 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
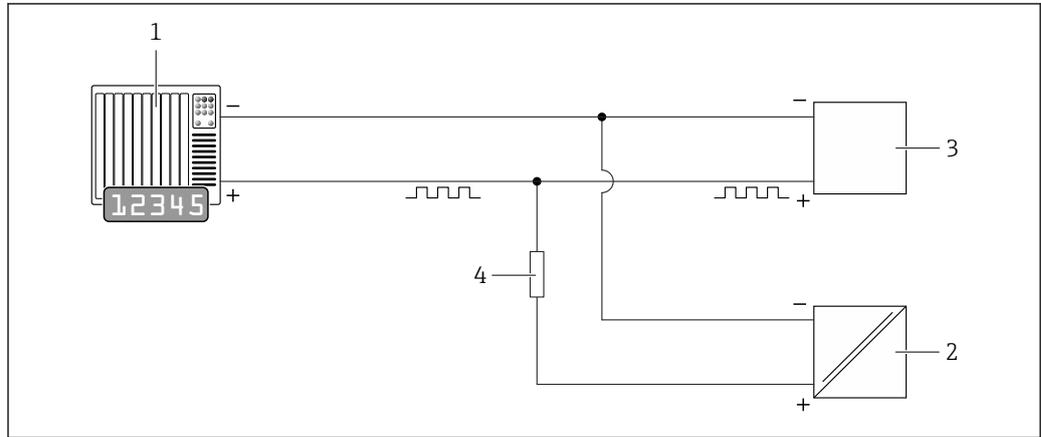
⊞ *13   Connection example for pulse output (passive)*

1   Automation system with pulse input (e.g. PLC)
2   External DC power supply (e.g. 24 VDC)
3   Open collector pulse input of the transmitter: observe input values → ▤ 107
4   Pull-up resistor (e.g. 10 kOhm)
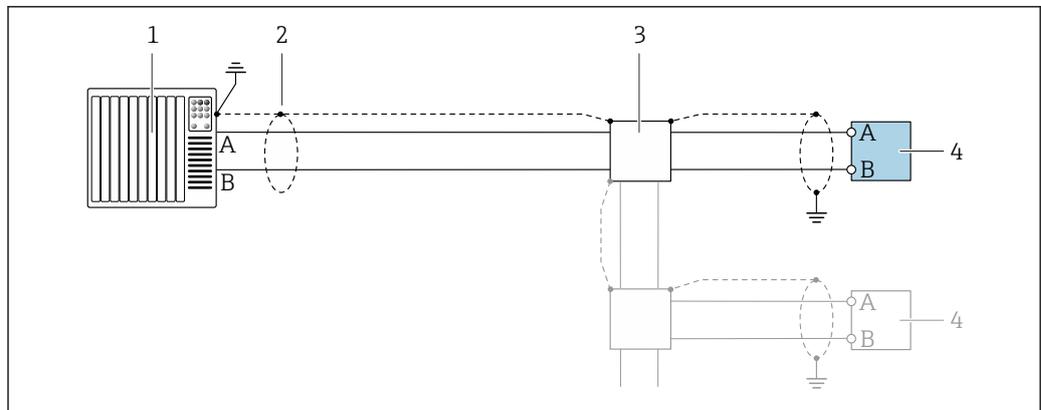
Modbus RS485

⊞ *14   Connection example for Modbus RS485, non-hazardous area*

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

7.9   Hardware settings

7.9.1   Enabling the terminating resistor

Modbus RS485

To avoid incorrect communication transmission caused by impedance mismatch, terminate the Modbus RS485 cable correctly at the start and end of the bus segment.
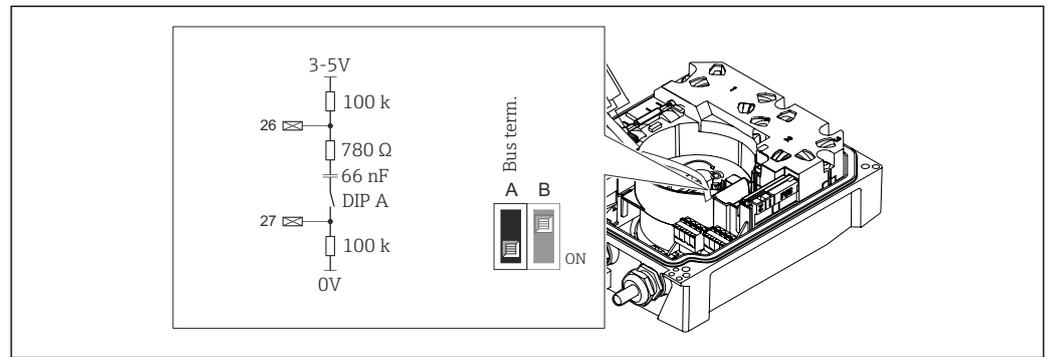
⊞ 15   Terminating resistor can be enabled via DIP switch on the electronics module

ℹ️ If the device is not powered via an external mains voltage (only possible with order code for "Energy supply", option K "100-240VAC/ 19-30VDC, lithium battery" and option S "100-240VAC/19-30VDC, w/o battery"), switch "A" must always be set to "ON".

7.10   Ensuring the degree of protection

7.10.1   Degree of protection IP68, Type 6P enclosure or IP66/67, Type 4X enclosure - Proline 800

Depending on the version, the sensor meets all the requirements of IP68 degree of protection, Type 6P enclosure or IP66/67, Type 4X enclosure → 🖺 115.

To guarantee IP68 degree of protection, Type 6P enclosure or IP67, Type 4X enclosure, carry out the following steps after the electrical connection:

1. Check that the housing seal is clean and fitted correctly. Dry, clean or replace the seals if necessary.

2. Tighten the housing cover until the triangular marks on the cover point to one another exactly.

3. Tighten the bayonet lock on the connection plug until it engages into place.

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

Depending on the version, the sensor meets all the requirements of IP68 protection, Type 6P enclosure → 🖺 115 and can be used as a remote device version .

The degree of protection of the transmitter is always only IP66/67, Type 4X enclosure and the transmitter must be treated accordingly → 🖺 66.

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

1. Firmly tighten the cable glands (torque: 2 to 3.5 Nm) until there is no gap between the bottom of the cover and the housing support surface.

2. Firmly tighten the union nut of the cable glands.

3. Pot the field housing with a potting compound.

4. Check that the housing seals are clean and fitted correctly. Dry, clean or replace the seals if necessary.

5. Tighten all housing screws and screw covers (torque: 20 to 30 Nm).

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

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

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

1. Check that the housing seals are clean and fitted correctly. Dry, clean or replace the seals if necessary.

2. Tighten all housing screws and screw covers.

3. Firmly tighten the cable glands.

4. To ensure that moisture does not enter the cable entry, route the cable so that it loops down before the cable entry ("water trap").
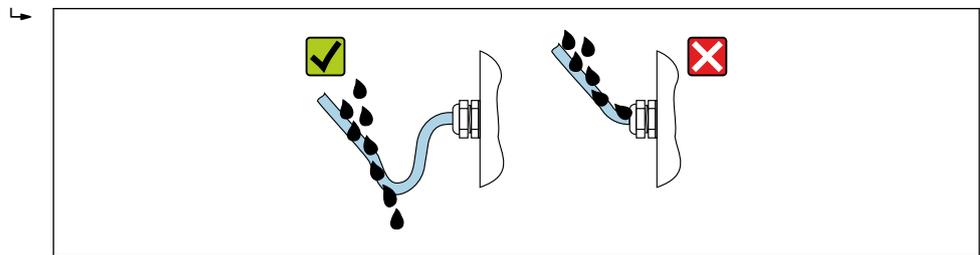
A0029278

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.

7.11 Post-connection check

Are cables or the device undamaged (visual inspection)?	❑
Do the cables comply with the requirements?	❑
Do the mounted cables have adequate strain relief?	❑
Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" ?	❑
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?	❑
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 ?	❑
Are all housing covers installed and the screws tightened with the correct tightening torque?	❑

8 Operation options

8.1 Overview of operation options
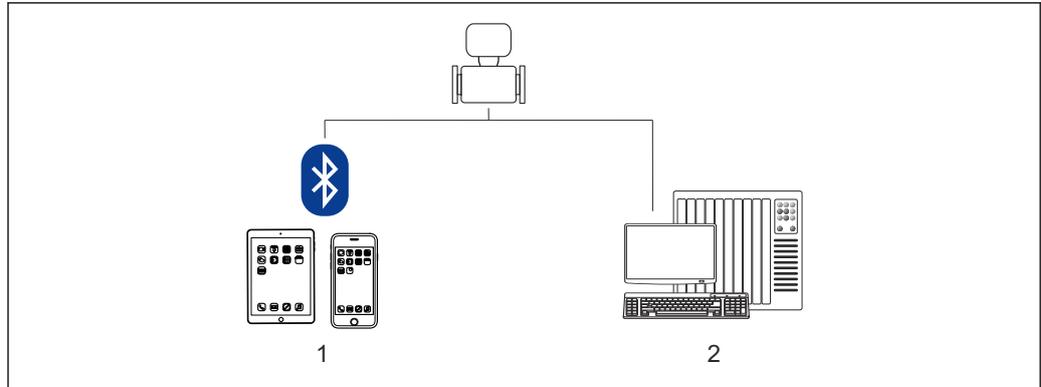
1   Smartphone/tablet (via SmartBlue)
2   Computer (via Modbus)

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.
   ↳ 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

Firmware version	01.00.zz	▪ On the title page of the Operating Instructions ▪ On the transmitter nameplate ▪ Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	12.2020	---

For an overview of the various firmware versions for the device → 🖺 93

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.

Operating tool via service interface (SmartBlue)	Sources for obtaining device descriptions
SmartBlue app	ANDROID APP ON Google Play Download on the App Store A0033202
DeviceCare	▪ www.endress.com → Download Area ▪ CD–ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)

9.2   Modbus RS485 information

9.2.1   Function codes

Function codes are used to define which read or write action is carried out via the Modbus protocol. The measuring device supports the following function codes:

Code	Name	Description	Application
03	Read holding register	Master reads one or more Modbus registers from the device. A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes ⓘ The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.	Read device parameters with read and write access Example: Read volume flow
04	Read input register	Master reads one or more Modbus registers from the device. A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes ⓘ The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.	Read device parameters with read access Example: Read totalizer value
06	Write single registers	Master writes a new value to **one** Modbus register of the measuring device. ⓘ Use function code 16 to write multiple registers with just 1 telegram.	Write only 1 device parameter Example: reset totalizer
08	Diagnostics	Master checks the communication connection to the measuring device. The following "Diagnostics codes" are supported: • Sub-function 00 = Return query data (loopback test) • Sub-function 02 = Return diagnostics register	
16	Write multiple registers	Master writes a new value to multiple Modbus registers of the device. A maximum of 120 consecutive registers can be written with 1 telegram. ⓘ If the required device parameters are not available as a group, yet must nevertheless be addressed with a single telegram, use Modbus data map → 🖹 73	Write multiple device parameters
23	Read/Write multiple registers	Master reads and writes a maximum of 118 Modbus registers of the measuring device simultaneously with 1 telegram. Write access is executed **before** read access.	Write and read multiple device parameters Example: • Read mass flow • Reset totalizer

ⓘ Broadcast messages are only allowed with function codes 06, 16 and 23.

9.2.2 Register information

📖 For an overview of device parameters with their respective Modbus register information, please refer to the "Modbus RS485 register information" section in the "Description of device parameters" documentation .

9.2.3   Response time

Response time of the measuring device to the request telegram of the Modbus master: typically 3 to 5 ms

Modbus RS485 power save mode

If the device is not powered via an external mains voltage (only possible with order code for "Energy supply", option K "100-240VAC/ 19-30VDC, lithium battery" and option S "100-240VAC/19-30VDC, w/o battery"), the Modbus-RS485 circuit on the transmitter, i.e. the slave, is deactivated between two communication cycles in order to save energy. To activate the circuit and communicate with the slave, a retry function must be provided in the Modbus master which resends a telegram to the slave if no response is received. In addition, DIP switch A on the electronics module must be set to "ON". → 🕮 13

The first telegram sent by the master first activates the Modbus RS485 circuit on the slave. After a certain period of time, specified by the master, in which the slave does not send a reply, the master sends a retry message with the same content. The slave can interpret and reply to this telegram. The Modbus-RS485 circuit is deactivated again afterwards.

This approach is particularly suitable for low data throughput rates and point-to-point connections. Power supply via the mains voltage is recommended for high data throughput rates and bus networks.

9.2.4   Data types

FLOAT • Floating point numbers IEEE 754 • Data length = 4 bytes (2 registers)			
Byte 3	Byte 2	Byte 1	Byte 0
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
S = sign, E = exponent, M = mantissa			

INTEGER Data length = 2 bytes (1 register)	
Byte 1	Byte 0
Most significant byte (MSB)	Least significant byte (LSB)

STRING • Data length = depends on device parameter • Example of a device parameter with a data length = 18 bytes (9 registers)				
Byte 17	Byte 16	...	Byte 1	Byte 0
Most significant byte (MSB)		...		Least significant byte (LSB)

9.2.5   Byte transmission sequence

Byte addressing, i.e. the transmission sequence of the bytes, is not specified in the Modbus specification. It is necessary to coordinate the addressing method between the master and slave during commissioning. This can be configured in the device using the **Byte order** parameter.

The bytes are transmitted depending on the selection in the **Byte order** parameter:

FLOAT				
Selection	Sequence			
	1.	2.	3.	4.
1 – 0 – 3 – 2 *	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)
0 – 1 – 2 – 3	Byte 0 (MMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)
2 – 3 – 0 – 1	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 0 (MMMMMMMM)	Byte 1 (MMMMMMMM)
3 – 2 – 1 – 0	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)
* = factory setting, S = sign, E = exponent, M = mantissa				

INTEGER		
Selection	Sequence	
	1.	2.
1 – **0** – 3 – 2 * 3 – 2 – **1** – **0**	Byte 1 (MSB)	Byte 0 (LSB)
0 – **1** – 2 – 3 2 – 3 – **0** – **1**	Byte 0 (LSB)	Byte 1 (MSB)
* = factory setting, MSB = most significant byte, LSB = least significant byte		

STRING Example of a device parameter with a data length = 18 bytes (9 registers)					
Selection	Sequence				
	1.	2.	...	17.	18.
1 – **0** – 3 – 2 * 3 – 2 – **1** – **0**	Byte 17 (MSB)	Byte 16	...	Byte 1	Byte 0 (LSB)
0 – **1** – 2 – 3 2 – 3 – **0** – **1**	Byte 16	Byte 17 (MSB)	...	Byte 0 (LSB)	Byte 1
* = factory setting, MSB = most significant byte, LSB = least significant byte					

9.2.6   Modbus data map

Function of the Modbus data map

The device offers a special memory area, the Modbus data map (for a maximum of 16 device parameters), to allow users to call up multiple device parameters via Modbus RS485 and not only individual device parameters or a group of consecutive device parameters.

Grouping of device parameters is flexible and the Modbus master can read or write to the entire data block simultaneously with a single request telegram.

Structure of the Modbus data map

The Modbus data map consists of two data sets:
- Scan list: Configuration area
  The device parameters to be grouped are defined in a list by entering their Modbus RS485 register addresses in the list.
- Data area
  The measuring device reads out the register addresses entered in the scan list cyclically and writes the associated device data (values) to the data area.

For an overview of device parameters with their respective Modbus register information, please refer to the "Modbus RS485 register information" section in the "Description of device parameters" documentation .

Scan list configuration

For configuration, the Modbus RS485 register addresses of the device parameters to be grouped must be entered in the scan list. Please note the following basic requirements of the scan list:

Max. entries	16 device parameters
Supported device parameters	Only parameters with the following characteristics are supported: • Access type: read or write access • Data type: float or integer

Configuration of the scan list via SmartBlue or DeviceCare

Application → Communication → Modbus data map → Scan list register 0 to 15

Scan list	
No.	**Configuration register**
0	Scan list register 0
...	...
15	Scan list register 15

Configuration of the scan list via Modbus RS485

Carried out using register addresses 5001 - 5016

Scan list			
No.	**Modbus RS485 register**	**Data type**	**Configuration register**
0	5001	Integer	Scan list register 0
...	...	Integer	...
15	5016	Integer	Scan list register 15

Reading out data via Modbus RS485

The Modbus master accesses the data area of the Modbus data map to read out the current values of the device parameters defined in the scan list.

Master access to data area	Via register addresses 5051-5081

Data area				
Device parameter value	**Modbus RS485 register**		**Data type***	**Access****
	Start register	**End register (Float only)**		
Value of scan list register 0	5051	5052	Integer/float	Read/write
Value of scan list register 1	5053	5054	Integer/float	Read/write
Value of scan list register ...	...	...	...	...
Value of scan list register 15	5081	5082	Integer/float	Read/write

* Data type depends on the device parameters entered in the scan list.
** Data access depends on the device parameters entered in the scan list. If the device parameter entered supports read and write access, the parameter can also be accessed via the data area.

10 Commissioning

10.1 Function check

Before commissioning the measuring device:

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

- "Post-installation check" checklist
- "Post-connection check" checklist

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 → 🖹 68

10.2.2 Connect the SmartBlue App to the device

Log in → 🖹 69

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 made will be saved. For this reason, the device may be in an undefined state!
In this case, a reset to the default settings is recommended.

1. Open the **Guidance** menu.

2. Start the **Commissioning** wizard.

3. Follow the instructions in the **SmartBlue App**.
   ↳ The configuration is completed.

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 → 🖹 76
- Write protection via write protection switch → 🖹 13

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 securing 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 securing screws!
Risk of damaging the plastic transmitter.
▸   Tighten the securing screws as per the tightening torque .

Reverse the removal procedure to reassemble the transmitter.

11   Operation

11.1   Wake on Touch

If you touch the display for 5 seconds the device displays measured values and status information.
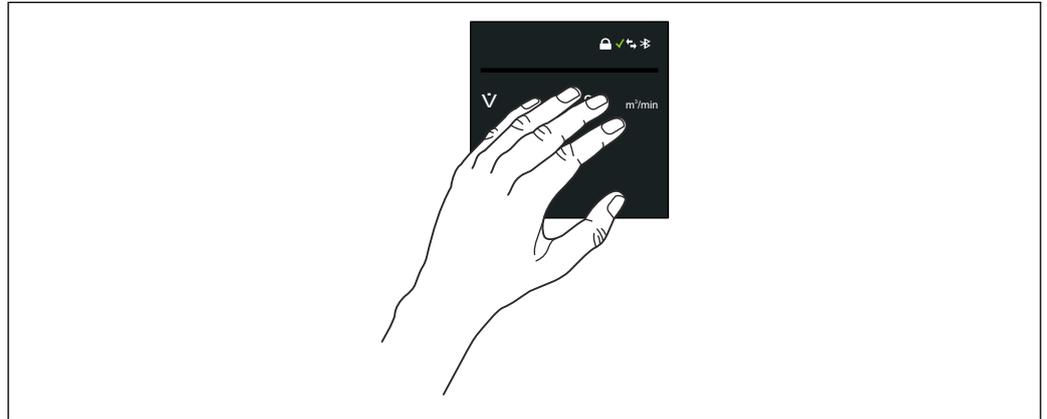
A0043867

🔒	**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.
▽	**Functional test** • Device is in the service mode, e.g. during a simulation. • Output signal is temporarily invalid.
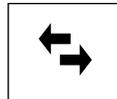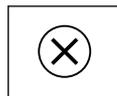
11.2   Adapting the measuring device to the process conditions

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

📖 Detailed information on "**Guidance** menu" and "**Application** menu": Device parameters → 🖹 128

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

ℹ The disabling of the interface can only be undone using Wake on Touch → 🖹 79.

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

▶ Software configuration	
Activate SW option	→ 🖹 81
Software option overview	→ 🖹 81

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.

12   Diagnostics and troubleshooting

12.1   General troubleshooting

For local display

Error	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 → 🗎 54.
	Supply voltage has incorrect polarity.	Correct the polarity.
	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 → 🗎 79.

For output signals

Error	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🗎 100.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Parametrization errors	Check parameterization and correct it.
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 LiveList on smartphone or tablet	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 with 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
No write access to parameters	Hardware write protection enabled	Set the write protection switch on the back of the display to the **ON** position → 🖹 13.
No write access to parameters	Current user role has limited access authorization	1. Check user role . 2. Enter correct customer-specific access code .
No connection via Modbus RS485	Modbus RS485 bus cable connected incorrectly	Check the terminal assignment → 🖹 48.
No connection via Modbus RS485	In battery mode, switch A, which is located under the electronics module, is set to the "OFF" position.	Set switch A to "ON".
No connection via Modbus RS485	In battery mode, the device is in the power save mode.	Add the missing master message to wake the device from the power save mode → 🖹 72.
No connection via Modbus RS485	Modbus RS485 cable incorrectly terminated	Check the terminating resistor → 🖹 65.
No connection via Modbus RS485	Incorrect settings for the communication interface	Check the Modbus RS485 configuration .

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.

Functional test

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

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

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** • The 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. • IO1/IO2 overload • 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   Diagnostic information via communication interface

12.3.1   Reading out diagnostic information

Diagnostic information can be read out via Modbus RS485 register addresses.

• Via register address **6801** (data type = string): diagnosis code, e.g. F270
• Via register address **6821** (data type = string): diagnosis code, e.g. F270

   For an overview of diagnostic events with diagnosis number and diagnosis code

12.3.2   Configuring error response mode

The error response mode for Modbus RS485 communication can be configured in the **Communication** submenu using 2 parameters.

Navigation path
Application → Communication

Parameter overview with brief description

Parameters	Description	Selection	Factory setting
Failure mode	Select measured value output behavior when a diagnostic message occurs via Modbus communication. [i] The effect of this parameter depends on the option selected in the **Assign diagnostic behavior** parameter.	• NaN value • Last valid value [i] NaN ≡ not a number	NaN value

12.4   Adapting the diagnostic information

12.4.1   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 via Modbus RS485 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 via Modbus RS485 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.

12.5   Overview of diagnostic information

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

[i] In the case of some items of diagnostic information, the diagnostic behavior can be changed. Adapting the diagnostic information → 🖹 86

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of sensor				
082	Data storage inconsistent	1. Check module connections 2. Contact service	F	Alarm
083	Memory content inconsistent	1. Restart device 2. Restore HistoROM S-DAT backup ('Device reset' parameter) 3. Replace HistoROM S-DAT	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
169	Conductivity measurement failed	1. Check grounding conditions 2. Deactivate conductivity measurement	M	Warning
170	Coil resistance faulty	Check ambient and process temperature	F	Alarm
181	Sensor connection faulty	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	F	Alarm
Diagnostic of electronic				
201	Electronics faulty	1. Restart device 2. Replace electronics	F	Alarm
242	Firmware incompatible	1. Check firmware version 2. Flash or replace electronic module	F	Alarm
245	Firmware update failed	1. Retry firmware update 2. Replace celluar radio module	M	Warning
252	Module incompatible	1. Check electronic modules 2. Check if correct modules are available (e.g. NEx, Ex) 3. Replace electronic modules	F	Alarm
270	Electronic module defective	Replace electronic module	F	Alarm
271	Electronic module faulty	1. Restart device 2. Replace electronic module	F	Alarm
272	Electronic module faulty	Restart device	F	Alarm
273	Electronic module defective	Change electronics	F	Alarm
278	Display module defective	Replace display module	F	Alarm
283	Memory content inconsistent	1. Reset device 2. Contact service	F	Alarm
302	Device verification active	Device verification active, please wait.	C	Warning
311	Electronic module faulty	1. Do not reset device 2. Contact service	M	Warning
331	Firmware update failed in module 1 to n	1. Update firmware of device 2. Restart device	F	Warning
372	Electronic module faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	F	Alarm
376	Electronic module faulty	1. Replace electronic module 2. Turn off diagnostic message	S	Warning [1]
378	Electronic module supply voltage faulty	1. Restart device 2. Check if failure recurs 3. Replace electronic module	F	Alarm
383	Memory content	1. Restart device 2. Delete T-DAT via 'Reset device' parameter 3. Replace T-DAT	F	Alarm
387	HistoROM data faulty	Contact service organization	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of configuration				
410	Data transfer failed	1. Check connection 2. Retry data transfer	F	Alarm
412	Processing download	Download active, please wait	C	Warning
417	Communication network not available	1. Check communication network 2. Check cellular radio antenna 3. Check network subscription	M	Warning
418	Software shutdown successfully	Disconnect the power supply of the device	F	Alarm
425	Communication certificate faulty	Replace affected certificate	M	Warning
437	Configuration incompatible	1. Restart device 2. Contact service	F	Alarm
438	Dataset different	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
443	Pulse output 1 to n faulty	1. Check process 2. Check pulse output settings	S	Warning [1]
453	Flow override active	Deactivate flow override	C	Warning
465	SIM card defective	1. Check SIM card 2. Replace SIM card	M	Warning
484	Failure mode simulation active	Deactivate simulation	C	Alarm
485	Process variable simulation active	Deactivate simulation	C	Warning
493	Pulse output simulation active	Deactivate pulse output simulation	C	Warning
495	Diagnostic event simulation active	Deactivate simulation	C	Warning
511	Electronic module settings faulty	1. Check measuring period and integration time 2. Check sensor properties	C	Alarm
531	Empty pipe adjustment faulty	Execute EPD adjustment	S	Warning
540	Custody transfer mode failed	1. Power off device and toggle DIP switch 2. Deactivate custody transfer mode 3. Reactivate custody transfer mode 4. Check electronic components	F	Alarm
Diagnostic of process				
810	Server connection failed	Check server	M	Warning
832	Electronics temperature too high	Reduce ambient temperature	S	Warning [1]
833	Electronics temperature too low	Increase ambient temperature	S	Warning [1]
842	Process value above limit	Low flow cut off active! 1. Check low flow cut off configuration	S	Warning [1]
890	Battery low	Prepare battery replacement	C	Warning

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
891	Battery empty	Replace battery	M	Warning
938	EMC interference	1. Check ambient conditions regarding EMC influence 2. Turn off diagnostic message	F	Alarm [1]
955	Flow limit exceeded	Check process	S	Warning [1]
956	Pressure limit exceeded	Check process	S	Warning [1]
957	Time-dependent flow limit exceeded	Check process	S	Warning [1]
958	Time-dependent pressure limit exceeded	Check process	S	Warning [1]
959	Event at status input detected	Check triggering signal path	C	Warning [1]
960	Battery lifetime is less than 180 days	Replace batteries	C	Warning [1]
961	Electrode potential out of specification	1. Check process conditions 2. Check ambient conditions	S	Warning [1]
962	Pipe empty	1. Perform full pipe adjustment 2. Perform empty pipe adjustment 3. Turn off empty pipe detection	S	Warning [1]

1)   Diagnostic behavior can be changed.

12.6   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 → 🗎 90

Navigation
"Diagnostics" menu → Active diagnostics

▸ Active diagnostics

Actual diagnostics   → 🗎 90

Timestamp   → 🗎 90

Previous diagnostics   → 🗎 90

Timestamp   → 🗎 90

Operating time from restart   → 🗎 90

Operating time   → 🗎 90

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)

12.7   Diagnostic 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

12.8   Event logbook

12.8.1   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 → Event list

100 event messages can be displayed in chronological order.

The event history includes entries for:
• Diagnostic events → 🗐 86
• Information events → 🗐 91

In addition to the operation time of its occurrence, each event is also assigned a symbol that indicates whether the event has occurred or is ended:
• Diagnostic 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 → 🗐 90

12.8.2   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)

12.8.3 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
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

Info number	Info name
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

12.9   Resetting the measuring device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter (→ 🖹 92).

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

12.10   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

Parameter	Description	User interface
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

12.11   Firmware history

Release date	Firmware version	Firmware changes	Documentation type	Documentation
03.2021	01.00.zz	Original firmware	Operating Instructions	BA02043D/06/EN/01.21

13   Maintenance

13.1   Maintenance tasks

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 seals.

⚠ 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 transmitter 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.

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

ℹ Replace the battery pack if a diagnostic message is output.

ℹ Observe the specified temperature range of the batteries.

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 without any loss of data.
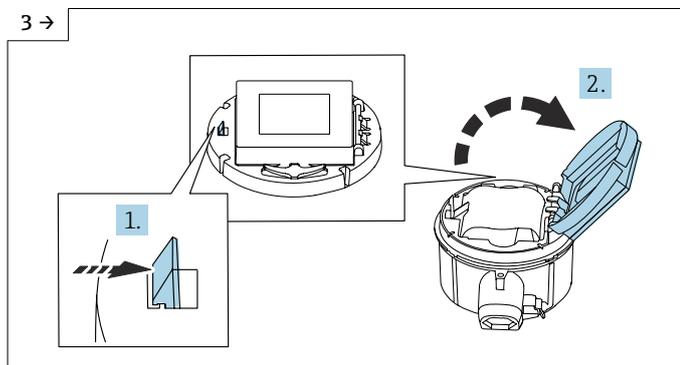6. Replace the empty battery pack.
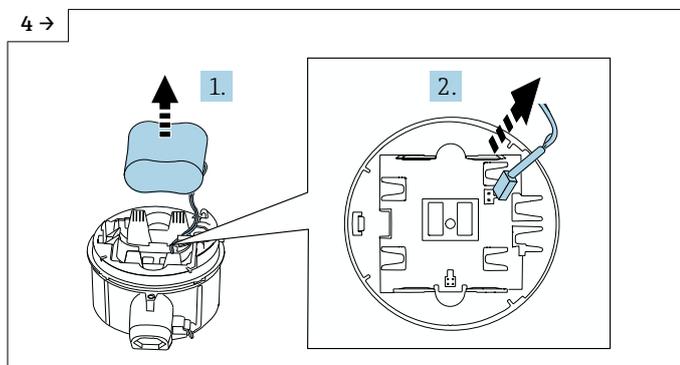
Replacing the empty battery pack - Promag 800
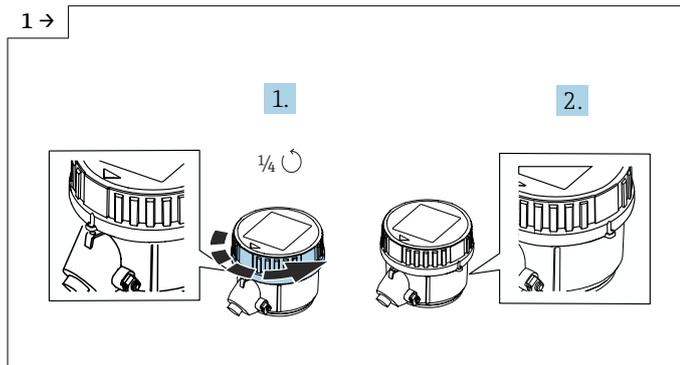
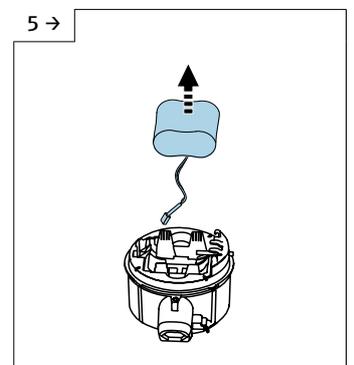▸ Turn the cover to the right by a 1/4 turn.
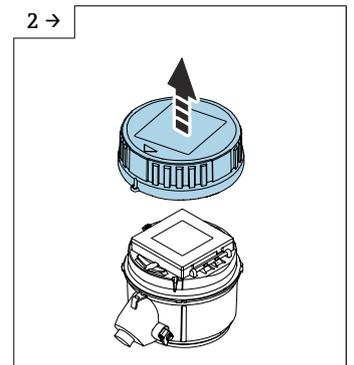
▸ Lift off the cover.

▸ Open the cover of the electronics carrier.

▸ Take the battery out of the battery compartment (it is still attached, however) and disconnect the battery plug.

▸ Now remove the battery from the battery compartment entirely.
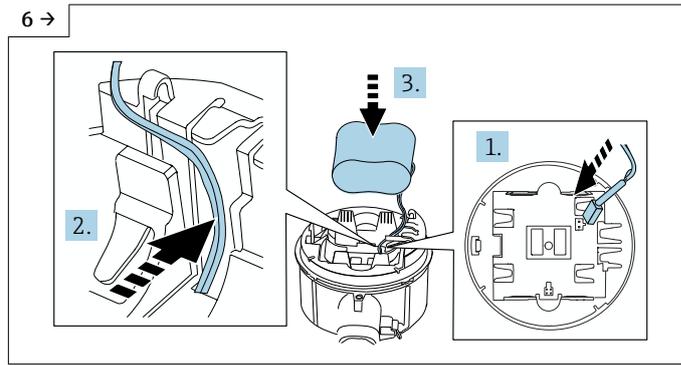
A0046733

▶ Insert the battery plug and place the cable in the recess of the battery carrier as shown in the graphic. Place the battery in the battery compartment.
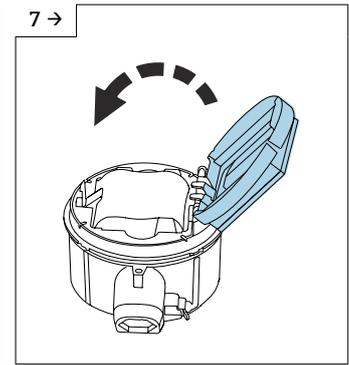
A0046744

▶ Close the cover of the battery carrier.
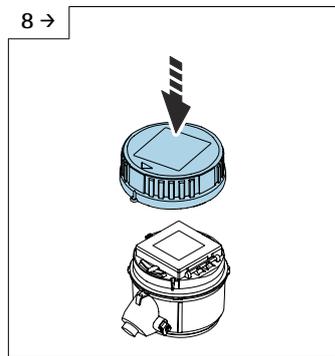
A0046727

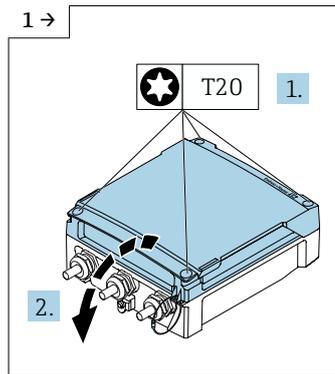▶ Fit the cover on the transmitter housing.
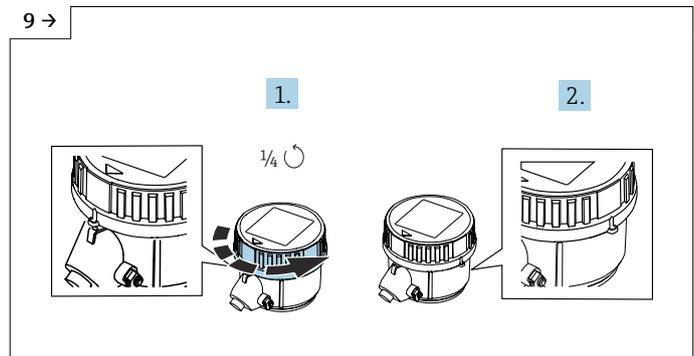
A0046655
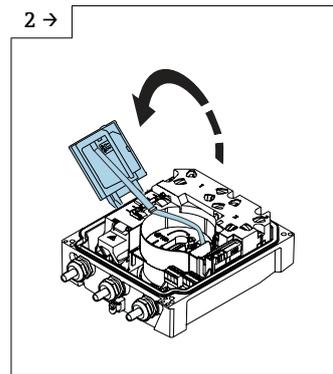
▶ Turn the cover to the right by a 1/4 turn.
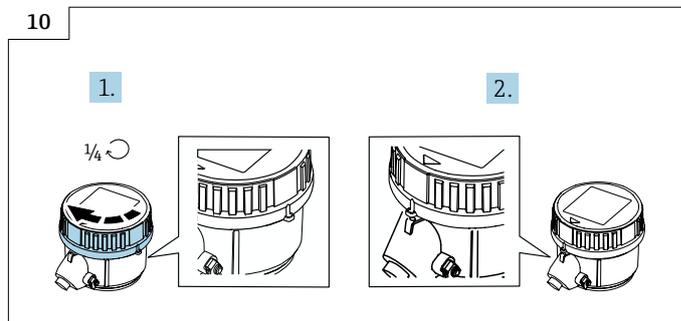
A0046735

▶ Turn the cover to the left by a 1/4 turn.
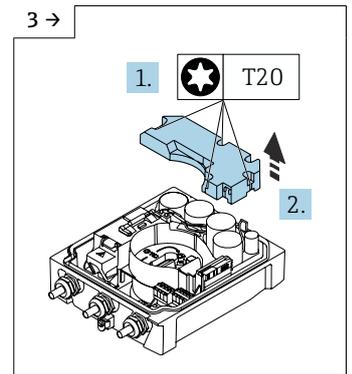
Replacing the empty battery pack - Promag 800 Advanced

A0042838

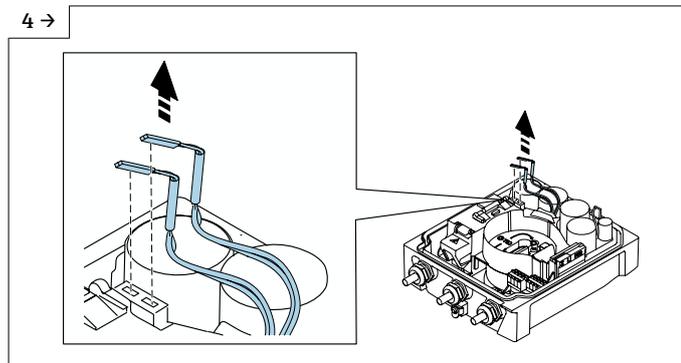▸ Open the connection compartment cover.
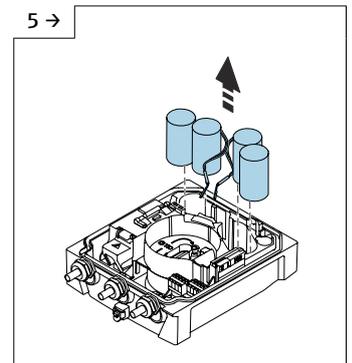

A0043731

▸ Open the display module.

A0043343

▸ Remove the cover of the battery pack.
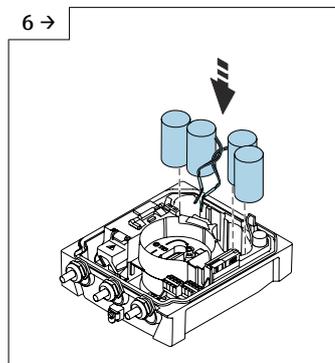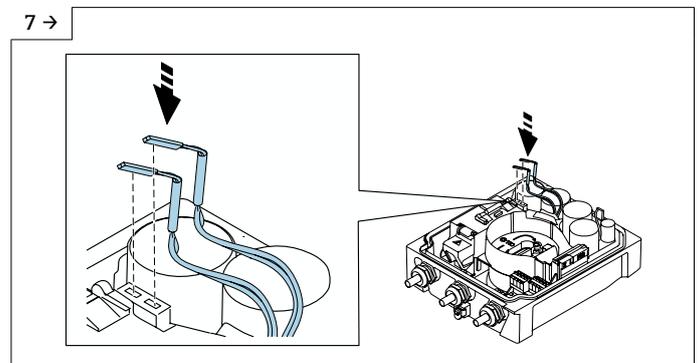

A0043347

▸ Unplug the empty battery pack.
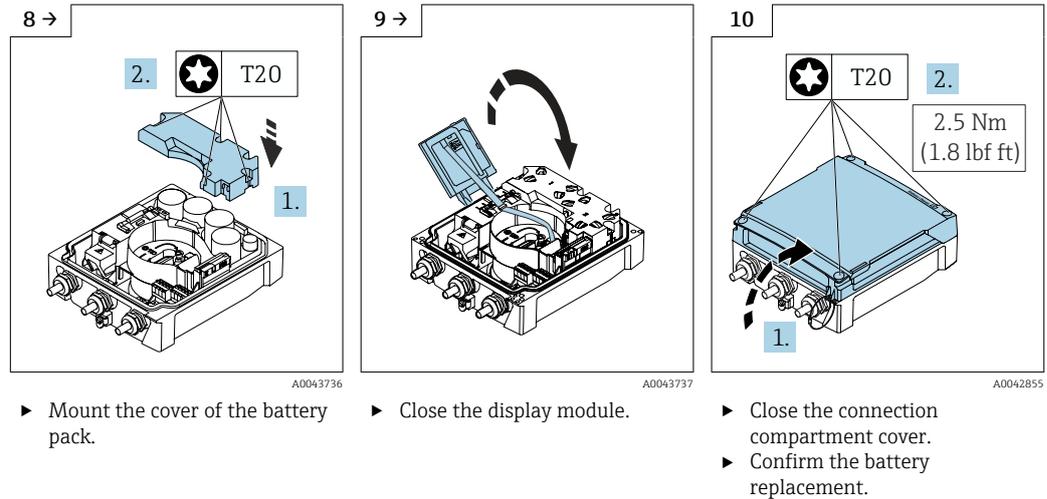

A0043354

▸ Remove the empty battery pack.

A0043732

▸ Insert the new battery pack.

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 →	9 →	10

A0043736   A0043737   A0042855

▶ Mount the cover of the battery pack. ▶ Close the display module. ▶ 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.

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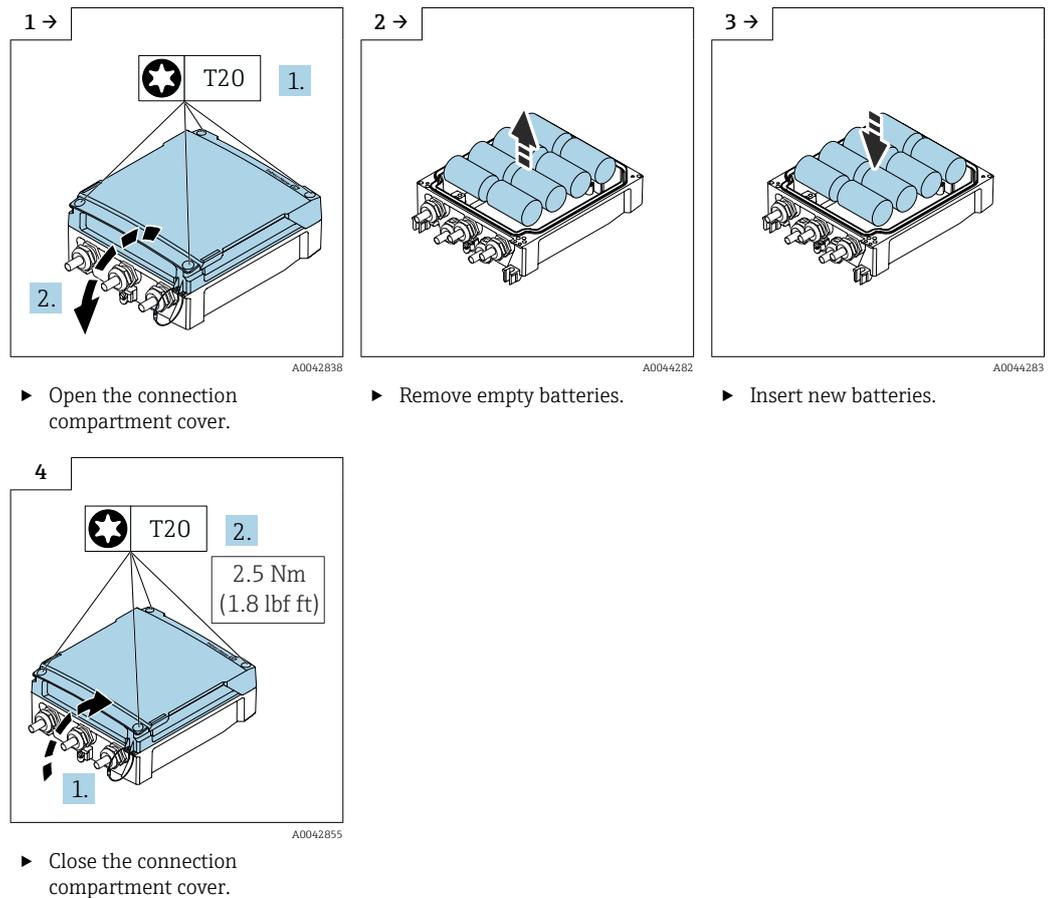
The following lithium thyionyl chloride batteries are recommended by Endress +Hauser:
- Tadiran SL2780
- Saft LS33600
- Eve ER34615
- Tadiran SL2880

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 wide variety of measuring and test equipment, such as W@M or device tests.

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

List of some of the measuring and testing equipment: → 🕮 103

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 information

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 modification 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 every repair and each conversion and enter them into the *W@M* life cycle management database and Netilion Analytics.

14.2 Spare parts

W@M 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 (→ 🔖 92) 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:
   http://www.endress.com/support/return-material
   ↳ Select the region.

2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

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 Endress+Hauser 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. Recycle used batteries wherever possible.

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 transmitter

Accessories	Description
Ground cable	Set, consisting of two ground cables for potential equalization.
Display guard	Is used to protect the display against impact or scoring, for example from sand in desert areas. ℹ️ Order number: 71504534
Cable set, Modbus, 3x pulse, 5m/15ft	ℹ️ Order number: 71504535
Application package, Promag 800	ℹ️ Order number: DK5014
1x battery pack, lithium	ℹ️ Order number: DK5016-AA

15.1.2 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.
Application package, Promag 800	ℹ️ Order number: DK5014
1x battery pack, lithium	ℹ️ Order number: DK5016-CA
2x battery pack, lithium	ℹ️ Order number: DK5016-CB

15.1.3 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

Accessory	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: • Choice of measuring devices with 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.
W@M	W@M Life Cycle Management Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle. W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, see: www.endress.com/lifecyclemanagement
Endress+Hauser SmartBlue app	The device 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 diagnostics 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** • Devices with iOS: 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 only suitable 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** Compact version – transmitter and sensor form a mechanical unit. **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 → 🖹 15

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	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

Nominal diameter		Recommended flow	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]
125	–	220 to 7 500 dm³/min	15 dm³	30 dm³/min
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
1000	40	850 to 28 000	1	125
–	42	950 to 30 000	1	125
1200	48	1 250 to 40 000	1.5	150
–	54	1 550 to 50 000	1.5	200

Flow characteristic values in US units

Nominal diameter		Recommended flow	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

Nominal diameter		Recommended flow	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]
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
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
40	1000	3 800 to 125 000	250	480
42	–	4 200 to 135 000	250	600
48	1200	5 500 to 175 000	400	600

Recommended measuring range

Flow limit → 🖹 118

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   **External measured values**

Digital communication

The measured values are written by the automation system via Modbus RS485.

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	**Proline Promag 800** With the order code for "Output; Input", option **N**: Modbus RS485, 3 outputs can be set either as a pulse output or switch output **Proline Promag 800 - Advanced** With the order code for "Output; Input", option **M**: Modbus RS485, 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
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.

Modbus RS485

Physical interface	In accordance with EIA/TIA-485-A standard

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

Status/pulse output

Status/pulse output	
Failure mode	No pulses

Modbus RS485

Failure mode	Choose from: • NaN value instead of current value • Last valid value

Local display

Plain text display	With information on the cause

Interface/protocol

Via digital communication:
• SmartBlue App
• Modbus RS485

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 order code for "Energy supply", option K "100-240VAC/
19-30VDC, lithium battery" and option S "100-240VAC/19-30VDC, w/o battery"

Protocol-specific data   **Modbus RS485**

Protocol	Modbus Applications Protocol Specification V1.1
Device type	Slave
Slave address range	1 to 247
Function codes	• 03: Read holding register • 04: Read input register • 06: Write single registers • 08: Diagnostics • 16: Write multiple registers • 23: Read/write multiple registers
Broadcast messages	Supported by the following function codes: • 06: Write single registers • 16: Write multiple registers • 23: Read/write multiple registers
Supported baud rate	• 1 200 BAUD • 2 400 BAUD • 4 800 BAUD • 9 600 BAUD • 19 200 BAUD • 38 400 BAUD • 57 600 BAUD • 115 200 BAUD

Data transfer mode	RTU
Data access	Each device parameter can be accessed via Modbus RS485.
	⊞ For Modbus register information

Modbus RS485 power save mode

If the device is not powered via an external mains voltage (only possible with order code for "Energy supply", option K "100-240VAC/ 19-30VDC, lithium battery" and option S "100-240VAC/19-30VDC, w/o battery"), the Modbus-RS485 circuit on the transmitter, i.e. the slave, is deactivated between two communication cycles in order to save energy. To activate the circuit and communicate with the slave, a retry function must be provided in the Modbus master which resends a telegram to the slave if no response is received. In addition, DIP switch A on the electronics module must be set to "ON". → 🖹 13

The first telegram sent by the master first activates the Modbus RS485 circuit on the slave. After a certain period of time, specified by the master, in which the slave does not send a reply, the master sends a retry message with the same content. The slave can interpret and reply to this telegram. The Modbus-RS485 circuit is deactivated again afterwards.

This approach is particularly suitable for low data throughput rates and point-to-point connections. Power supply via the mains voltage is recommended for high data throughput rates and bus networks.

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	→ 🖹 48

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

Order code "Accessory, attached", option "external battery housing without battery", option "PG".
- Maximum power:: 3.5 W
- Interface is designed for connecting an additional external battery supply to increase the operating life
- Two internal battery packs
- The displayed battery life shows the lifetime of the internal 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 [1]
- 47 to 63 Hz
- Maximum power: 4 W
- A battery pack to guarantee power supply to the device in the event of failure of the external power supply

Transient overvoltage	to OVERVOLTAGE CATEGORY ll levels
Brief temporary overvoltage between the cable and neutral conductor	up to 1 200 V for a maximum of 5 s
Permanently occurring temporary overvoltage between cable and ground	up to 500 V

Battery concept

Battery configuration options

The following configurations of power sources are possible:

Proline Promag 800
1 LTC [2] battery pack, order code for "Power supply", option H

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

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1)   These values are absolute minimum and maximum values. There is no tolerance. The DC power unit must be tested to ensure it is technically safe (e.g., PELV, SELV) with transients of less than 700 Vp
2)   Lithium-thionyl chloride
3)   Lithium hybrid layer capacitor

Buffer capacitor specifications

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

ℹ️ 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.

Estimated battery lifetime
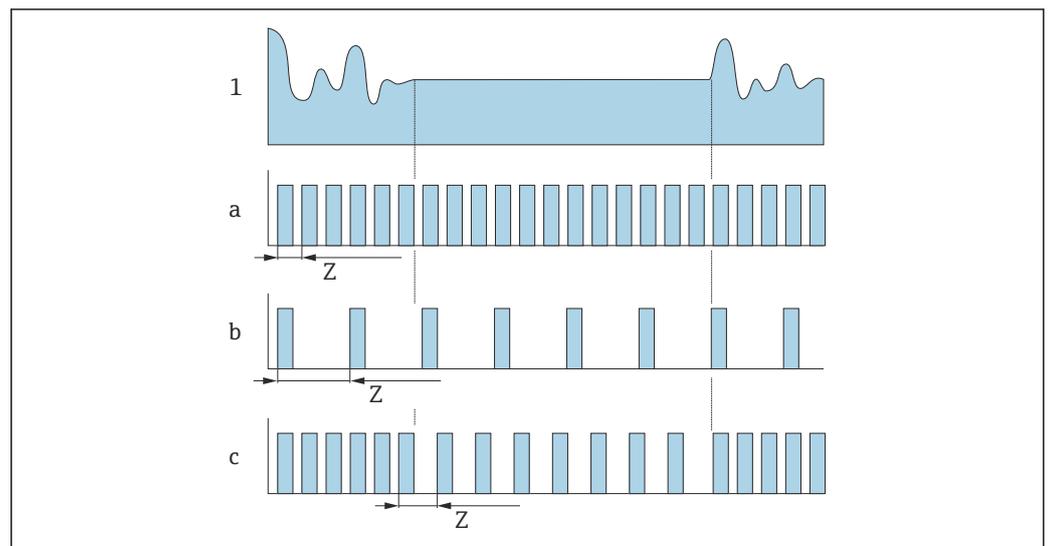
🖻 16   Operating principle of various data logging methods

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

ℹ️ 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.

ℹ️ 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.

ℹ️ To calculate the estimated battery life, use the Applicator → 🕮 103.

Nominal estimated battery lifetime - Proline 800

Sensor	Transmitter with Modbus
DN 15 to 300	10 years
DN 350 to 600	8 years
DN 700 to 1200	4 Jahre

Test conditions:
- A full battery pack
- 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
- An active pulse output with 2 Hz @ 5 ms
- Modbus transmission interval: 15 seconds
- Ambient temperature: 25 °C (77 °F)

The battery lifetime is significantly shortened by:
- Shortening the EFM measuring interval
- Frequently activating the display
- Decreasing the pulse value of the pulse outputs
- Increasing the pulse width of the pulse outputs
- Shortening the Modbus transmission interval
- Operating at ambient temperatures < 0 °C (32 °F) and > 40 °C (104 °F)

Nominal estimated battery lifetime - Proline 800 Advanced

DN 15 to 300	15 years
DN 350 to 600	12 years
DN 700 to 1200	7 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
- Modbus transmission interval: 15 seconds
- 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 Modbus transmission interval
- Shortening the data logger interval
- Operating at ambient temperatures < 0 °C (32 °F) and > 40 °C (104 °F)

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	

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

Electrical connection	→ 🕮 52

Potential equalization	→ 🕮 55

Terminals	Spring terminals for wire cross-sections 0.5 to 2.5 mm² (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)

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

Cable specification	→ 🕮 45

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 measured error

Error limits under reference operating conditions

o.r. = of reading

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

ℹ️ Fluctuations in the supply voltage do not have any effect within the specified range.
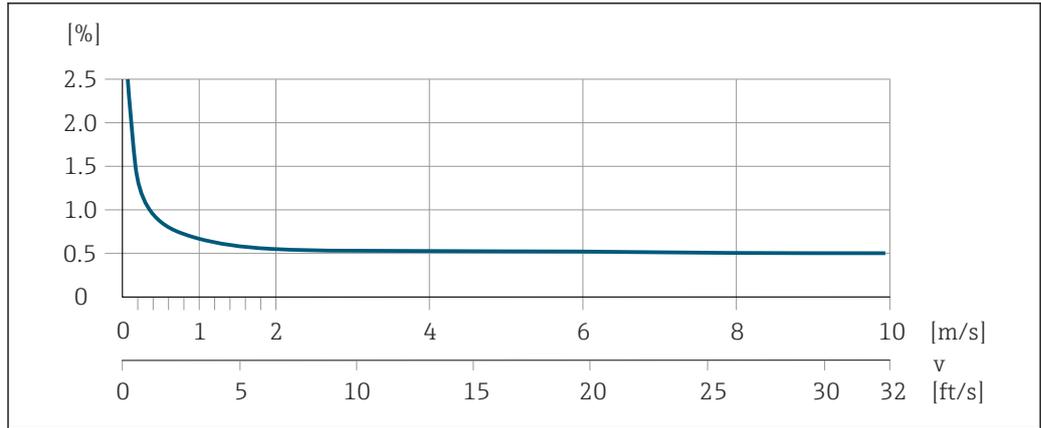
⊞ 17   Maximum measured error in % o.r.

Electrical conductivity
Maximum measured error not specified.

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

Accuracy of outputs

The outputs have the following base accuracy specifications.

Pulse output

o.r. = of reading

Accuracy	Max. ±50 ppm o.r. (over the entire ambient temperature range)

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   Installation

Installation conditions

16.8   Environment

Ambient temperature range	→ 🖹 30
Storage temperature	The storage temperature corresponds to the operating temperature range of the transmitter and the sensor → 🖹 30. • 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.
Humidity	The device is suitable for outdoor and indoor use with a relative humidity • from 80 % at temperatures up to +40 °C (+104 °F) • linear decreasing to 50 % at +60 °C (+140 °F)
Operating height	Up to 2 000 m
Atmosphere	If a plastic transmitter housing is permanently exposed to certain steam and air mixtures, this can damage the housing. ℹ️ 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
	
	ℹ️ An inserted mating connector or a fitted protection cap is accepted as a prerequisite for maintaining the specified degree of protection.
	
	Sensor Proline Promag 800
	• Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
	• Optional:
	  • IP68 Type 6P, suitable for pollution degree 4
	  • Order code for "Sensor option", option CQ "Temporarily water-proof". Suitable for temporary use under non-corrosive water. Operating duration at a maximum depth of: 3 m (10 ft): maximum 168 hours
	
	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- and shock-resistance	**Proline 800 - Advanced**
	
	For measuring points that can be subject to vibration, mount the external mobile communications antenna at a separate location.
	
	Sinusoidal vibration according to 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	• Protect the transmitter housing against mechanical effects, such as shock or impact; the use of the remote version is sometimes preferable. • Never use the transmitter housing as a ladder or climbing aid.
Electromagnetic compatibility (EMC)	As per IEC/EN 61326 Details are provided in the Declaration of Conformity. The selection of a sensor with a steel housing is recommended for use in the vicinity of electrical power supply lines with strong currents.

16.9   Process

Medium temperature range
- 0 to +70 °C (+32 to +158 °F) for hard rubber, DN 50 to 600 (2 to 24")
- –20 to +50 °C (–4 to +122 °F) for polyurethane, DN 25 to 600 (1 to 24")
- –20 to +90 °C (–4 to +194 °F) for PTFE, DN 25 to 300 (1 to 12")
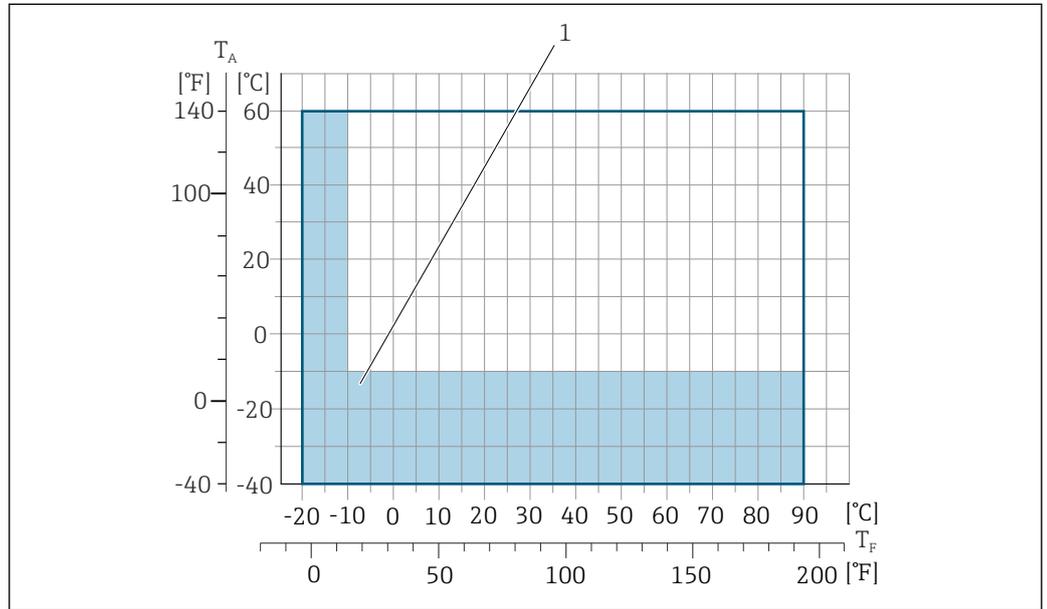
T_A   *Ambient temperature*
T_F   *Medium temperature*
1   *Colored area: The ambient temperature range of –10 to –40 °C (+14 to –40 °F) and the medium temperature range of –10 to –20 °C (+14 to –4 °F) only apply for stainless flanges*

For detailed information regarding the medium temperature in custody transfer, see the Special Documentation → 🕮 129.

Conductivity   ≥20 µS/cm for liquids in general.

Remote version
The necessary minimum conductivity also depends on the length of the connecting cable → 🕮 31.

Pressure-temperature ratings

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

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 … 1200	2 … 48	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 … 1200	1 … 48	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)	+90 °C (+194 °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 an overview of the full scale values for the measuring range, see the "Measuring range" section → 🖹 104

🛈 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 → 🖹 30

A0032667-EN
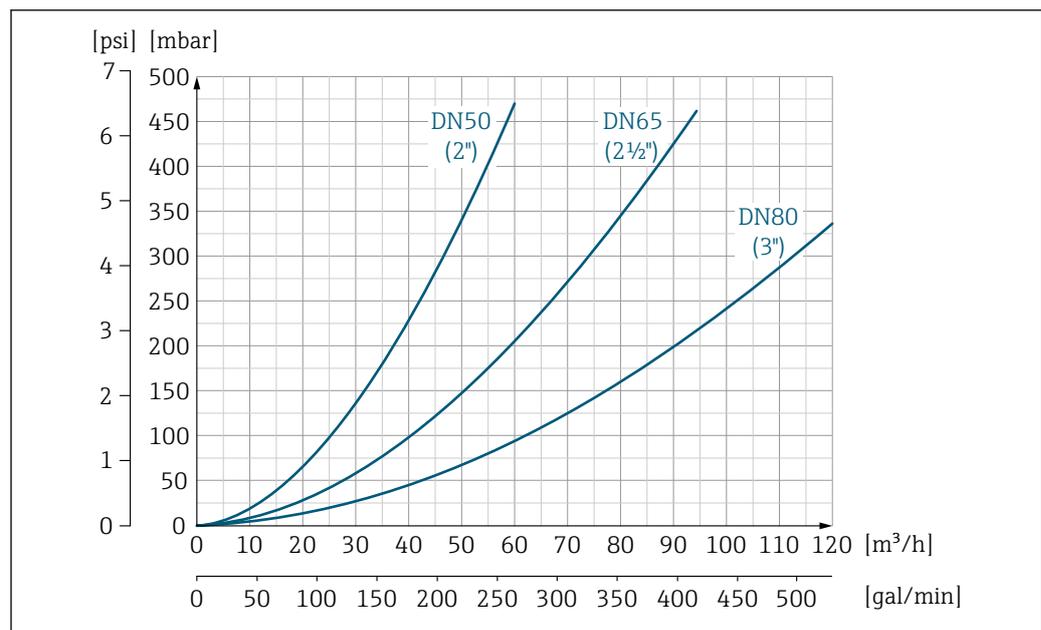
🖻 *18   Pressure loss DN 50 to 80 (2 to 3") for order code for "Design", option C "Fixed flange, constricted measuring tube", 0 x DN inlet/outlet runs"*
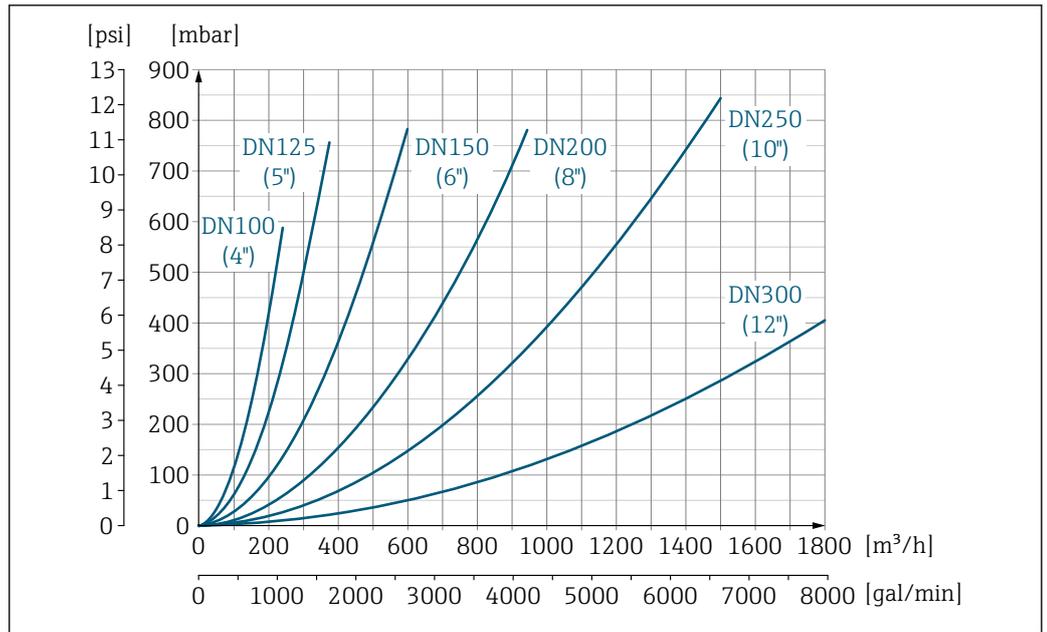
🖻 19   Pressure loss DN 100 to 300 (4 to 12") for order code for "Design", option C "Fixed flange, constricted measuring tube", 0 x DN inlet/outlet runs"

System pressure	→ 🕮 30

Vibrations	→ 🕮 30

16.10   Mechanical construction

Design, dimensions
📖 For the dimensions and installed lengths of the device, see the "Technical Information" document, "Mechanical construction" section

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 1 200 mm (18 to 48 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
1000	40	589
–	42	–
1200	48	850

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 48 in (450 to 1200 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
1000	40	1984
–	42	2426
1200	48	3087

Measuring tube specification

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

Nominal diameter		Pressure rating				Measuring tube internal diameter					
		EN (DIN)	ASME	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane		PTFE	
[mm]	[in]					[mm]	[in]	[mm]	[in]	[mm]	[in]
25	1	PN 40	Class 150	–	20K	–	–	24	0.93	25	1.00
32	–	PN 40	–	–	20K	–	–	32	1.28	34	1.34
40	1 ½	PN 40	Class 150	–	20K	–	–	38	1.51	40	1.57
50	2	PN 40	Class 150	Table E, PN 16	10K	50	1.98	50	1.98	52	2.04
50 [1]	2	PN 40	Class 150	Table E, PN 16	10K	32	1.26	–	–	–	–
65	–	PN 16	–	–	10K	66	2.60	66	2.60	68	2.67
65 [1]	–	PN 16	–	–	10K	38	1.50	–	–	–	–
80	3	PN 16	Class 150	Table E, PN 16	10K	79	3.11	79	3.11	80	3.15
80 [1]	3	PN 16	Class 150	Table E, PN 16	10K	50	1.97	–	–	–	–
100	4	PN 16	Class 150	Table E, PN 16	10K	101	3.99	104	4.11	104	4.09
100 [1]	4	PN 16	Class 150	Table E, PN 16	10K	66	2.60	–	–	–	–
125	–	PN 16	–	–	10K	127	4.99	130	5.11	129	5.08
125 [1]	–	PN 16	–	–	10K	79	3.11	–	–	–	–
150	6	PN 16	Class 150	Table E, PN 16	10K	155	6.11	158	6.23	156	6.15
150 [1]	6	PN 16	Class 150	Table E, PN 16	10K	102	4.02	–	–	–	–
200	8	PN 10	Class 150	Table E, PN 16	10K	204	8.02	207	8.14	202	7.96
200 [1]	8	PN 16	Class 150	Table E, PN 16	10K	127	5.00	–	–	–	–
250	10	PN 10	Class 150	Table E, PN 16	10K	258	10.14	261	10.26	256	10.09
250 [1]	10	PN 16	Class 150	Table E, PN 16	10K	156	6.14	–	–	–	–
300	12	PN 10	Class 150	Table E, PN 16	10K	309	12.15	312	12.26	306	12.03
300 [1]	12	PN 16	Class 150	Table E, PN 16	10K	204	8.03	–	–	–	–
350	14	PN 10	Class 150	Table E, PN 16	10K	337	13.3	340	13.4	–	–
375	15	–	–	PN 16	10K	389	15.3	392	15.4	–	–
400	16	PN 10	Class 150	Table E, PN 16	10K	387	15.2	390	15.4	–	–
450	18	PN 10	Class 150	–	10K	436	17.2	439	17.3	–	–
500	20	PN 10	Class 150	Table E, PN 16	10K	487	19.2	490	19.3	–	–
600	24	PN 10	Class 150	Table E, PN 16	10K	585	23.0	588	23.1	–	–
700	28	PN 10	Class D	Table E, PN 16	10K	694	27.3	697	27.4	–	–
750	30	–	Class D	Table E, PN 16	10K	743	29.3	746	29.4	–	–
800	32	PN 10	Class D	Table E, PN 16	–	794	31.3	797	31.4	–	–
900	36	PN 10	Class D	Table E, PN 16	–	895	35.2	898	35.4	–	–
1000	40	PN 6	Class D	Table E, PN 16	–	991	39.0	994	39.1	–	–
–	42	–	Class D	–	–	1043	41.1	1043	41.1	–	–
1200	48	PN 6	Class D	Table E, PN 16	–	1191	46.9	1197	47.1	–	–

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 1200 (14 to 48")
  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 1200 (28 to 48")
  Stainless steel: 1.4301, 304

Liner

• DN 25 to 300 (1 to 12"): PTFE
• DN 25 to 1200 (1 to 48"): polyurethane
• DN 50 to 1200 (2 to 48"): 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 1200: 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 1000: 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 → 🖹 124

Surface roughness	Electrodes with 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022): < 0.5 µm (19.7 µin) (All data relate to parts in contact with medium)

16.11   Operability

Local display	

A0040439

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	Modbus

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 for the product are available on the product page at www.endress.com.

1. Select the product using the filters and search field.

2. Open the product page.

3. Select **Downloads**.

4. Select **Technical Documentation**.

5. Select **ZE (Certificates)** as the filter

A list of all the certificates appears.

Current approvals for the product are available on the product page at www.endress.com.

1. Select the product using the filters and search field.

2. Open the product page.

3. Select **Downloads**.

4. Select **Approvals**.

A list of all the approvals appears.

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
RCM mark	The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".
Drinking water approval	• ACS • KTW/W270 • NSF 61 • WRAS BS 6920
Radio approval	The measuring device has radio approval.
	For detailed information regarding radio approval, see the Special Documentation → 🖹 129
Pressure Equipment Directive	• With the marking: a) PED/G1/x (x = category) or b) UK/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 UKCA) 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.

Other standards and guidelines	• EN 60529 Degrees of protection provided by enclosures (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

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 the process influences (e.g. corrosion, abrasion, deposit buildup etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor process or product quality, e.g. gas entrainment.

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

16.14   Accessories

📖 Overview of accessories available for order

16.15   Supplementary documentation

ℹ️ For an overview of the scope of the associated Technical Documentation, refer to the following:
- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the matrix code on the 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	KA01494D

Description of Device Parameters

Measuring device	Documentation code
Proline 800	GP01153D

Supplementary device-
dependent documentation

Special Documentation

Contents	Documentation code
Heartbeat Technology	SD01746D
Display with Bluetooth interface	SD02655D
Using Open Source Software Licenses	SD02658D
Information on Custody Transfer Measurement	SD02038D

Installation Instructions

Content	Comment
Installation instructions for spare part sets and accessories	• Access the overview of all the available spare part sets via *W@M Device Viewer* → 🖹 100 • Accessories available for order with Installation Instructions

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