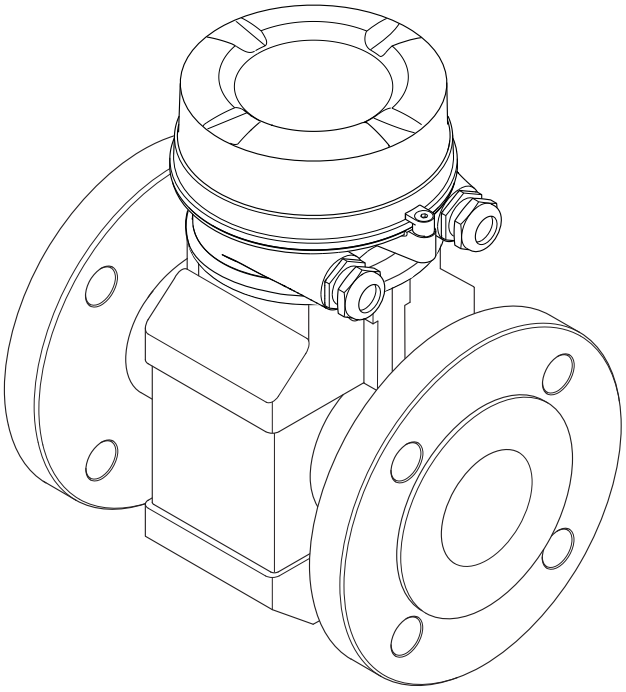
BA01307D/06/EN/02.17
71380232

Valid as of version
01.01.zz (Device firmware)



# Operating Instructions
# **Proline Promag E 100**
# **PROFIBUS DP**

Electromagnetic flowmeter



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 used

### 1.2.1 Safety symbols

| Symbol | Meaning |
|---|---|
| DANGER | **DANGER!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury. |
| WARNING | **WARNING!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |
| CAUTION | **CAUTION!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury. |
| NOTICE | **NOTE!**<br>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**<br>A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
| ⊕ | **Protective Earth (PE)**<br>A terminal which must be connected to ground prior to establishing any other connections.<br>The ground terminals are situated inside and outside the device:<br>▪ Inner ground terminal: Connects the protectiv earth to the mains supply.<br>▪ Outer ground terminal: Connects the device to the plant grounding system. |

### 1.2.3 Tool symbols

| Symbol | Meaning |
|---|---|
|  | Allen key |
|  | Open-ended wrench |

### 1.2.4 Symbols for certain types of information

| Symbol | Meaning |
|---|---|
|  | **Permitted**<br>Procedures, processes or actions that are permitted. |
|  | **Preferred**<br>Procedures, processes or actions that are preferred. |
|  | **Forbidden**<br>Procedures, processes or actions that are forbidden. |
|  | **Tip**<br>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. |

### 1.2.5 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 |
|  | 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:

- 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 2-D matrix code (QR code) on the nameplate.

For a detailed list of the individual documents along with the documentation code

### 1.3.1 Standard documentation

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

### 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

**PROFIBUS®**
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

**Microsoft®**
Registered trademark of the Microsoft Corporation, Redmond, Washington, USA

# 2 Basic 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 Designated use

**Application and media**
The measuring device described in these Brief Operating Instructions is intended only for flow measurement of liquids with a minimum conductivity of 5 µS/cm.

Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

Measuring devices for use in hazardous areas, in hygienic applications or 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 measuring device is not operated at atmospheric temperature, compliance with the relevant basic conditions specified in the associated device documentation is absolutely essential: "Documentation" section→ 🖹 7.
- Protect the measuring device permanently against corrosion from environmental influences.

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

**⚠ WARNING**

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

NOTICE

**Verification for borderline cases:**

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

**Residual risks**

⚠ WARNING

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

- For elevated fluid temperatures, ensure protection against contact to prevent burns.

## 2.3 Workplace safety

For work on and with the device:

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

For welding work on the piping:

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

If working on and with the device with wet hands:

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

## 2.4 Operational safety

Risk of injury.

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

**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.

## 2.6 IT security

We only provide a warranty 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 device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

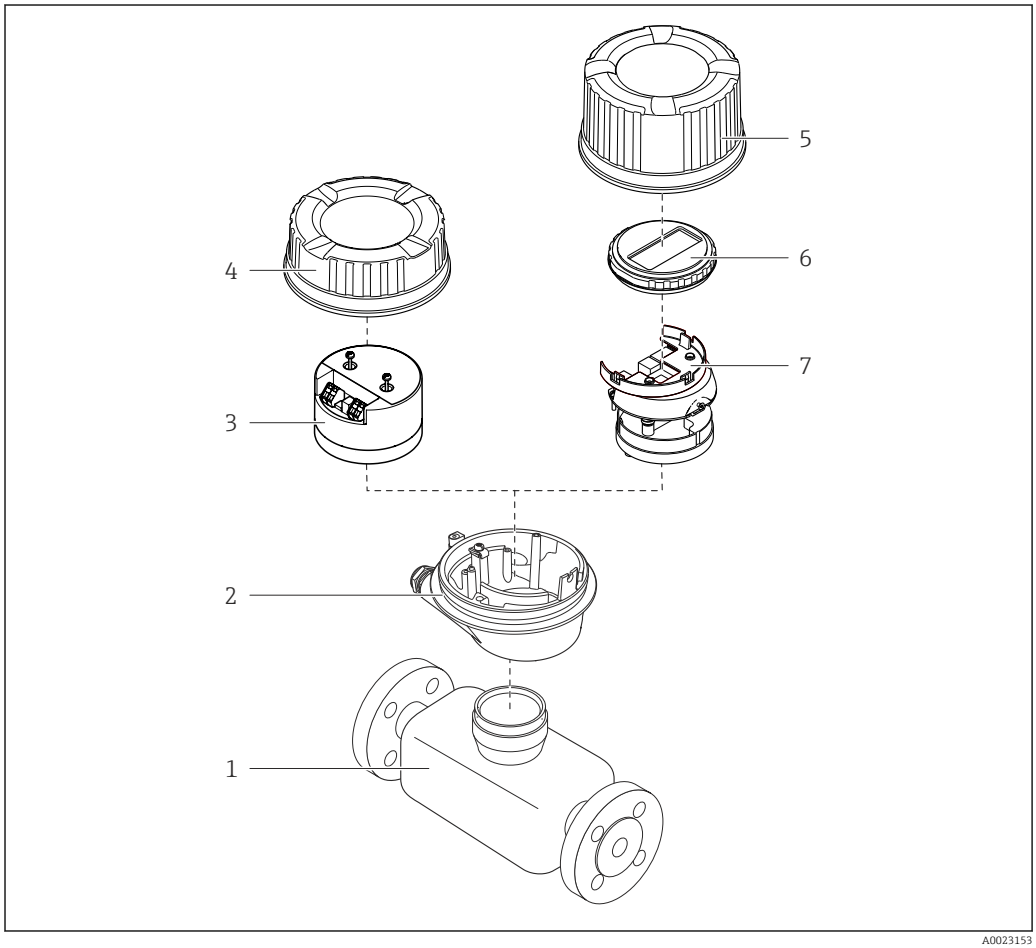
# 3 Product description

The device consists of a transmitter and a sensor.

The device is available as a compact version:
The transmitter and sensor form a mechanical unit.

## 3.1 Product design

### 3.1.1 Device version with PROFIBUS DP communication type

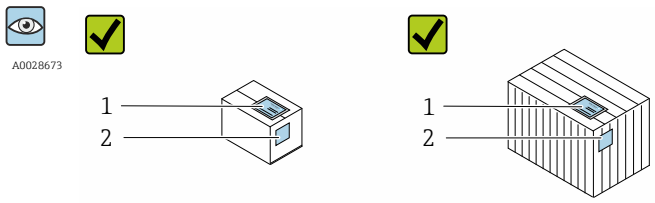



1 *Important components of a measuring device*

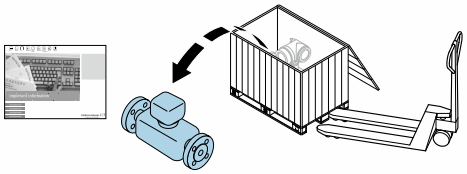
1 *Sensor*
2 *Transmitter housing*
3 *Main electronics module*
4 *Transmitter housing cover*
5 *Transmitter housing cover (version for optional onsite display)*
6 *Onsite display (optional)*
7 *Main electronics module (with bracket for optional onsite display)*

# 4 Incoming acceptance and product identification

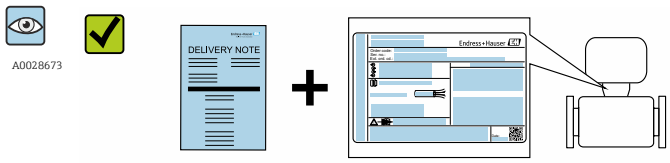
## 4.1 Incoming acceptance



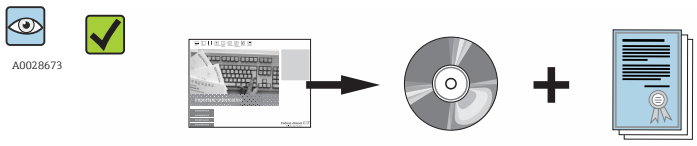

Are the order codes on the delivery note (1) and the product sticker (2) identical?




Are the goods undamaged?




Do the nameplate data match the ordering information on the delivery note?




Is the CD-ROM with the Technical Documentation (depends on device version) and documents present?

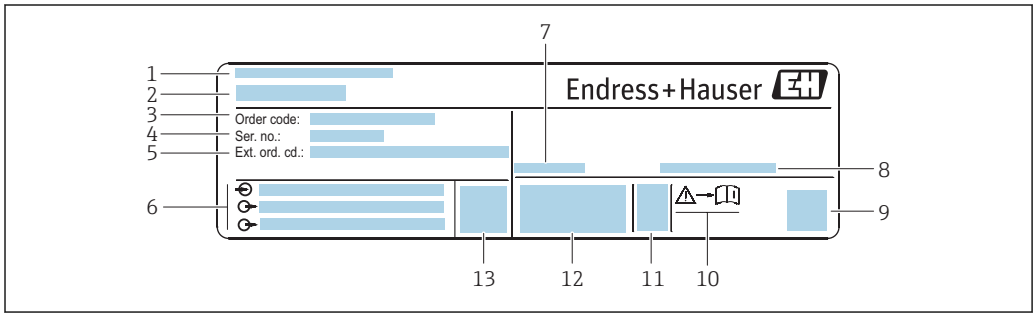
- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- Depending on the device version, the CD-ROM might not be part of the delivery! The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 14.

## 4.2 Product identification

The following options are available for identification of the measuring device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the measuring device is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information for the measuring 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 2-D matrix code (QR code) on the nameplate.

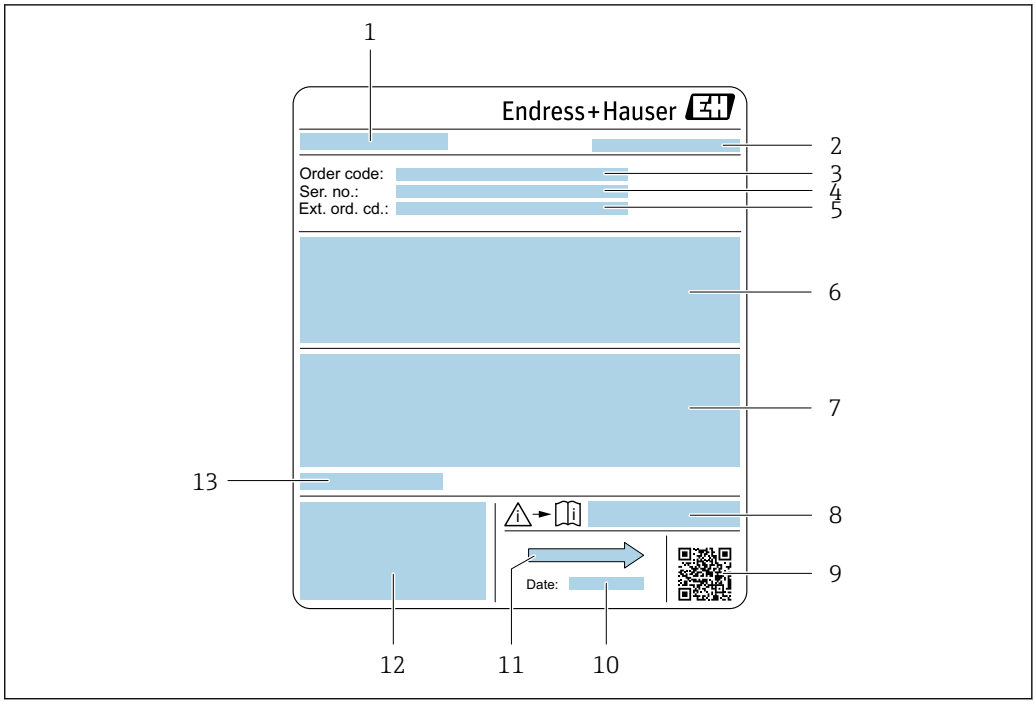
### 4.2.1 Transmitter nameplate




2 *Example of a transmitter nameplate*

1 *Manufacturing location*
2 *Name of the transmitter*
3 *Order code*
4 *Serial number (ser. no.)*
5 *Extended order code (Ext. ord. cd.)*
6 *Electrical connection data, e.g. available inputs and outputs, supply voltage*
7 *Permitted ambient temperature ($T_a$)*
8 *Degree of protection*
9 *2-D matrix code*
10 *Document number of safety-related supplementary documentation*
11 *Manufacturing date: year-month*
12 *CE mark, C-Tick*
13 *Firmware version (FW)*

### 4.2.2 Sensor nameplate




3 *Example of sensor nameplate*

1 *Name of the sensor*
2 *Manufacturing location*
3 *Order code*
4 *Serial number (ser. no.)*
5 *Extended order code (Ext. ord. cd.)*
6 *Flow; nominal diameter of the sensor; pressure rating; nominal pressure; system pressure; fluid temperature range; material of liner and electrodes*
7 *Approval information for explosion protection, Pressure Equipment Directive and degree of protection*
8 *Document number of safety-related supplementary documentation → 128*
9 *2-D matrix code*
10 *Manufacturing date: year-month*
11 *Flow direction*
12 *CE mark, C-Tick*
13 *Permitted ambient temperature ($T_a$)*

**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!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |
|  | **Reference to documentation**<br>Refers to the corresponding device documentation. |
|  | **Protective ground connection**<br>A terminal which must be connected to ground prior to establishing any other connections. |

# 5 Storage and transport

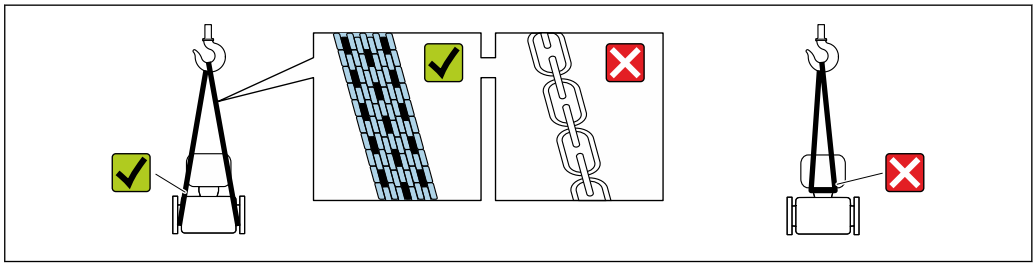
## 5.1 Storage conditions

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 tube.
- 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 lining.
- Store in a dry and dust-free place.
- Do not store outdoors.

Storage temperature→ 117

## 5.2 Transporting the product

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



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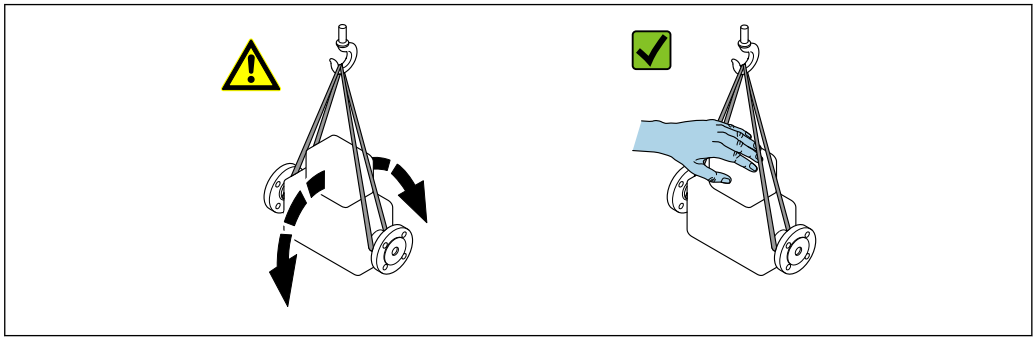
Do not remove protective covers or caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.

### 5.2.1 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).



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### 5.2.2 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.

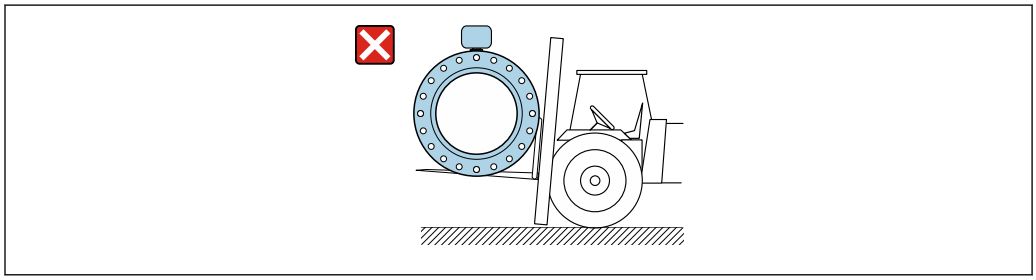
### 5.2.3 Transporting with a fork lift

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.



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## 5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

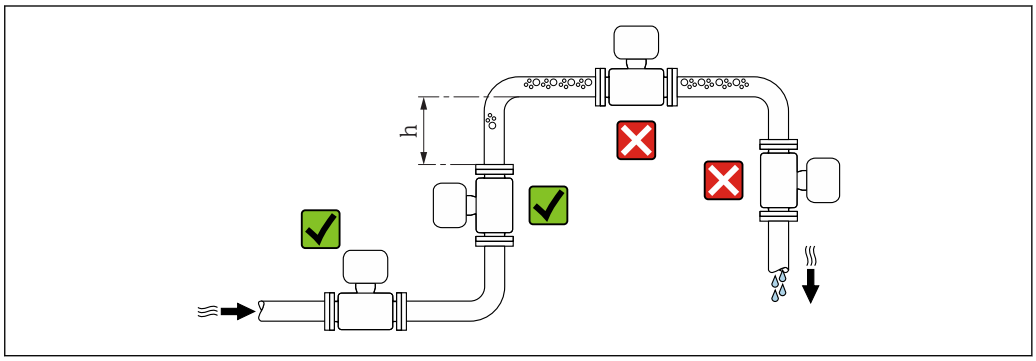
- Measuring device secondary packaging: polymer stretch film that conforms to EC Directive 2002/95/EC (RoHS).
- Packaging:
  - Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
    or
  - Carton in accordance with European Packaging Directive 94/62EC; recyclability is confirmed by the affixed RESY symbol.
- Seaworthy packaging (optional): Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
- Carrying and mounting hardware:
  - Disposable plastic pallet
  - Plastic straps
  - Plastic adhesive strips
- Dunnage: Paper cushion

# 6 Installation

## 6.1 Installation conditions

### 6.1.1 Mounting position

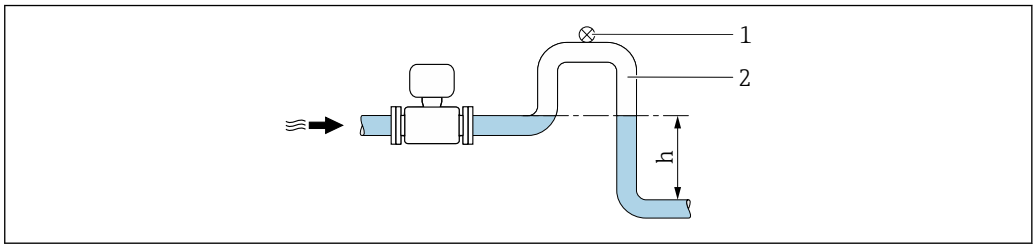
#### Mounting location




Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: h ≥ 2 × DN

*Installation in down pipes*

Install a siphon with a vent valve downstream of the sensor in down pipes whose length h ≥ 5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.

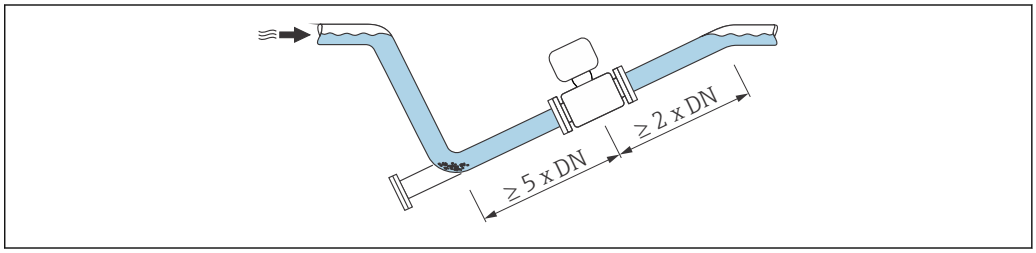



4 *Installation in a down pipe*

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

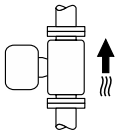
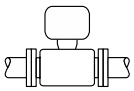
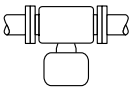
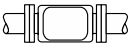
*Installation in partially filled pipes*

A partially filled pipe with a gradient necessitates a drain-type configuration.



### Orientation

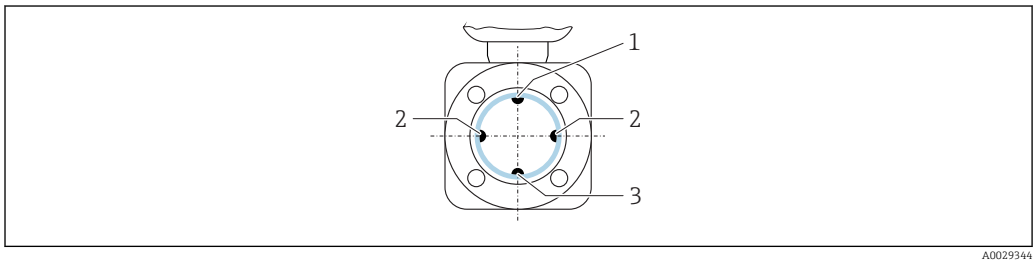
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

| Orientation | | | Recommendation |
|---|---|---|---|
| **A** | Vertical orientation |  A0015591 | ✓✓ |
| **B** | Horizontal orientation, transmitter at top |  A0015589 | ✓✓ 1) |
| **C** | Horizontal orientation, transmitter at bottom |  A0015590 | ✓✓ 2) 3) |
| **D** | Horizontal orientation, transmitter at side |  A0015592 | ✗ |

1) Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
3) To prevent the electronics module from overheating in the case of a sharp rise in temperature (e.g. CIP- or SIP processes), install the device with the transmitter component pointing downwards.

*Horizontal*

- Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the two 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.



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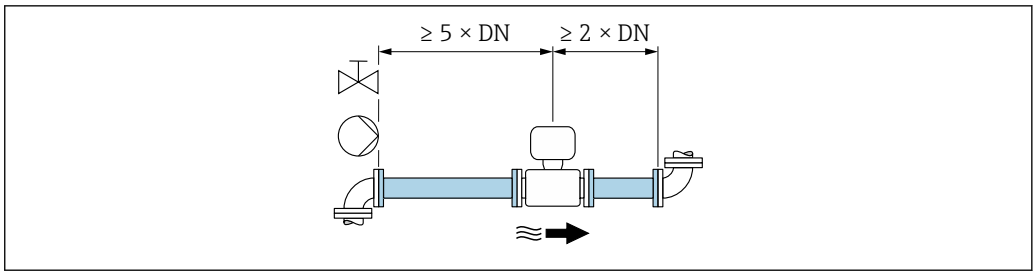
*1 EPD electrode for empty pipe detection*
*2 Measuring electrodes for signal detection*
*3 Reference electrode for potential equalization*

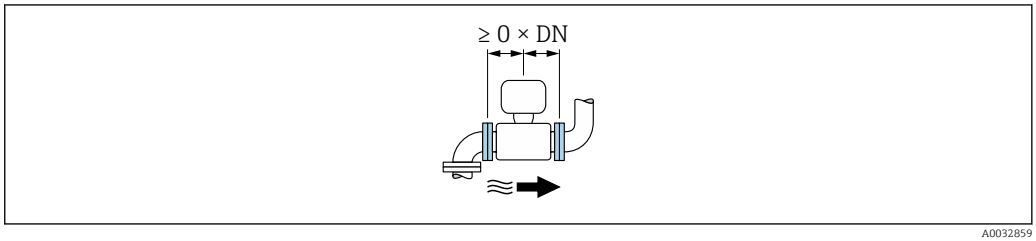
### Inlet and outlet runs

If possible, install the sensor upstream from fittings such as valves, T-pieces or elbows.

Observe the following inlet and outlet runs to comply with accuracy specifications:




5 *Order code for "Design", option A "Insertion length short, ISO/DVGW until DN400, DN450-2000 1:1" and order code for "Design", option B "Insertion length long, ISO/DVGW until DN400, DN450-2000 1:1.3"*




6 *Order code for "Design", option C "Insertion length short ISO/DVGW until DN300, w/o inlet and outlet runs, constricted meas.tube"*

*Installation dimensions*

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

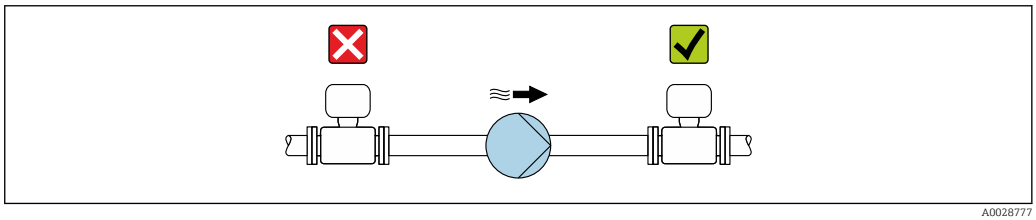
## 6.1.2 Requirements from environment and process

### Ambient temperature range

| | |
|---|---|
| Transmitter | −40 to +60 °C (−40 to +140 °F) |
| Local display | −20 to +60 °C (−4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range. |
| Sensor | Process connection material, carbon steel: −10 to +60 °C (+14 to +140 °F) |
| Liner | Do not exceed or fall below the permitted temperature range of the liner . |

If operating outdoors:
- Install the measuring device in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions.
- Avoid direct exposure to weather conditions.

### System pressure

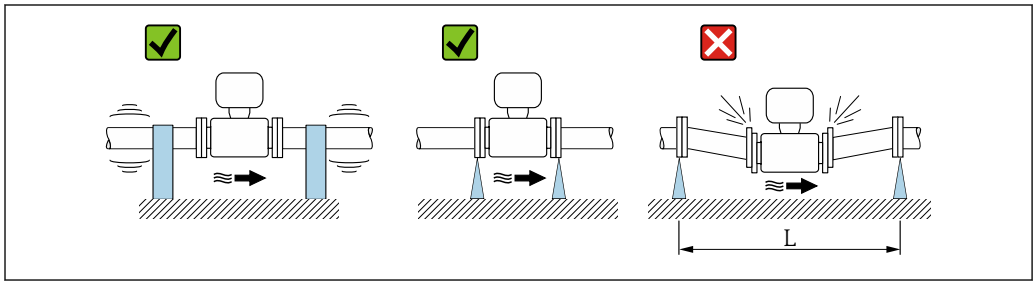


Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.

Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.

- Information on the liner's resistance to partial vacuum → 118
- Information on the shock resistance of the measuring system → 117
- Information on the vibration resistance of the measuring system → 117

### Vibrations




7 *Measures to avoid device vibrations (L > 10 m (33 ft))*

In the event of very strong vibrations, the pipe and sensor must be supported and fixed.

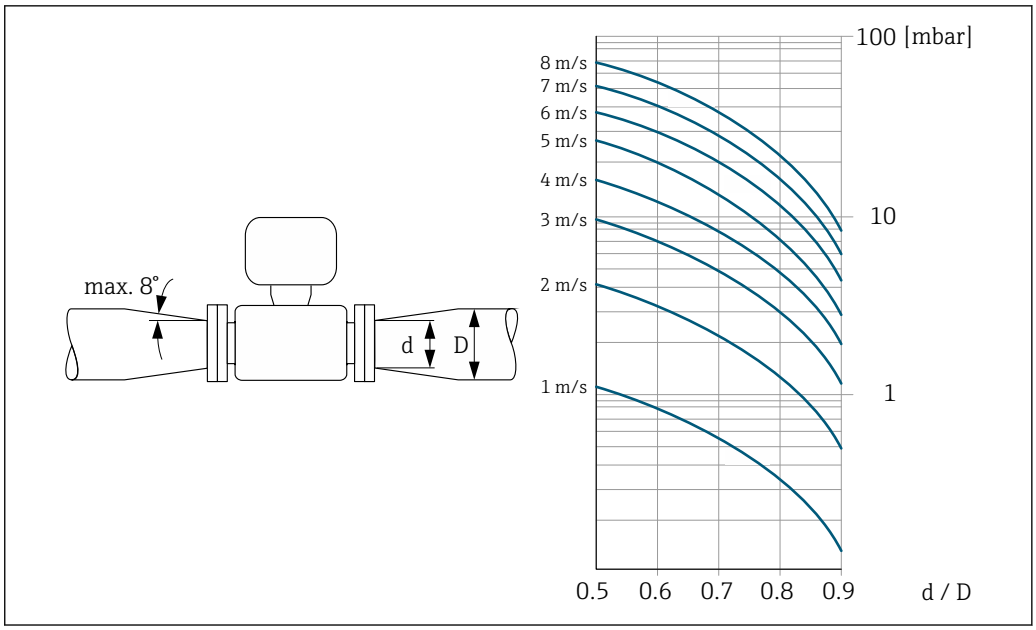
- Information on the shock resistance of the measuring system → 117
- Information on the vibration resistance of the measuring system → 117

### 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.




## 6.2 Mounting the measuring device

### 6.2.1 Required tools

**For sensor**

For flanges and other process connections: Corresponding mounting tools

### 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

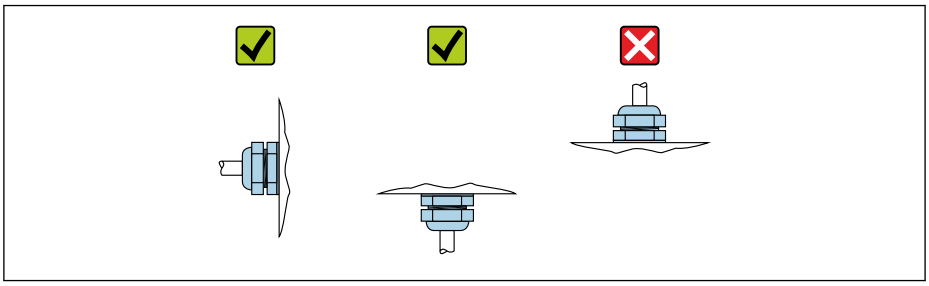
**⚠ WARNING**

**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 gaskets are clean and undamaged.
- ▶ Install the gaskets 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 required screw tightening torques → 🖹 24.

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




### 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. When mounting the process connections, make sure that the seals concerned are clean and centered correctly.
2. For DIN flanges: only use seals according to DIN EN 1514-1.
3. For "PTFE" lining: generally additional seals are **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 faces or damage the seals.

*Screw tightening torques for EN 1092-1 (DIN 2501), PN 10/16/25/40*

| Nominal diameter | Pressure rating | Screws | Flange thickness | Max. screw tightening torque [Nm] | |
|---|---|---|---|---|---|
| [mm] | [bar] | [mm] | [mm] | PTFE | PFA |
| 15 | PN 40 | 4 × M12 | 16 | 11 | – |
| 25 | PN 40 | 4 × M12 | 18 | 26 | 20 |
| 32 | PN 40 | 4 × M16 | 18 | 41 | 35 |
| 40 | PN 40 | 4 × M16 | 18 | 52 | 47 |
| 50 | PN 40 | 4 × M16 | 20 | 65 | 59 |
| 65 [1)] | PN 16 | 8 × M16 | 18 | 43 | 40 |
| 65 | PN 40 | 8 × M16 | 22 | 43 | 40 |
| 80 | PN 16 | 8 × M16 | 20 | 53 | 48 |
| 80 | PN 40 | 8 × M16 | 24 | 53 | 48 |
| 100 | PN 16 | 8 × M16 | 20 | 57 | 51 |
| 100 | PN 40 | 8 × M20 | 24 | 78 | 70 |

| Nominal diameter [mm] | Pressure rating [bar] | Screws [mm] | Flange thickness [mm] | Max. screw tightening torque [Nm] | |
|---|---|---|---|---|---|
| | | | | PTFE | PFA |
| 125 | PN 16 | 8 × M16 | 22 | 75 | 67 |
| 125 | PN 40 | 8 × M24 | 26 | 111 | 99 |
| 150 | PN 16 | 8 × M20 | 22 | 99 | 85 |
| 150 | PN 40 | 8 × M24 | 28 | 136 | 120 |
| 200 | PN 10 | 8 × M20 | 24 | 141 | 101 |
| 200 | PN 16 | 12 × M20 | 24 | 94 | 67 |
| 200 | PN 25 | 12 × M24 | 30 | 138 | 105 |
| 250 | PN 10 | 12 × M20 | 26 | 110 | – |
| 250 | PN 16 | 12 × M24 | 26 | 131 | – |
| 250 | PN 25 | 12 × M27 | 32 | 200 | – |
| 300 | PN 10 | 12 × M20 | 26 | 125 | – |
| 300 | PN 16 | 12 × M24 | 28 | 179 | – |
| 300 | PN 25 | 16 × M27 | 34 | 204 | – |
| 350 | PN 10 | 16 × M20 | 26 | 188 | – |
| 350 | PN 16 | 16 × M24 | 30 | 254 | – |
| 350 | PN 25 | 16 × M30 | 38 | 380 | – |
| 400 | PN 10 | 16 × M24 | 26 | 260 | – |
| 400 | PN 16 | 16 × M27 | 32 | 330 | – |
| 400 | PN 25 | 16 × M33 | 40 | 488 | – |
| 450 | PN 10 | 20 × M24 | 28 | 235 | – |
| 450 | PN 16 | 20 × M27 | 40 | 300 | – |
| 450 | PN 25 | 20 × M33 | 46 | 385 | – |
| 500 | PN 10 | 20 × M24 | 28 | 265 | – |
| 500 | PN 16 | 20 × M30 | 34 | 448 | – |
| 500 | PN 25 | 20 × M33 | 48 | 533 | – |
| 600 | PN 10 | 20 × M27 | 28 | 345 | – |
| 600 [1)] | PN 16 | 20 × M33 | 36 | 658 | – |
| 600 | PN 25 | 20 × M36 | 58 | 731 | – |

1) Designed acc. to EN 1092-1 (not to DIN 2501)

*Screw tightening torques for EN 1092-1 (DIN 2501), PN 10/16/25, P245GH/stainless; calculated according to EN 1591-1:2014 for flanges as per EN 1092-1:2013*

| Nominal diameter [mm] | Pressure rating [bar] | Screws [mm] | Flange thickness [mm] | Nom. screw tightening torque [Nm] PTFE |
|---|---|---|---|---|
| 350 | PN 10 | 16 × M20 | 26 | 60 |
| 350 | PN 16 | 16 × M24 | 30 | 115 |
| 350 | PN 25 | 16 × M30 | 38 | 220 |
| 400 | PN 10 | 16 × M24 | 26 | 90 |
| 400 | PN 16 | 16 × M27 | 32 | 155 |
| 400 | PN 25 | 16 × M33 | 40 | 290 |

| Nominal diameter [mm] | Pressure rating [bar] | Screws [mm] | Flange thickness [mm] | Nom. screw tightening torque [Nm] PTFE |
|---|---|---|---|---|
| 450 | PN 10 | 20 × M24 | 28 | 90 |
| 450 | PN 16 | 20 × M27 | 34 | 155 |
| 450 | PN 25 | 20 × M33 | 46 | 290 |
| 500 | PN 10 | 20 × M24 | 28 | 100 |
| 500 | PN 16 | 20 × M30 | 36 | 205 |
| 500 | PN 25 | 20 × M33 | 48 | 345 |
| 600 | PN 10 | 20 × M27 | 30 | 150 |
| 600 | PN 16 | 20 × M33 | 40 | 310 |
| 600 | PN 25 | 20 × M36 | 48 | 500 |

*Screw tightening torques for ASME B16.5, Class 150/300*

| Nominal diameter | | Pressure rating | Screws | Max. screw tightening torque [Nm] ([lbf · ft]) | |
|---|---|---|---|---|---|
| [mm] | [in] | [psi] | [in] | PTFE | PFA |
| 15 | ½ | Class 150 | 4 × ½ | 6 (4) | – (–) |
| 15 | ½ | Class 300 | 4 × ½ | 6 (4) | – (–) |
| 25 | 1 | Class 150 | 4 × ½ | 11 (8) | 10 (7) |
| 25 | 1 | Class 300 | 4 × 5/8 | 14 (10) | 12 (9) |
| 40 | 1 ½ | Class 150 | 4 × ½ | 24 (18) | 21 (15) |
| 40 | 1 ½ | Class 300 | 4 × ¾ | 34 (25) | 31 (23) |
| 50 | 2 | Class 150 | 4 × 5/8 | 47 (35) | 44 (32) |
| 50 | 2 | Class 300 | 8 × 5/8 | 23 (17) | 22 (16) |
| 80 | 3 | Class 150 | 4 × 5/8 | 79 (58) | 67 (49) |
| 80 | 3 | Class 300 | 8 × ¾ | 47 (35) | 42 (31) |
| 100 | 4 | Class 150 | 8 × 5/8 | 56 (41) | 50 (37) |
| 100 | 4 | Class 300 | 8 × ¾ | 67 (49) | 59 (44) |
| 150 | 6 | Class 150 | 8 × ¾ | 106 (78) | 86 (63) |
| 150 | 6 | Class 300 | 12 × ¾ | 73 (54) | 67 (49) |
| 200 | 8 | Class 150 | 8 × ¾ | 143 (105) | 109 (80) |
| 250 | 10 | Class 150 | 12 × 7/8 | 135 (100) | – (–) |
| 300 | 12 | Class 150 | 12 × 7/8 | 178 (131) | – (–) |
| 350 | 14 | Class 150 | 12 × 1 | 260 (192) | – (–) |
| 400 | 16 | Class 150 | 16 × 1 | 246 (181) | – (–) |
| 450 | 18 | Class 150 | 16 × 1 1/8 | 371 (274) | – (–) |
| 500 | 20 | Class 150 | 20 × 1 1/8 | 341 (252) | – (–) |
| 600 | 24 | Class 150 | 20 × 1 ¼ | 477 (352) | – (–) |

*Screw tightening torques for JIS B2220, 10/20K*

| Nominal diameter | Pressure rating | Screws | Max. screw tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | [mm] | PTFE | PFA |
| 25 | 10K | 4 × M16 | 32 | 27 |
| 25 | 20K | 4 × M16 | 32 | 27 |
| 32 | 10K | 4 × M16 | 38 | – |
| 32 | 20K | 4 × M16 | 38 | – |
| 40 | 10K | 4 × M16 | 41 | 37 |
| 40 | 20K | 4 × M16 | 41 | 37 |
| 50 | 10K | 4 × M16 | 54 | 46 |
| 50 | 20K | 8 × M16 | 27 | 23 |
| 65 | 10K | 4 × M16 | 74 | 63 |
| 65 | 20K | 8 × M16 | 37 | 31 |
| 80 | 10K | 8 × M16 | 38 | 32 |
| 80 | 20K | 8 × M20 | 57 | 46 |
| 100 | 10K | 8 × M16 | 47 | 38 |
| 100 | 20K | 8 × M20 | 75 | 58 |
| 125 | 10K | 8 × M20 | 80 | 66 |
| 125 | 20K | 8 × M22 | 121 | 103 |
| 150 | 10K | 8 × M20 | 99 | 81 |
| 150 | 20K | 12 × M22 | 108 | 72 |
| 200 | 10K | 12 × M20 | 82 | 54 |
| 200 | 20K | 12 × M22 | 121 | 88 |
| 250 | 10K | 12 × M22 | 133 | – |
| 250 | 20K | 12 × M24 | 212 | – |
| 300 | 10K | 16 × M22 | 99 | – |
| 300 | 20K | 16 × M24 | 183 | – |

*Screw tightening torques for JIS B2220, 10/20K*

| Nominal diameter | Pressure rating | Screws | Nom. screw tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | [mm] | PUR | HG |
| 350 | 10K | 16 × M22 | 109 | 109 |
| 350 | 20K | 16 × M30×3 | 217 | 217 |
| 400 | 10K | 16 × M24 | 163 | 163 |
| 400 | 20K | 16 × M30×3 | 258 | 258 |
| 450 | 10K | 16 × M24 | 155 | 155 |
| 450 | 20K | 16 × M30×3 | 272 | 272 |
| 500 | 10K | 16 × M24 | 183 | 183 |
| 500 | 20K | 16 × M30×3 | 315 | 315 |
| 600 | 10K | 16 × M30 | 235 | 235 |
| 600 | 20K | 16 × M36×3 | 381 | 381 |
| 700 | 10K | 16 × M30 | 300 | 300 |
| 750 | 10K | 16 × M30 | 339 | 339 |

*Screw tightening torques for AS 2129, Table E*

| Nominal diameter [mm] | Screws [mm] | Max. screw tightening torque [Nm] PTFE |
|---|---|---|
| 25 | 4 × M12 | 21 |
| 50 | 4 × M16 | 42 |

*Screw tightening torques for AS 4087, PN 16*

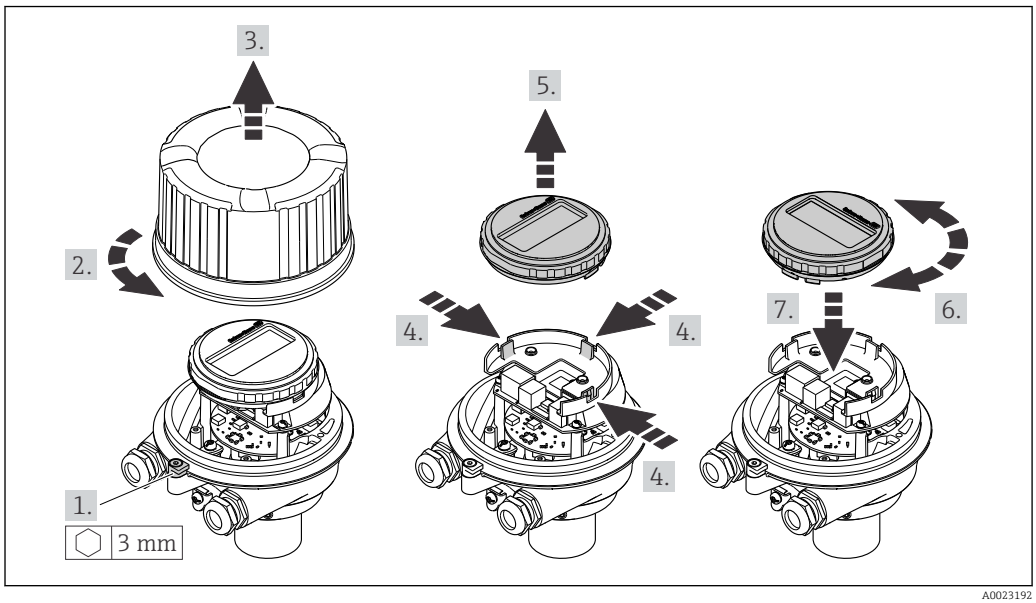
| Nominal diameter [mm] | Screws [mm] | Max. screw tightening torque [Nm] PTFE |
|---|---|---|
| 50 | 4 × M16 | 42 |

### 6.2.4 Turning the display module

The local display is only available with the following device version:
Order code for "Display; Operation", option **B**: 4-line; lit, via communication

The display module can be turned to optimize display readability.

**Aluminum housing version, AlSi10Mg, coated**

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## 6.3 Post-installation check

| | |
|---|---|
| Is the device undamaged (visual inspection)? | ❑ |
| Does the measuring device conform to the measuring point specifications?<br>For example:<br>▪ Process temperature<br>▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)<br>▪ Ambient temperature<br>▪ Measuring range | ❑ |

| | |
|---|---|
| Has the correct orientation for the sensor been selected ?<br>▪ According to sensor type<br>▪ According to medium temperature<br>▪ According to medium properties (outgassing, with entrained solids) | ❑ |
| Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping ? | ❑ |
| 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

**The measuring device does not have an internal circuit breaker.**

- ▶ 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 Connection conditions

### 7.1.1 Required tools

- For cable entries: Use corresponding tools
- For securing clamp (on aluminum housing): Allen screw3 mm
- For securing screw (for stainless steel housing): open-ended wrench 8 mm
- Wire stripper
- When using stranded cables: crimper for wire end ferrule

### 7.1.2 Requirements for connecting cable

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

#### Electrical safety

In accordance with applicable federal/national regulations.

#### 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

Standard installation cable is sufficient.

#### Signal cable

*PROFIBUS DP*

The IEC 61158 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 $mm^2$ (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. |

### Cable diameter

- Cable glands supplied:
  M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Spring terminals:
  Wire cross-sections 0.5 to 2.5 mm$^2$ (20 to 14 AWG)

## 7.1.3 Terminal assignment

### Transmitter

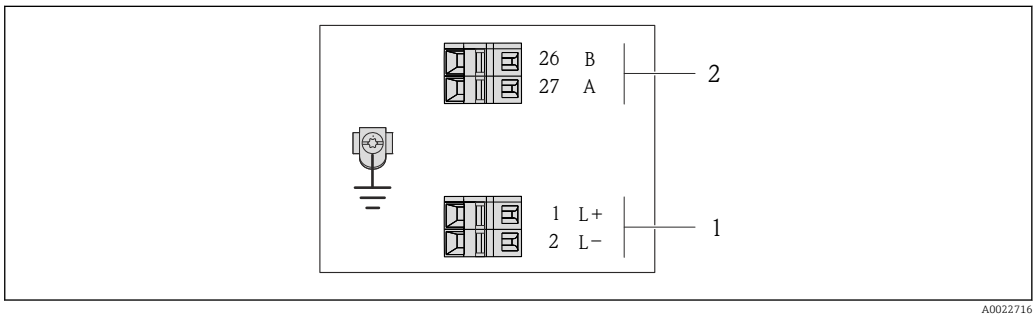
*PROFIBUS DP connection version*

For use in the non-hazardous area and Zone 2/Div. 2

Order code for "Output", option **L**

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

| Order code "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|---|---|---|
| | Output | Power supply | |
| Option **A** | Terminals | Terminals | ▪ Option **A**: coupling M20x1<br>▪ Option **B**: thread M20x1<br>▪ Option **C**: thread G ½"<br>▪ Option **D**: thread NPT ½" |
| Option **A** | Device plugs<br>→ 32 | Terminals | ▪ Option **L**: plug M12x1 + thread NPT ½"<br>▪ Option **N**: plug M12x1 + coupling M20<br>▪ Option **P**: plug M12x1 + thread G ½"<br>▪ Option **U**: plug M12x1 + thread M20 |
| Option **A** | Device plugs<br>→ 32 | Device plugs<br>→ 32 | Option **Q**: 2 x plug M12x1 |
| Order code for "Housing":<br>Option **A**: compact, coated aluminum | | | |




*8 PROFIBUS DP terminal assignment*

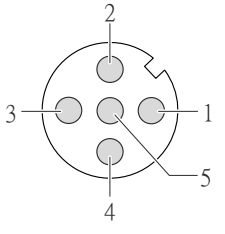
*1 Power supply: DC 24 V*
*2 PROFIBUS DP*

| Order code "Output" | Terminal number | | | |
|---|---|---|---|---|
| | Power supply | | Output | |
| | 2 (L-) | 1 (L+) | 26 (RxD/TxD-P) | 27 (RxD/TxD-N) |
| Option **L** | DC 24 V | | B | A |
| Order code for "Output":<br>Option **L**: PROFIBUS DP, for use in non-hazardous areas and Zone 2/Div. 2 | | | | |

### 7.1.4 Pin assignment, device plug

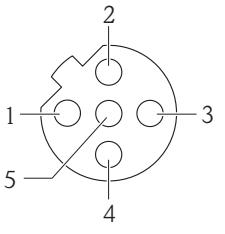
#### Supply voltage

For use in the non-hazardous area and Zone 2/Div. 2.




| Pin | | Assignment |
|---|---|---|
| 1 | L+ | DC 24 V |
| 2 | | Not assigned |
| 3 | | Not assigned |
| 4 | L- | DC 24 V |
| 5 | | Grounding/shielding |
| **Coding** | | **Plug/socket** |
| A | | Plug |

#### Device plug for signal transmission (device side)




| Pin | | Assignment |
|---|---|---|
| 1 | | Not assigned |
| 2 | A | PROFIBUS DP |
| 3 | | Not assigned |
| 4 | B | PROFIBUS DP |
| 5 | | Grounding/shielding |
| **Coding** | | **Plug/socket** |
| B | | Socket |

### 7.1.5 Preparing the measuring device

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 → 30.

## 7.2 Connecting the measuring device

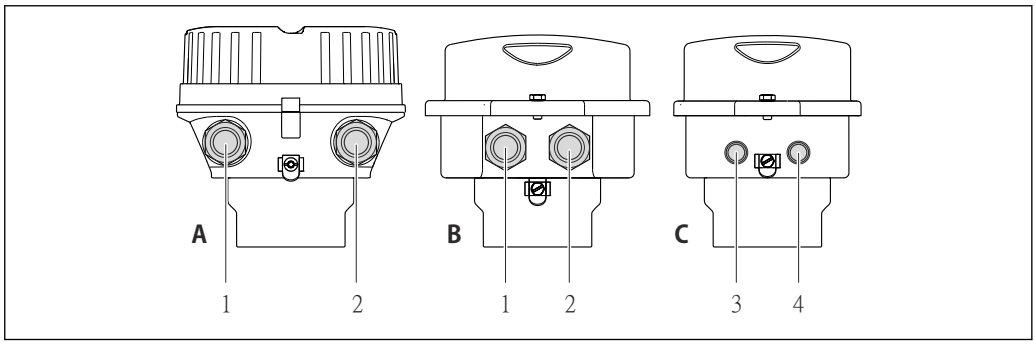
NOTICE

**Limitation of electrical safety due to incorrect connection!**

- Have electrical connection work carried out by appropriately trained specialists only.
- Observe applicable federal/national installation codes and regulations.
- Comply with local workplace safety regulations.
- Always connect the protective ground cable ⏚ before connecting additional cables.
- For use in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.
- The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

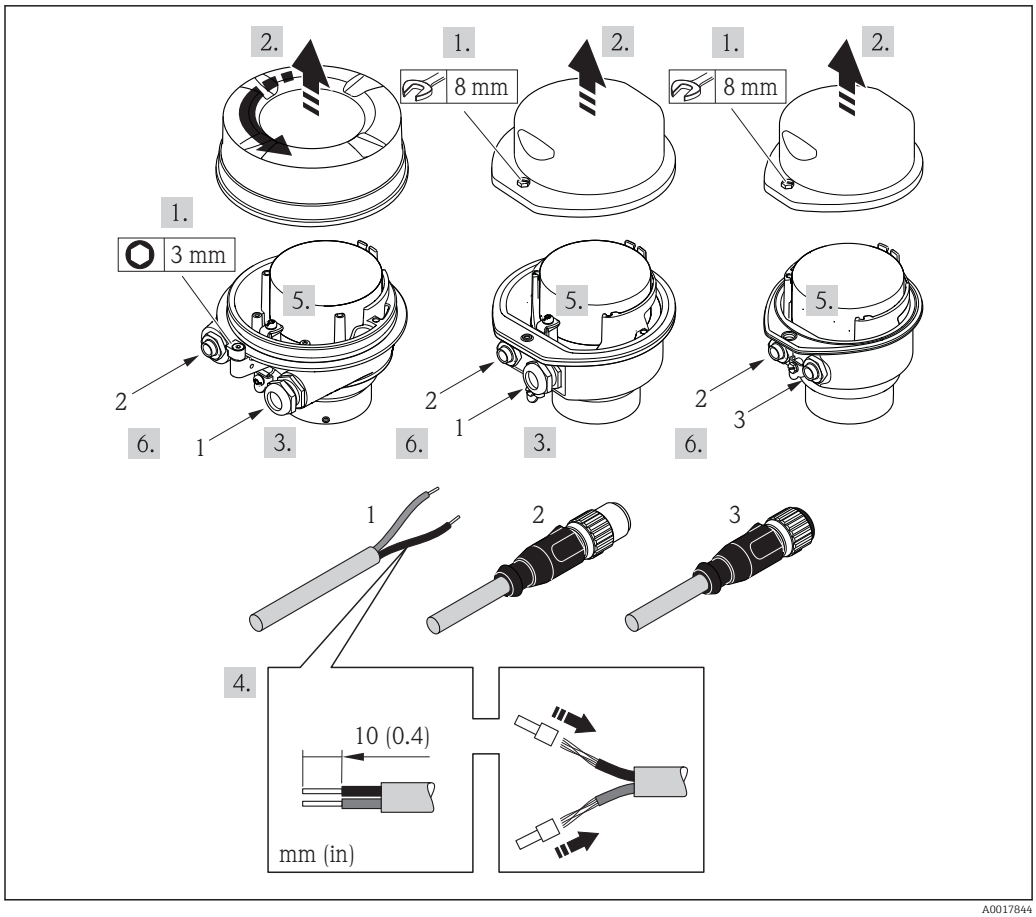
### 7.2.1 Connecting the transmitter

The connection of the transmitter depends on the following order codes:
- Housing version: compact or ultra-compact
- Connection version: device plug or terminals




9 *Housing versions and connection versions*

*A Compact, coated aluminum*
*B Compact hygienic, stainless or compact, stainless*
*1 Cable entry or device plug for signal transmission*
*2 Cable entry or device plug for supply voltage*
*C Ultra-compact hygienic, stainless or ultra-compact, stainless*
*3 Device plug for signal transmission*
*4 Device plug for supply voltage*




10 *Device versions with connection examples*

1 *Cable*
2 *Device plug for signal transmission*
3 *Device plug for supply voltage*

Depending on the housing version disconnect the local display from the main electronics module: Operating Instructions for the device .

- Connect the cable in accordance with the terminal assignment or the device plug pin assignment .

## 7.2.2 Ensure potential equalization

### Requirements

**CAUTION**

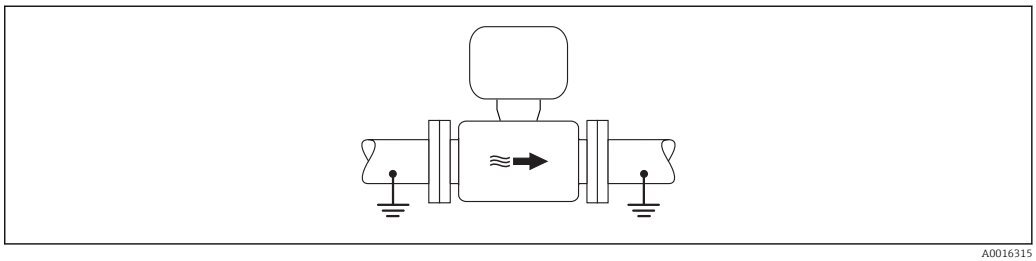
**Electrode damage can result in the complete failure of the device!**

- Same electrical potential for the medium and sensor
- Company-internal grounding concepts
- Pipe material and grounding

For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).

### Connection example, standard scenario

*Metal, grounded pipe*



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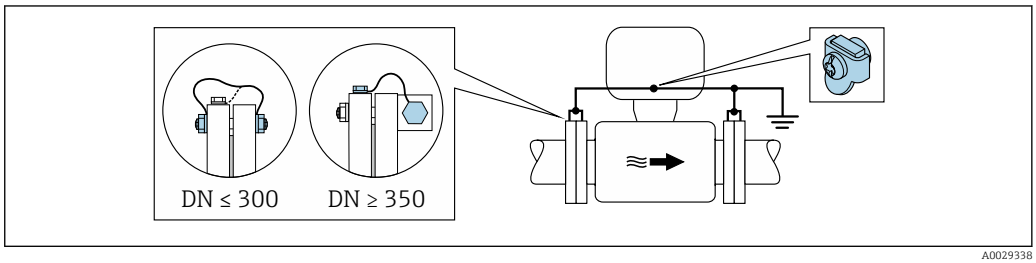
11 *Potential equalization via measuring tube*

### Connection example in special situations

*Unlined and ungrounded metal pipe*

This connection method also applies in situations where:
- The customary potential equalization is not used
- Equalizing currents are present

| | |
|---|---|
| **Ground cable** | Copper wire, at least 6 mm² (0.0093 in²) |

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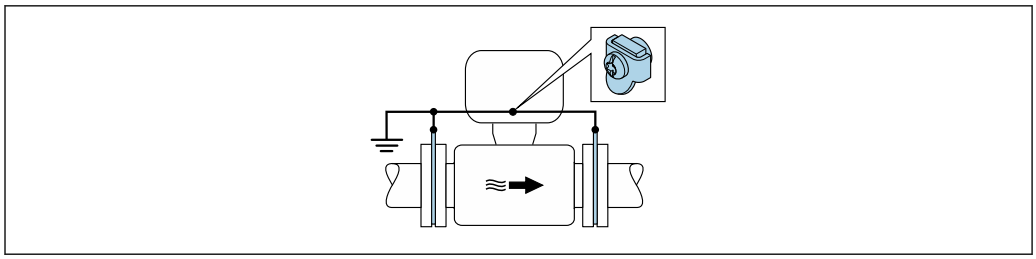
12 *Potential equalization via ground terminal and pipe flanges*

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

*Plastic pipe or pipe with insulating liner*

This connection method also applies in situations where:
- The customary potential equalization is not used
- Equalizing currents are present

| | |
|---|---|
| **Ground cable** | Copper wire, at least 6 mm² (0.0093 in²) |



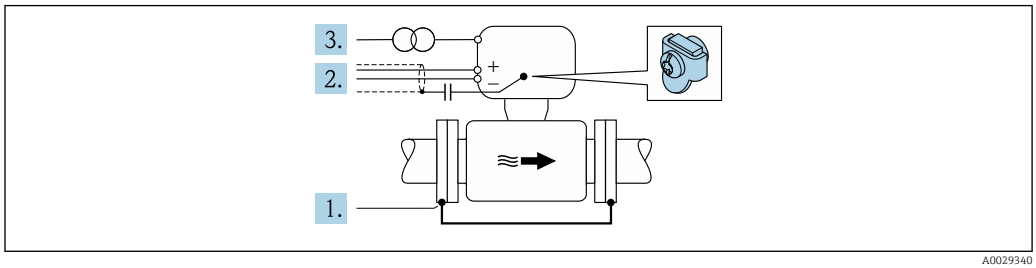

13 *Potential equalization via ground terminal and ground disks*

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

*Pipe with a cathodic protection unit*

This connection method is only used if the following two conditions are met:
- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the personal protection equipment

| | |
|---|---|
| **Ground cable** | Copper wire, at least 6 mm² (0.0093 in²) |



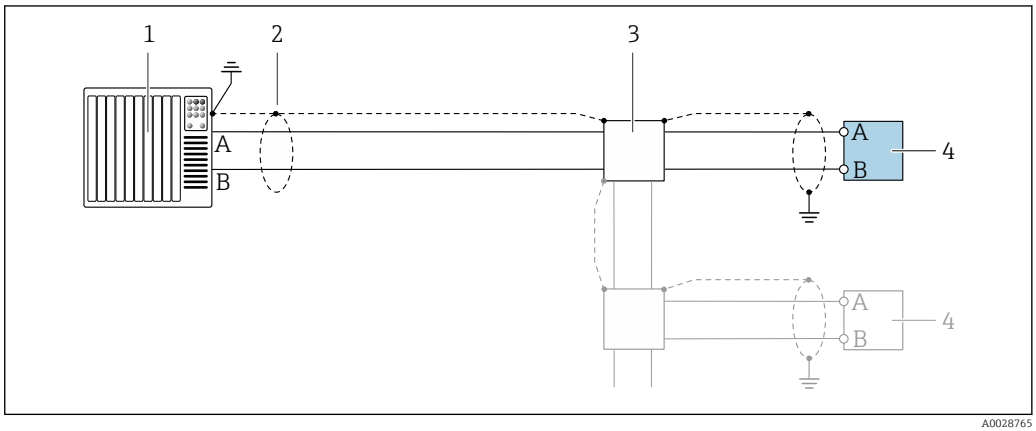

Prerequisite: The sensor is installed in the pipe in a way that provides electrical insulation.

1. Connect the two flanges of the pipe to one another via a ground cable.
2. Guide the shield of the signal lines through a capacitor.
3. Connect the measuring device to the power supply such that it is floating in relation to the protective ground (isolation transformer).

## 7.3 Special connection instructions

### 7.3.1 Connection examples

**PROFIBUS DP**




14 *Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2*

1 *Control system (e.g. PLC)*
2 *Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications*
3 *Transmitter*

If baud rates > 1.5 MBaud an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.

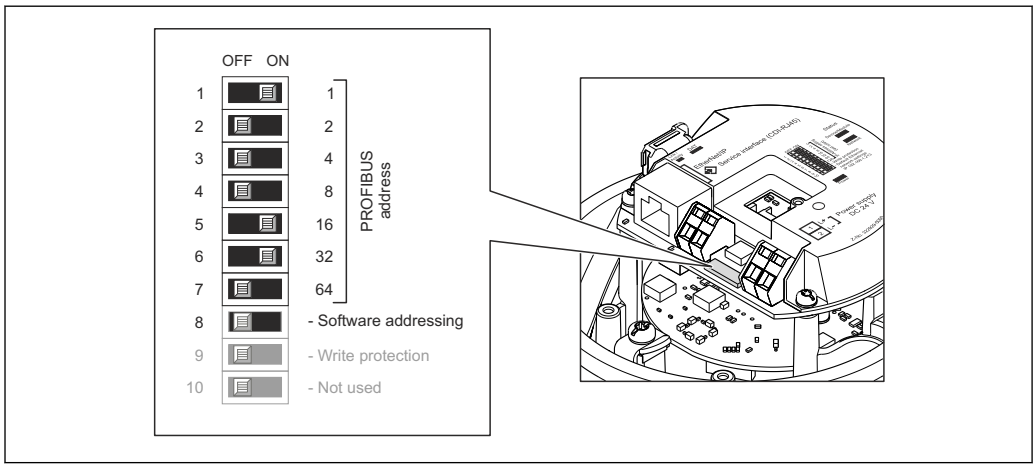
## 7.4 Hardware settings

### 7.4.1 Setting the device address

**PROFIBUS DP**

The address must always be configured for a PROFIBUS DP/PA device. The valid address range is between 1 and 126. In a PROFIBUS DP/PA network, each address can only be assigned once. If an address is not configured correctly, the device is not recognized by the master. All measuring devices are delivered from the factory with the device address 126 and with the software addressing method.

*Setting the address*




15 *Addressing using DIP switches on the I/O electronics module*

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary → 124.
3. Disable software addressing via DIP switch 8 (OFF).
4. Set the desired device address via the corresponding DIP switches.
   ↳ Example → 15, 38: 1 + 16 + 32 = device address 49
   The device demands rebooting after 10 s. After rebooting, hardware addressing is enabled with the configured IP address.
5. Reverse the removal procedure to reassemble the transmitter.

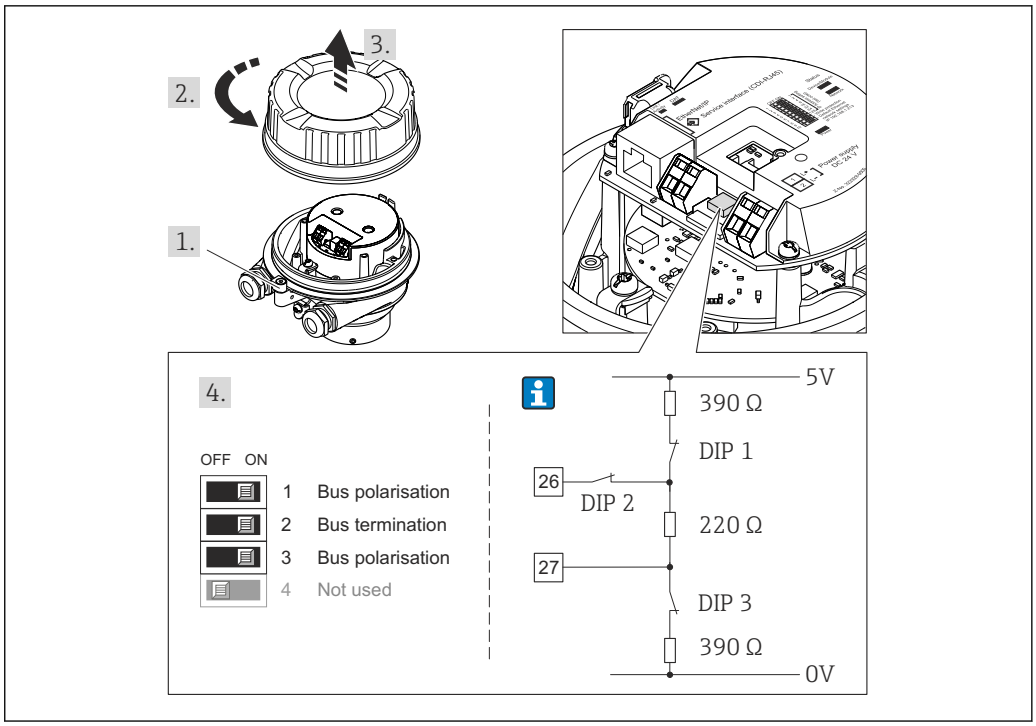
## 7.4.2 Enabling the terminating resistor

### PROFIBUS DP

To avoid incorrect communication transmission caused by impedance mismatch, terminate the PROFIBUS DP cable correctly at the start and end of the bus segment.

- If the device is operated with a baud rate of 1.5 MBaud and under:
  For the last transmitter on the bus, terminate via DIP switch 2 (bus termination) and DIP switch 1 and 3 (bus polarization). Setting: ON – ON – ON → 16, 39.
- For baud rates > 1.5 MBaud:
  Due to the capacitance load of the user and the line reflections generated as a result, ensure that an external bus terminator is used.

It is generally advisable to use an external bus terminator as the entire segment can fail if a device that is terminated internally is defective.



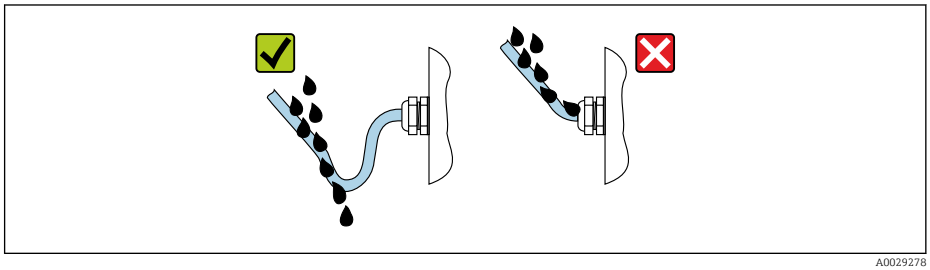

16 *Termination using DIP switches on the I/O electronics module (for baud rates < 1.5 MBaud)*

## 7.5 Ensuring the degree of protection

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




6. Insert dummy plugs into unused cable entries.

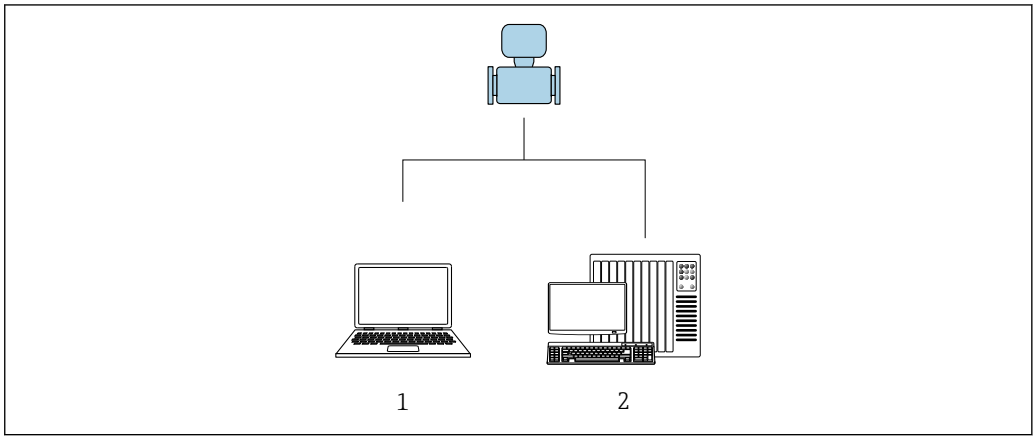
## 7.6 Post-connection check

| | |
|---|---|
| Are cables or the device undamaged (visual inspection)? | ❑ |
| Do the cables used meet the requirements→ 🖹 30? | ❑ |
| Do the cables have adequate strain relief? | ❑ |

| | |
|---|---|
| Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 🖹 39 ? | ❑ |
| Depending on the device version: are all the device plugs firmly tightened ? | ❑ |
| Does the supply voltage match the specifications on the transmitter nameplate → 🖹 114? | ❑ |
| Is the terminal assignment → 🖹 31 or pin assignment of the connector → 🖹 32 correct? | ❑ |
| If supply voltage is present, is the power LED on the electronics module of the transmitter lit green → 🖹 12? | ❑ |
| Is the potential equalization established correctly ? | ❑ |
| Depending on the device version, is the securing clamp or fixing screw firmly tightened? | ❑ |

# 8 Operation options

## 8.1 Overview of operating options

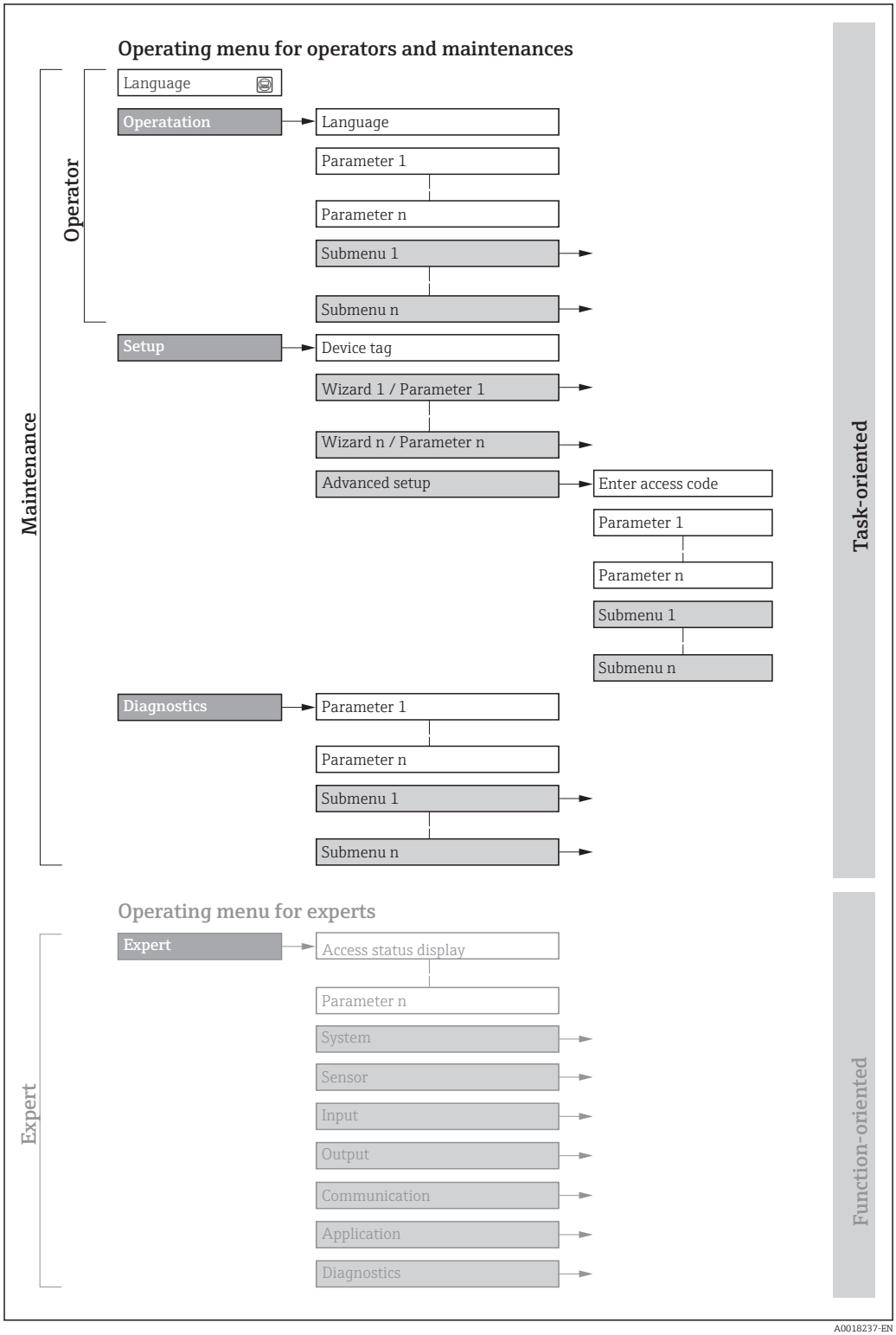



*1 Computer with Web browser (e.g. Internet Explorer) or with "FieldCare" operating tool*
*2 Automation system, e.g. "RSLogix" (Rockwell Automation) and work station for measuring device operation with Add-on Profile Level 3 for "RSLogix 5000" software (Rockwell Automation)*

# 8.2 Structure and function of the operating menu

## 8.2.1 Structure of the operating menu

For an overview of the operating menu for experts: "Description of Device Parameters" document supplied with the device




17 *Schematic structure of the operating menu*

### 8.2.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles (operator, maintenance etc.). Each user role contains typical tasks within the device lifecycle.

| Menu/parameter | | User role and tasks | Content/meaning |
|---|---|---|---|
| Language | task-oriented | **Role "Operator", "Maintenance"**<br>Tasks during operation:<br>▪ Configuring the operational display<br>▪ Reading measured values | ▪ Defining the operating language<br>▪ Defining the Web server operating language<br>▪ Resetting and controlling totalizers |
| Operation | | | ▪ Configuring the operational display (e.g. display format, display contrast)<br>▪ Resetting and controlling totalizers |
| Setup | | **"Maintenance" role**<br>Commissioning:<br>Configuration of the measurement | Submenus for fast commissioning:<br>▪ Set the system units<br>▪ Configuring the operational display<br>▪ Set the low flow cut off<br>▪ Empty pipe detection<br>Advanced setup<br>▪ For more customized configuration of the measurement (adaptation to special measuring conditions)<br>▪ Configuration of totalizers<br>▪ Configuration of electrode cleaning (optional)<br>▪ Configure the WLAN settings<br>▪ Administration (define access code, reset measuring device) |
| Diagnostics | | **"Maintenance" role**<br>Fault elimination:<br>▪ Diagnostics and elimination of process and device errors<br>▪ Measured value simulation | Contains all parameters for error detection and analyzing process and device errors:<br>▪ Diagnostic list<br>Contains up to 5 currently pending diagnostic messages.<br>▪ Event logbook<br>Contains event messages that have occurred.<br>▪ Device information<br>Contains information for identifying the device.<br>▪ Measured values<br>Contains all current measured values.<br>▪ Analog inputs<br>Is used to display the analog input.<br>▪ Heartbeat<br>The functionality of the device is checked on demand and the verification results are documented.<br>▪ Simulation<br>Is used to simulate measured values or output values. |
| | | | |
| Expert | function-oriented | Tasks that require detailed knowledge of the function of the device:<br>▪ Commissioning measurements under difficult conditions<br>▪ Optimal adaptation of the measurement to difficult conditions<br>▪ Detailed configuration of the communication interface<br>▪ Error diagnostics in difficult cases | Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device:<br>▪ System<br>Contains all higher-order device parameters which do not concern the measurement or the communication interface.<br>▪ Sensor<br>Configuration of the measurement.<br>▪ Communication<br>Configuration of the digital communication interface and the Web server.<br>▪ Submenus for function blocks (e.g. "Analog Inputs")<br>Configuration of function blocks.<br>▪ Application<br>Configure the functions that go beyond the actual measurement (e.g. totalizer).<br>▪ Diagnostics<br>Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology. |

# 8.3 Access to the operating menu via the web browser

## 8.3.1 Function range

Thanks to the integrated Web server, the device can be operated and configured via a Web browser and via a service interface (CDI-RJ45) . In addition to the measured values, status information on the device is also displayed and allows the user to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

For additional information on the Web server, refer to the Special Documentation for the device → 129

## 8.3.2 Prerequisites

*Computer hardware*

| | |
|---|---|
| Interface | The computer must have an RJ45 interface. |
| Connection | Standard Ethernet cable with RJ45 connector. |
| Screen | Recommended size: ≥12" (depends on the screen resolution) |

*Computer software*

| | |
|---|---|
| Recommended operating systems | Microsoft Windows 7 or higher.<br>Microsoft Windows XP is supported. |
| Web browsers supported | ▪ Microsoft Internet Explorer 8 or higher<br>▪ Microsoft Edge<br>▪ Mozilla Firefox<br>▪ Google Chrome<br>▪ Safari |

*Computer settings*

| | |
|---|---|
| User rights | Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (for adjusting the IP address, subnet mask etc.). |
| Proxy server settings of the Web browser | The Web browser setting *Use a Proxy Server for Your LAN* must be **deselected** . |
| JavaScript | JavaScript must be enabled.<br>If JavaScript cannot be enabled: enter http://XXX.XXX.X.XXX/basic.html in the address line of the Web browser, e.g. http://192.168.1.212/basic.html. A fully functional but simplified version of the operating menu structure starts in the Web browser. |
| Network connections | Only the active network connections to the measuring device should be used. |
| | Switch off all other network connections such as WLAN. |

In the event of connection problems: → 80

*Measuring device: Via CDI-RJ45 service interface*

| Device | CDI-RJ45 service interface |
|---|---|
| Measuring device | The measuring device has an RJ45 interface. |
| Web server | Web server must be enabled; factory setting: ON<br>For information on enabling the Web server → 48 |

### 8.3.3 Establishing a connection

#### Via service interface (CDI-RJ45)

*Preparing the measuring device*

*Configuring the Internet protocol of the computer*

The following information refers to the default Ethernet settings of the device.

IP address of the device: 192.168.1.212 (factory setting)

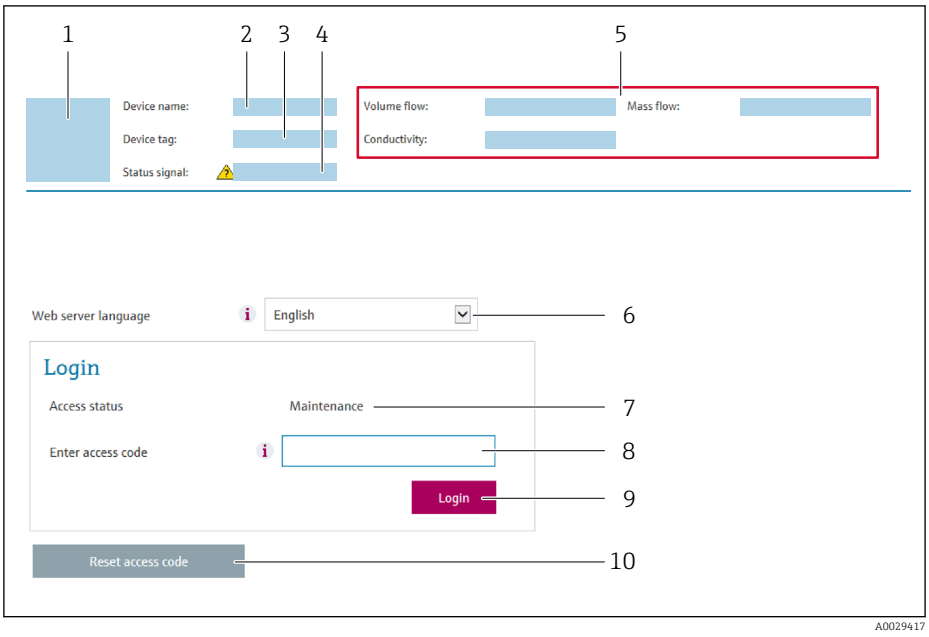
1. Switch on the measuring device.
2. Connect to the computer using a cable → 📄 125.
3. If a 2nd network card is not used, close all the applications on the notebook.
   ↳ Applications requiring Internet or a network, such as e-mail, SAP applications, Internet or Windows Explorer.
4. Close any open Internet browsers.
5. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

| | |
|---|---|
| **IP address** | 192.168.1.XXX; for XXX all numerical sequences except: 0, 212 and 255 → e.g. 192.168.1.213 |
| **Subnet mask** | 255.255.255.0 |
| **Default gateway** | 192.168.1.212 or leave cells empty |

#### Starting the Web browser

1. Start the Web browser on the computer.

2. Enter the IP address of the Web server in the address line of the Web browser: 192.168.1.212
   ↳ The login page appears.




1 *Picture of device*
2 *Device name*
3 *Device tag*
4 *Status signal*
5 *Current measured values*
6 *Operating language*
7 *User role*
8 *Access code*
9 *Login*
10 *Reset access code*

If a login page does not appear, or if the page is incomplete → 80

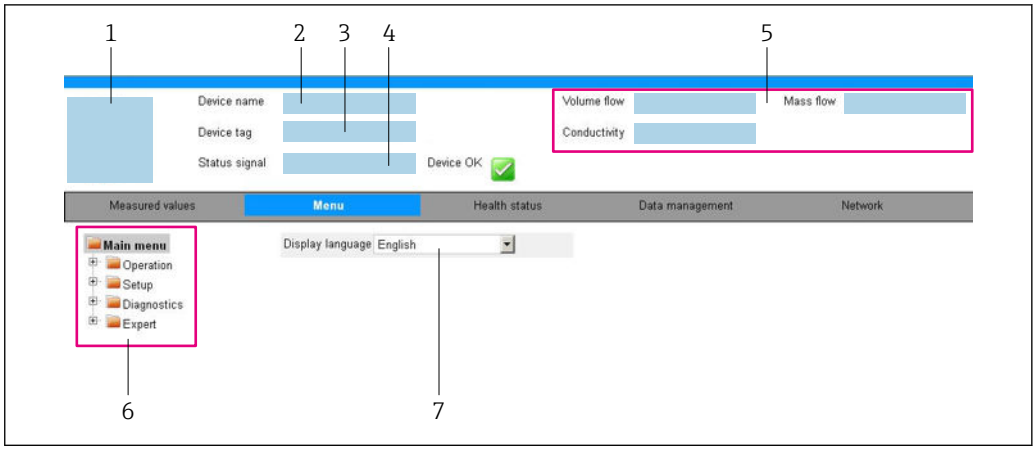
### 8.3.4 Logging on

1. Select the preferred operating language for the Web browser.
2. Enter the user-specific access code.
3. Press **OK** to confirm your entry.

| | |
|---|---|
| **Access code** | 0000 (factory setting); can be changed by customer |

If no action is performed for 10 minutes, the Web browser automatically returns to the login page.

### 8.3.5 User interface




1 *Picture of device*
2 *Device name*
3 *Device tag*
4 *Status signal*
5 *Current measured values*
6 *Navigation area*
7 *Local display language*

#### Header

The following information appears in the header:
- Device tag
- Device status with status signal → 82
- Current measured values

#### Function row

| Functions | Meaning |
|---|---|
| Measured values | Displays the measured values of the measuring device |
| Menu | ▪ Access to the operating menu from the measuring device<br>▪ The structure of the operating menu is the same as for the operating tools<br>For detailed information on the structure of the operating menu, see the Operating Instructions for the measuring device |
| Device status | Displays the diagnostic messages currently pending, listed in order of priority |
| Data management | Data exchange between PC and measuring device:<br>▪ Device configuration:<br>– Load settings from the device (XML format, save configuration)<br>– Save settings to the device (XML format, restore configuration)<br>▪ Logbook - Export Event logbook (.csv file)<br>▪ Documents - Export documents:<br>– Export backup data record (.csv file, create documentation of the measuring point configuration)<br>– Verification report (PDF file, only available with the "Heartbeat Verification" application package)<br>▪ File for system integration - If using fieldbuses, upload device drivers for system integration from the measuring device:<br>PROFIBUS DP: GSD file |
| Network configuration | Configuration and checking of all the parameters required for establishing the connection to the measuring device:<br>▪ Network settings (e.g. IP address, MAC address)<br>▪ Device information (e.g. serial number, firmware version) |
| Logout | End the operation and call up the login page |

### Navigation area

If a function is selected in the function bar, the submenus of the function open in the navigation area. The user can now navigate through the menu structure.

### Working area

Depending on the selected function and the related submenus, various actions can be performed in this area:
- Configuring parameters
- Reading measured values
- Calling up help text
- Starting an upload/download

## 8.3.6 Disabling the Web server

The Web server of the measuring device can be switched on and off as required using the **Web server functionality** parameter.

### Navigation

"Expert" menu → Communication → Web server

### Parameter overview with brief description

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Web server functionality | Switch the Web server on and off. | ▪ Off<br>▪ On | On |

### Function scope of the "Web server functionality" parameter

| Option | Description |
|---|---|
| Off | ▪ The web server is completely disabled.<br>▪ Port 80 is locked. |
| On | ▪ The complete functionality of the web server is available.<br>▪ JavaScript is used.<br>▪ The password is transferred in an encrypted state.<br>▪ Any change to the password is also transferred in an encrypted state. |

### Enabling the Web server

If the Web server is disabled it can only be re-enabled with the **Web server functionality** parameter via the following operating options:
- Via Bedientool "FieldCare"
- Via "DeviceCare" operating tool

## 8.3.7 Logging out

Before logging out, perform a data backup via the **Data management** function (upload configuration from device) if necessary.

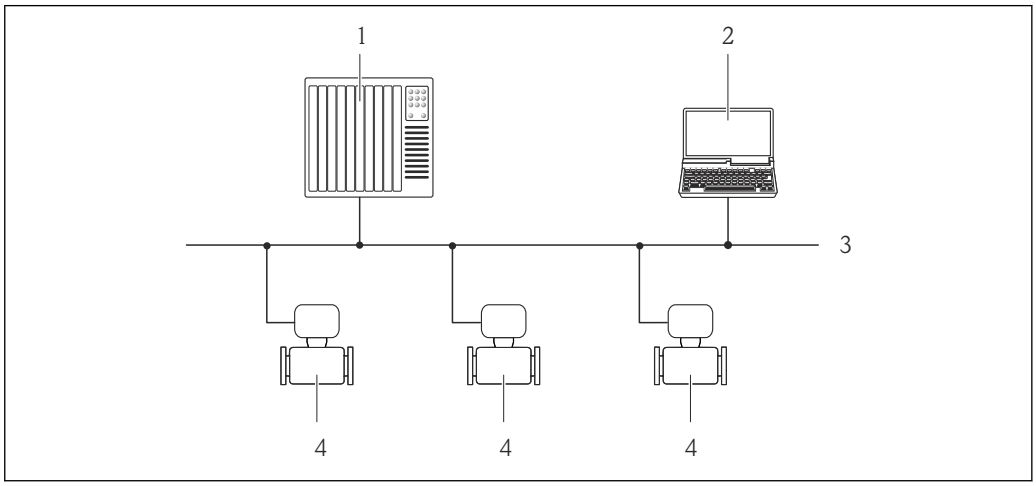
1. Select the **Logout** entry in the function row.
   ↳ The home page with the Login box appears.
2. Close the Web browser.
3. If no longer needed:
   Reset modified properties of the Internet protocol (TCP/IP) → 45.

# 8.4 Access to the operating menu via the operating tool

## 8.4.1 Connecting the operating tool

### Via PROFIBUS DP network

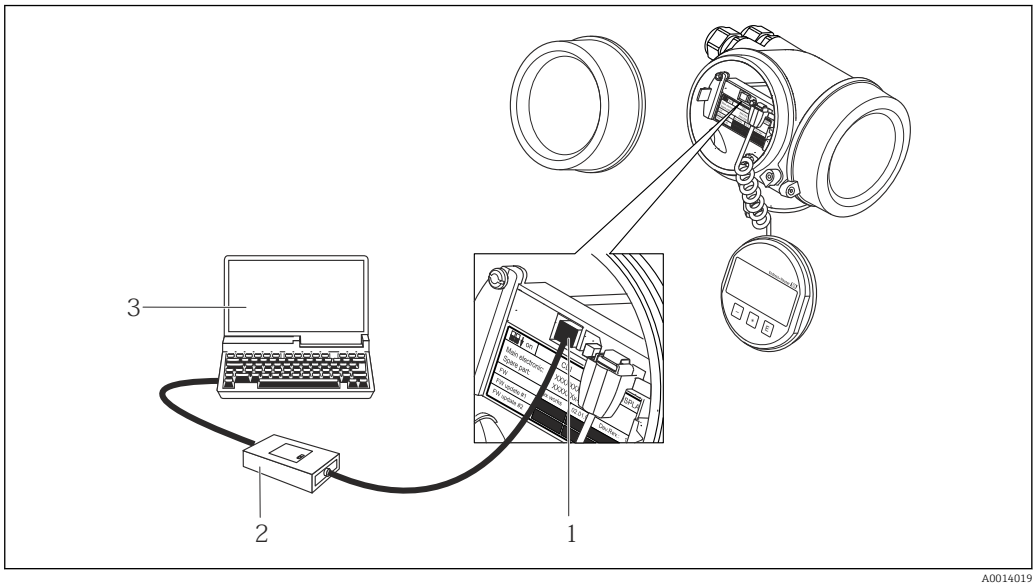
This communication interface is available in device versions with PROFIBUS DP.




18 *Options for remote operation via PROFIBUS DP network*

1 *Automation system*
2 *Computer with PROFIBUS network card*
3 *PROFIBUS DP network*
4 *Measuring device*

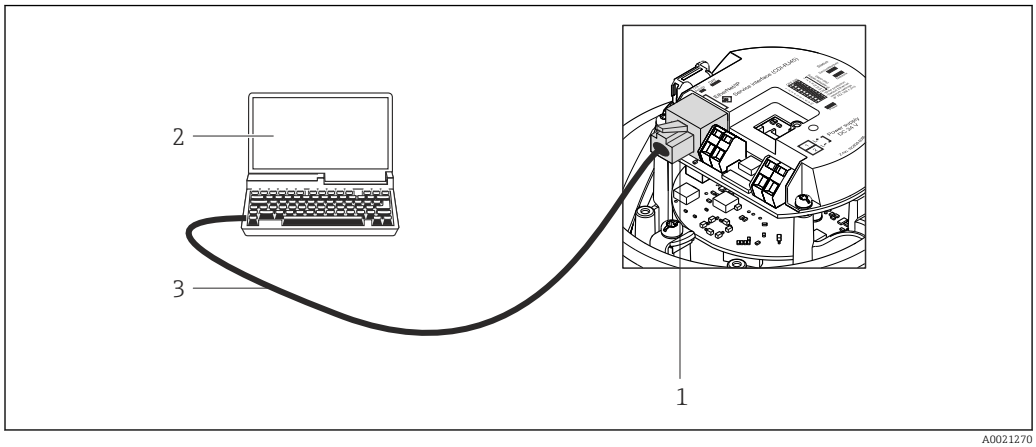
### Via service interface (CDI)




1 *Service interface (CDI = Endress+Hauser Common Data Interface) of the measuring device*
2 *Commubox FXA291*
3 *Computer with FieldCare operating tool with COM DTM CDI Communication FXA291*

### Via service interface (CDI-RJ45)

*PROFIBUS DP*




*19 Connection for order code for "Output", option L: PROFIBUS DP*

*1 Service interface (CDI -RJ45) of the measuring device with access to the integrated Web server*
*2 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with "FieldCare" operating tool with COM DTM "CDI Communication TCP/IP"*
*3 Standard Ethernet connecting cable with RJ45 plug*

## 8.4.2 FieldCare

### Function scope

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

Access is via:
CDI-RJ45 service interface

Typical functions:
- Configuring parameters of transmitters
- Loading and saving device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook

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

### Source for device description files

See information → 52

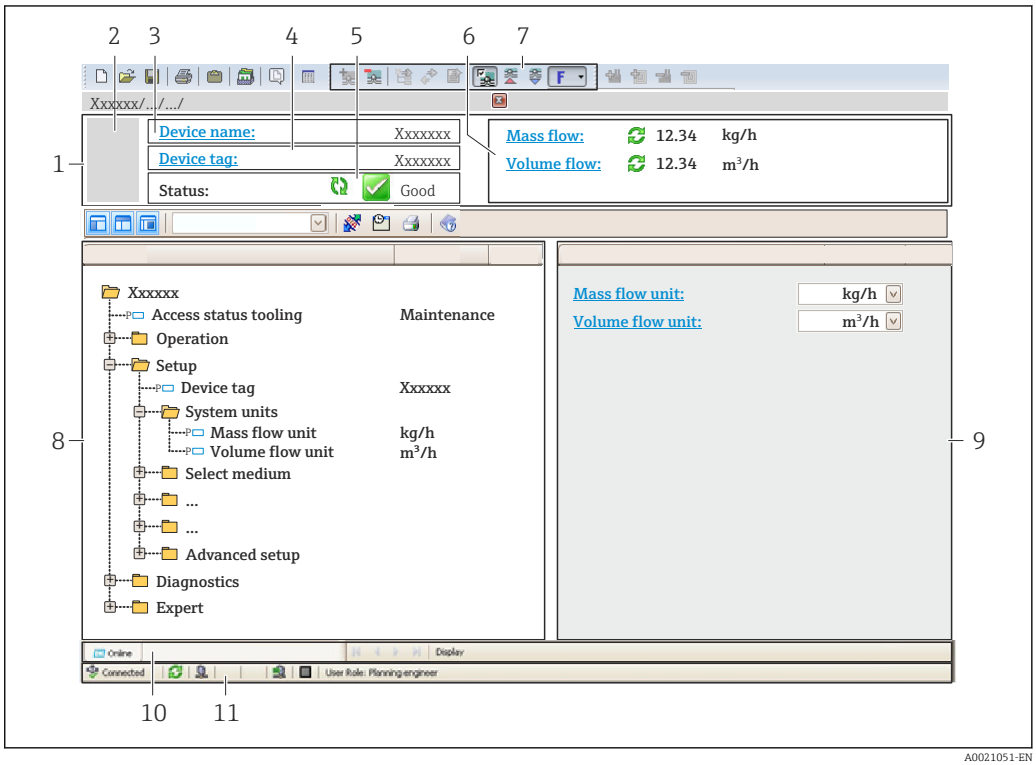
### Establishing a connection

1. Start FieldCare and launch the project.
2. In the network: Add a device.
   ↳ The **Add device** window opens.
3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.
4. Right-click **CDI Communication TCP/IP** and select the **Add device** option in the context menu that opens.
5. Select the desired device from the list and press **OK** to confirm.
   ↳ The **CDI Communication TCP/IP (Configuration)** window opens.
6. Enter the device address in the **IP address** field and press **Enter** to confirm: 192.168.1.212 (factory setting); if the IP address is not known .

7. Establish the online connection to the device.

For additional information, see Operating Instructions BA00027S and BA00059S

### User interface




*1 Header*
*2 Picture of device*
*3 Device name*
*4 Tag name*
*5 Status area with status signal→ 82*
*6 Display area for current measured values*
*7 Edit toolbar with additional functions such as save/restore, event list and create documentation*
*8 Navigation area with operating menu structure*
*9 Working area*
*10 Range of action*
*11 Status area*

## 8.4.3 DeviceCare

### Function scope

Tool to connect and configure Endress+Hauser field devices.

The fastest way to configure Endress+Hauser field devices is with the dedicated "DeviceCare" tool. Together with the device type managers (DTMs) it presents a convenient, comprehensive solution.

For details, see Innovation Brochure IN01047S

### Source for device description files

See information → 52

# 9 System integration

## 9.1 Overview of device description files

### 9.1.1 Current version data for the device

| | | |
|---|---|---|
| Firmware version | 01.01.zz | ▪ On the title page of the Operating instructions<br>▪ On the transmitter nameplate<br>▪ Firmware version<br>Diagnostics → Device information → Firmware version |
| Release date of firmware version | 10.2014 | --- |
| Manufacturer ID | 0x11 | Manufacturer ID<br>Diagnostics → Device information → Manufacturer ID |
| Device type ID | 0x1560 | Device type<br>Diagnostics → Device information → Device type |
| Profile version | 3.02 | --- |

For an overview of the different firmware versions for the device

### 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 PROFIBUS protocol | Sources for obtaining device descriptions |
|---|---|
| FieldCare | ▪ www.endress.com → Download Area<br>▪ CD-ROM (contact Endress+Hauser)<br>▪ DVD (contact Endress+Hauser) |
| DeviceCare | ▪ www.endress.com → Download Area<br>▪ CD-ROM (contact Endress+Hauser)<br>▪ DVD (contact Endress+Hauser) |

## 9.2 Device master file (GSD)

In order to integrate field devices into a bus system, the PROFIBUS system needs a description of the device parameters, such as output data, input data, data format, data volume and supported transmission rate.

These data are available in the device master file (GSD) which is provided to the PROFIBUS Master when the communication system is commissioned. In addition device bit maps, which appear as icons in the network structure, can also be integrated.

With the Profile 3.0 device master file (GSD) it is possible to exchange field devices made by different manufacturers without having to reconfigure.

Generally speaking two different GSD versions are possible with Profile 3.0 and higher.

- Before configuring, the user must decide which GSD should be used to operate the system.
- The setting can be changed via a Class 2 master.

### 9.2.1 Manufacturer-specific GSD

This GSD guarantees the unrestricted functionality of the measuring device. Device-specific process parameters and functions are therefore available.

| Manufacturer-specific GSD | ID number | File name |
|---|---|---|
| PROFIBUS DP | 0x1561 | EH3x1561.gsd |

The fact that the manufacturer-specific GSD should be used is specified in the **Ident number selector** parameter by selecting the **Manufacturer** option.

Where to acquire the manufacturer-specific GSD:
www.endress.com → Download Area

### 9.2.2 Profile GSD

Differs in terms of the number of Analog Input blocks (AI) and the measured values. If a system is configured with a Profile GSD, it is possible to exchange devices made by different manufacturers. However, it is essential to ensure that the order of the cyclic process values is correct.

| ID number | Supported blocks | Supported channels |
|---|---|---|
| 0x9740 | ▪ 1 Analog Input<br>▪ 1 Totalizer | ▪ Channel Analog Input: volume flow<br>▪ Channel totalizer: volume flow |
| 0x9741 | ▪ 2 Analog Input<br>▪ 1 Totalizer | ▪ Channel Analog Input 1: volume flow<br>▪ Channel Analog Input 2: mass flow<br>▪ Channel totalizer: volume flow |
| 0x9742 | ▪ 3 Analog Input<br>▪ 1 Totalizer | ▪ Channel Analog Input 1: volume flow<br>▪ Channel Analog Input 2: mass flow<br>▪ Channel Analog Input 3: corrected volume flow<br>▪ Channel totalizer: volume flow |

The Profile GSD that is to be used is specified in the **Ident number selector** parameter by selecting the **Profile 0x9740** option, **Profile 0x9741** option or **Profile 0x9742** option.

## 9.3 Cyclic data transmission

Cyclic data transmission when using the device master file (GSD).

### 9.3.1 Block model

The block model shows which input and output data the measuring device makes available for cyclic data exchange. Cyclic data exchange takes place with a PROFIBUS master (Class 1), e.g. a control system etc.

| Measuring device | | | | | Control system |
|---|---|---|---|---|---|
| Transducer Block | Analog Input block 1 to 4 | → 54 | Output value AI | → | PROFIBUS DP |
| | Totalizer block 1 to 3 | → 55 | Output value TOTAL | → | |
| | | | Controller SETTOT | ← | |
| | | | Configuration MODETOT | ← | |
| | Analog Output block 1 to 2 | → 57 | Input values AO | ← | |
| | Discrete Input block 1 to 2 | → 57 | Output values DI | → | |
| | Discrete Output block 1 to 2 | → 58 | Input values DO | ← | |

### Defined order of modules

The measuring device works as a modular PROFIBUS slave. In contrast to a compact slave, a modular slave has a variable design and consists of several individual modules. The device master file (GSD) contains a description of the individual modules (input and output data) along with their individual properties.

The modules are permanently assigned to the slots, i.e. when configuring the modules, the order and the arrangement of the modules must be respected.

| Slot | Module | Function block |
|---|---|---|
| 1…4 | AI | Analog Input block 1 to 4 |
| 5 | TOTAL or SETTOT_TOTAL or SETOT_MODETOT_TOTAL | Totalizer block 1 |
| 6 | | Totalizer block 2 |
| 7 | | Totalizer block 3 |
| 8…9 | AO | Analog Output block 1 to 2 |
| 10…11 | DI | Discrete Input block 1 to 2 |
| 12…13 | DO | Discrete Output block 1 to 2 |

To optimize the data throughput rate of the PROFIBUS network, it is advisable to only configure modules that are processed in the PROFIBUS master system. If this results in gaps between the configured modules, these gaps must be assigned to the EMPTY_MODULE.

## 9.3.2 Description of the modules

The data structure is described from the perspective of the PROFIBUS master:
- Input data: Are sent from the measuring device to the PROFIBUS master.
- Output data: Are sent from the PROFIBUS master to the measuring device.

### AI module (Analog Input)

Transmit an input variable from the measuring device to the PROFIBUS master (Class 1).

The selected input variable, along with the status, is cyclically transmitted to the PROFIBUS Master (Class 1) via the AI module. The input variable is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Four Analog Input blocks are available (slot 1 to 4).

*Selection: input variable*

The input variable can be specified using the CHANNEL parameter.

| CHANNEL | Input variable |
|---|---|
| 33122 | Volume flow |
| 32961 | Mass flow |
| 33093 | Corrected volume flow |
| 708 | Flow velocity |
| 1132 | Conductivity |
| 1407 | Corrected conductivity |
| 33101 | Temperature |
| 1042 | Electronic temperature |

*Factory setting*

| Function block | Factory setting |
|---|---|
| AI 1 | Volume flow |
| AI 2 | Mass flow |
| AI 3 | Corrected volume flow |
| AI 4 | Flow velocity |

*Data structure*

*Input data of Analog Input*

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|---|---|---|---|---|
| Measured value: floating point number (IEEE 754) | | | | Status |

### TOTAL module

Transmit a totalizer value from the measuring device to the PROFIBUS master (Class 1).

A selected totalizer value, along with the status, is cyclically transmitted to a PROFIBUS Master (Class 1) via the TOTAL module. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the totalizer value.

Three Totalizer blocks are available (slot 5 to 7).

*Selection: totalizer value*

The totalizer value can be specified using the CHANNEL parameter.

| CHANNEL | Input variable |
|---|---|
| 33122 | Volume flow |
| 32961 | Mass flow |
| 33093 | Corrected volume flow |

*Factory setting*

| Function block | Factory setting: TOTAL |
|---|---|
| Totalizer 1, 2 and 3 | Volume flow |

*Data structure*

*Input data of TOTAL*

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|---|---|---|---|---|
| Measured value: floating point number (IEEE 754) | | | | Status |

### SETTOT_TOTAL module

The module combination consists of the SETTOT and TOTAL functions:
- SETTOT: Control the totalizers via the PROFIBUS master.
- TOTAL: Transmit totalizer value, along with the status, to the PROFIBUS master.

Three Totalizer blocks are available (slot 5 to 7).

*Selection: control totalizer*

| CHANNEL | Value SETTOT | Control totalizer |
|---|---|---|
| 33310 | 0 | Totalize |
| 33046 | 1 | Resetting |
| 33308 | 2 | Adopt totalizer initial setting |

*Factory setting*

| Function block | Factory setting: Value SETTOT (meaning) |
|---|---|
| Totalizer 1, 2 and 3 | 0 (totalizing) |

*Data structure*

*Output data of SETTOT*

| Byte 1 |
|---|
| Control variable 1 |

*Input data of TOTAL*

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|---|---|---|---|---|
| Measured value: floating point number (IEEE 754) | | | | Status |

### SETTOT_MODETOT_TOTAL module

The module combination consists of the SETTOT, MODETOT and TOTAL functions:
- SETTOT: Control the totalizers via the PROFIBUS master.
- MODETOT: Configure the totalizers via the PROFIBUS master.
- TOTAL: Transmit totalizer value, along with the status, to the PROFIBUS master.

Three Totalizer blocks are available (slot 5 to 7).

*Selection: totalizer configuration*

| CHANNEL | MODETOT value | Totalizer configuration |
|---|---|---|
| 33306 | 0 | Balancing |
| 33028 | 1 | Balance the positive flow |
| 32976 | 2 | Balance the negative flow |
| 32928 | 3 | Stop totalizing |

*Factory setting*

| Function block | Factory setting: Value MODETOT (meaning) |
|---|---|
| Totalizer 1, 2 and 3 | 0 (balancing) |

*Data structure*

*Output data of SETTOT and MODETOT*

| Byte 1 | Byte 2 |
|---|---|
| Control variable 1: SETTOT | Control variable 2: MODETOT |

*Input data of TOTAL*

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|---|---|---|---|---|
| Measured value: floating point number (IEEE 754) | | | | Status |

### AO module (Analog Output)

Transmit a compensation value from the PROFIBUS master (Class 1) to the measuring device.

A compensation value, along with the status, is cyclically transmitted from the PROFIBUS Master (Class 1) to the measuring device via the AO module. The compensation value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the compensation value.

Two Analog Output blocks are available (slot 8 to 9).

*Assigned compensation values*

A compensation value is permanently assigned to the individual Analog Output blocks.

| CHANNEL | Function block | Compensation value |
|---|---|---|
| 731 | AO 1 | External density |
| 307 | AO 2 | External temperature [1] |

1) The compensation variables must be transmitted to the device in the SI basic unit

The selection is made via: Expert → Sensor → External compensation

*Data structure*

*Output data of Analog Output*

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|---|---|---|---|---|
| Measured value: floating point number (IEEE 754) | | | | Status |

### DI module (Discrete Input)

Transmit discrete input values from the measuring device to the PROFIBUS master (Class 1). Discrete input values are used by the measuring device to transmit the state of device functions to the PROFIBUS master (Class 1).

The DI module cyclically transmits the discrete input value, along with the status, to the PROFIBUS Master (Class 1). The discrete input value is depicted in the first byte. The second byte contains standardized status information pertaining to the input value.

Two Discrete Input blocks are available (slot 10 to 11).

*Selection: device function*

The device function can be specified using the CHANNEL parameter.

| CHANNEL | Device function | Factory setting: Status (meaning) |
|---|---|---|
| 893 | Status switch output | ▪ 0 (device function not active)<br>▪ 1 (device function active) |
| 894 | Empty pipe detection | |

| CHANNEL | Device function | Factory setting: Status (meaning) |
|---|---|---|
| 895 | Low flow cut off | |
| 1430 | Status verification [1] | |

1) Only available with the Heartbeat Verification application package

*Factory setting*

| Function block | Factory setting |
|---|---|
| DI 1 | Empty pipe detection |
| DI 2 | Low flow cut off |

*Data structure*

*Input data of Discrete Input*

| Byte 1 | Byte 2 |
|---|---|
| Discrete | Status |

### DO module (Discrete Output)

Transmit discrete output values from the PROFIBUS master (Class 1) to the measuring device. Discrete output values are used by the PROFIBUS master (Class 1) to enable and disable device functions.

The DO module cyclically transmits the discrete output value, along with the status, to the measuring device. The discrete output value is depicted in the first byte. The second byte contains standardized status information pertaining to the output value.

Two Discrete Output blocks are available (slot 12 to 13).

*Assigned device functions*

A device function is permanently assigned to the individual Discrete Output blocks.

| CHANNEL | Function block | Device function | Values: control (meaning) |
|---|---|---|---|
| 891 | DO 1 | Flow override | ▪ 0 (disable device function)<br>▪ 1 (enable device function) |
| 1429 | DO 2 | Start verification [1] | |

1) Only available with the Heartbeat Verification application package

*Data structure*

*Output data of Discrete Output*

| Byte 1 | Byte 2 |
|---|---|
| Discrete | Status |

### EMPTY_MODULE module

This module is used to assign empty spaces arising from modules not being used in the slots → 🖹 54.

# 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→ 28
- "Post-connection check" checklist → 39

## 10.2 Connecting via FieldCare

- For FieldCare connection
- For connecting via FieldCare → 50
- For the FieldCare → 51 user interface

## 10.3 Configuring the device address via software

In the **"Communication" submenu** the device address can be set.

**Navigation**
"Setup" menu → Communication → Device address

### 10.3.1 PROFIBUS network

At time of delivery, the measuring device has the following factory setting:

| | |
|---|---|
| **Device address** | 126 |

If hardware addressing is active, software addressing is blocked

## 10.4 Setting the operating language

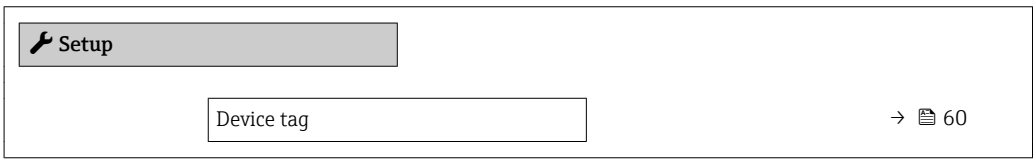
Factory setting: English or ordered local language

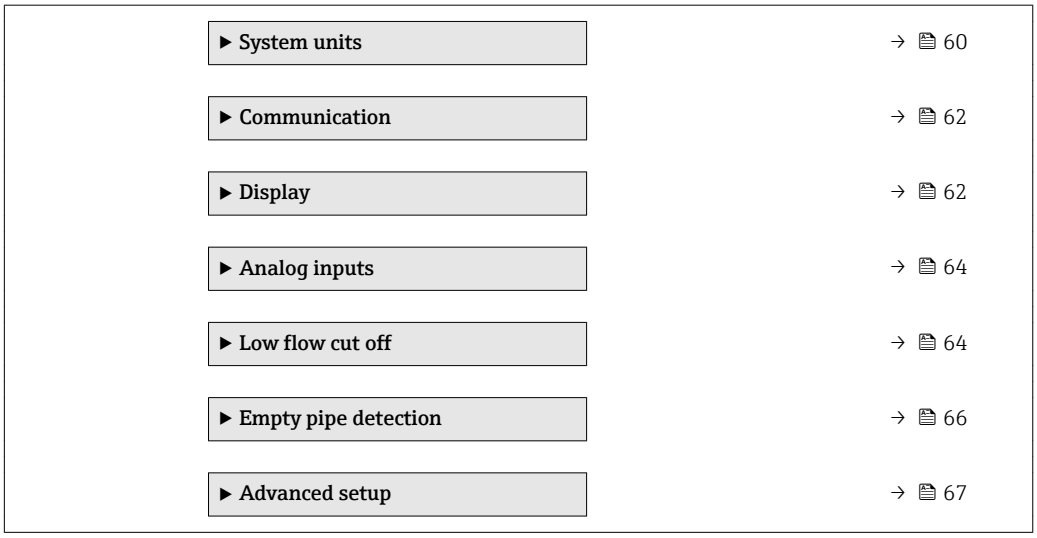
The operating language can be set in FieldCare, DeviceCare or via the Web server:
Operation → Display language

## 10.5 Configuring the measuring device

The **Setup** menu with its submenus contains all the parameters needed for standard operation.

**Navigation**
"Setup" menu






### 10.5.1 Defining the tag name

To enable fast identification of the measuring point within the system, you can enter a unique designation using the **Device tag** parameter and thus change the factory setting.

Enter the tag name in the "FieldCare" operating tool → 51

**Navigation**
"Setup" menu → Device tag

**Parameter overview with brief description**

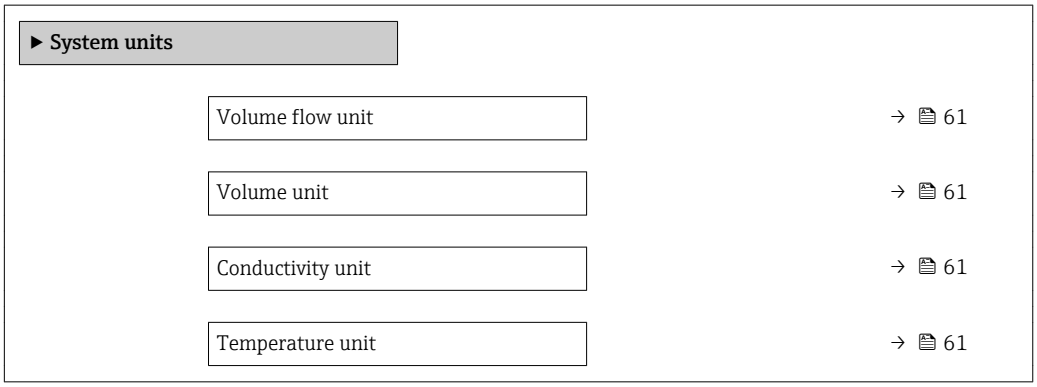
| Parameter | Description | User entry | Factory setting |
|---|---|---|---|
| Device tag | Enter the name for the measuring point. | Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /). | Promag 100 DP |

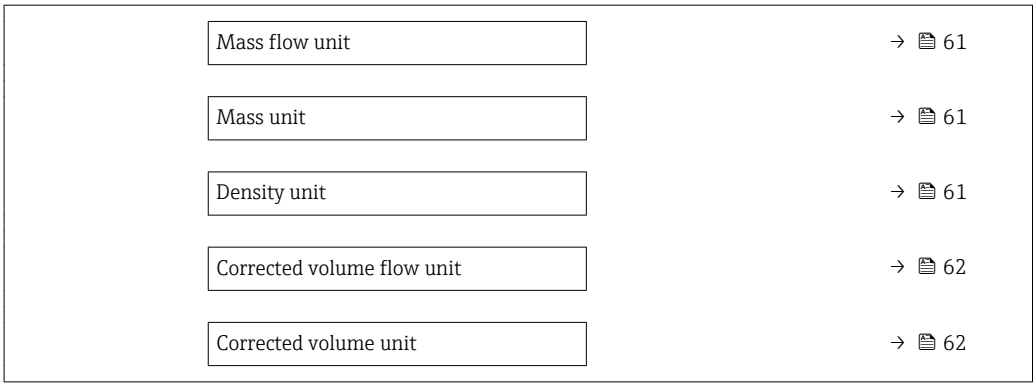
### 10.5.2 Setting the system units

In the **System units** submenu the units of all the measured values can be set.

Depending on the device version, not all submenus and parameters are available in every device. The selection can vary depending on the order code.

**Navigation**
"Setup" menu → Advanced setup → System units






### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection | Factory setting |
|---|---|---|---|---|
| Volume flow unit | – | Select volume flow unit.<br>*Result*<br>The selected unit applies for:<br>▪ Output<br>▪ Low flow cut off<br>▪ Simulation process variable | Unit choose list | Country-specific:<br>▪ l/h<br>▪ gal/min (us) |
| Volume unit | – | Select volume unit. | Unit choose list | Country-specific:<br>▪ $m^3$<br>▪ gal (us) |
| Conductivity unit | The **On** option is selected in the **Conductivity measurement** parameter parameter. | Select conductivity unit.<br>*Effect*<br>The selected unit applies for:<br>Simulation process variable | Unit choose list | µS/cm |
| Temperature unit | – | Select temperature unit.<br>*Result*<br>The selected unit applies for:<br>▪ **Temperature** parameter<br>▪ **Maximum value** parameter<br>▪ **Minimum value** parameter<br>▪ **External temperature** parameter<br>▪ **Maximum value** parameter<br>▪ **Minimum value** parameter | Unit choose list | Country-specific:<br>▪ °C<br>▪ °F |
| Mass flow unit | – | Select mass flow unit.<br>*Result*<br>The selected unit applies for:<br>▪ Output<br>▪ Low flow cut off<br>▪ Simulation process variable | Unit choose list | Country-specific:<br>▪ kg/h<br>▪ lb/min |
| Mass unit | – | Select mass unit. | Unit choose list | Country-specific:<br>▪ kg<br>▪ lb |
| Density unit | – | Select density unit.<br>*Result*<br>The selected unit applies for:<br>▪ Output<br>▪ Simulation process variable | Unit choose list | Country-specific:<br>▪ kg/l<br>▪ $lb/ft^3$ |

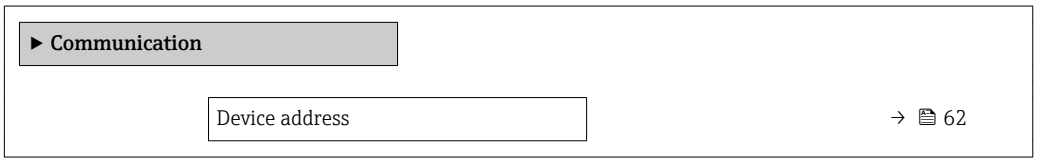
| Parameter | Prerequisite | Description | Selection | Factory setting |
|---|---|---|---|---|
| Corrected volume flow unit | – | Select corrected volume flow unit.<br>*Result*<br>The selected unit applies for: **Corrected volume flow** parameter (→ 77) | Unit choose list | Country-specific:<br>▪ Nl/h<br>▪ Sft³/h |
| Corrected volume unit | – | Select corrected volume unit. | Unit choose list | Country-specific:<br>▪ Nm³<br>▪ Sft³ |

## 10.5.3 Configuring communication interface

The **Communication** submenu guides you systematically through all the parameters that have to be configured for selecting and setting the communication interface.

### Navigation

"Setup" menu → Communication




### Parameter overview with brief description

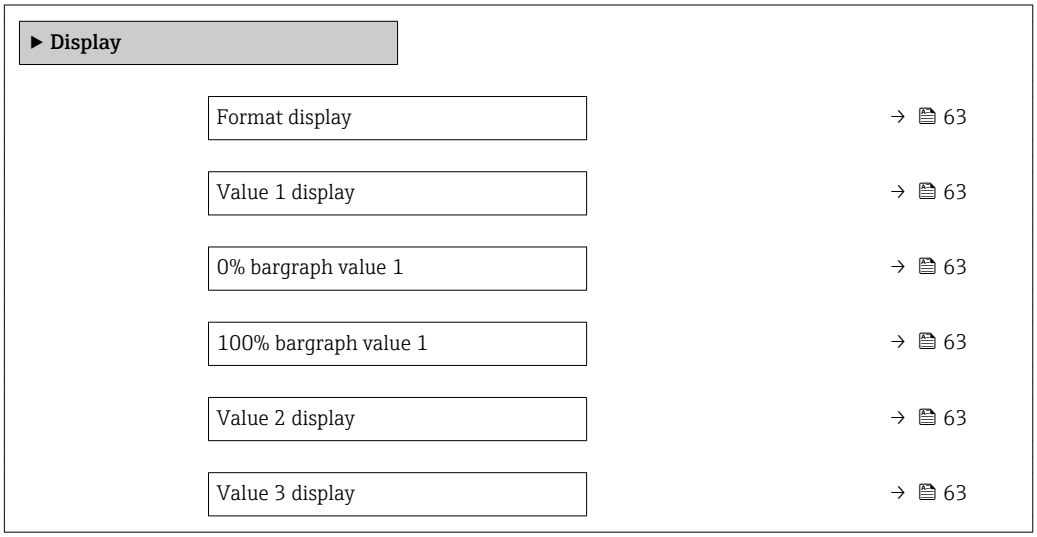
| Parameter | Description | User entry | Factory setting |
|---|---|---|---|
| Device address | Enter device address. | 0 to 126 | 126 |

## 10.5.4 Configuring the local display

The **Display** wizard guides you systematically through all the parameters that can configured for configuring the local display.

### Navigation

"Setup" menu → Display



| | |
|---|---|
| 0% bargraph value 3 | → 63 |
| 100% bargraph value 3 | → 63 |
| Value 4 display | → 63 |

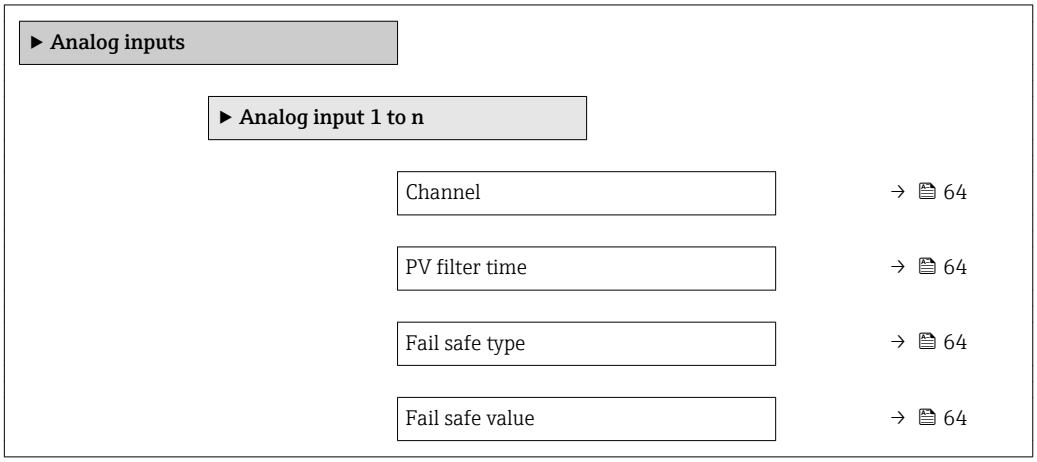
### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Format display | A local display is provided. | Select how measured values are shown on the display. | ▪ 1 value, max. size<br>▪ 1 bargraph + 1 value<br>▪ 2 values<br>▪ 1 value large + 2 values<br>▪ 4 values | 1 value, max. size |
| Value 1 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ None<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Electronic temperature | Volume flow |
| 0% bargraph value 1 | A local display is provided. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter | None |
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 63) | None |
| 0% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 0 |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 63) | None |

### 10.5.5 Configuring the analog inputs

The **Analog inputs** submenu guides the user systematically to the individual **Analog input 1 to n** submenu. From here you get to the parameters of the individual analog input.

**Navigation**
"Setup" menu → Analog inputs



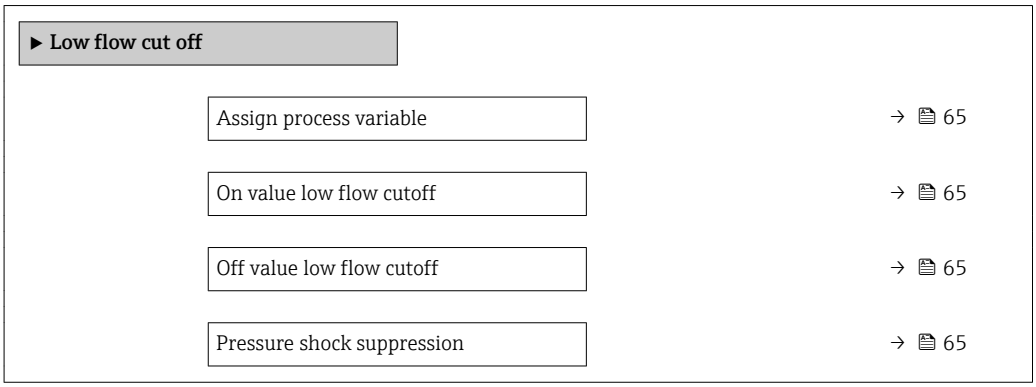

**Parameter overview with brief description**

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Channel | – | Select the process variable. | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Temperature<br>▪ Electronic temperature | Volume flow |
| PV filter time | – | Specify the time to suppress signal peaks. During the specified time the analog input does not respond to an erratic increase in the process variable. | Positive floating-point number | 0 |
| Fail safe type | – | Select the failure mode. | ▪ Fail safe value<br>▪ Fallback value<br>▪ Off | Off |
| Fail safe value | In **Fail safe type** parameter, the **Fail safe value** option is selected. | Specify the values to be output when an error occurs. | Signed floating-point number | 0 |

### 10.5.6 Configuring the low flow cut off

The **Low flow cut off** submenu contains the parameters that must be set in order to configure the low flow cut off.

### Navigation
"Setup" menu → Low flow cut off



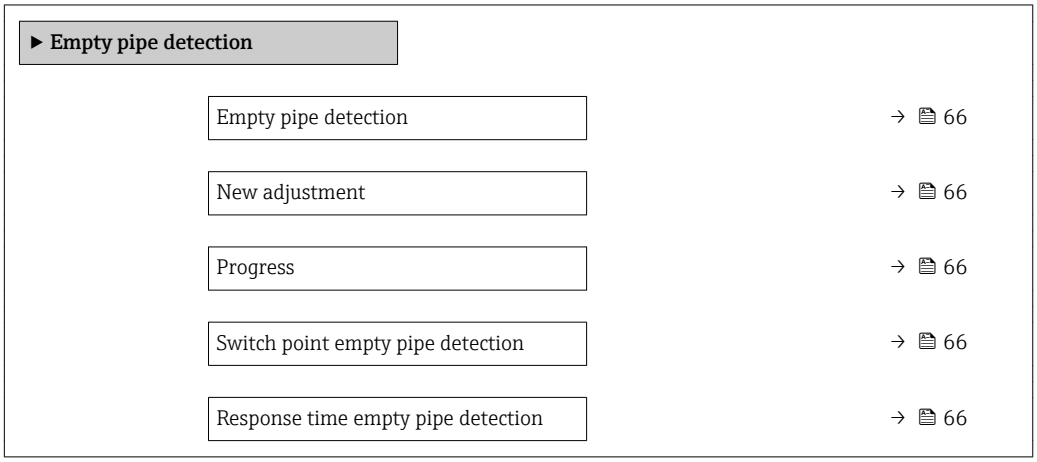

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Assign process variable | – | Select process variable for low flow cut off. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Volume flow |
| On value low flow cutoff | One of the following options is selected in the **Assign process variable** parameter (→ 65):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Enter on value for low flow cut off. | Signed floating-point number | Depends on country and nominal diameter |
| Off value low flow cutoff | One of the following options is selected in the **Assign process variable** parameter (→ 65):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Enter off value for low flow cut off. | 0 to 100.0 % | 50 % |
| Pressure shock suppression | One of the following options is selected in the **Assign process variable** parameter (→ 65):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Enter time frame for signal suppression (= active pressure shock suppression). | 0 to 100 s | 0 s |

### 10.5.7 Configuring empty pipe detection

The **Empty pipe detection** submenu contains parameters that must be configured for the configuration of empty pipe detection.

**Navigation**
"Setup" menu → Empty pipe detection



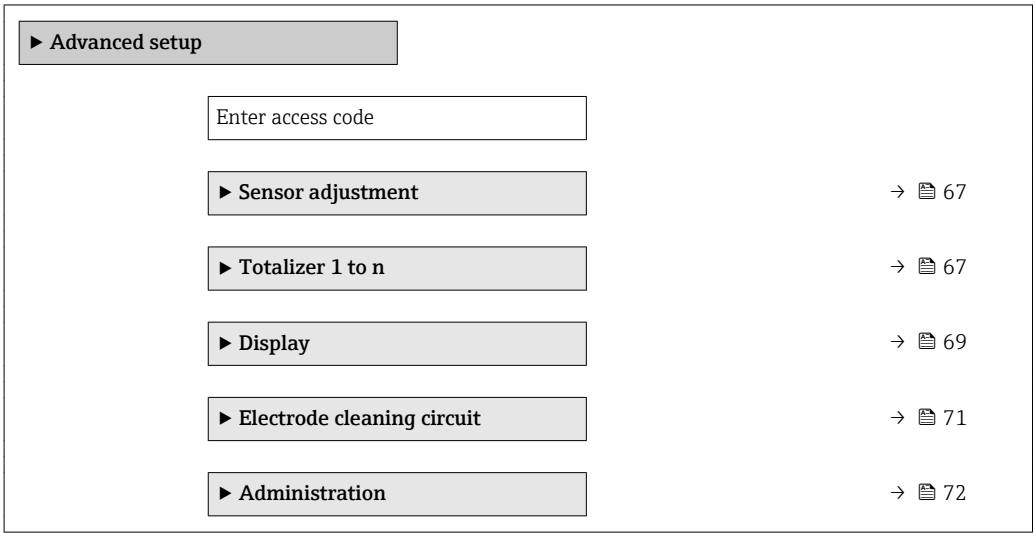

**Parameter overview with brief description**

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Empty pipe detection | – | Switch empty pipe detection on and off. | ▪ Off<br>▪ On | Off |
| New adjustment | The **On** option is selected in the **Empty pipe detection** parameter. | Select type of adjustment. | ▪ Cancel<br>▪ Empty pipe adjust<br>▪ Full pipe adjust | Cancel |
| Progress | The **On** option is selected in the **Empty pipe detection** parameter. | Shows the progress. | ▪ Ok<br>▪ Busy<br>▪ Not ok | – |
| Switch point empty pipe detection | The **On** option is selected in the **Empty pipe detection** parameter. | Enter hysteresis in %, below this value the measuring tube will detected as empty. | 0 to 100 % | 10 % |
| Response time empty pipe detection | In the **Empty pipe detection** parameter (→ 66), the **On** option is selected. | Enter the time before diagnostic message S862 "Pipe empty" is displayed for empty pipe detection. | 0 to 100 s | 1 s |

## 10.6 Advanced settings

The **Advanced setup** submenu together with its submenus contains parameters for specific settings.

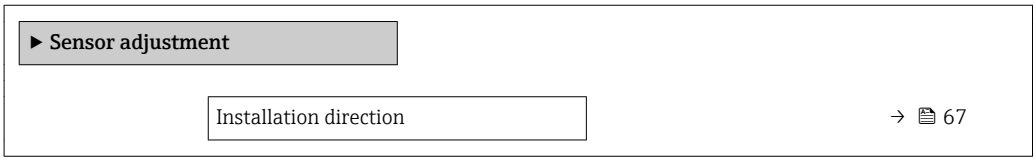
**Navigation**
"Setup" menu → Advanced setup




### 10.6.1 Carrying out a sensor adjustment

The **Sensor adjustment** submenu contains parameters that pertain to the functionality of the sensor.

**Navigation**
"Setup" menu → Advanced setup → Sensor adjustment



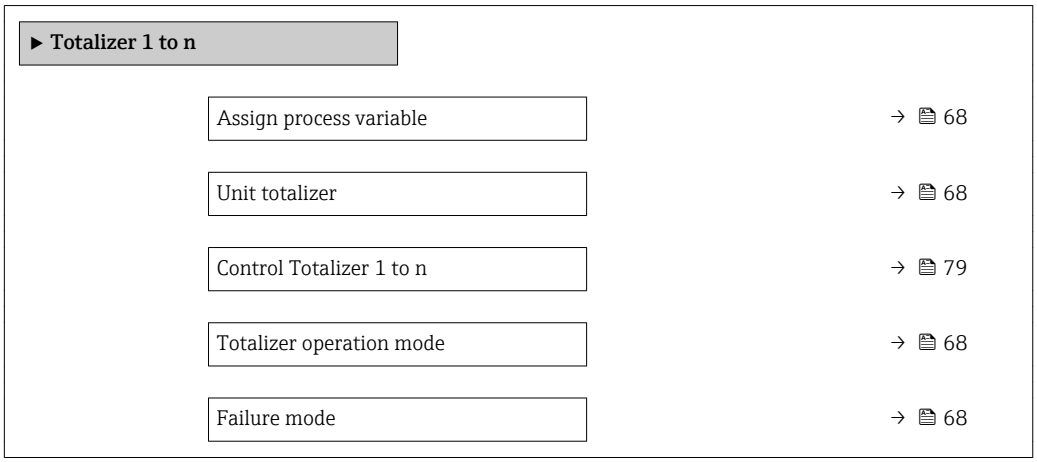

**Parameter overview with brief description**

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Installation direction | Set sign of flow direction to match the direction of the arrow on the sensor. | ▪ Flow in arrow direction<br>▪ Flow against arrow direction | Flow in arrow direction |

### 10.6.2 Configuring the totalizer

In the **"Totalizer 1 to n" submenu** the individual totalizer can be configured.

### Navigation
"Setup" menu → Advanced setup → Totalizer 1 to n



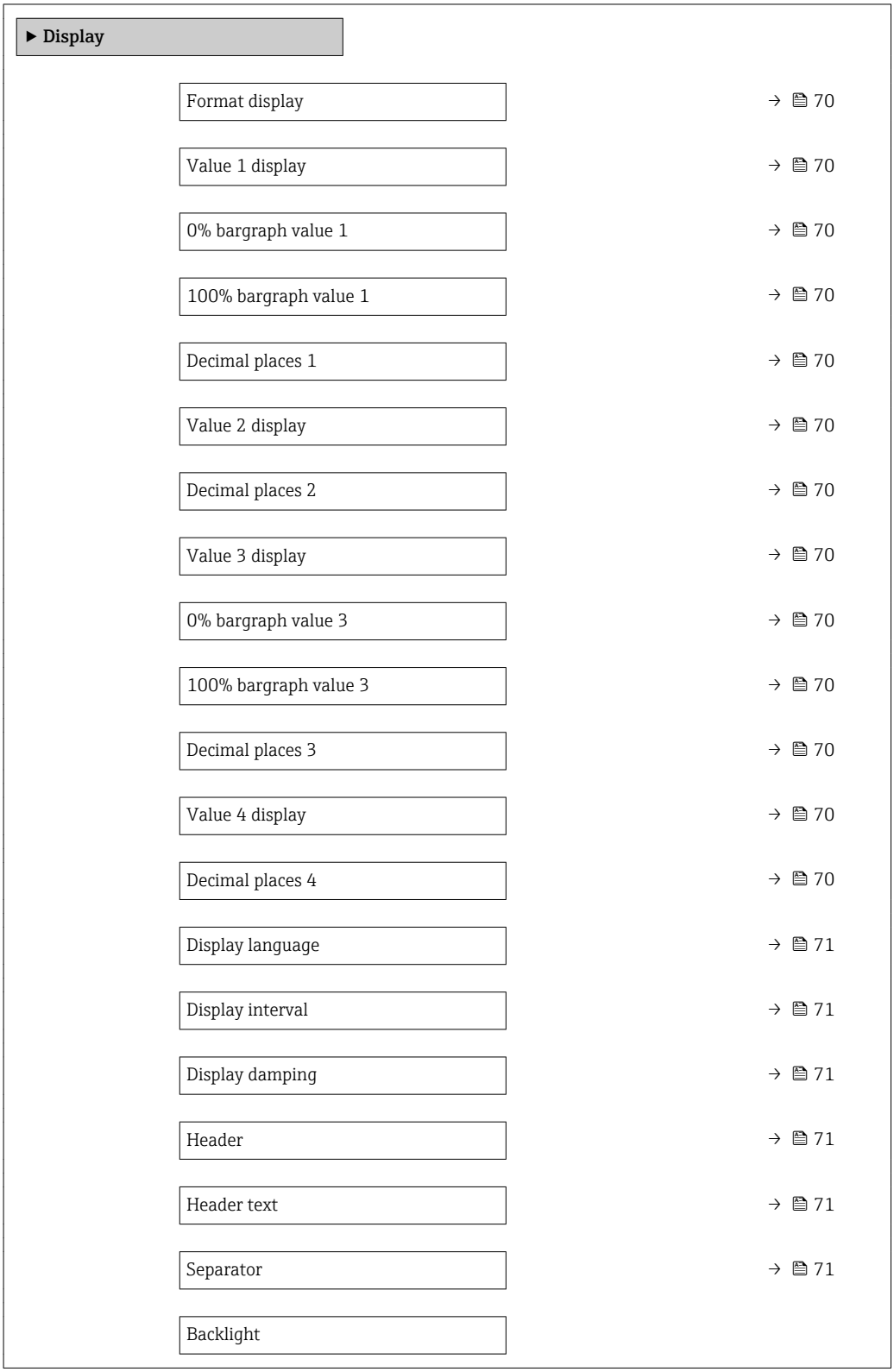

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection | Factory setting |
|---|---|---|---|---|
| Assign process variable | – | Select process variable for totalizer. | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Volume flow |
| Unit totalizer | One of the following options is selected in the **Assign process variable** parameter:<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Select the unit for the process variable of the totalizer. | Unit choose list | Country-specific:<br>▪ $m^3$<br>▪ $ft^3$ |
| Totalizer operation mode | In the **Assign process variable** parameter, one of the following options is selected:<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Select totalizer calculation mode. | ▪ Net flow total<br>▪ Forward flow total<br>▪ Reverse flow total<br>▪ Last valid value | Net flow total |
| Failure mode | One of the following options is selected in the **Assign process variable** parameter:<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Define the totalizer behavior in the event of a device alarm. | ▪ Stop<br>▪ Actual value<br>▪ Last valid value | Actual value |

### 10.6.3 Carrying out additional display configurations

In the **Display** submenu you can set all the parameters associated with the configuration of the local display.

**Navigation**
"Setup" menu → Advanced setup → Display



## Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Format display | A local display is provided. | Select how measured values are shown on the display. | ▪ 1 value, max. size<br>▪ 1 bargraph + 1 value<br>▪ 2 values<br>▪ 1 value large + 2 values<br>▪ 4 values | 1 value, max. size |
| Value 1 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ None<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Electronic temperature | Volume flow |
| 0% bargraph value 1 | A local display is provided. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |
| Decimal places 1 | A measured value is specified in the **Value 1 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx | x.xx |
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter | None |
| Decimal places 2 | A measured value is specified in the **Value 2 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx | x.xx |
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🖹 63) | None |
| 0% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 0 |
| Decimal places 3 | A measured value is specified in the **Value 3 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx | x.xx |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🖹 63) | None |
| Decimal places 4 | A measured value is specified in the **Value 4 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx | x.xx |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Display language | A local display is provided. | Set display language. | ▪ English<br>▪ Deutsch *<br>▪ Français *<br>▪ Español *<br>▪ Italiano *<br>▪ Nederlands *<br>▪ Portuguesa *<br>▪ Polski *<br>▪ русский язык (Russian) *<br>▪ Svenska *<br>▪ Türkçe *<br>▪ 中文 (Chinese) *<br>▪ 日本語 (Japanese) *<br>▪ 한국어 (Korean) *<br>▪ العَرَبِيّة (Arabic) *<br>▪ Bahasa Indonesia *<br>▪ ภาษาไทย (Thai) *<br>▪ tiếng Việt (Vietnamese) *<br>▪ čeština (Czech) * | English (alternatively, the ordered language is preset in the device) |
| Display interval | A local display is provided. | Set time measured values are shown on display if display alternates between values. | 1 to 10 s | 5 s |
| Display damping | A local display is provided. | Set display reaction time to fluctuations in the measured value. | 0.0 to 999.9 s | 0.0 s |
| Header | A local display is provided. | Select header contents on local display. | ▪ Device tag<br>▪ Free text | Device tag |
| Header text | In the **Header** parameter, the **Free text** option is selected. | Enter display header text. | Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /) | ---------- |
| Separator | A local display is provided. | Select decimal separator for displaying numerical values. | ▪ . (point)<br>▪ , (comma) | . (point) |

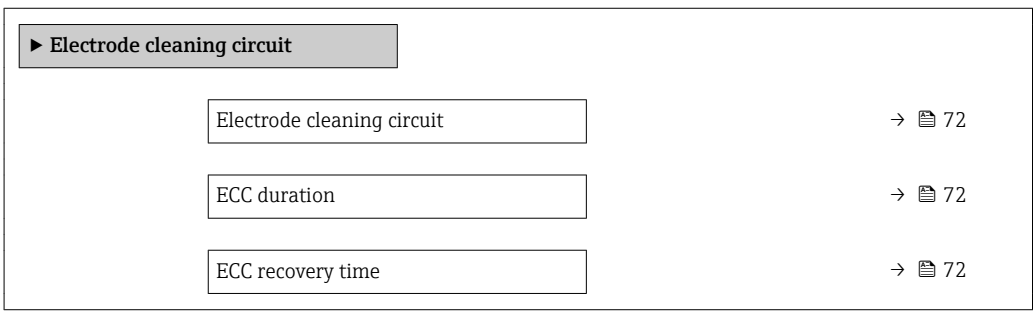
* Visibility depends on order options or device settings

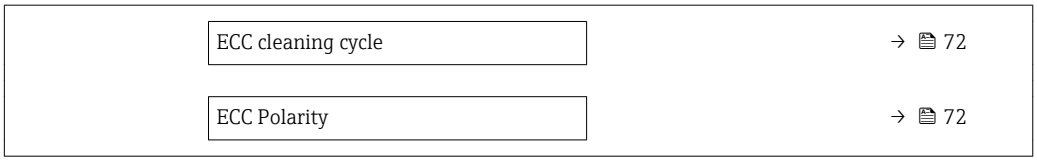
### 10.6.4 Performing electrode cleaning

The **Electrode cleaning circuit** submenu contains parameters that must be configured for the configuration of electrode cleaning.

The submenu is only available if the device was ordered with electrode cleaning.

**Navigation**
"Setup" menu → Advanced setup → Electrode cleaning circuit






### Parameter overview with brief description

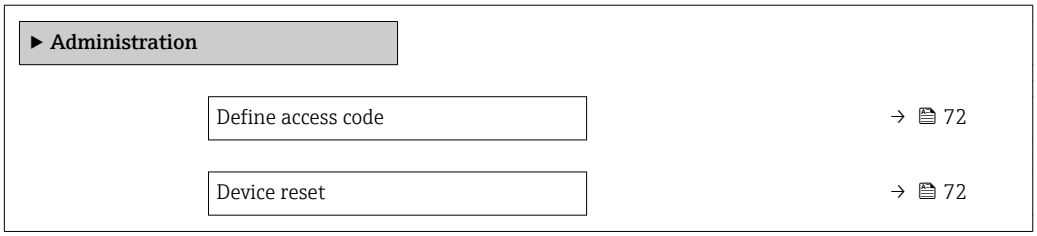
| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Electrode cleaning circuit | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Enable the cyclic electrode cleaning circuit. | ▪ Off<br>▪ On | Off |
| ECC duration | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Enter the duration of electrode cleaning in seconds. | 0.01 to 30 s | 2 s |
| ECC recovery time | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Define recovery time after electrode cleaning. During this time the current output values will be held at last valid value. | Positive floating-point number | 60 s |
| ECC cleaning cycle | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Enter the pause duration between electrode cleaning cycles. | 0.5 to 168 h | 0.5 h |
| ECC Polarity | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Select the polarity of the electrode cleaning circuit. | ▪ Positive<br>▪ Negative | Depends on the electrode material:<br>▪ Platinum: **Negative** option<br>▪ Tantalum, Alloy C22, stainless steel: **Positive** option |

## 10.6.5 Using parameters for device administration

The **Administration** submenu systematically guides the user through all the parameters that can be used for device administration purposes.

### Navigation

"Setup" menu → Advanced setup → Administration



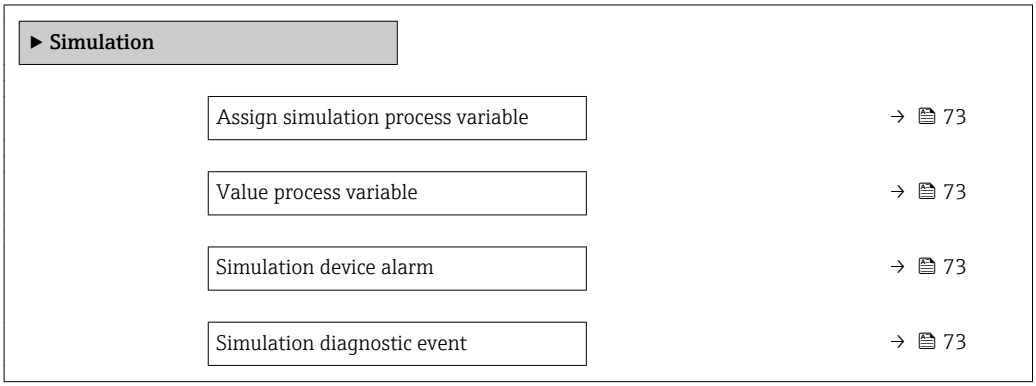

### Parameter overview with brief description

| Parameter | Description | User entry / Selection | Factory setting |
|---|---|---|---|
| Define access code | Define release code for write access to parameters. | 0 to 9 999 | 0 |
| Device reset | Reset the device configuration - either entirely or in part - to a defined state. | ▪ Cancel<br>▪ To delivery settings<br>▪ Restart device | Cancel |

## 10.7 Simulation

The **Simulation** submenu enables you to simulate, without a real flow situation, various process variables in the process and the device alarm mode and to verify downstream signal chains (switching valves or closed-control loops).

**Navigation**
"Diagnostics" menu → Simulation




### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Assign simulation process variable | – | Select a process variable for the simulation process that is activated. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Conductivity * | Off |
| Value process variable | One of the following options is selected in the **Assign simulation process variable** parameter (→ 73):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Conductivity *<br>▪ Corrected conductivity *<br>▪ Temperature * | Enter the simulation value for the selected process variable. | Depends on the process variable selected | 0 |
| Simulation device alarm | – | Switch the device alarm on and off. | ▪ Off<br>▪ On | Off |
| Diagnostic event category | – | Select a diagnostic event category. | ▪ Sensor<br>▪ Electronics<br>▪ Configuration<br>▪ Process | Process |
| Simulation diagnostic event | – | Select a diagnostic event for the simulation process that is activated. | ▪ Off<br>▪ Diagnostic event picklist (depends on the category selected) | Off |

* Visibility depends on order options or device settings

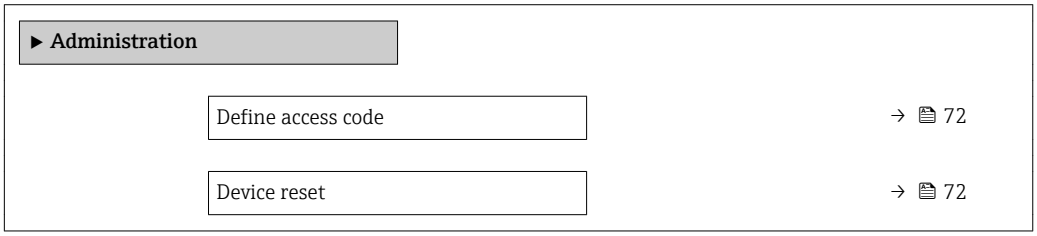
## 10.8 Protecting settings from unauthorized access

The following options exist for protecting the configuration of the measuring device from unintentional modification after commissioning:
- Write protection via access code for Web browser → 74
- Write protection via write protection switch → 74

### 10.8.1 Write protection via access code

With the customer-specific access code, access to the measuring device via the Web browser is protected, as are the parameters for the measuring device configuration.

**Navigation**
"Setup" menu → Advanced setup → Administration → Define access code




**Defining the access code via the Web browser**

1. Navigate to the **Define access code** parameter.
2. Define a max. 16-digit numeric code as an access code.
3. Enter the access code again in the to confirm the code.
   ↳ The Web browser switches to the login page.

If no action is performed for 10 minutes, the Web browser automatically returns to the login page.

- 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 via Web browser is indicated by the **Access status tooling** parameter. Navigation path: Operation → Access status tooling

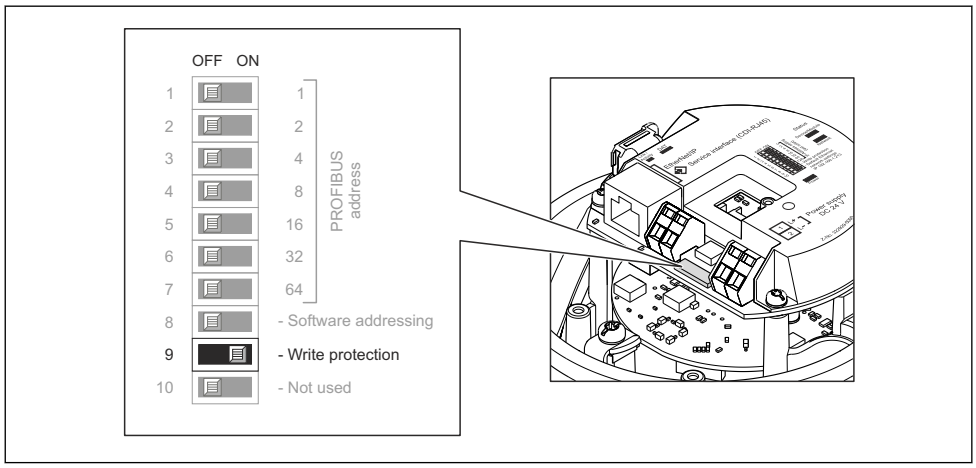
### 10.8.2 Write protection via write protection switch

The write protection switch makes it possible to block write access to the entire operating menu with the exception of the following parameters:
- External pressure
- External temperature
- Reference density
- All parameters for configuring the totalizer

The parameter values are now read only and cannot be edited any more:
- Via service interface (CDI-RJ45)
- Via PROFIBUS DP

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary → 124.

3.

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Setting the write protection switch on the main electronics module to the **On** position enables hardware write protection. Setting the write protection switch on the main electronics module to the **Off** position (factory setting) disables hardware write protection.

↳ If hardware write protection is enabled: the **Locking status** parameter displays the **Hardware locked** option ; if disabled, the **Locking status** parameter does not display any option .

4. Reverse the removal procedure to reassemble the transmitter.

# 11 Operation

## 11.1 Reading the device locking status

Device active write protection: **Locking status** parameter

**Navigation**
"Operation" menu → Locking status

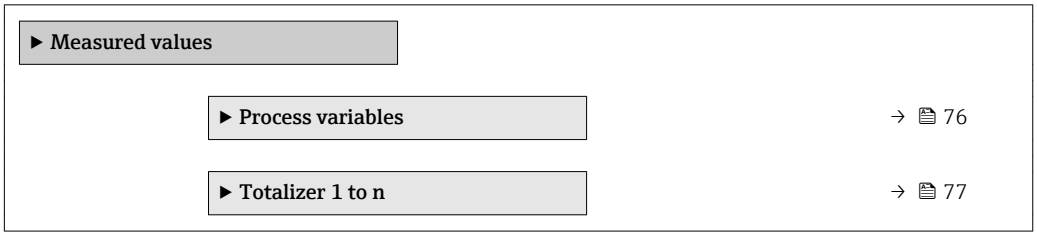
*Function scope of "Locking status" parameter*

| Options | Description |
|---|---|
| Hardware locked | The write protection switch (DIP switch) for hardware locking is activated on the I/O electronic module. This prevents write access to the parameters . |
| Temporarily locked | Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset etc.). Once the internal processing has been completed, the parameters can be changed once again. |

## 11.2 Reading measured values

With the **Measured values** submenu, it is possible to read all the measured values.

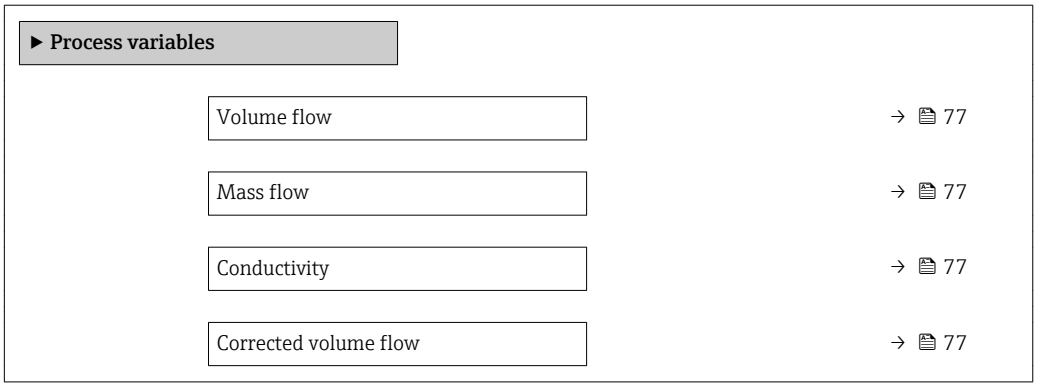
**Navigation**
"Diagnostics" menu → Measured values

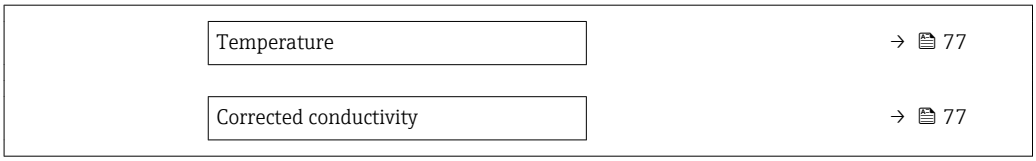



### 11.2.1 "Process variables" submenu

The **Process variables** submenu contains all the parameters needed to display the current measured values for each process variable.

**Navigation**
"Diagnostics" menu → Measured values → Process variables






### Parameter overview with brief description

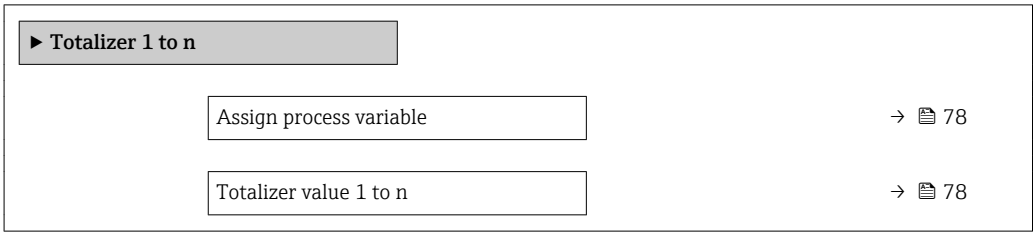
| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Volume flow | – | Displays the volume flow currently measured.<br>*Dependency*<br>The unit is taken from the **Volume flow unit** parameter (→ 61). | Signed floating-point number |
| Mass flow | – | Displays the mass flow currently calculated.<br>*Dependency*<br>The unit is taken from the **Mass flow unit** parameter (→ 61). | Signed floating-point number |
| Corrected volume flow | – | Displays the corrected volume flow currently calculated.<br>*Dependency*<br>The unit is taken from the **Corrected volume flow unit** parameter (→ 62). | Signed floating-point number |
| Conductivity | The **On** option is selected in the **Conductivity measurement** parameter. | Displays the conductivity currently measured.<br>*Dependency*<br>The unit is taken from the **Conductivity unit** parameter (→ 61). | Signed floating-point number |
| Corrected conductivity | One of the following conditions is met:<br>▪ Order code for "Sensor option", option **CI** "Medium temperature sensor"<br>or<br>▪ The temperature is read into the flowmeter from an external device. | Displays the conductivity currently corrected.<br>*Dependency*<br>The unit is taken from the **Conductivity unit** parameter (→ 61). | Positive floating-point number |
| Temperature | For the following order code:<br>"Sensor option", option **CI** "Medium temperature sensor" | Displays the temperature currently calculated.<br>*Dependency*<br>The unit is taken from the **Temperature unit** parameter (→ 61). | Positive floating-point number |

## 11.2.2 Totalizer

The **Totalizer** submenu contains all the parameters needed to display the current measured values for every totalizer.

### Navigation

"Diagnostics" menu → Measured values → Totalizer 1 to n



| | |
|---|---|
| Totalizer status 1 to n | → 78 |
| Totalizer status (Hex) 1 to n | → 78 |

**Parameter overview with brief description**

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Assign process variable | – | Select process variable for totalizer. | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Volume flow |
| Totalizer value 1 to n | In the **Assign process variable** parameter one of the following options is selected:<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Total mass flow<br>▪ Condensate mass flow<br>▪ Energy flow<br>▪ Heat flow difference | Displays the current totalizer counter value. | Signed floating-point number | 0 $m^3$ |
| Totalizer status 1 to n | – | Displays the current totalizer status. | ▪ Good<br>▪ Uncertain<br>▪ Bad | – |
| Totalizer status (Hex) 1 to n | In **Target mode** parameter, the **Auto** option is selected. | Displays the current status value (hex) of the totalizer. | 0 to 0xFF | – |

## 11.3 Adapting the measuring device to the process conditions

The following are available for this purpose:
- Basic settings using the**Setup** menu (→ 59)
- Advanced settings using the**Advanced setup** submenu (→ 67)

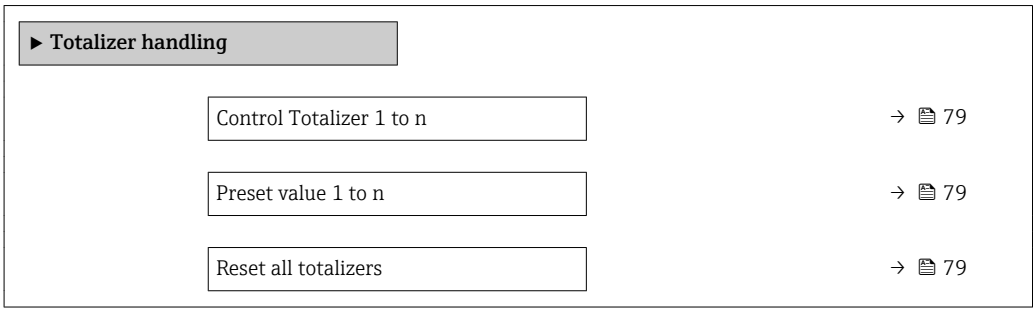
## 11.4 Performing a totalizer reset

The totalizers are reset in the **Operation** submenu:
Control Totalizer 1 to n

*Function scope of the "Control Totalizer " parameter*

| Options | Description |
|---|---|
| Totalize | The totalizer is started. |
| Reset + hold | The totaling process is stopped and the totalizer is reset to 0. |
| Preset + hold | The totaling process is stopped and the totalizer is set to its defined start value from the **Preset value 1 to n** parameter. |
| Stop totalizing option | Totalizing is stopped. |

### Navigation
"Operation" menu → Totalizer handling




### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Control Totalizer 1 to n | In the **Assign process variable** parameter, one of the following options is selected:<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Control totalizer value. | ▪ Totalize<br>▪ Reset + hold<br>▪ Preset + hold | Totalize |
| Preset value 1 to n | – | Specify start value for totalizer. | Signed floating-point number | 0 $m^3$ |
| Reset all totalizers | – | Reset all totalizers to 0 and start. | ▪ Cancel<br>▪ Reset + totalize | Cancel |

# 12 Diagnostics and troubleshooting

## 12.1 General troubleshooting

*For local display*

| Error | Possible causes | Solution |
|---|---|---|
| Local display dark and no output signals | Supply voltage does not match the value indicated on the nameplate. | Apply the correct supply voltage . |
| Local display dark and no output signals | The polarity of the supply voltage is wrong. | Correct the polarity. |
| Local display dark and no output signals | No contact between connecting cables and terminals. | Check the connection of the cables and correct if necessary. |
| Local display dark and no output signals | Terminals are not plugged into the I/O electronics module correctly. | Check terminals. |
| Local display dark and no output signals | I/O electronics module is defective. | Order spare part → 🖹 107. |
| Local display is dark, but signal output is within the valid range | Display is set too bright or too dark. | ▪ Set the display brighter by simultaneously pressing ⊞ + Ⓔ.<br>▪ Set the display darker by simultaneously pressing ⊟ + Ⓔ. |
| Local display is dark, but signal output is within the valid range | The cable of the display module is not plugged in correctly. | Insert the plug correctly into the main electronics module and display module. |
| Local display is dark, but signal output is within the valid range | Display module is defective. | Order spare part → 🖹 107. |
| Backlighting of local display is red | Diagnostic event with "Alarm" diagnostic behavior has occurred. | Take remedial measures |
| Message on local display:<br>"Communication Error"<br>"Check Electronics" | Communication between the display module and the electronics is interrupted. | ▪ Check the cable and the connector between the main electronics module and display module.<br>▪ Order spare part → 🖹 107. |

*For output signals*

| Error | Possible causes | Solution |
|---|---|---|
| Green power LED on the main electronics module of the transmitter is dark | Supply voltage does not match the value indicated on the nameplate. | Apply the correct supply voltage . |
| Device measures incorrectly. | Configuration error or device is operated outside the application. | 1. Check and correct parameter configuration.<br>2. Observe limit values specified in the "Technical Data". |

*For access*

| Error | Possible causes | Solution |
|---|---|---|
| No write access to parameters | Hardware write protection enabled | Set the write protection switch on main electronics module to the **OFF** position → 🖹 74. |
| No connection via PROFIBUS DP | PROFIBUS DP bus cable connected incorrectly | Check terminal assignment → 🖹 31. |
| No connection via PROFIBUS DP | Device plug connected incorrectly | Check the pin assignment of the connector . |

| Error | Possible causes | Solution |
|---|---|---|
| No connection via PROFIBUS DP | PROFIBUS DP cable incorrectly terminated | Check terminating resistor → 🖹 38. |
| Not connecting to Web server | Web server disabled | Using the "FieldCare" or "DeviceCare" operating tool, check whether the Web server of the measuring device is enabled, and enable it if necessary→ 🖹 48 . |
| | Incorrect setting for the Ethernet interface of the computer | 1. Check the properties of the Internet protocol (TCP/IP) → 🖹 45.<br>2. Check the network settings with the IT manager. |
| Not connecting to Web server | Incorrect IP address | Check the IP address: 192.168.1.212 → 🖹 45 |
| Web browser frozen and operation no longer possible | Data transfer active | Wait until data transfer or current action is finished. |
| | Connection lost | 1. Check cable connection and power supply.<br>2. Refresh the Web browser and restart if necessary. |
| Content of Web browser incomplete or difficult to read | Not using optimum version of Web server. | 1. Use the correct Web browser version → 🖹 44.<br>2. Clear the Web browser cache and restart the Web browser. |
| | Unsuitable view settings. | Change the font size/display ratio of the Web browser. |
| No or incomplete display of contents in the Web browser | ▪ JavaScript not enabled<br>▪ JavaScript cannot be enabled | 1. Enable JavaScript.<br>2. Enter http://XXX.XXX.X.XXX/basic.html as the IP address. |
| Operation with FieldCare or DeviceCare via CDI-RJ45 service interface (port 8000) | Firewall of computer or network is preventing communication | Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access. |
| Flashing of firmware with FieldCare or DeviceCare via CDI-RJ45 service interface (via port 8000 or TFTP ports) | Firewall of computer or network is preventing communication | Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access. |

## 12.2 Diagnostic information via light emitting diodes

### 12.2.1 Transmitter

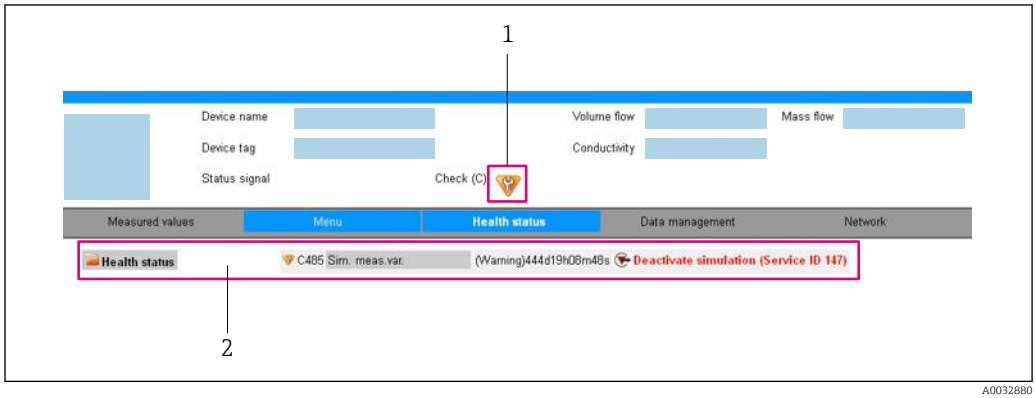
Different LEDs in the transmitter provide information on the device status.

| LED | Color | Meaning |
|---|---|---|
| Supply voltage | Off | Supply voltage is off or too low |
| | Green | Supply voltage is ok |
| Alarm | Off | Device status is ok |
| | Flashing red | A device error of diagnostic behavior "Warning" has occurred |
| | Red | ▪ A device error of diagnostic behavior "Alarm" has occurred<br>▪ Boot loader is active |
| Communication | Flashing white | PROFIBUS DP communication is active |

## 12.3 Diagnostic information in the Web browser

### 12.3.1 Diagnostic options

Any faults detected by the measuring device are displayed in the Web browser on the home page once the user has logged on.




1 *Status area with status signal*
2 *Diagnostic information → 82 and remedial measures with Service ID*

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter
- Via submenu → 100

#### Status signals

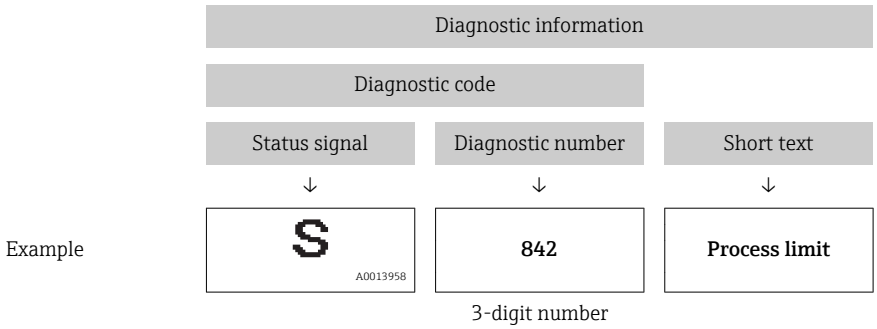
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

| Symbol | Meaning |
|---|---|
| | **Failure**<br>A device error has occurred. The measured value is no longer valid. |
| | **Function check**<br>The device is in service mode (e.g. during a simulation). |
| | **Out of specification**<br>The device is operated:<br>Outside its technical specification limits (e.g. outside the process temperature range) |
| | **Maintenance required**<br>Maintenance is required. The measured value is still valid. |

The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107.

#### Diagnostic information

The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault.



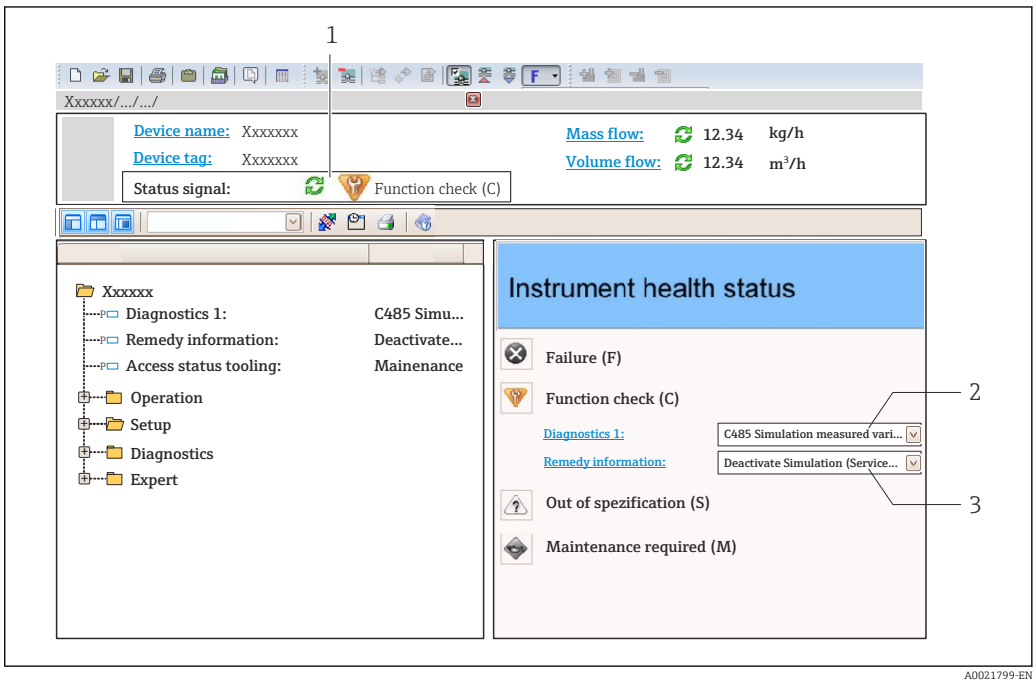

### 12.3.2 Calling up remedy information

Remedy information is provided for every diagnostic event to ensure that problems can be rectified quickly. These measures are displayed in red along with the diagnostic event and the related diagnostic information.

## 12.4 Diagnostic information in DeviceCare or FieldCare

### 12.4.1 Diagnostic options

Any faults detected by the measuring device are displayed on the home page of the operating tool once the connection has been established.

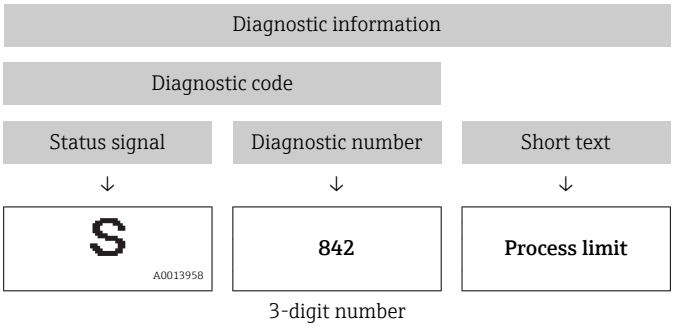



1 *Status area with status signal*
2 *Diagnostic information→ 82*
3 *Remedy information with Service ID*

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter
- Via submenu → 100

### Diagnostic information

The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault.




## 12.4.2 Calling up remedy information

Remedy information is provided for every diagnostic event to ensure that problems can be rectified quickly:

- On the home page
  Remedy information is displayed in a separate field below the diagnostics information.
- In the **Diagnostics** menu
  Remedy information can be called up in the working area of the user interface.

The user is in the **Diagnostics** menu.

1. Call up the desired parameter.
2. On the right in the working area, mouse over the parameter.
   ↳ A tool tip with remedy information for the diagnostic event appears.

# 12.5 Adapting the diagnostic information

## 12.5.1 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 behavior** submenu.

Expert → System → Diagnostic handling → Diagnostic behavior

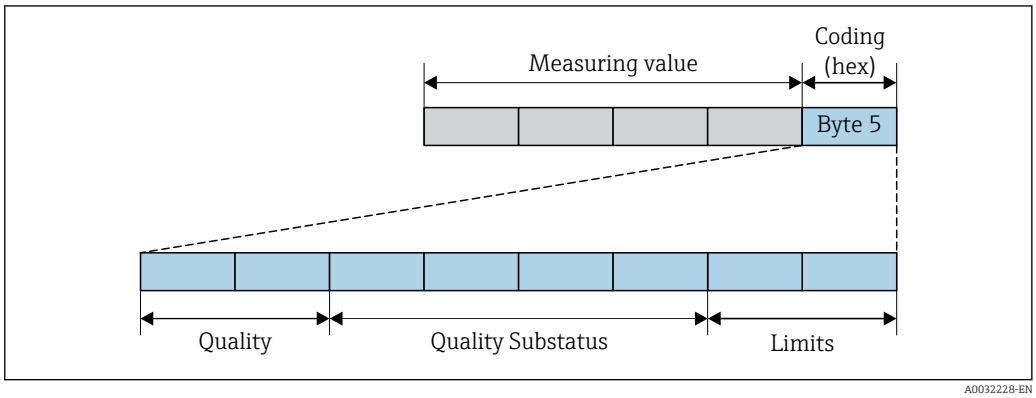
### Available diagnostic behaviors

The following diagnostic behaviors can be assigned:

| Diagnostic behavior | Description |
|---|---|
| Alarm | The device stops measurement. The totalizers assume the defined alarm condition. A diagnostic message is generated. |
| Warning | The device continues to measure. The measured value output via PROFIBUS and the totalizers 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 (**Event list** submenu) and not in alternation with the operational display. |
| Off | The diagnostic event is ignored, and no diagnostic message is generated or entered. |

### Displaying the measured value status

If the Analog Input, Digital Input and Totalizer function blocks are configured for cyclic data transmission, the device status is coded as per PROFIBUS PA Profile 3.02 Specification and transmitted along with the measured value to the PROFIBUS Master (Class 1) via the coding byte (byte 5). The coding byte is split into three segments: Quality, Quality Substatus and Limits.




20 *Structure of the coding byte*

The content of the coding byte depends on the configured failsafe mode in the particular function block. Depending on which failsafe mode has been configured, status information in accordance with PROFIBUS PA Profile Specification 3.02 is transmitted to the PROFIBUS Master (Class 1) via the coding byte .

### Determining the measured value status and device status via the diagnostic behavior

When the diagnostic behavior is assigned, this also changes the measured value status and device status for the diagnostic information. The measured value status and device status depend on the choice of diagnostic behavior and on the group in which the diagnostic information is located. The measured value status and device status are firmly assigned to the particular diagnostic behavior and cannot be changed individually.

The diagnostic information is grouped as follows:
- Diagnostic information pertaining to the sensor: diagnostic number 000 to 199 → 85
- Diagnostic information pertaining to the electronics: diagnostic number 200 to 399 → 86
- Diagnostic information pertaining to the configuration: diagnostic number 400 to 599 → 86
- Diagnostic information pertaining to the process: diagnostic number 800 to 999 → 86

Depending on the group in which the diagnostic information is located, the following measured value status and device status are firmly assigned to the particular diagnostic behavior:

*Diagnostic information pertaining to the sensor: diagnostic number 000 to 199*

| Diagnostic behavior (configurable) | Measured value status (fixed assignment) | | | | Device diagnosis (fixed assignment) |
|---|---|---|---|---|---|
| | Quality | Quality Substatus | Coding (hex) | Category (NE107) | |
| Alarm | BAD | Maintenance alarm | 0x24 to 0x27 | F (Failure) | Maintenance alarm |
| Warning | GOOD | Maintenance demanded | 0xA8 to 0xAB | M (Maintenance) | Maintenance demanded |

| Diagnostic behavior (configurable) | Measured value status (fixed assignment) | | | | Device diagnosis (fixed assignment) |
|---|---|---|---|---|---|
| | Quality | Quality Substatus | Coding (hex) | Category (NE107) | |
| Logbook entry only | GOOD | ok | 0x80 to 0x8E | – | – |
| Off | | | | | |

*Diagnostic information pertaining to the electronics: diagnostic number 200 to 399*

| Diagnostic behavior (configurable) | Measured value status (fixed assignment) | | | | Device diagnosis (fixed assignment) |
|---|---|---|---|---|---|
| | Quality | Quality Substatus | Coding (hex) | Category (NE107) | |
| Alarm | BAD | Maintenance alarm | 0x24 to 0x27 | F (Failure) | Maintenance alarm |
| Warning | | | | | |
| Logbook entry only | GOOD | ok | 0x80 to 0x8E | – | – |
| Off | | | | | |

*Diagnostic information pertaining to the configuration: diagnostic number 400 to 599*

| Diagnostic behavior (configurable) | Measured value status (fixed assignment) | | | | Device diagnosis (fixed assignment) |
|---|---|---|---|---|---|
| | Quality | Quality Substatus | Coding (hex) | Category (NE107) | |
| Alarm | BAD | Process related | 0x28 to 0x2B | F (Failure) | Invalid process condition |
| Warning | UNCERTAIN | Process related | 0x78 to 0x7B | S (Out of specification) | Invalid process condition |
| Logbook entry only | GOOD | ok | 0x80 to 0x8E | – | – |
| Off | | | | | |

*Diagnostic information pertaining to the process: diagnostic number 800 to 999*

| Diagnostic behavior (configurable) | Measured value status (fixed assignment) | | | | Device diagnosis (fixed assignment) |
|---|---|---|---|---|---|
| | Quality | Quality Substatus | Coding (hex) | Category (NE107) | |
| Alarm | BAD | Process related | 0x28 to 0x2B | F (Failure) | Invalid process condition |
| Warning | UNCERTAIN | Process related | 0x78 to 0x7B | S (Out of specification) | Invalid process condition |
| Logbook entry only | GOOD | ok | 0x80 to 0x8E | – | – |
| Off | | | | | |

## 12.6 Overview of diagnostic information

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

In the case of some items of diagnostic information, the diagnostic behavior can be changed. Change the diagnostic information → 84

### 12.6.1 Diagnostic of sensor

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 004 | Sensor | | 1. Change sensor<br>2. Contact service | ▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 022 | Sensor temperature | | 1. Change main electronic module<br>2. Change sensor | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 043 | Sensor short circuit | | 1. Check sensor and cable<br>2. Change sensor or cable | ▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 062 | Sensor connection | | 1. Check sensor connections<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 082 | Data storage | | 1. Check module connections<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 083 | Memory content | | 1. Restart device<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 190 | Special event 1 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 191 | Special event 5 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

### 12.6.2 Diagnostic of electronic

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 201 | Device failure | | 1. Restart device<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 222 | Electronic drift | | Change main electronic module | ▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 242 | Software incompatible | | 1. Check software<br>2. Flash or change main electronics module | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 252 | Modules incompatible | | 1. Check electronic modules<br>2. Change electronic modules | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 262 | Module connection | | 1. Check module connections<br>2. Change main electronics | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 270 | Main electronic failure | | Change main electronic module | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 271 | Main electronic failure | | 1. Restart device<br>2. Change main electronic module | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 272 | Main electronic failure | | 1. Restart device<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 273 | Main electronic failure | | Change electronic | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 281 | Electronic initialization | | Firmware update active, please wait! | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 283 | Memory content | | 1. Reset device<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 302 | Device verification active | | Device verification active, please wait. | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 311 | Electronic failure | | 1. Reset device<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 311 | Electronic failure | | 1. Do not reset device<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | M | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 322 | Electronic drift | | 1. Perform verification manually<br>2. Change electronic | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 382 | Data storage | | 1. Insert DAT module<br>2. Change DAT module | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 383 | Memory content | | 1. Restart device<br>2. Check or change DAT module 3. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 390 | Special event 2 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 391 | Special event 6 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

### 12.6.3 Diagnostic of configuration

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 410 | Data transfer | | 1. Check connection<br>2. Retry data transfer | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 411 | Up-/download active | | Up-/download active, please wait | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 411 | Up-/download active | | Up-/download active, please wait | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 437 | Configuration incompatible | | 1. Restart device<br>2. Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 438 | Dataset | | 1. Check data set file<br>2. Check device configuration<br>3. Up- and download new configuration | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | M | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 453 | Flow override | | Deactivate flow override | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 482 | FB not Auto/Cas | | Set Block in AUTO mode | – |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 484 | Simulation failure mode | | Deactivate simulation | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | C | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 485 | Simulation measured variable | | Deactivate simulation | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 495 | Simulation diagnostic event | | Deactivate simulation | – |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 497 | Simulation block output | | Deactivate simulation | – |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 500 | Electrode 1 potential exceeded | | 1. Check process cond.<br>2. Increase system pressure | ▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 500 | Electrode difference voltage too high | | 1. Check process cond.<br>2. Increase system pressure | ▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 530 | Electrode cleaning is running | | 1. Check process cond.<br>2. Increase system pressure | – |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 531 | Empty pipe detection | | Execute EPD adjustment | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 537 | Configuration | | 1. Check IP addresses in network<br>2. Change IP address | – |
| | Status signal | F | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 590 | Special event 3 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 591 | Special event 7 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

### 12.6.4 Diagnostic of process

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 832 | Electronic temperature too high | | Reduce ambient temperature | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 833 | Electronic temperature too low | | Increase ambient temperature | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 834 | Process temperature too high | | Reduce process temperature | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 835 | Process temperature too low | | Increase process temperature | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 842 | Process limit | | Low flow cut off active!<br>1. Check low flow cut off configuration | ▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 862 | Empty pipe | | 1. Check for gas in process<br>2. Adjust empty pipe detection | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 882 | Input signal | | 1. Check input configuration<br>2. Check external device or process conditions | ▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 937 | EMC interference | | Change main electronic module | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 938 | EMC interference | | 1. Check ambient conditions regarding EMC influence<br>2. Change main electronic module | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Electronic temperature<br>▪ Electronic temperature<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 990 | Special event 4 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Influenced measured variables |
|---|---|---|---|---|
| No. | Short text | | | |
| 991 | Special event 8 | | Contact service | ▪ Conductivity<br>▪ Corrected conductivity<br>▪ Density<br>▪ Empty pipe detection<br>▪ Flow velocity<br>▪ Low flow cut off<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Temperature<br>▪ Volume flow |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

## 12.7 Pending diagnostic events

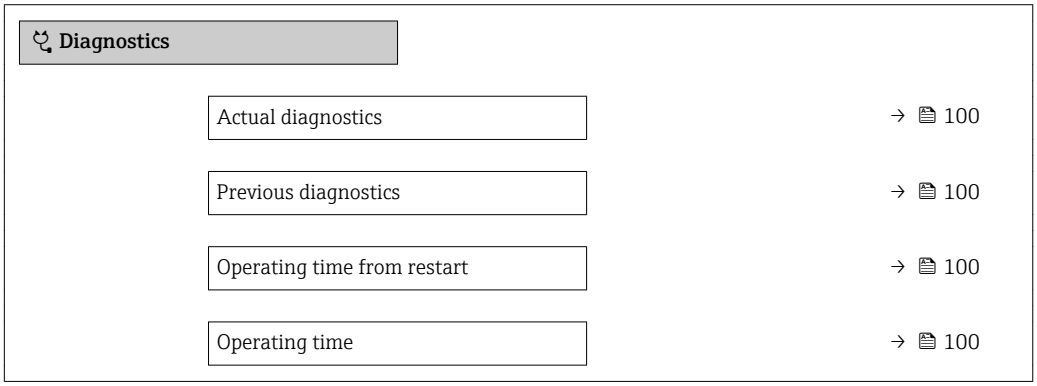
The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

To call up the measures to rectify a diagnostic event:
- Via Web browser → 📄 83
- Via "FieldCare" operating tool → 📄 84
- Via "DeviceCare" operating tool → 📄 84

Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 📄 100

### Navigation

"Diagnostics" menu




### Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Actual diagnostics | A diagnostic event has occurred. | Shows the current occured diagnostic event along with its diagnostic information.<br>If two or more messages occur simultaneously, the message with the highest priority is shown on the display. | Symbol for diagnostic behavior, diagnostic code and short message. |
| Previous diagnostics | Two diagnostic events have already occurred. | Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information. | Symbol for diagnostic behavior, diagnostic code and short message. |
| Operating time from restart | – | Shows the time the device has been in operation since the last device restart. | Days (d), hours (h), minutes (m) and seconds (s) |
| Operating time | – | Indicates how long the device has been in operation. | Days (d), hours (h), minutes (m) and seconds (s) |

## 12.8 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 Web browser → 83
- Via "FieldCare" operating tool → 84
- Via "DeviceCare" operating tool → 84

## 12.9 Event logbook

### 12.9.1 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

A maximum of 20 event messages can be displayed in chronological order.

The event history includes entries for:
- Diagnostic events → 86
- Information events → 101

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 Web browser → 83
- Via "FieldCare" operating tool → 84
- Via "DeviceCare" operating tool → 84

For filtering the displayed event messages → 101

### 12.9.2 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)

### 12.9.3 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) |
| I1089 | Power on |
| I1090 | Configuration reset |
| I1091 | Configuration changed |
| I1110 | Write protection switch changed |
| I1137 | Electronic changed |
| I1151 | History reset |
| I1155 | Reset electronic temperature |
| I1157 | Memory error event list |
| I1185 | Display backup done |
| I1186 | Restore via display done |
| I1187 | Settings downloaded with display |
| I1188 | Display data cleared |
| I1189 | Backup compared |
| I1256 | Display: access status changed |
| I1264 | Safety sequence aborted |
| I1335 | Firmware changed |
| I1351 | Empty pipe detection adjustment failure |
| I1353 | Empty pipe detection adjustment ok |
| I1361 | Wrong web server login |
| I1397 | Fieldbus: access status changed |
| I1398 | CDI: access status changed |
| I1443 | Coating thickness not determined |
| I1444 | Device verification passed |
| I1445 | Device verification failed |
| I1446 | Device verification active |
| I1457 | Failed:Measured error verification |
| I1459 | Failed: I/O module verification |
| I1461 | Failed: Sensor verification |
| I1462 | Failed:Sensor electronic module verific. |

## 12.10 Resetting the measuring device

Using the**Device reset** parameter (→ 72) it is possible to reset the entire device configuration or some of the configuration to a defined state.

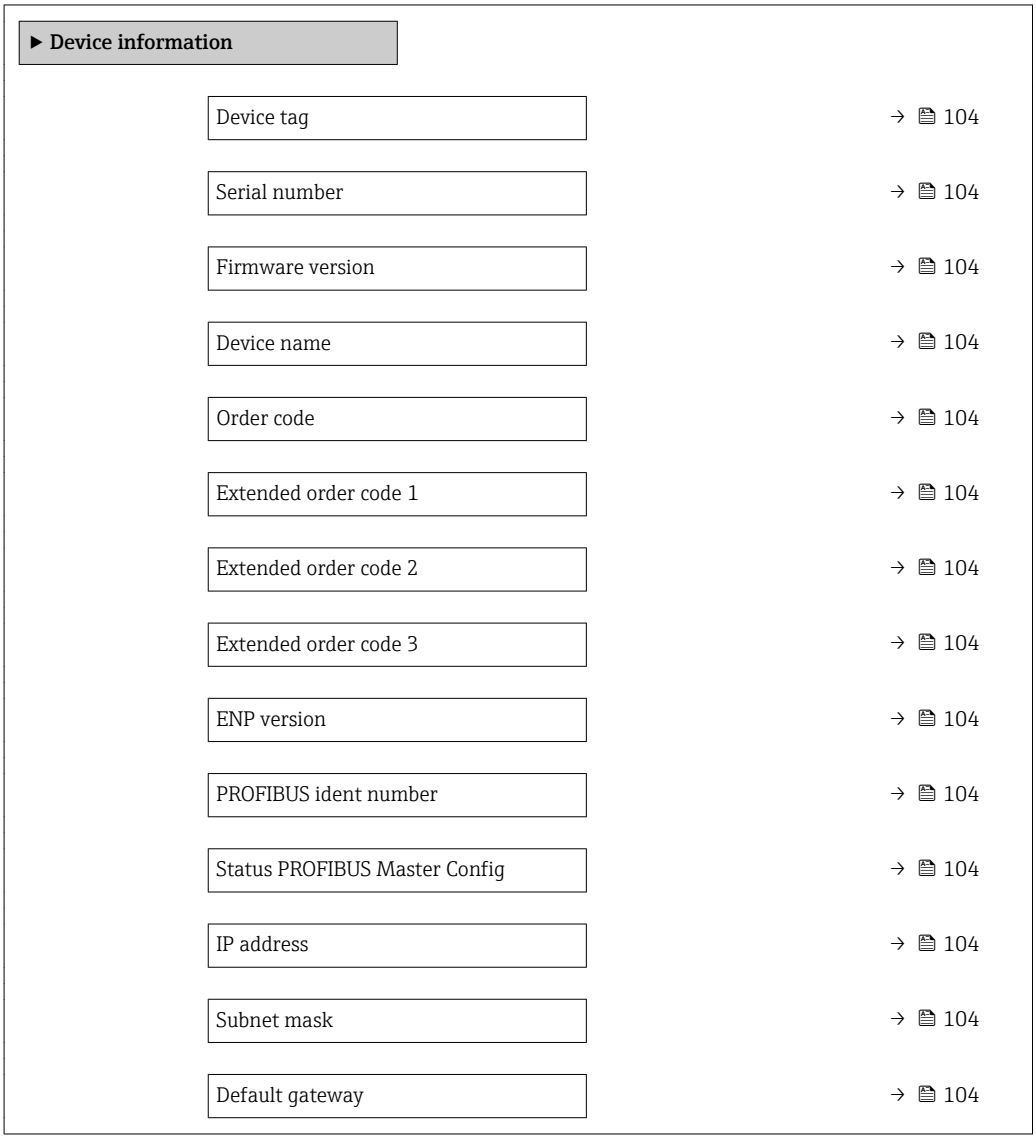
### 12.10.1 Function scope of the "Device reset" parameter

| Options | Description |
|---|---|
| Cancel | No action is executed and the user exits the parameter. |
| To delivery settings | Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.<br>This option is not visible if no customer-specific settings have been ordered. |
| Restart device | The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged. |

## 12.11 Device information

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

**Navigation**
"Diagnostics" menu → Device information



## Parameter overview with brief description

| Parameter | Description | User interface | Factory setting |
|---|---|---|---|
| Device tag | Shows name of measuring point. | Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /). | Promag 100 DP |
| Serial number | Shows the serial number of the measuring device. | A maximum of 11-digit character string comprising letters and numbers. | – |
| Firmware version | Shows the device firmware version installed. | Character string in the format xx.yy.zz | – |
| Device name | Shows the name of the transmitter.<br>The name can be found on the nameplate of the transmitter. | Max. 32 characters such as letters or numbers. | Promag 100 DP |
| Order code | Shows the device order code.<br>The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field. | Character string composed of letters, numbers and certain punctuation marks (e.g. /). | – |
| Extended order code 1 | Shows the 1st part of the extended order code.<br>The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |
| Extended order code 2 | Shows the 2nd part of the extended order code.<br>The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |
| Extended order code 3 | Shows the 3rd part of the extended order code.<br>The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |
| ENP version | Shows the version of the electronic nameplate (ENP). | Character string | 2.02.00 |
| PROFIBUS ident number | Displays the PROFIBUS identification number. | 0 to FFFF | 0x1560 |
| Status PROFIBUS Master Config | Displays the status of the PROFIBUS Master configuration. | ▪ Active<br>▪ Not active | Not active |
| IP address | Displays the IP address of the Web server of the measuring device. | 4 octet: 0 to 255 (in the particular octet) | 192.168.1.212 |
| Subnet mask | Displays the subnet mask. | 4 octet: 0 to 255 (in the particular octet) | 255.255.255.0 |
| Default gateway | Displays the default gateway. | 4 octet: 0 to 255 (in the particular octet) | 0.0.0.0 |

## 12.12 Firmware history

| Release date | Firmware version | Order code for "Firmware version" | Firmware changes | Documentation type | Documentation |
|---|---|---|---|---|---|
| 09.2013 | 01.01.00 | Option **78** | Original firmware | Operating Instructions | – |
| 10.2014 | 01.01.zz | Option **69** | ▪ Integration of optional local display<br>▪ New unit "Beer Barrel (BBL)"<br>▪ Simulation of diagnostic events | Operating Instructions | |

It is possible to flash the firmware to the current version or the previous version using the service interface.

For the compatibility of the firmware version with the previous version, the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.

The manufacturer's information is available:
- In the Download Area of the Endress+Hauser web site: www.endress.com → Downloads
- Specify the following details:
  - Product root: e.g. 5H1B
    The product root is the first part of the order code: see the nameplate on the device.
  - Text search: Manufacturer's information
  - Media type: Documentation – Technical Documentation

# 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.

### 13.1.2 Interior cleaning

No interior cleaning is planned for the device.

### 13.1.3 Replacing seals

The sensor's seals (particularly aseptic molded seals) must be replaced periodically.

The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature.

Replacement seals (accessory part) → 128

## 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: → 109

## 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 Repairs

## 14.1 General notes

### 14.1.1 Repair and conversion concept

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

### 14.1.2 Notes for repair and conversion

For repair and 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.

## 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 (→ 104) 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 measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at http://www.endress.com/support/return-material

## 14.5 Disposal

### 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 fluids.

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.

# 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 transmitter

| Accessories | Description |
|---|---|
| Ground cable | Set, consisting of two ground cables for potential equalization. |

### 15.1.2 For the sensor

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

## 15.2 Communication-specific accessories

| Accessories | Description |
|---|---|
| Commubox FXA291 | Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.<br>For details, see the "Technical Information" document TI405C/07 |

## 15.3 Service-specific accessories

| Accessories | Description |
|---|---|
| Applicator | Software for selecting and sizing Endress+Hauser measuring devices:<br>▪ Choice of measuring devices for industrial requirements<br>▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy.<br>▪ Graphic illustration of the calculation results<br>▪ 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.<br>Applicator is available:<br>▪ Via the Internet: https://wapps.endress.com/applicator<br>▪ As a downloadable DVD for local PC installation. |

| | |
|---|---|
| W@M | W@M Life Cycle Management<br>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.<br>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.<br>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit<br>www.endress.com/lifecyclemanagement |
| FieldCare | FDT-based plant asset management tool from Endress+Hauser.<br>It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.<br>For details, see Operating Instructions BA00027S and BA00059S |
| DeviceCare | Tool for connecting and configuring Endress+Hauser field devices.<br>For details, see Innovation brochure IN01047S |

## 15.4 System components

| Accessories | Description |
|---|---|
| Memograph M graphic data manager | The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.<br>For details, see "Technical Information" TI00133R and Operating Instructions BA00247R |

# 16 Technical data

## 16.1 Application

The measuring device is only suitable for flow measurement of liquids with a minimum conductivity of 5 µS/cm.

Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

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.<br>The device is available as a compact version:<br>The transmitter and sensor form a mechanical unit.<br>For information on the structure of the device → 12 |

## 16.3 Input

| | |
|---|---|
| Measured variable | **Direct measured variables**<br>▪ Volume flow (proportional to induced voltage)<br>▪ Electrical conductivity<br><br>**Calculated measured variables**<br>▪ Mass flow<br>▪ Corrected volume flow |
| Measuring range | Typically v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified accuracy<br>Electrical conductivity: ≥ 5 µS/cm for liquids in general<br><br>**Recommended measuring range**<br>"Flow limit" section → 119 |
| Operable flow range | Over 1000 : 1 |

Input signal

**External measured values**

To increase the accuracy of certain measured variables or to calculate the corrected volume flow, the automation system can continuously write different measured values to the measuring device:
- Operating pressure to increase accuracy (Endress+Hauser recommends the use of a pressure measuring device for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase accuracy (e.g. iTEMP)
- Reference density for calculating the corrected volume flow

Various pressure transmitters and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section → 110

It is recommended to read in external measured values to calculate the following measured variables:
Corrected volume flow

*Digital communication*

The measured values are written from the automation system to the measuring device via PROFIBUS DP.

## 16.4 Output

Output signal

**PROFIBUS DP**

| | |
|---|---|
| **Signal encoding** | NRZ code |
| **Data transfer** | 9.6 kBaud...12 MBaud |

Signal on alarm

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

**Current output 4 to 20 mA**

*4 to 20 mA*

| | |
|---|---|
| **Failure mode** | Choose from:<br>▪ 4 to 20 mA in accordance with NAMUR recommendation NE 43<br>▪ 4 to 20 mA in accordance with US<br>▪ Min. value: 3.59 mA<br>▪ Max. value: 22.5 mA<br>▪ Freely definable value between: 3.59 to 22.5 mA<br>▪ Actual value<br>▪ Last valid value |

**Pulse/frequency/switch output**

| | |
|---|---|
| **Pulse output** | |
| **Failure mode** | Choose from:<br>▪ Actual value<br>▪ No pulses |
| **Frequency output** | |
| **Failure mode** | Choose from:<br>▪ Actual value<br>▪ 0 Hz<br>▪ Defined value: 0 to 12 500 Hz |

| Switch output | |
|---|---|
| **Failure mode** | Choose from:<br>▪ Current status<br>▪ Open<br>▪ Closed |

### PROFIBUS DP

| | |
|---|---|
| **Status and alarm messages** | Diagnostics in accordance with PROFIBUS PA Profile 3.02 |

### Local display

| | |
|---|---|
| **Plain text display** | With information on cause and remedial measures |
| **Backlight** | Red backlighting indicates a device error. |

Status signal as per NAMUR recommendation NE 107

### Interface/protocol

- Via digital communication:
  PROFIBUS DP
- Via service interface
  CDI-RJ45 service interface

| | |
|---|---|
| **Plain text display** | With information on cause and remedial measures |

### Web server

| | |
|---|---|
| **Plain text display** | With information on cause and remedial measures |

### Light emitting diodes (LED)

| | |
|---|---|
| **Status information** | Status indicated by various light emitting diodes<br>The following information is displayed depending on the device version:<br>▪ Supply voltage active<br>▪ Data transmission active<br>▪ Device alarm/error has occurred<br>Diagnostic information via light emitting diodes |

Low flow cut off

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

Galvanic isolation

The following connections are galvanically isolated from each other:
- Outputs
- Power supply

Protocol-specific data

**Protocol-specific data**

| | |
|---|---|
| **Manufacturer ID** | 0x11 |
| **Ident number** | 0x1561 |

| | |
|---|---|
| **Profile version** | 3.02 |
| **Device description files (GSD, DTM, DD)** | Information and files under:<br>▪ www.endress.com<br>On the product page for the device: Documents/Software → Device drivers<br>▪ www.profibus.org |
| **Output values**<br>(from measuring device to automation system) | **Analog input 1 to 4**<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Temperature<br>▪ Electronic temperature<br>**Digital input 1 to 2**<br>▪ Empty pipe detection<br>▪ Low flow cut off<br>▪ Verification status<br>**Totalizer 1 to 3**<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow |
| **Input values**<br>(from automation system to measuring device) | **Analog output 1 to 2 (fixed assignment)**<br>▪ External temperature<br>▪ External density<br>**Digital output 1 to 2 (fixed assignment)**<br>▪ Digital output 1: switch positive zero return on/off<br>▪ Digital output 2: start verification<br>**Totalizer 1 to 3**<br>▪ Totalize<br>▪ Reset and hold<br>▪ Preset and hold<br>▪ Stop<br>▪ Operating mode configuration:<br>– Net flow total<br>– Forward flow total<br>– Reverse flow total |
| **Supported functions** | ▪ Identification & Maintenance<br>Simplest device identification on the part of the control system and nameplate<br>▪ PROFIBUS upload/download<br>Reading and writing parameters is up to ten times faster with PROFIBUS upload/download<br>▪ Condensed status<br>Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur |
| **Configuration of the device address** | ▪ DIP switches on the I/O electronics module<br>▪ Via operating tools (e.g. FieldCare) |

## 16.5 Power supply

| | |
|---|---|
| Terminal assignment | → 31 |
| Pin assignment, device plug | → 32 |
| Supply voltage | The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV). |

**Transmitter**

DC 20 to 30 V

Power consumption

**Transmitter**

| Order code for "Output" | Maximum Power consumption |
|---|---|
| Option **L**: PROFIBUS DP | 3.5 W |

Current consumption

**Transmitter**

| Order code for "Output" | Maximum Current consumption | Maximum switch-on current |
|---|---|---|
| Option **L**: PROFIBUS DP | 145 mA | 18 A (< 0.125 ms) |

Power supply failure

- Totalizers stop at the last value measured.
- Depending on the device version, the configuration is retained in the device memory or in the plug-in memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

Electrical connection

→ 🖹 33

Potential equalization

→ 🖹 34

Terminals

**Transmitter**

Spring terminals for wire cross-sections0.5 to 2.5 $mm^2$ (20 to 14 AWG)

Cable entries

- Cable gland: M20 × 1.5 with cable Φ6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - M20
  - G ½"
  - NPT ½"

Cable specification

→ 🖹 30

## 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

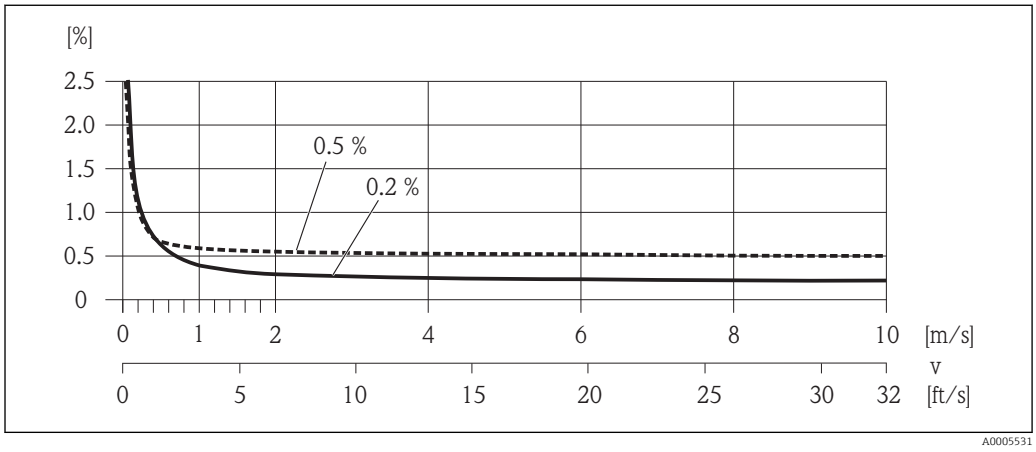
Maximum measured error

**Error limits under reference operating conditions**

o.r. = of reading

**Volume flow**
- ±0.5 % o.r. ± 1 mm/s (0.04 in/s)
- Optional: ±0.2 % o.r. ± 2 mm/s (0.08 in/s)

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




*21 Maximum measured error in % o.r.*

**Electrical conductivity**
Max. measured error not specified.

**Accuracy of outputs**

The output accuracy must be factored into the measured error if analog outputs are used, but can be ignored for fieldbus outputs (e.g. Modbus RS485, EtherNet/IP).

The outputs have the following base accuracy specifications.

Repeatability

o.r. = of reading

**Volume flow**
Max. ±0.1 % o.r. ± 0.5 mm/s (0.02 in/s)

**Electrical conductivity**
Max. ±5 % o.r.

Temperature measurement response time

$T_{90}$ < 15 s

Influence of ambient temperature

**Current output**

o.r. = of reading

| | |
|---|---|
| **Temperature coefficient** | Max. ±0.005 % o.r./°C |

**Pulse/frequency output**

| | |
|---|---|
| **Temperature coefficient** | No additional effect. Included in accuracy. |

## 16.7 Installation

"Mounting requirements"

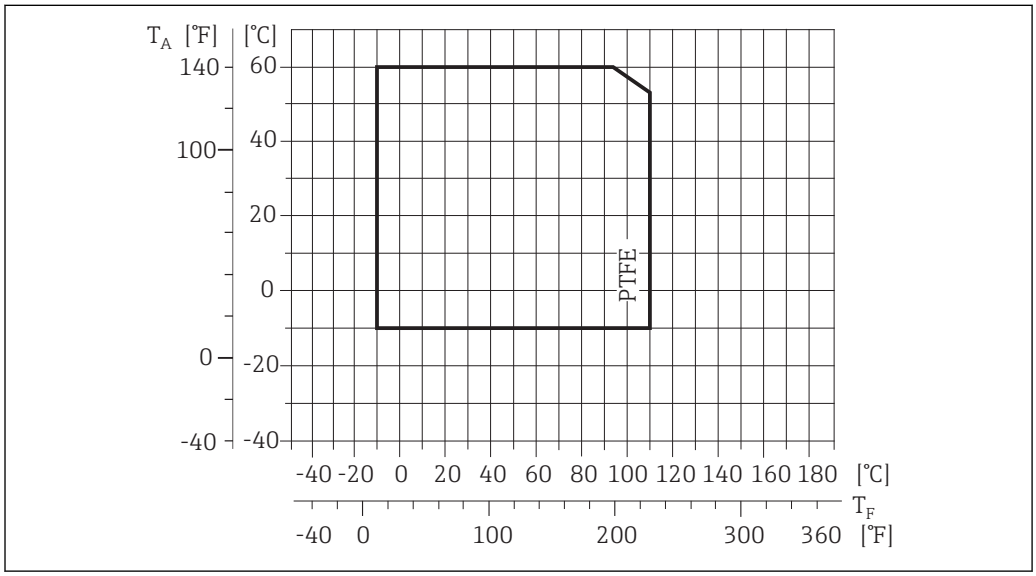
## 16.8 Environment

| | |
|---|---|
| Ambient temperature range | → 📄 21<br><br>**Temperature tables**<br>Observe the interdependencies between the permitted ambient and fluid temperatures when operating the device in hazardous areas.<br>For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device. |
| Storage temperature | The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.→ 📄 21<br>▪ Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures.<br>▪ Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner.<br>▪ If protection caps or protective covers are mounted these should never be removed before installing the measuring device. |
| Degree of protection | **Transmitter and sensor**<br>▪ As standard: IP66/67, type 4X enclosure<br>▪ When housing is open: IP20, type 1 enclosure<br>▪ Display module: IP20, type 1 enclosure |
| Vibration resistance | ▪ Vibration, sinusoidal according to IEC 60068-2-6<br>– 2 to 8.4 Hz, 3.5 mm peak<br>– 8.4 to 2 000 Hz, 1 g peak<br>▪ Vibration broad-band random, according to IEC 60068-2-64<br>– 10 to 200 Hz, 0.003 $g^2$/Hz<br>– 200 to 2 000 Hz, 0.001 $g^2$/Hz<br>– Total: 1.54 g rms |
| Shock resistance | Shock, half-sine according to IEC 60068-2-27<br>6 ms 30 g |
| Impact resistance | Rough handling shocks according to IEC 60068-2-31 |
| Mechanical load | ▪ Protect the transmitter housing against mechanical effects, such as shock or impact.<br>▪ Never use the transmitter housing as a ladder or climbing aid. |
| Electromagnetic compatibility (EMC) | ▪ As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)<br>▪ Complies with emission limits for industry as per EN 55011 (Class A)<br>▪ Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784<br>The following applies for PROFIBUS DP: If baud rates > 1.5 MBaud, an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.<br>Details are provided in the Declaration of Conformity. |

## 16.9 Process

Medium temperature range

−10 to +110 °C (−4 to +230 °F)




$T_A$ Ambient temperature

$T_F$ Medium temperature

Conductivity

≥ 5 µS/cm for liquids in general. Stronger filter damping is required for very low conductivity values.

Pressure-temperature ratings

An overview of the pressure-temperature ratings for the process connections is provided in the "Technical Information" document

Pressure tightness

"–" = no specifications possible

*Liner: PTFE*

| Nominal diameter | | Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures: | | | |
|---|---|---|---|---|---|
| [mm] | [in] | +25 °C (+77 °F) | +80 °C (+176 °F) | +100 °C (+212 °F) | +110 °C (+230 °F) |
| 15 | ½ | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 25 | 1 | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 32 | – | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 40 | 1 ½ | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 50 | 2 | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 65 | – | 0 (0) | – | 40 (0.58) | 130 (1.89) |
| 80 | 3 | 0 (0) | – | 40 (0.58) | 130 (1.89) |
| 100 | 4 | 0 (0) | – | 135 (1.96) | 170 (2.47) |
| 125 | – | 135 (1.96) | – | 240 (3.48) | 385 (5.58) |
| 150 | 6 | 135 (1.96) | – | 240 (3.48) | 385 (5.58) |
| 200 | 8 | 200 (2.90) | – | 290 (4.21) | 410 (5.95) |
| 250 | 10 | 330 (4.79) | – | 400 (5.80) | 530 (7.69) |

| Nominal diameter | | Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures: | | | |
|---|---|---|---|---|---|
| [mm] | [in] | +25 °C (+77 °F) | +80 °C (+176 °F) | +100 °C (+212 °F) | +110 °C (+230 °F) |
| 300 | 12 | 400 (5.80) | – | 500 (7.25) | 630 (9.14) |
| 350 | 14 | 470 (6.82) | – | 600 (8.70) | 730 (10.6) |
| 400 | 16 | 540 (7.83) | – | 670 (9.72) | 800 (11.6) |
| 450 | 18 | No negative pressure permitted! | | | |
| 500 | 20 | | | | |
| 600 | 24 | | | | |

## 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). Also match the velocity of flow (v) to the physical properties of the fluid:

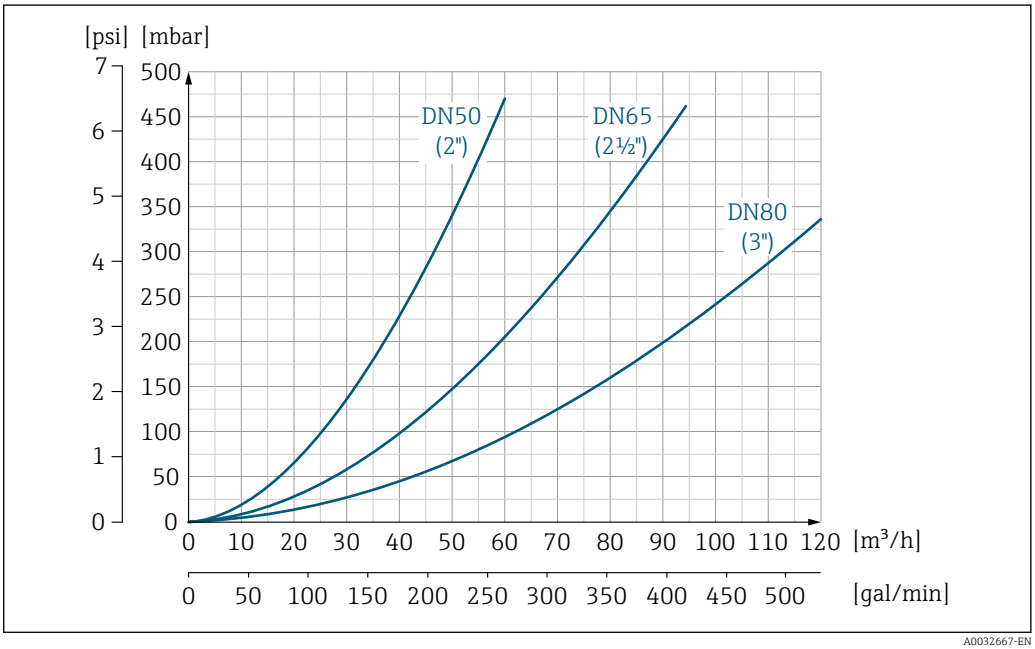
- v < 2 m/s (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry)
- v > 2 m/s (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludge)

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

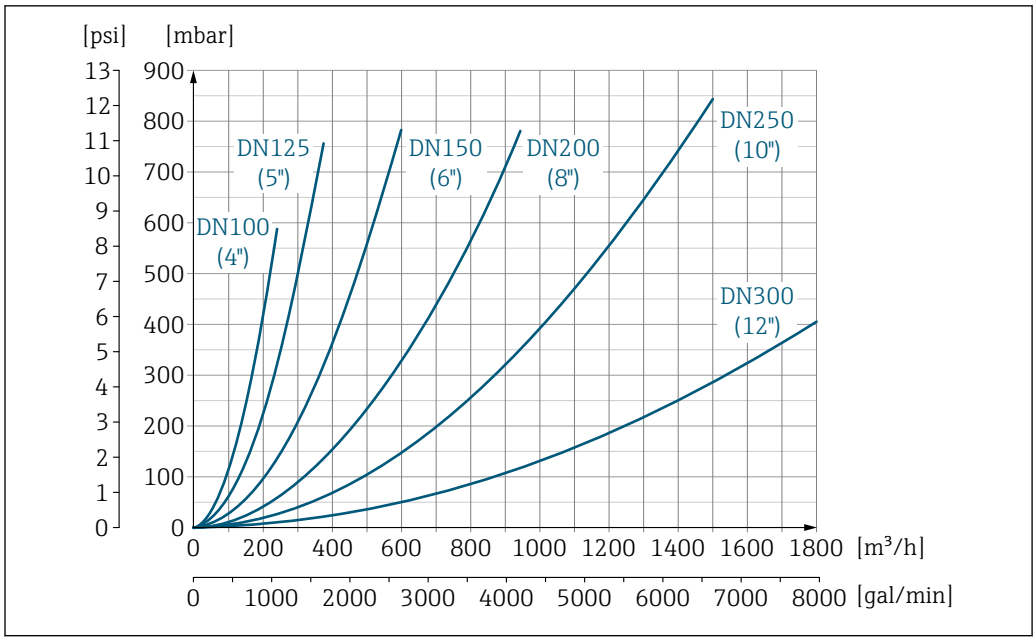
For an overview of the full scale values for the measuring range, see the "Measuring range" section → 111

## 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 → 22




22 *Pressure loss DN 50 to 80 (2 to 3") in the case of order code for "Design", option C "Insertion length short ISO/DVGW to DN300, without inlet/outlet runs, constricted meas.tube"*




*23 Pressure loss DN 100 to 300 (4 to 12") in the case of order code for "Design", option C "Insertion length short ISO/DVGW to DN300, without inlet/outlet runs, constricted meas.tube"*

System pressure → 21

Vibrations → 22

## 16.10 Mechanical construction

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

Weight

**Compact version**

- Including the transmitter (1.8 kg (4.0 lb))
- Weight specifications excluding packaging material

*Weight in SI units*

| Nominal diameter | | EN (DIN) | | | | ASME | JIS |
|---|---|---|---|---|---|---|---|
| | | PN 6 | PN 10 | PN 16 | PN 40 | Class 150 | 10K |
| [mm] | [in] | [kg] | [kg] | [kg] | [kg] | [kg] | [kg] |
| 15 | ½ | – | – | – | 4.9 | 4.9 | 4.9 |
| 25 | 1 | – | – | – | 5.7 | 5.7 | 5.7 |
| 32 | – | – | – | – | 6.4 | – | 5.7 |
| 40 | 1 ½ | – | – | – | 7.8 | 7.8 | 6.7 |
| 50 | 2 | – | – | – | 9.0 | 9.0 | 7.7 |
| 65 | – | – | – | 10.4 | – | – | 9.5 |
| 80 | 3 | – | – | 12.4 | – | 12.4 | 10.9 |
| 100 | 4 | – | – | 14.4 | – | 14.4 | 13.1 |
| 125 | – | – | – | 19.9 | – | – | 19.4 |

| Nominal diameter | | EN (DIN) | | | | ASME | JIS |
|---|---|---|---|---|---|---|---|
| | | PN 6 | PN 10 | PN 16 | PN 40 | Class 150 | 10K |
| [mm] | [in] | [kg] | [kg] | [kg] | [kg] | [kg] | [kg] |
| 150 | 6 | – | – | 23.9 | – | 23.9 | 22.9 |
| 200 | 8 | – | 43.4 | 44.4 | – | 43.4 | 40.3 |
| 250 | 10 | – | 63.4 | 68.4 | – | 73.4 | 67.8 |
| 300 | 12 | – | 68.4 | 79.4 | – | 108.4 | 70.7 |
| 350 | 14 | 75.8 | 86.8 | 102 | – | 135.8 | 79 |
| 400 | 16 | 87.8 | 102.8 | 123.8 | – | 166.8 | 100 |
| 450 | 18 | 101.7 | 116.7 | 147.6 | – | 190.9 | 128 |
| 500 | 20 | 113.2 | 130.8 | 188.3 | – | 226.8 | 142 |
| 600 | 24 | 153.8 | 179.4 | 298.3 | – | 327.1 | 188 |

*Weight in US units*

| Nominal diameter | | ASME |
|---|---|---|
| [mm] | [in] | Class 150 [lbs] |
| 15 | ½ | 10.8 |
| 25 | 1 | 12.6 |
| 40 | 1 ½ | 17.2 |
| 50 | 2 | 19.9 |
| 80 | 3 | 27.3 |
| 100 | 4 | 31.8 |
| 150 | 6 | 52.7 |
| 200 | 8 | 95.7 |
| 250 | 10 | 161.9 |
| 300 | 12 | 239.0 |
| 350 | 14 | 299.4 |
| 400 | 16 | 367.8 |
| 450 | 18 | 420.8 |
| 500 | 20 | 500.1 |
| 600 | 24 | 721.1 |

## Measuring tube specification

| Nominal diameter | | Pressure rating | | | Process connection internal diameter | |
|---|---|---|---|---|---|---|
| | | EN (DIN) | ASME | JIS | PTFE | |
| [mm] | [in] | [bar] | [psi] | [bar] | [mm] | [in] |
| 15 | ½ | PN 40 | Class 150 | 20K | 14 | 0.55 |
| 25 | 1 | PN 40 | Class 150 | 20K | 26 | 1.02 |
| 32 | – | PN 40 | – | 20K | 34 | 1.34 |
| 40 | 1 ½ | PN 40 | Class 150 | 20K | 40 | 1.57 |
| 50 | 2 | PN 40 | Class 150 | 10K | 51 | 2.01 |
| 65 | – | PN 16 | – | 10K | 67 | 2.64 |

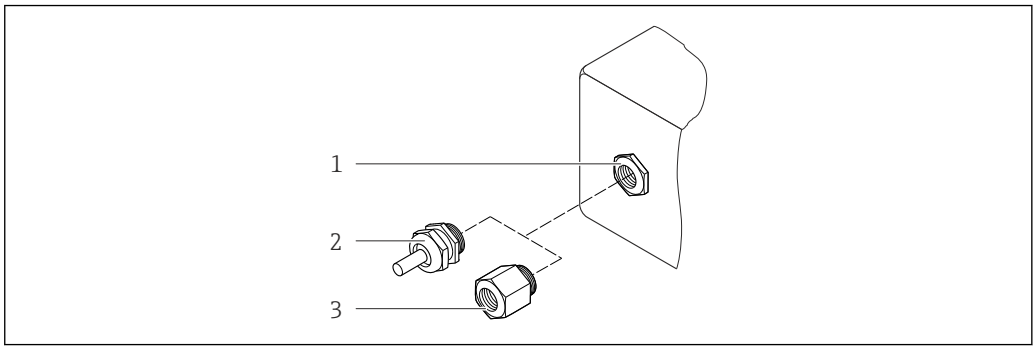
| Nominal diameter | | Pressure rating | | | Process connection internal diameter | |
|---|---|---|---|---|---|---|
| | | EN (DIN) | ASME | JIS | PTFE | |
| [mm] | [in] | [bar] | [psi] | [bar] | [mm] | [in] |
| 80 | 3 | PN 16 | Class 150 | 10K | 79 | 3.11 |
| 100 | 4 | PN 16 | Class 150 | 10K | 103 | 4.06 |
| 125 | – | PN 16 | – | 10K | 128 | 5.04 |
| 150 | 6 | PN 16 | Class 150 | 10K | 155 | 6.10 |
| 200 | 8 | PN 10/16 | Class 150 | 10K | 203 | 7.99 |
| 250 | 10 | PN 10 | – | 10K | 257 | 10.1 |
| 250 | 10 | PN 16 | Class 150 | 10K | 255 | 10.0 |
| 300 | 12 | PN 16 | Class 150 | 10K | 302 | 11.9 |
| 350 | 14 | PN 6/10 | – | 10K | 338 | 13.3 |
| 350 | 14 | PN 16 | Class 150 | 10K | 334 | 13.1 |
| 400 | 16 | PN 6/10 | – | 10K | 388 | 15.3 |
| 400 | 16 | PN 16 | – | 10K | 386 | 15.2 |
| 400 | 16 | – | Class 150 | 10K | 384 | 15.1 |
| 450 | 18 | PN 6/10 | – | 10K | 440 | 17.3 |
| 450 | 18 | PN 16 | – | 10K | 438 | 17.2 |
| 450 | 18 | – | Class 150 | 10K | 434 | 17.1 |
| 500 | 20 | PN 6/10 | – | 10K | 491 | 19.3 |
| 500 | 20 | PN 16 | – | 10K | 487 | 19.2 |
| 500 | 20 | – | Class 150 | 10K | 485 | 19.1 |
| 600 | 24 | PN 6 | – | 10K | 592 | 23.3 |
| 600 | 24 | PN 10 | – | 10K | 590 | 23.2 |
| 600 | 24 | PN 16 | – | 10K | 588 | 23.2 |
| 600 | 24 | – | Class 150 | 10K | 582 | 22.9 |

## Materials

### Transmitter housing

- Order code for "Housing", option **A** "Compact, aluminum coated":
  Aluminum, AlSi10Mg, coated
- Window material for optional local display (→ 🖹 124):
  For order code for "Housing", option **A**: glass

### Cable entries/cable glands




24 *Possible cable entries/cable glands*

*1 Female thread M20 × 1.5*
*2 Cable gland M20 × 1.5*
*3 Adapter for cable entry with internal thread G ½" or NPT ½"*

*Order code for "Housing", option A "Compact, coated aluminum"*

The various cable entries are suitable for hazardous and non-hazardous areas.

| Cable entry/cable gland | Material |
|---|---|
| Cable gland M20 × 1.5 | Nickel-plated brass |
| Adapter for cable entry with internal thread G ½" | |
| Adapter for cable entry with internal thread NPT ½" | |

### Device plug

| Electrical connection | Material |
|---|---|
| Plug M12x1 | ▪ Socket: Stainless steel, 1.4404 (316L)<br>▪ Contact housing: Polyamide<br>▪ Contacts: Gold-plated brass |

### Sensor housing

- DN 15 to 300 (½ to 12"): coated aluminum AlSi10Mg
- DN 350 to 600 (14 to 24"): carbon steel with protective varnish

### Measuring tubes

Stainless steel, 1.4301/304/1.4306/304L; for flanges made of carbon with Al/Zn protective coating (DN 15 to 300 (½ to 12")) or protective varnish (DN 350 to 600 (14 to 24"))

*Liner*

PTFE

### Process connections

EN 1092-1 (DIN 2501)
Carbon steel, E250C [1]/S235JRG2/P245GH

ASME B16.5
Carbon steel, A105

1) DN 15 to 300 (½ to 12") with Al/Zn-protective coating; DN 350 to 600 (14 to 24") with protective coating

JIS B2220
Carbon steel, A105/A350 LF2

**Electrodes**

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum

**Seals**

As per DIN EN 1514-1, form IBC

**Accessories**

*Ground disks*

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum; titanium

Fitted electrodes

Measuring electrodes, reference electrodes and electrodes for empty pipe detection:
Standard: stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum

Process connections

- EN 1092-1 (DIN 2501): DN ≤ 300 (12") Form A, DN ≥ 350 (14") Form B; dimensions DN 65 PN 16 and only as per EN 1092-1
- ASME B16.5
- JIS B2220
- AS 2129 Table E
- AS 4087 PN 16

Surface roughness

Stainless steel electrodes, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum:
≤ 0.3 to 0.5 µm (11.8 to 19.7 µin)
(All data relate to parts in contact with fluid)

## 16.11 Operability

Local display

The local display is only available with the following device order code:
Order code for "Display; operation", option **B**: 4-line; illuminated, via communication

**Display element**

- 4-line liquid crystal display with 16 characters per line.
- White background lighting; switches to red in event of device errors.
- Format for displaying measured variables and status variables can be individually configured.
- Permitted ambient temperature for the display: −20 to +60 °C (−4 to +140 °F). The readability of the display may be impaired at temperatures outside the temperature range.

**Disconnecting the local display from the main electronics module**

In the case of the "Compact, aluminum coated" housing version, the local display must only be disconnected manually from the main electronics module. In the case of the "Compact, hygienic, stainless" and "Ultra-compact, hygienic, stainless" housing versions, the local display is integrated in the housing cover and is disconnected from the main electronics module when the housing cover is opened.

*"Compact, aluminum coated" housing version*

The local display is plugged onto the main electronics module. The electronic connection between the local display and main electronics module is established via a connecting cable.

For some work performed on the measuring device (e.g. electrical connection), it is advisable to disconnect the local display from the main electronics module:

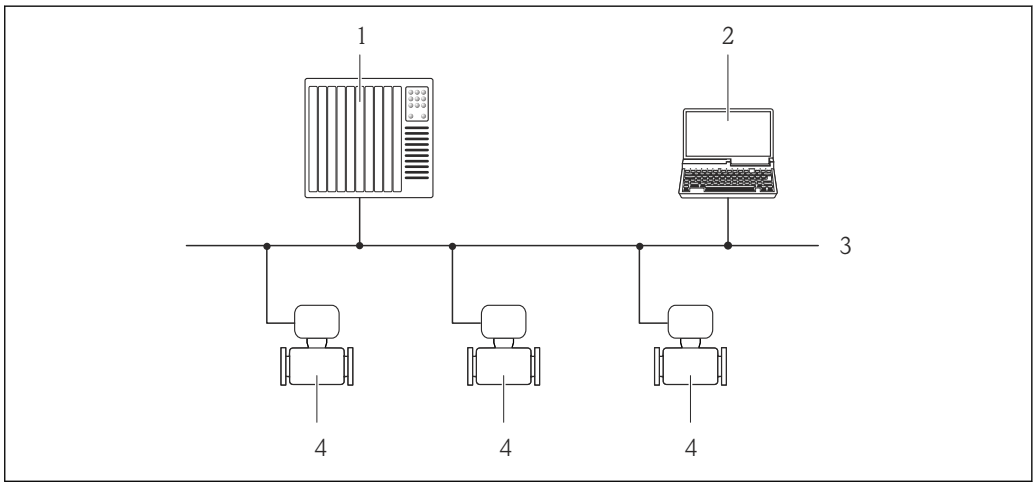
1. Press in the side latches of the local display.
2. Remove the local display from the main electronics module. Pay attention to the length of the connecting cable when doing so.

Once the work is completed, plug the local display back on.

Remote operation

**Via PROFIBUS DP network**

This communication interface is available in device versions with PROFIBUS DP.



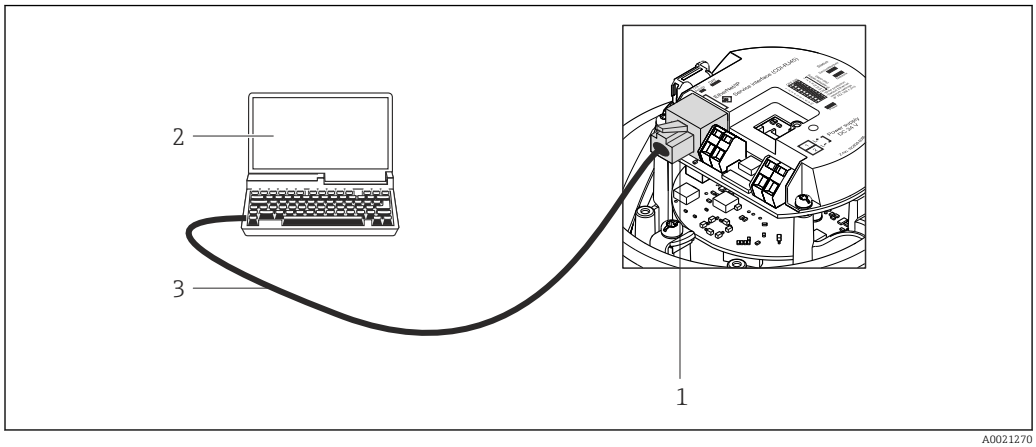

25 *Options for remote operation via PROFIBUS DP network*

*1 Automation system*
*2 Computer with PROFIBUS network card*
*3 PROFIBUS DP network*
*4 Measuring device*

Service interface

**Via service interface (CDI-RJ45)**

*PROFIBUS DP*




*26 Connection for order code for "Output", option L: PROFIBUS DP*

*1 Service interface (CDI -RJ45) of the measuring device with access to the integrated Web server*
*2 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with "FieldCare" operating tool with COM DTM "CDI Communication TCP/IP"*
*3 Standard Ethernet connecting cable with RJ45 plug*

Languages

Can be operated in the following languages:
- Via "FieldCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese
- Via Web browser
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish, Korean

## 16.12 Certificates and approvals

CE mark

The measuring system is in conformity with the statutory 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.

C-Tick symbol

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval

The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

Certification PROFIBUS

**PROFIBUS interface**

The measuring device is certified and registered by the PNO (PROFIBUS User Organization Organization). The measuring system meets all the requirements of the following specifications:
- Certified in accordance with PROFIBUS PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

Pressure Equipment Directive

- With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Essential Safety Requirements" specified in Appendix I of the Pressure Equipment Directive 2014/68/EC.
- Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art. 4, Par. 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EC.

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
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnosis of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications

## 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.

Cleaning

| Package | Description |
|---|---|
| Electrode cleaning circuit (ECC) | The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite ($Fe_3O_4$) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to the loss of signal. The application package is designed to AVOID build up of highly conductive matter and thin layers (typical of magnetite). |

Heartbeat Technology

| Package | Description |
|---|---|
| Heartbeat Verification +Monitoring | **Heartbeat Verification**<br>Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".<br>▪ Functional testing in the installed state without interrupting the process.<br>▪ Traceable verification results on request, including a report.<br>▪ Simple testing process via local operation or other operating interfaces.<br>▪ Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.<br>▪ Extension of calibration intervals according to operator's risk assessment.<br><br>**Heartbeat Monitoring**<br>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:<br>▪ Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time.<br>▪ Schedule servicing in time.<br>▪ Monitor the process or product quality, e.g. gas pockets. |

## 16.14 Accessories

Overview of accessories available for order → 109

## 16.15 Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- 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 2-D matrix code (QR code) on the nameplate.

Standard documentation

### Brief Operating Instructions

Brief Operating Instructions containing all the important information for standard commissioning is enclosed with the device.

### Operating Instructions

| Measuring device | Documentation code | | | | |
|---|---|---|---|---|---|
| | HART | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Promag E 100 | BA01305D | BA01307D | BA01306D | BA01308D | BA01423D |

### Description of device parameters

| Measuring device | Documentation code | | | | |
|---|---|---|---|---|---|
| | HART | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Promag 100 | GP01038D | GP01039D | GP01040D | GP01041D | GP01042D |

Supplementary device-dependent documentation

### Safety Instructions

| Contents | Documentation code |
|---|---|
| ATEX/IECEx Ex nA | XA01090D |

### Special Documentation

| Contents | Documentation code |
|---|---|
| Information on the Pressure Equipment Directive | SD01056D |
| Heartbeat Technology | SD01149D |

### Installation Instructions

| Contents | Comment |
|---|---|
| Installation instructions for spare part sets and accessories | ▪ Access the overview of all the available spare part sets via *W@M Device Viewer* → 🖹 107<br>▪ Accessories available for order with Installation Instructions → 🖹 109 |

# Index

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