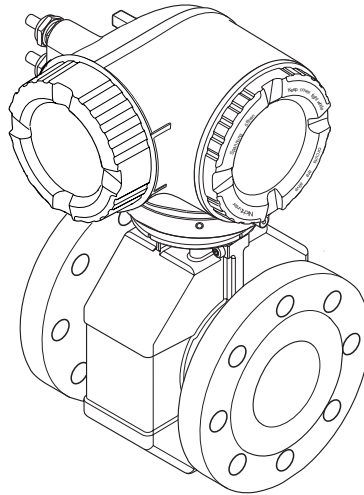


# Operating Instructions Proline Promag P 300 Modbus RS485

Electromagnetic flowmeter



- 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.

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# 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
	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	<b>NOTE!</b> 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
	<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	<b>Protective Earth (PE)</b> A terminal which must be connected to ground prior to establishing any other connections.  The ground terminals are situated inside and outside the device: <ul style="list-style-type: none"> <li>▪ Inner ground terminal: Connects the protective earth to the mains supply.</li> <li>▪ Outer ground terminal: Connects the device to the plant grounding system.</li> </ul>

### 1.2.3 Communication symbols









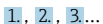



Symbol	Meaning
	<b>Wireless Local Area Network (WLAN)</b> Communication via a wireless, local network.
	<b>LED</b> Light emitting diode is off.

Symbol	Meaning
	<b>LED</b> Light emitting diode is on.
	<b>LED</b> Light emitting diode is flashing.



#### 1.2.4 Tool symbols



Symbol	Meaning
	Flat blade screwdriver
	Allen key
	Open-ended wrench

#### 1.2.5 Symbols for certain types of information


Symbol	Meaning
	<b>Permitted</b> Procedures, processes or actions that are permitted.
	<b>Preferred</b> Procedures, processes or actions that are preferred.
	<b>Forbidden</b> Procedures, processes or actions that are forbidden.
	<b>Tip</b> Indicates additional information.
	Reference to documentation.
	Reference to page.
	Reference to graphic.
	Notice or individual step to be observed.
	Series of steps.
	Result of a step.
	Help in the event of a problem.
	Visual inspection.

#### 1.2.6 Symbols in graphics



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

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

## 1.3 Documentation

 For an overview of the scope of the associated Technical Documentation, refer to the following:

- The *W@M Device Viewer* : Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://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  
→  179

### 1.3.1 Standard documentation

Document type	Purpose and content of the document
Technical Information	<b>Planning aid for your device</b> 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	<b>Guides you quickly to the 1st measured value - Part 1</b> The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device. <ul style="list-style-type: none"> <li>▪ Incoming acceptance and product identification</li> <li>▪ Storage and transport</li> <li>▪ Installation</li> </ul>
Transmitter Brief Operating Instructions	<b>Guides you quickly to the 1st measured value - Part 2</b> The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value). <ul style="list-style-type: none"> <li>▪ Product description</li> <li>▪ Installation</li> <li>▪ Electrical connection</li> <li>▪ Operation options</li> <li>▪ System integration</li> <li>▪ Commissioning</li> <li>▪ Diagnostic information</li> </ul>
Description of Device Parameters	<b>Reference for your parameters</b> 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. The document provides Modbus-specific information for each individual parameter in the Expert operating menu.

### 1.3.2 Supplementary device-dependent documentation

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



## **1.4 Registered trademarks**

**Modbus®**

Registered trademark of SCHNEIDER AUTOMATION, INC.

## 2 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  $\mu\text{S}/\text{cm}$ .

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

#### Incorrect use

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

#### **WARNING**

##### **Danger of breakage due to corrosive or abrasive fluids!**

- ▶ 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.


## 2.7 Device-specific IT security

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

Function/interface	Factory setting	Recommendation
Write protection via hardware write protection switch →  12	Not enabled.	Individually following risk assessment.
Access code (also applies for Web server login or FieldCare connection) →  13	Not enabled (0000).	Assign an individual access code during commissioning.
WLAN (order option in display module)	Enabled.	Individually following risk assessment.
WLAN security mode	Enabled (WPA2-PSK)	Do not change.
WLAN passphrase (password) →  13	Serial number	Assign an individual access code during commissioning.
WLAN mode	Access Point	Individually following risk assessment.
Web server →  13	Enabled.	Individually following risk assessment.
CDI-RJ45 service interface →  13	–	Individually following risk assessment.

### 2.7.1 Protecting access via hardware write protection

Write access to the device parameters via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare) can be disabled via a write protection switch (DIP switch on the motherboard). When hardware write protection is enabled, only read access to the parameters is possible.


Hardware write protection is disabled when the device is delivered →  118.

### 2.7.2 Protecting access via a password

Different passwords are available to protect write access to the device parameters or access to the device via the WLAN interface.


- **User-specific access code**  
Protect write access to the device parameters via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare). Access authorization is clearly regulated through the use of a user-specific access code.
- **WLAN passphrase**  
The network key protects a connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface which can be ordered as an option.


### User-specific access code

Write access to the device parameters via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code (→  116).


When the device is delivered, the device does not have an access code and is equivalent to 0000 (open).

### WLAN passphrase

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface (→  69) which can be ordered as an option is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter (→  110).

### General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, see the "Write protection via access code" section →  116


## 2.7.3 Access via fieldbus

When communicating via fieldbus, access to the device parameters can be restricted to "Read only" access. The option can be changed in the **Fieldbus writing access** parameter.

This does not affect cyclic measured value transmission to the higher-order system, which is always guaranteed.

 For detailed information, see the "Description of Device Parameters" document pertaining to the device →  179

## 2.7.4 Access via Web server

The device can be operated and configured via a Web browser with the integrated Web server (→  61). The connection is via the service interface (CDI-RJ45) or the WLAN interface.

The Web server is enabled when the device is delivered. The Web server can be disabled if necessary (e.g. after commissioning) via the **Web server functionality** parameter.

The device and status information can be hidden on the login page. This prevents unauthorized access to the information.

 For detailed information, see the "Description of Device Parameters" document pertaining to the device →  179

## 2.7.5 Access via CDI-RJ45 service interface

The device can be connected to a network via the CDI-RJ45 service interface. Device-specific functions guarantee the secure operation of the device in a network.

It is advisable to take relevant security concepts into consideration, such as those issued by the Federal Office for Information Security. This includes organizational security measures

such as the assignment of access authorization as well as technical measures such as network segmentation.

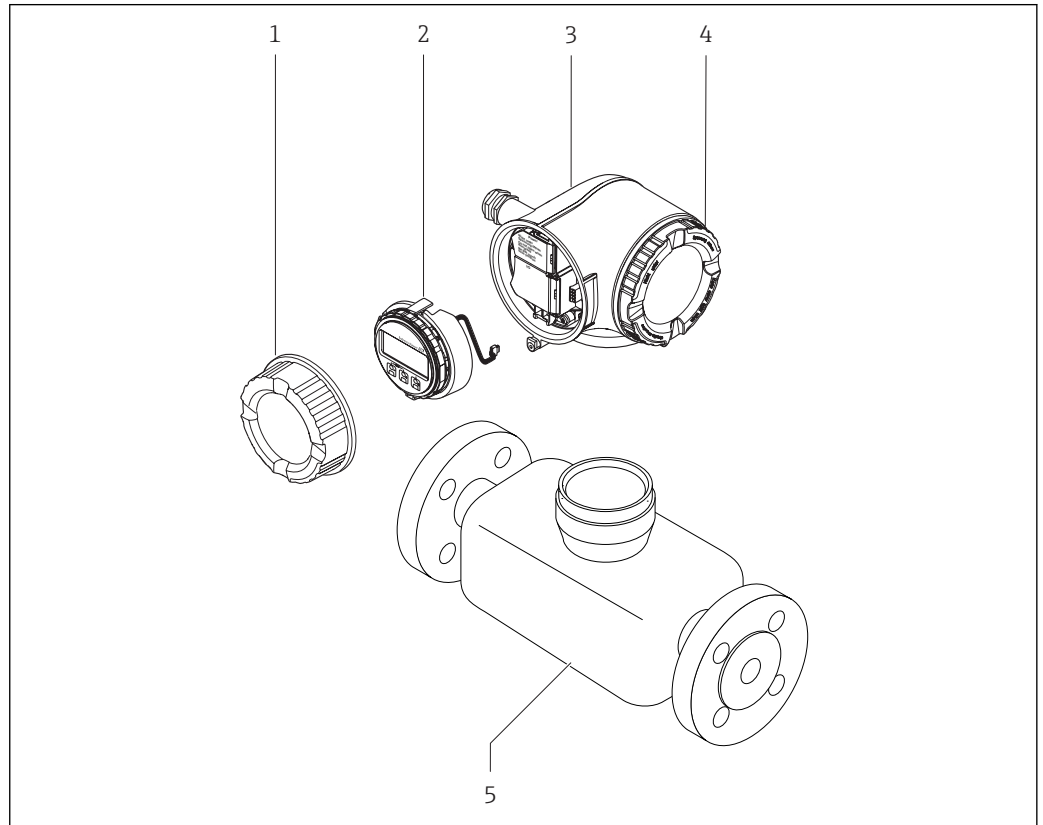
### 3 Product description

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



A0029586

#### 1 Important components of a measuring device

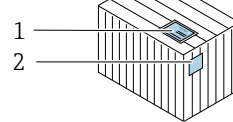
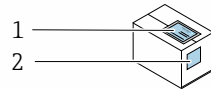
- 1 Connection compartment cover
- 2 Display module
- 3 Transmitter housing
- 4 Electronics compartment cover
- 5 Sensor

## 4 Incoming acceptance and product identification

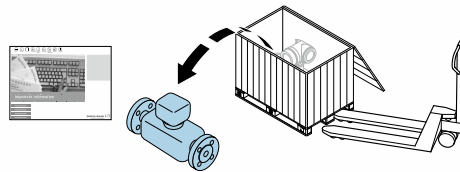
### 4.1 Incoming acceptance



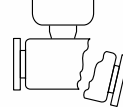
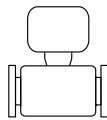
A0028673



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



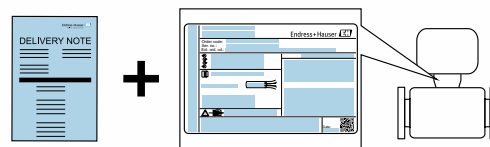
A0028673



Are the goods undamaged?



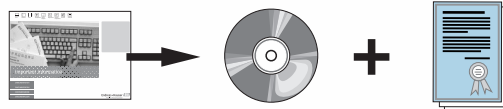
A0028673



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



A0028673



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 → 17.



### 4.2 Product identification

The following options are available for identification of the measuring device:

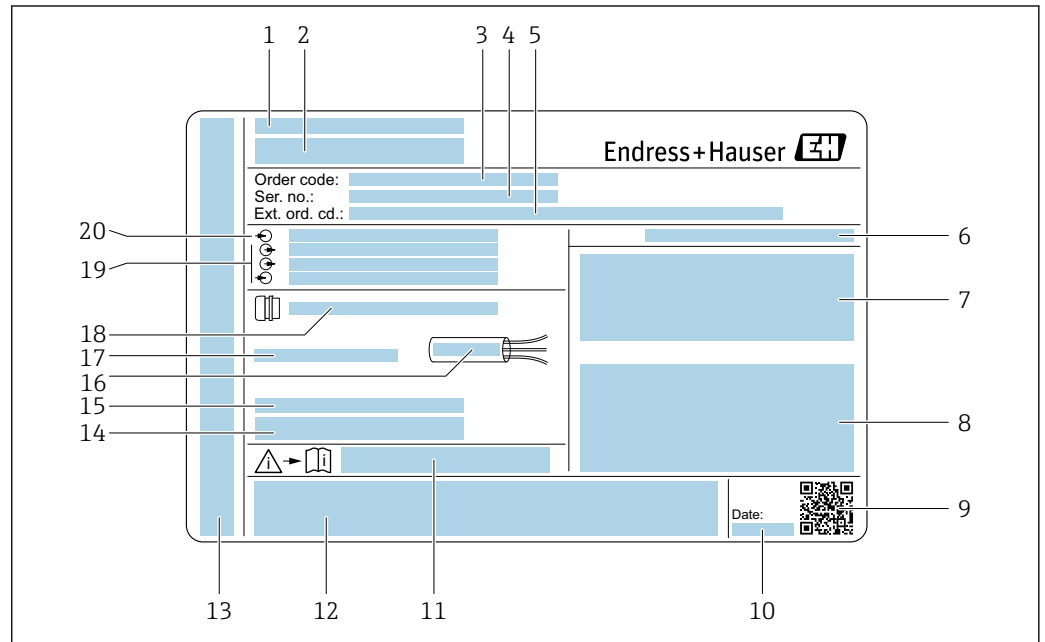
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): All information about the measuring device is displayed.
- Enter the 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](http://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.

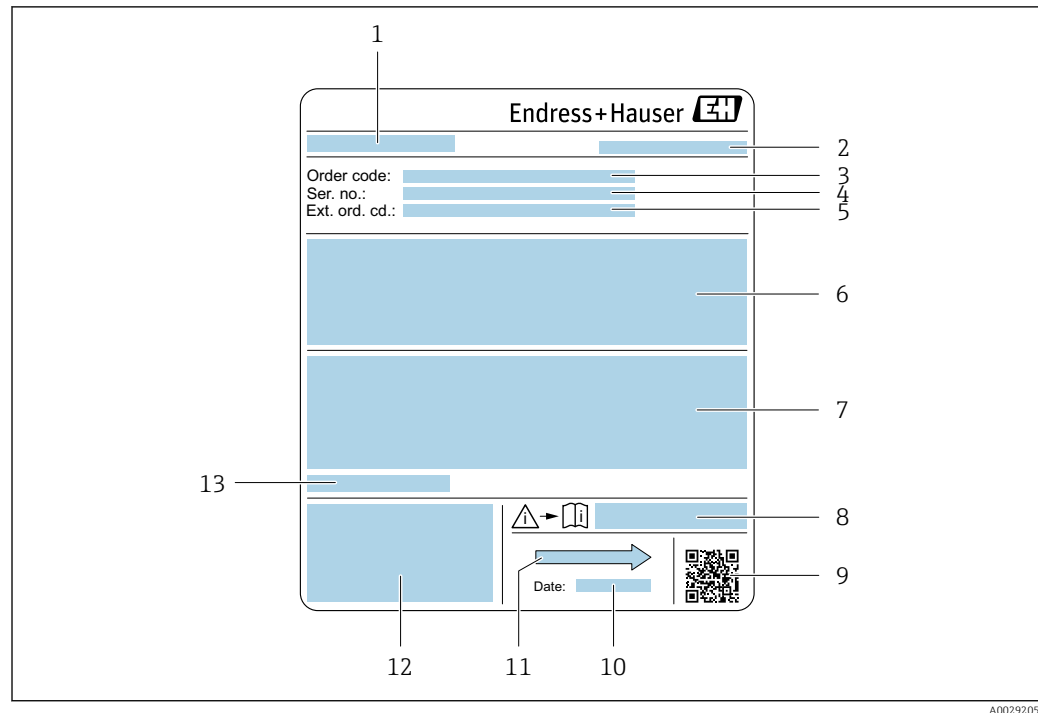
#### 4.2.1 Transmitter nameplate



 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 Degree of protection
- 7 Space for approvals: use in hazardous areas
- 8 Electrical connection data: available inputs and outputs
- 9 2-D matrix code
- 10 Manufacturing date: year-month
- 11 Document number of safety-related supplementary documentation
- 12 Space for approvals and certificates: e.g. CE mark, C-Tick
- 13 Space for degree of protection of connection and electronics compartment when used in hazardous areas
- 14 Firmware version (FW) and device revision (Dev.Rev.) from the factory
- 15 Space for additional information in the case of special products
- 16 Permitted temperature range for cable
- 17 Permitted ambient temperature ( $T_a$ )
- 18 Information on cable gland
- 19 Available inputs and outputs, supply voltage
- 20 Electrical connection data: supply voltage

## 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 → 179
- 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
	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	<b>Reference to documentation</b> Refers to the corresponding device documentation.
	<b>Protective ground connection</b> A terminal which must be connected to ground prior to establishing any other connections.

## 5 Storage and transport

### 5.1 Storage conditions

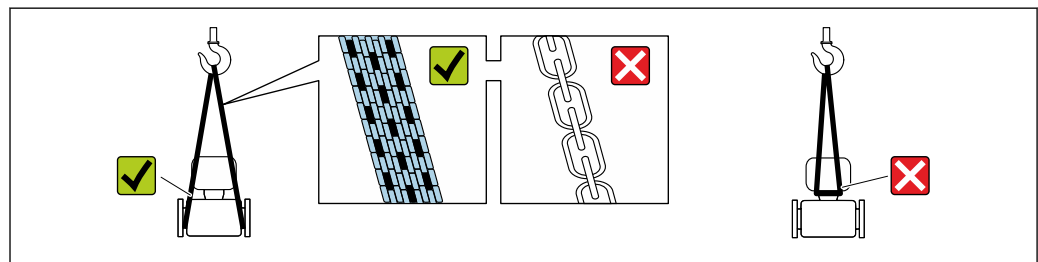
Observe the following notes for storage:

- ▶ 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 → 163

### 5.2 Transporting the product

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



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**i** 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.

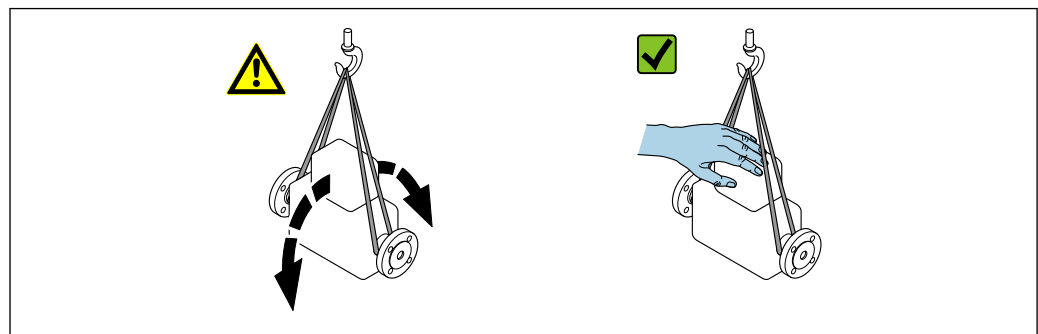
#### 5.2.1 Measuring devices without lifting lugs

##### **⚠ 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.

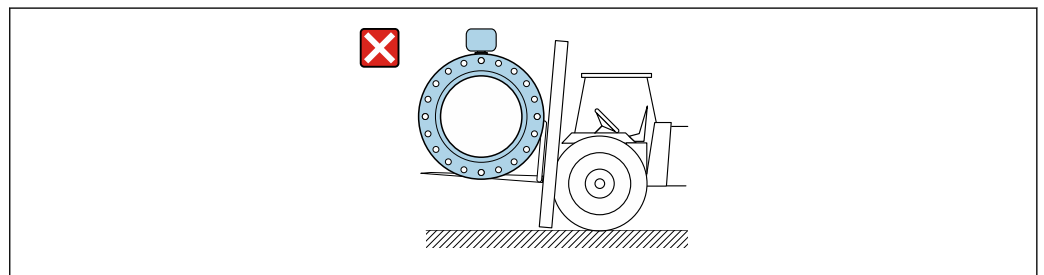
### 5.2.3 Transporting with a fork lift

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:

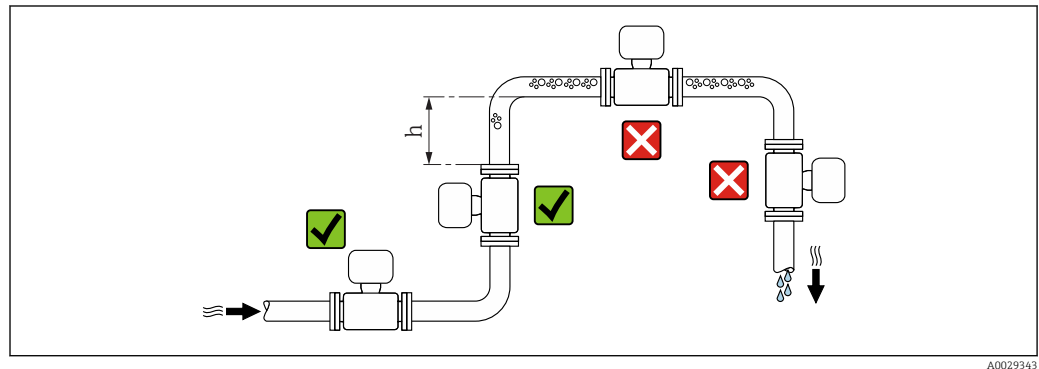
- Measuring device secondary packaging: polymer stretch film that conforms to EC Directive 2002/95/EC (RoHS).
- Packaging:
  - Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
  - or
  - Carton in accordance with European Packaging Directive 94/62EC; 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

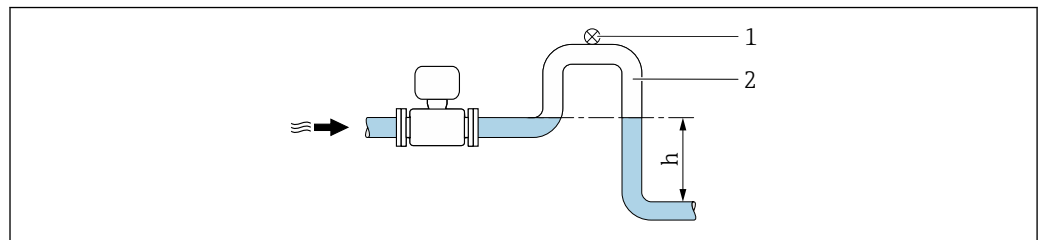


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Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow:  $h \geq 2 \times DN$

##### Installation in down pipes

Install a siphon with a vent valve downstream of the sensor in down pipes whose length  $h \geq 5 \text{ m}$  (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.



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##### 4 Installation in a down pipe

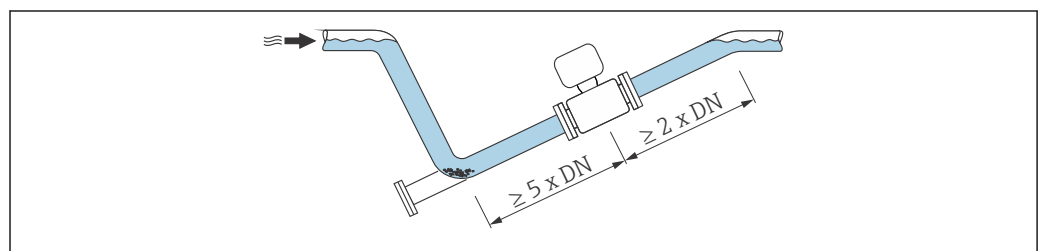
1 Vent valve

2 Pipe siphon

$h$  Length of down pipe

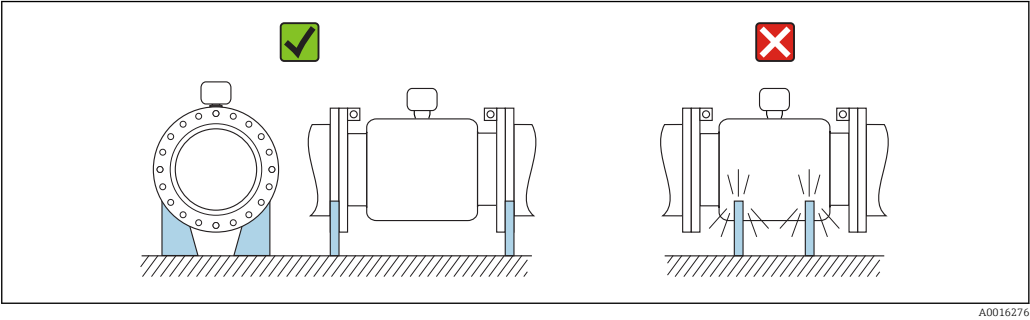
##### Installation in partially filled pipes

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



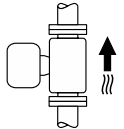
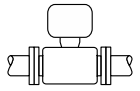
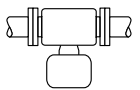

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For heavy sensors DN ≥ 350 (14")



Orientation

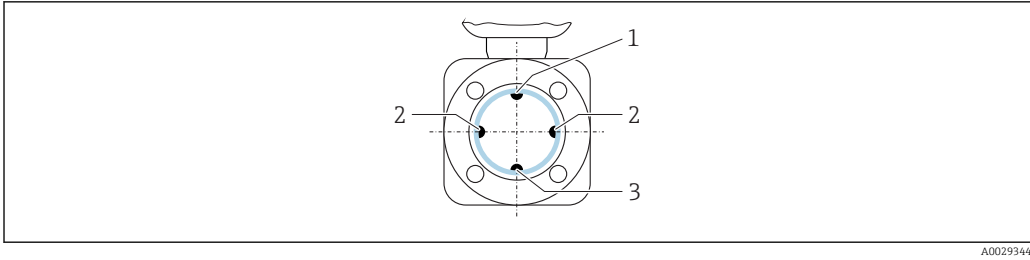
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

Orientation			Recommendation
A	Vertical orientation	 A0015591	✓✓
B	Horizontal orientation, transmitter at top	 A0015589	✓✓ <sup>1)</sup>
C	Horizontal orientation, transmitter at bottom	 A0015590	✓✓ <sup>2) 3)</sup>
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.

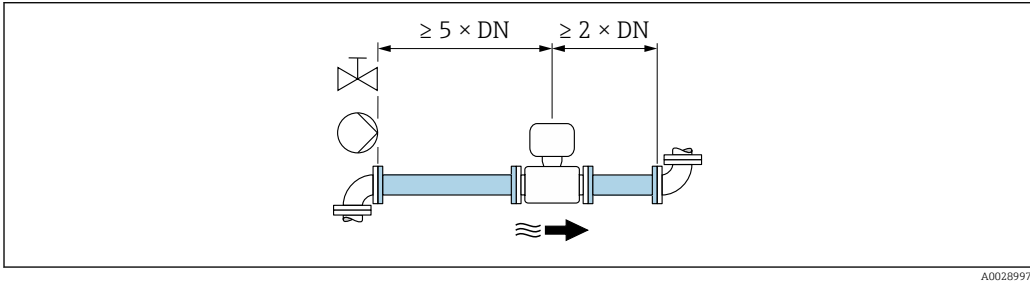


- 1 EPD electrode for empty pipe detection
- 2 Measuring electrodes for signal detection
- 3 Reference electrode for potential equalization

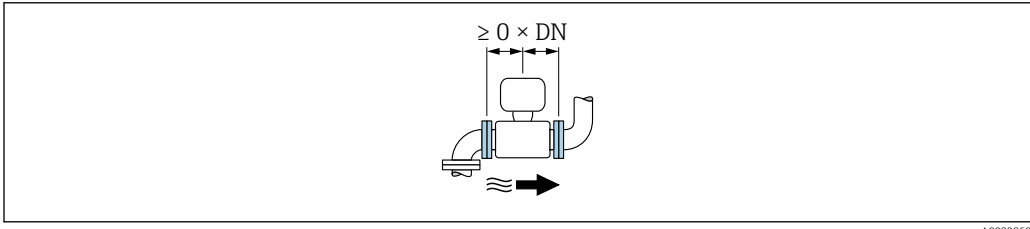
**i** Measuring devices with tantalum or platinum electrodes can be ordered without an EPD electrode. In this case, empty pipe detection is performed via the measuring electrodes.

**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*

**i** 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	Standard: -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.

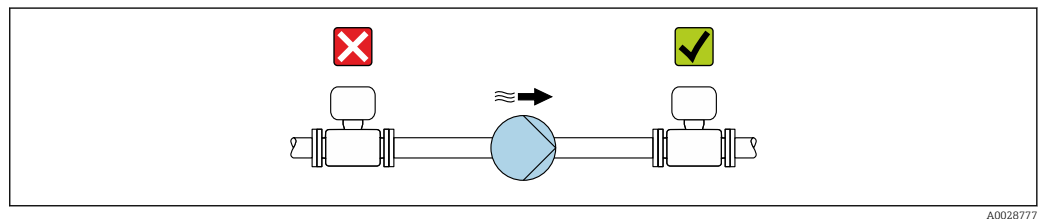


Sensor	<ul style="list-style-type: none"> <li>■ Process connection material, carbon steel: -10 to +60 °C (+14 to +140 °F)</li> <li>■ Process connection material, stainless steel: -40 to +60 °C (-40 to +140 °F)</li> </ul>
Liner	Do not exceed or fall below the permitted temperature range of the liner .

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



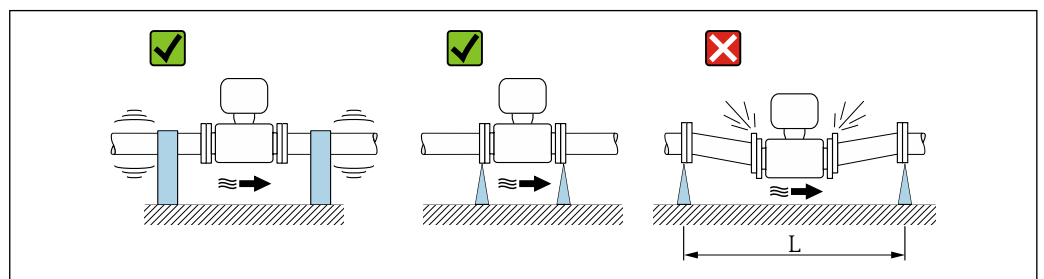
A0028777

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

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

- i**
- Information on the liner's resistance to partial vacuum → 165
  - Information on the shock resistance of the measuring system → 164
  - Information on the vibration resistance of the measuring system → 163

### Vibrations



A0029004

7 Measures to avoid device vibrations ( $L > 10\text{ m}$  (33 ft))

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

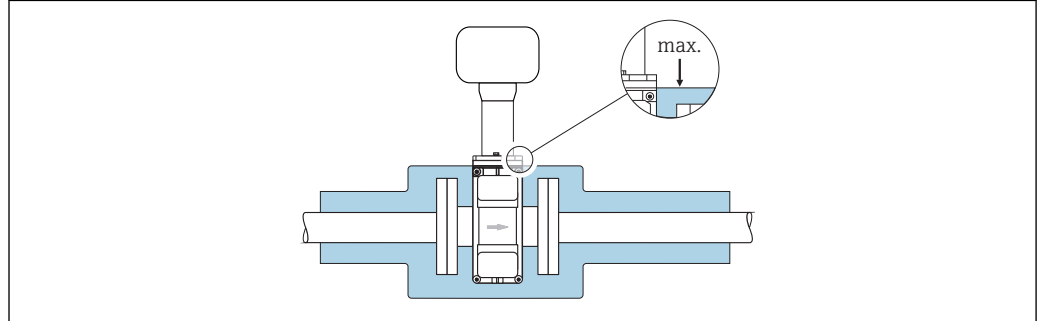
- i**
- Information on the shock resistance of the measuring system → 164
  - Information on the vibration resistance of the measuring system → 163

### Thermal insulation

Pipes generally have to be insulated if they carry very hot fluids to avoid energy losses and prevent accidental contact with pipes at temperatures that could cause injury. Guidelines regulating the insulation of pipes have to be taken into account.

**⚠ WARNING****Electronics overheating on account of thermal insulation!**

- The housing support dissipates heat and its entire surface area must remain uncovered. Make sure that the sensor insulation does not extend past the top of the two sensor half-shells.



A0031216

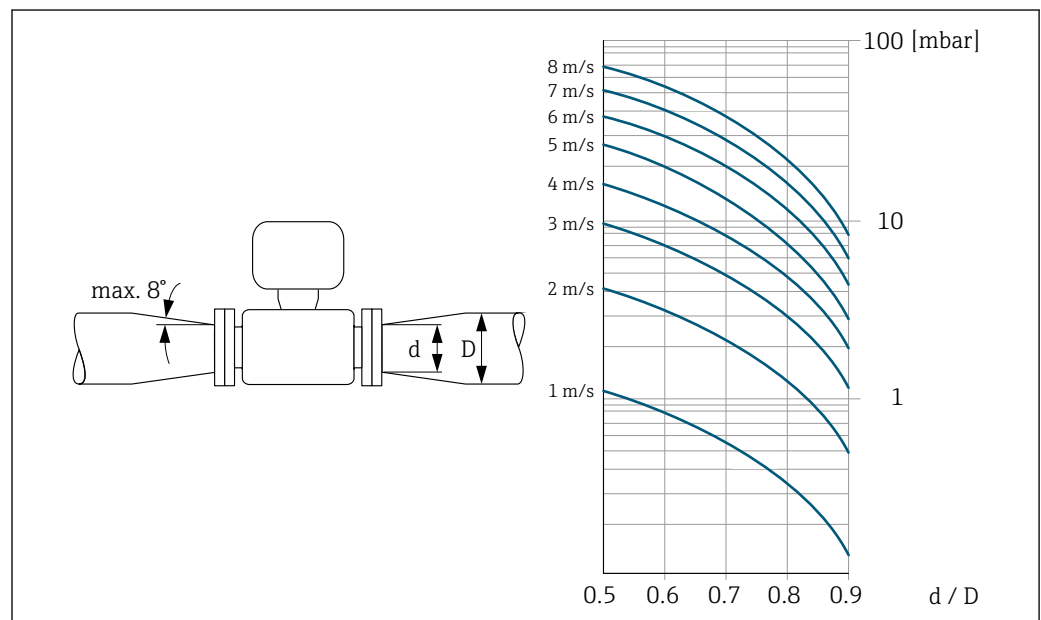
**Adapters**

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.

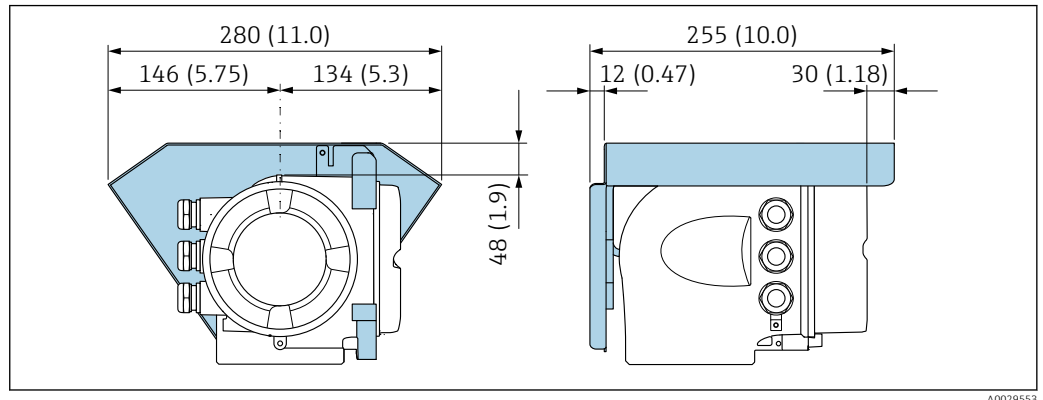
1. Calculate the ratio of the diameters  $d/D$ .
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the  $d/D$  ratio.



A0029002

### 6.1.3 Special mounting instructions

#### Protective cover



## 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.

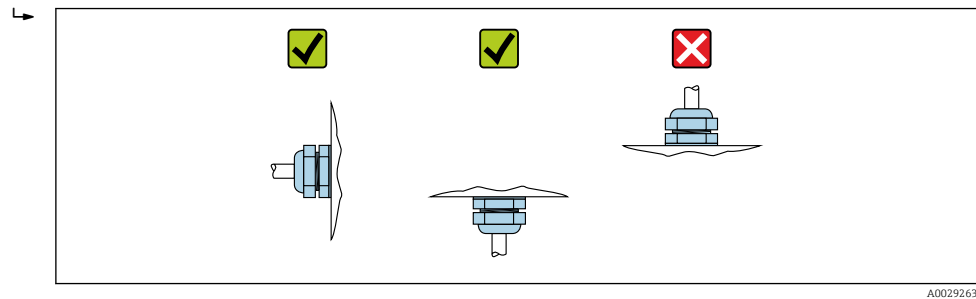
### 6.2.3 Mounting the sensor

#### **⚠ 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 → 28.

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



A0029263

### Mounting the seals

#### ⚠ CAUTION

**An electrically conductive layer could form on the inside of the measuring tube!**

Risk of measuring signal short circuit.

- Do not use electrically conductive sealing compounds such as graphite.

Comply with the following instructions when installing seals:

1. For DIN flanges: only use seals according to DIN EN 1514-1.
2. For "PFA" lining: generally additional seals are **not** required.
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 [mm]	Pressure rating [bar]	Screws [mm]	Flange thickness [mm]	Max. screw tightening torque [Nm]	
				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 <sup>1)</sup>	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
125	PN 16	8 × M16	22	75	67

Nominal diameter [mm]	Pressure rating [bar]	Screws [mm]	Flange thickness [mm]	Max. screw tightening torque [Nm]	
				PTFE	PFA
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 <sup>1)</sup>	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
450	PN 10	20 × M24	28	90

Nominal diameter	Pressure rating	Screws	Flange thickness	Nom. screw tightening torque [Nm]
[mm]	[bar]	[mm]	[mm]	PTFE
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 [mm]	Pressure rating [bar]	Screws [mm]	Max. screw tightening torque [Nm]	
			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 [mm]	Pressure rating [bar]	Screws [mm]	Nom. screw tightening torque [Nm]	
			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*

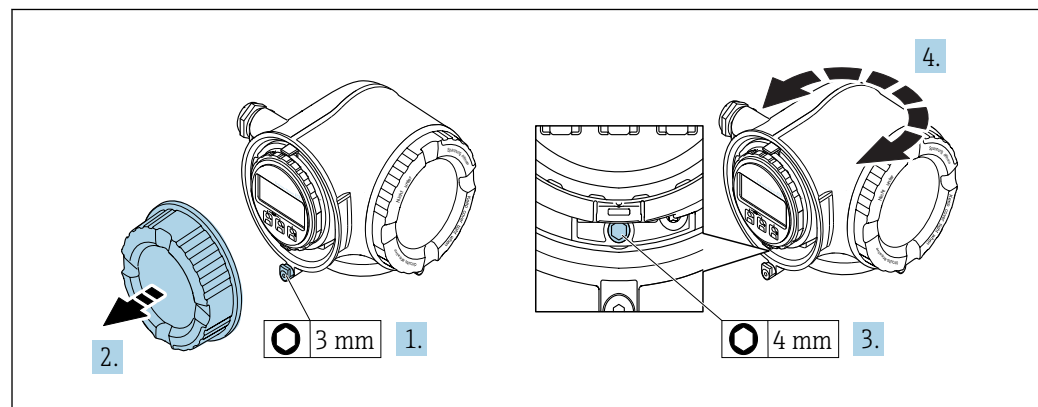
Nominal diameter [mm]	Screws [mm]	Max. screw tightening torque [Nm] PTFE
25	4 × M12	21
50	4 × M16	42

*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 transmitter housing

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



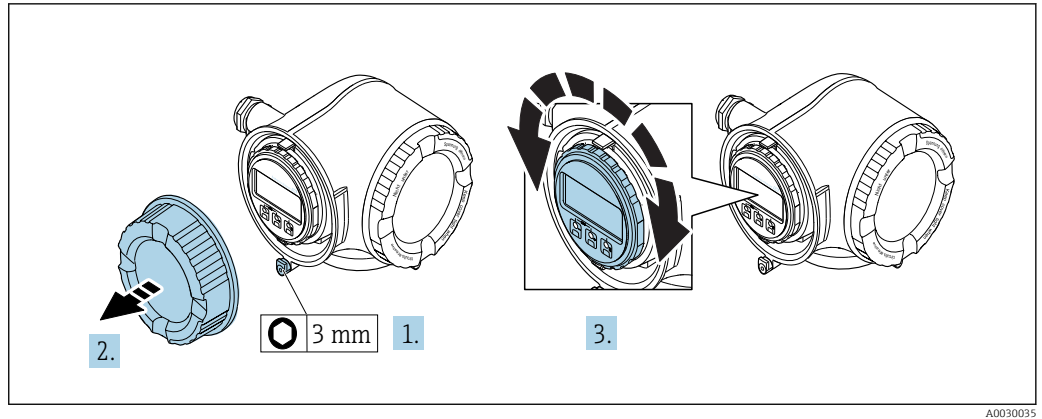
A0029993

1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Release the fixing screw.
4. Turn the housing to the desired position.
5. Firmly tighten the securing screw.
6. Screw on the connection compartment cover
7. Depending on the device version: Attach the securing clamp of the connection compartment cover.

### 6.2.5 Turning the display module

The display module can be turned to optimize display readability and operability.





1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Turn the display module to the desired position: max.  $8 \times 45^\circ$  in each direction.
4. Screw on the connection compartment cover.
5. Depending on the device version: Attach the securing clamp of the connection compartment cover.

### 6.3 Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Does the measuring device conform to the measuring point specifications? For example: <ul style="list-style-type: none"> <li>▪ Process temperature</li> <li>▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)</li> <li>▪ Ambient temperature</li> <li>▪ Measuring range</li> </ul>	<input type="checkbox"/>
Has the correct orientation for the sensor been selected ? <ul style="list-style-type: none"> <li>▪ According to sensor type</li> <li>▪ According to medium temperature</li> <li>▪ According to medium properties (outgassing, with entrained solids)</li> </ul>	<input type="checkbox"/>
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping ?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Is the device adequately protected from precipitation and direct sunlight?	<input type="checkbox"/>
Have the fixing screws been tightened with the correct tightening torque?	<input type="checkbox"/>

## 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 10 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: Allen key 3 mm
- Wire stripper
- When using stranded cables: Crimper for wire end ferrule
- For removing cables from terminal: Flat blade screwdriver  $\leq 3$  mm (0.12 in)

#### 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.

##### Protective ground cable

Cable: 2.1 mm<sup>2</sup> (14 AWG)

The grounding impedance must be less than 1  $\Omega$ .

##### 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

*Modbus RS485*

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

Cable type	A
Characteristic impedance	135 to 165 $\Omega$ at a measuring frequency of 3 to 20 MHz
Cable capacitance	$< 30$ pF/m
Wire cross-section	$> 0.34$ mm <sup>2</sup> (22 AWG)
Cable type	Twisted pairs
Loop resistance	$\leq 110$ $\Omega$ /km

<b>Signal damping</b>	Max. 9 dB over the entire length of the cable cross-section
<b>Shield</b>	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

*Current output 0/4 to 20 mA*

Standard installation cable is sufficient.

*Pulse/frequency/switch output*

Standard installation cable is sufficient.

*Double pulse output*

Standard installation cable is sufficient.

*Relay output*

Standard installation cable is sufficient.

*Current input 0/4 to 20 mA*

Standard installation cable is sufficient.

*Status input*

Standard installation cable is sufficient.

**Cable diameter**

- Cable glands supplied:  
M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Spring-loaded terminals: Suitable for strands and strands with ferrules.  
Conductor cross-section 0.2 to 2.5 mm<sup>2</sup> (24 to 12 AWG).

**Requirements for the connecting cable***Optionally available connecting cable*

A cable is supplied depending on the order option

- Order code for measuring device: order code **030** for "Display; operation", option **O**  
or
- Order code for measuring device: order code **030** for "Display; operation", option **M**  
and
- Order code for DKX001: order code **040** for "Cable", option **A, B, D, E**

<b>Standard cable</b>	2 × 2 × 0.34 mm <sup>2</sup> (22 AWG) PVC cable with common shield (2 pairs, pair-stranded)
<b>Flame resistance</b>	According to DIN EN 60332-1-2
<b>Oil-resistance</b>	According to DIN EN 60811-2-1
<b>Shielding</b>	Tin-plated copper-braid, optical cover ≥ 85 %
<b>Capacitance: core/shield</b>	≤200 pF/m
<b>L/R</b>	≤24 µH/Ω
<b>Available cable length</b>	5 m (15 ft)/10 m (35 ft)/20 m (65 ft)/30 m (100 ft)
<b>Operating temperature</b>	When mounted in a fixed position: -50 to +105 °C (-58 to +221 °F); when cable can move freely: -25 to +105 °C (-13 to +221 °F)

*Standard cable - customer-specific cable*

No cable is supplied, and it must be provided by the customer (up to max.

300 m (1 000 ft)) for the following order option:

Order code for DKX001: Order code **040** for "Cable", option **1** "None, provided by customer, max 300 m"

A standard cable can be used as the connecting cable.

<b>Standard cable</b>	4 cores (2 pairs); pair-stranded with common shield
<b>Shielding</b>	Tin-plated copper-braid, optical cover $\geq 85\%$
<b>Capacitance: core/shield</b>	Maximum 1 000 nF for Zone 1, Class I, Division 1
<b>L/R</b>	Maximum 24 $\mu\text{H}/\Omega$ for Zone 1, Class I, Division 1
<b>Cable length</b>	Maximum 300 m (1 000 ft), see the following table

<b>Cross-section</b>	<b>Max. cable length for use in Non-hazardous area, Ex Zone 2, Class I, Division 2 Ex Zone 1, Class I, Division 1</b>
0.34 mm <sup>2</sup> (22 AWG)	80 m (270 ft)
0.50 mm <sup>2</sup> (20 AWG)	120 m (400 ft)
0.75 mm <sup>2</sup> (18 AWG)	180 m (600 ft)
1.00 mm <sup>2</sup> (17 AWG)	240 m (800 ft)
1.50 mm <sup>2</sup> (15 AWG)	300 m (1 000 ft)



### 7.1.3 Terminal assignment

#### Transmitter: supply voltage, input/outputs

The terminal assignment of the inputs and outputs depends on the individual order version of the device. The device-specific terminal assignment is documented on an adhesive label in the terminal cover.

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)

Device-specific terminal assignment: adhesive label in terminal cover.

 Terminal assignment of the remote display and operating module →  40.


### 7.1.4 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 →  34.

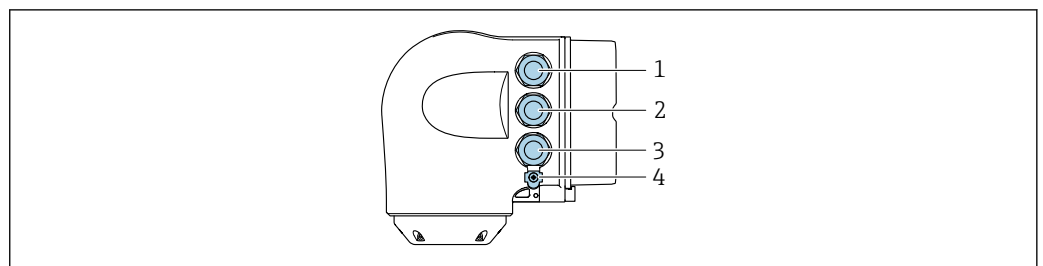
## 7.2 Connecting the measuring device

#### NOTICE

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

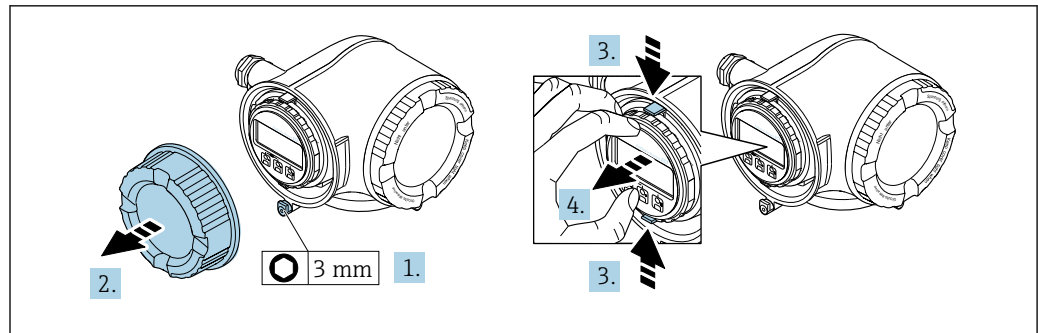
- Have electrical connection work carried out by appropriately trained specialists only.
- Observe applicable federal/national installation codes and regulations.
- Comply with local workplace safety regulations.
- Always connect the protective ground cable  before connecting additional cables.
- For use in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.

### 7.2.1 Connecting the transmitter



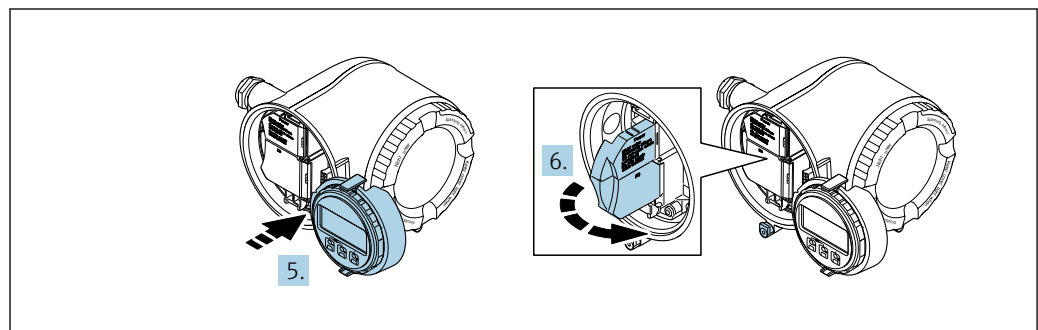
A0026781

- 1 Terminal connection for supply voltage
- 2 Terminal connection for signal transmission, input/output
- 3 Terminal connection for signal transmission, input/output or terminal connection for network connection via service interface (CDI-RJ45); optional: connection for external WLAN antenna or remote display and operating module DKX001
- 4 Protective earth (PE)



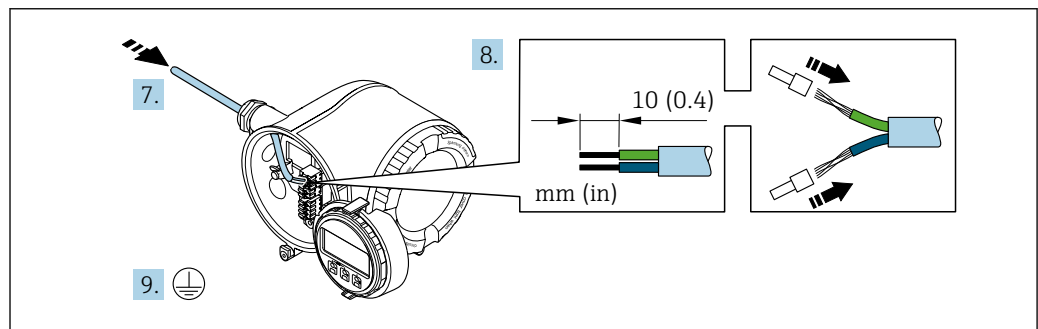
A0029813

1. Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Squeeze the tabs of the display module holder together.
4. Remove the display module holder.



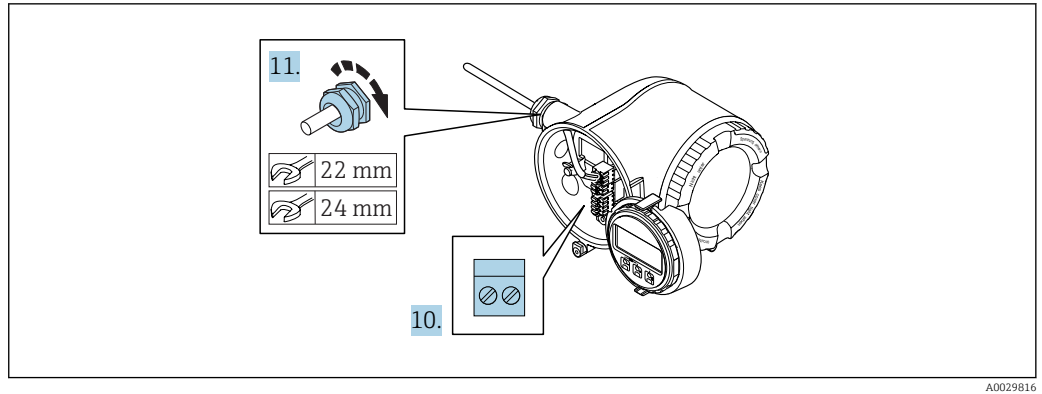
A0029814

5. Attach the holder to the edge of the electronics compartment.
6. Open the terminal cover.



A0029815

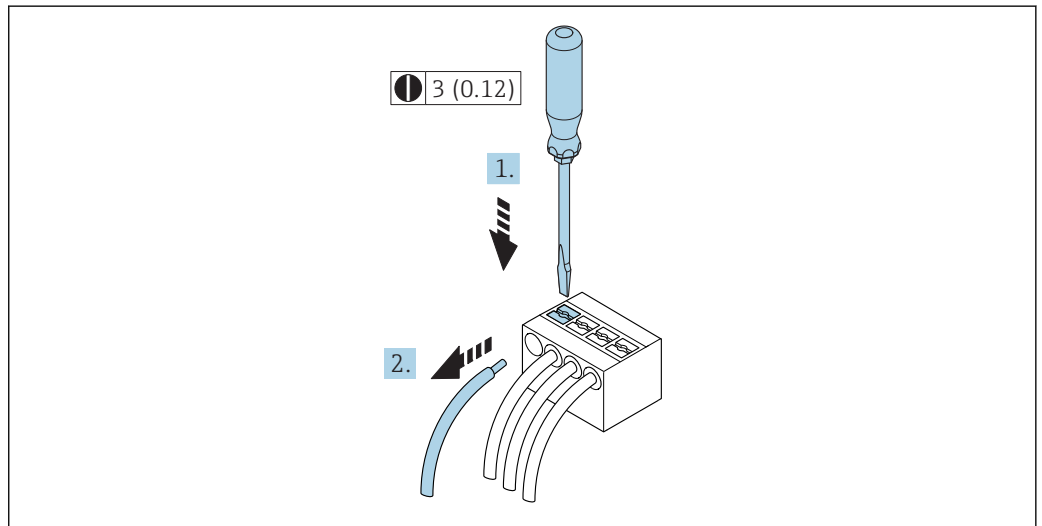
7. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
8. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
9. Connect the protective ground.



A0029816

10. Connect the cable in accordance with the terminal assignment .
  - ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
  - Supply voltage terminal assignment:** Adhesive label in the terminal cover or → 37.
11. Firmly tighten the cable glands.
  - ↳ This concludes the cable connection process.
12. Close the terminal cover.
13. Fit the display module holder in the electronics compartment.
14. Screw on the connection compartment cover.
15. Secure the securing clamp of the connection compartment cover.

### Removing a cable



A0029598

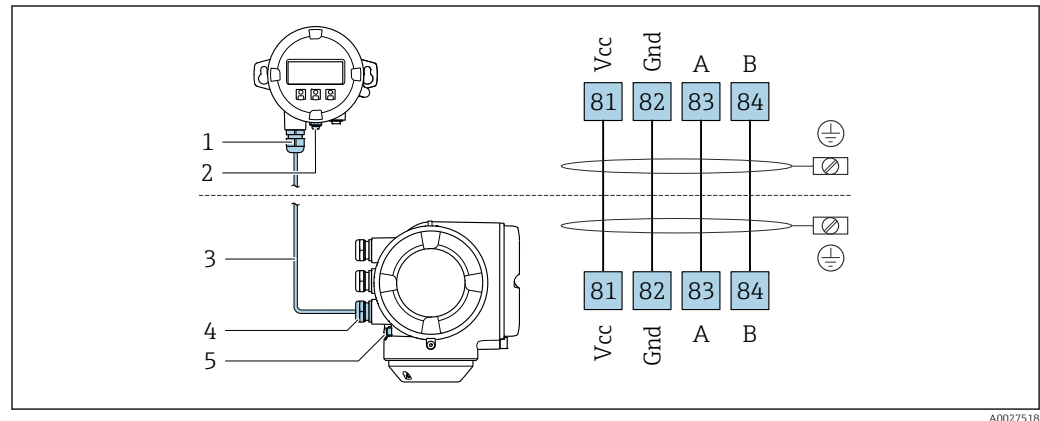
8 Engineering unit mm (in)

1. To remove a cable from the terminal, use a flat-blade screwdriver to push the slot between the two terminal holes
2. while simultaneously pulling the cable end out of the terminal.

### 7.2.2 Connecting the remote display and operating module DKX001

**i** The remote display and operating module DKX001 is available as an optional extra  
→ 151.

- The measuring device is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring device. Display or operation at the transmitter is not possible in this case.
- If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring device display module. Only one display or operation unit may be connected to the transmitter at any one time.



A0027518

- 1 Remote display and operating module DKX001
- 2 Protective earth (PE)
- 3 Connecting cable
- 4 Measuring device
- 5 Protective earth (PE)

## 7.3 Ensure potential equalization

### 7.3.1 Requirements

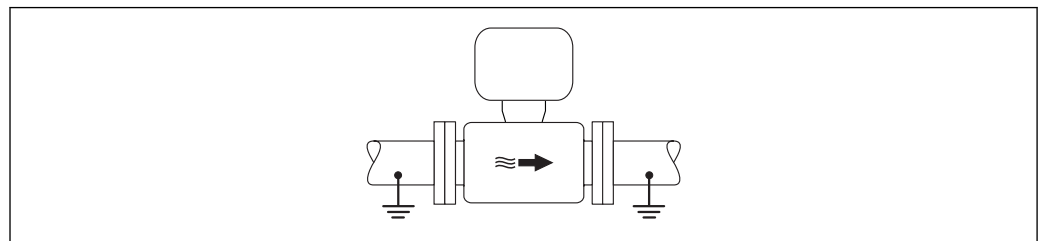
#### **CAUTION**

**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

### 7.3.2 Connection example, standard scenario

#### Metal, grounded pipe



A0016315

**9** Potential equalization via measuring tube



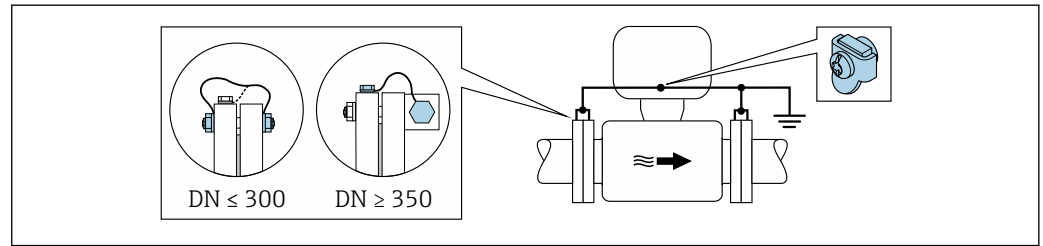
### 7.3.3 Connection example in special situations

#### Unlined and ungrounded metal pipe

This connection method also applies in situations where:

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

<b>Ground cable</b>	Copper wire, at least 6 mm <sup>2</sup> (0.0093 in <sup>2</sup> )
---------------------	---



10 Potential equalization via ground terminal and pipe flanges

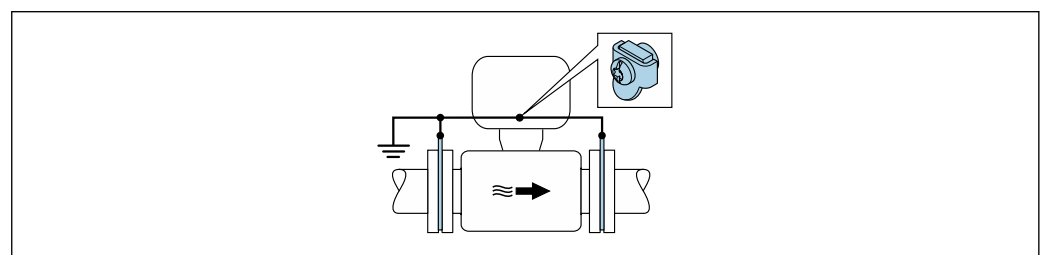
1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.
2. If  $DN \leq 300$  (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
3. If  $DN \geq 350$  (14"): Mount the ground cable directly on the metal transport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

#### 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

<b>Ground cable</b>	Copper wire, at least 6 mm <sup>2</sup> (0.0093 in <sup>2</sup> )
---------------------	---



11 Potential equalization via ground terminal and ground disks

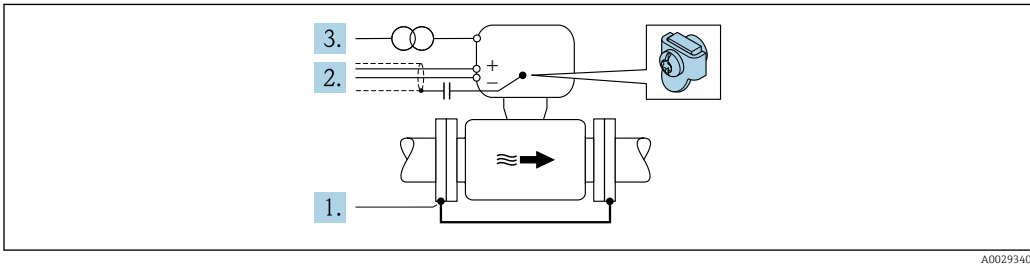
1. Connect the ground disks to the ground terminal via the ground cable.
2. Connect the ground disks to ground potential.

#### 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 mm <sup>2</sup> (0.0093 in <sup>2</sup> )
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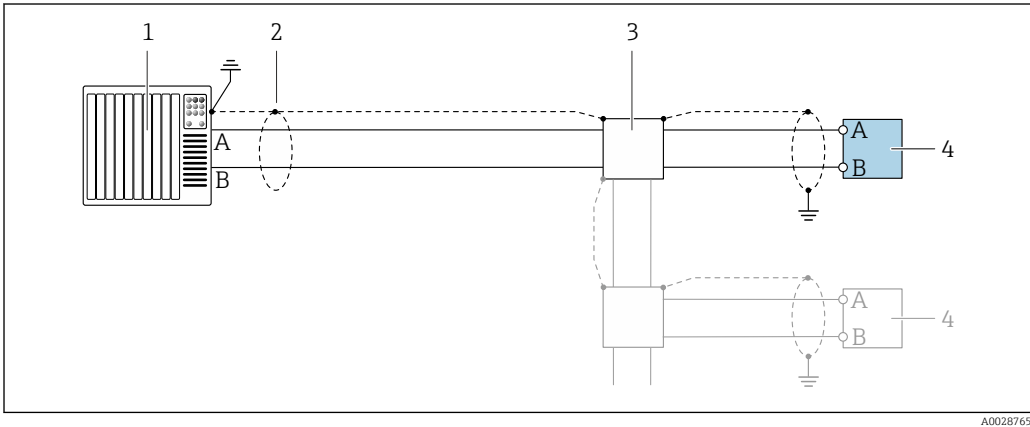
Prerequisite: The sensor is installed in the pipe in a way that provides electrical insulation.

- 1. Connect the two flanges of the pipe to one another via a ground cable.
- 2. 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).

## 7.4 Special connection instructions

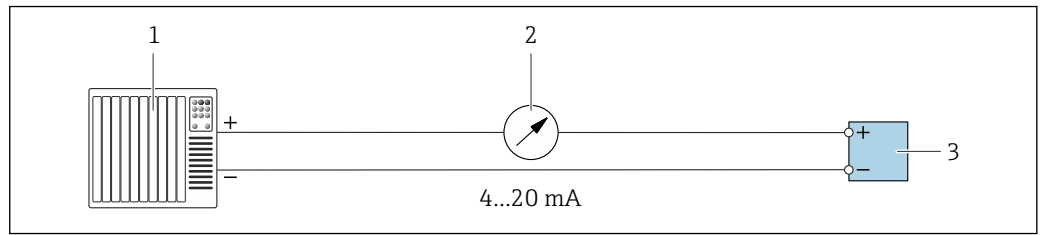
### 7.4.1 Connection examples

#### Modbus RS485



12 Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2

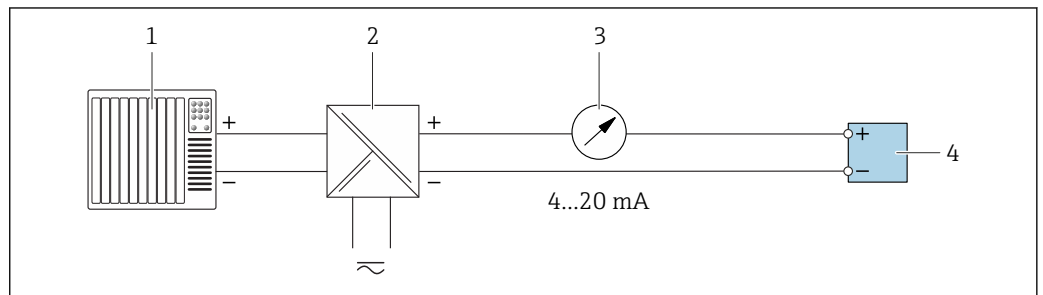
- 1 Control system (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 3 Distribution box
- 4 Transmitter

**Current output 4-20 mA**

A0028758

13 Connection example for 4-20 mA current output (active)

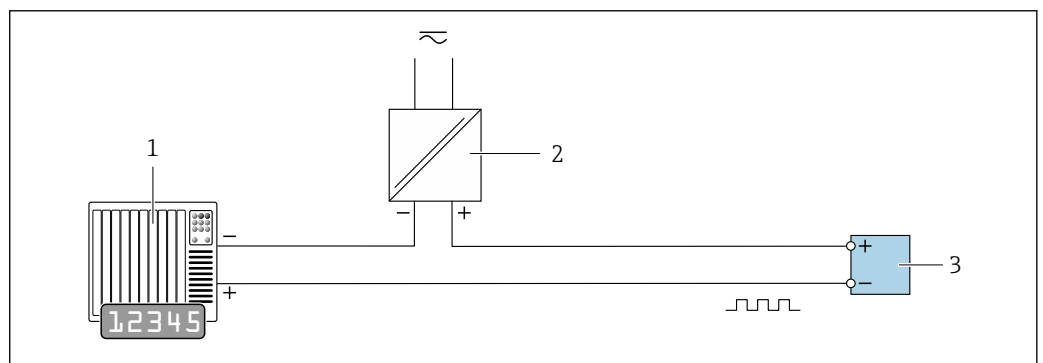
- 1 Automation system with current input (e.g. PLC)
- 2 Analog display unit: observe maximum load
- 3 Transmitter



A0028759

14 Connection example for 4-20 mA current output (passive)

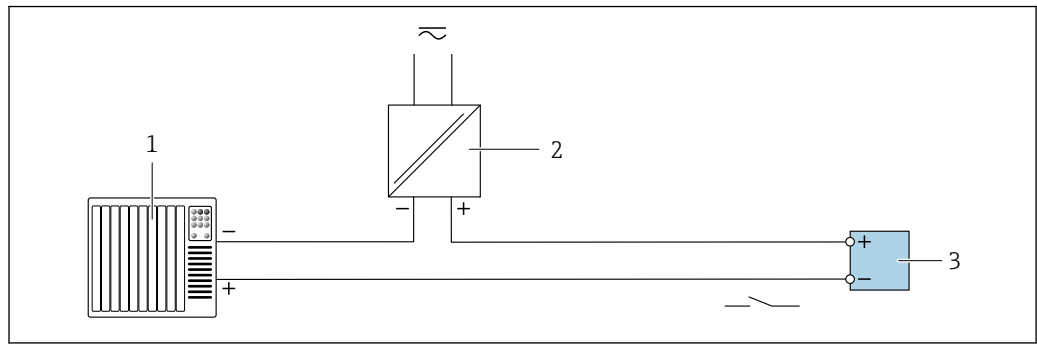
- 1 Automation system with current input (e.g. PLC)
- 2 Active barrier for power supply (e.g. RN221N)
- 3 Analog display unit: observe maximum load
- 4 Transmitter

**Pulse/frequency output**

A0028761

15 Connection example for pulse/frequency output (passive)

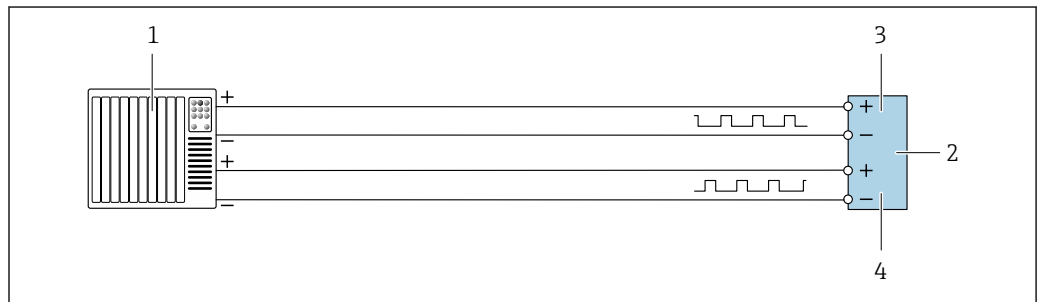
- 1 Automation system with pulse/frequency input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 156

**Switch output**

A0028760

**16** Connection example for switch output (passive)

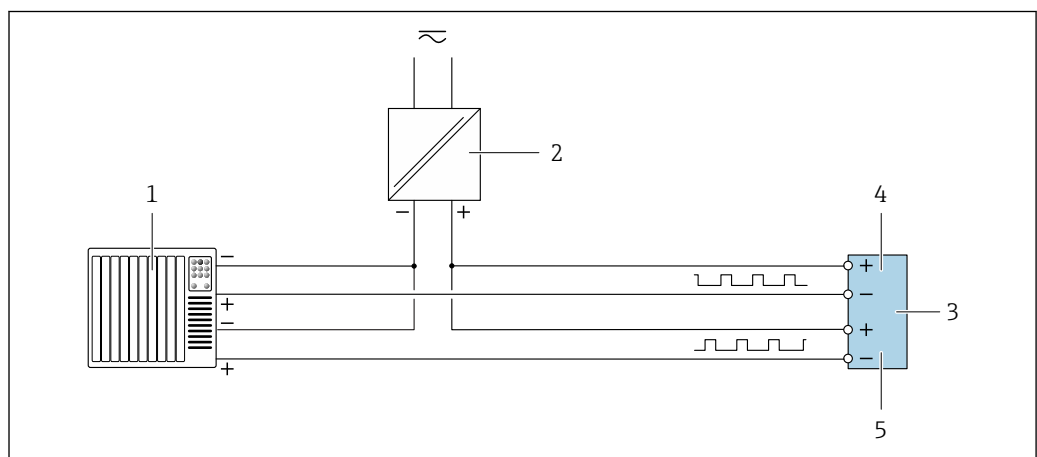
- 1 Automation system with switch input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 156

**Double pulse output**

A0029280

**17** Connection example for double pulse output (active)

- 1 Automation system with double pulse input (e.g. PLC)
- 2 Transmitter: Observe input values → 157
- 3 Double pulse output
- 4 Double pulse output (slave), phase-shifted

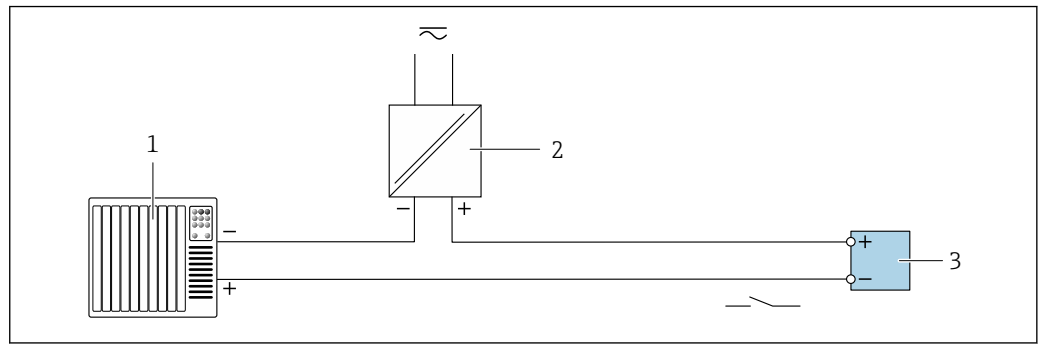


A0029279

**18** Connection example for double pulse output (passive)

- 1 Automation system with double pulse input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 157
- 4 Double pulse output
- 5 Double pulse output (slave), phase-shifted

### Relay output

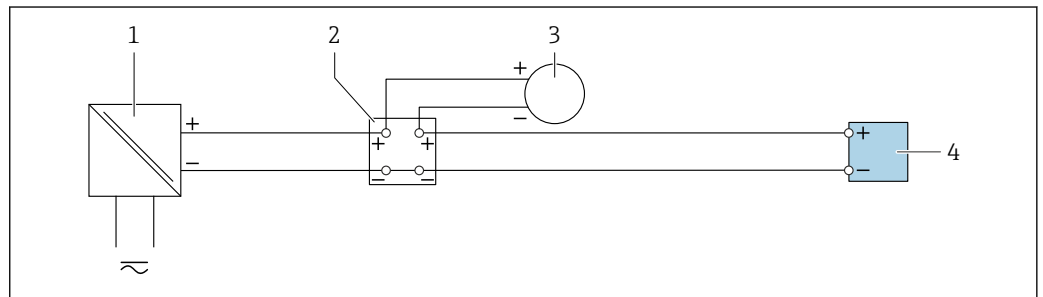


A0028760

19 Connection example for relay output (passive)

- 1 Automation system with relay input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 158

### Current input

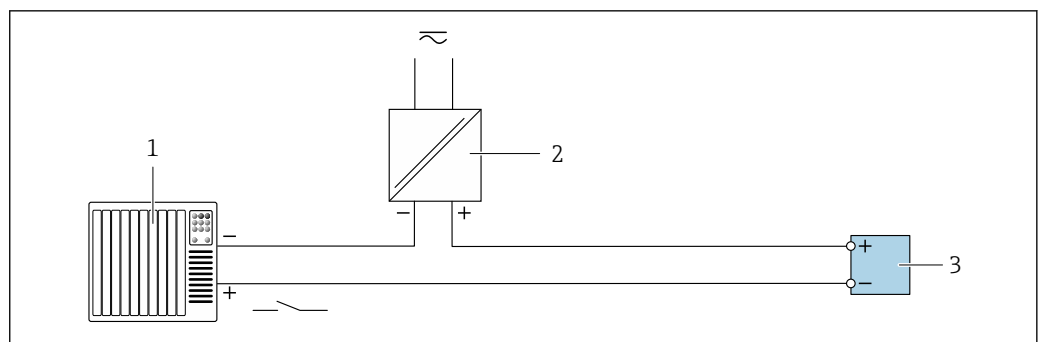


A0028915

20 Connection example for 4 to 20 mA current input

- 1 Power supply
- 2 External measuring device (for reading in pressure or temperature, for instance)
- 3 Transmitter: Observe input values

### Status input



A0028764

21 Connection example for status input

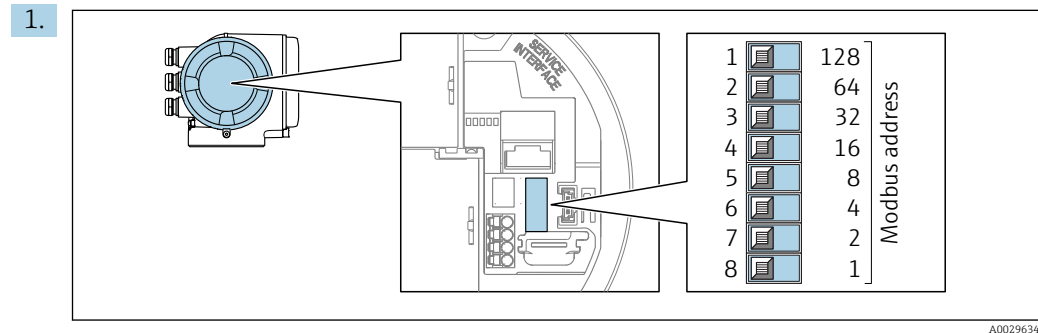
- 1 Automation system with status output (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values

## 7.5 Hardware settings

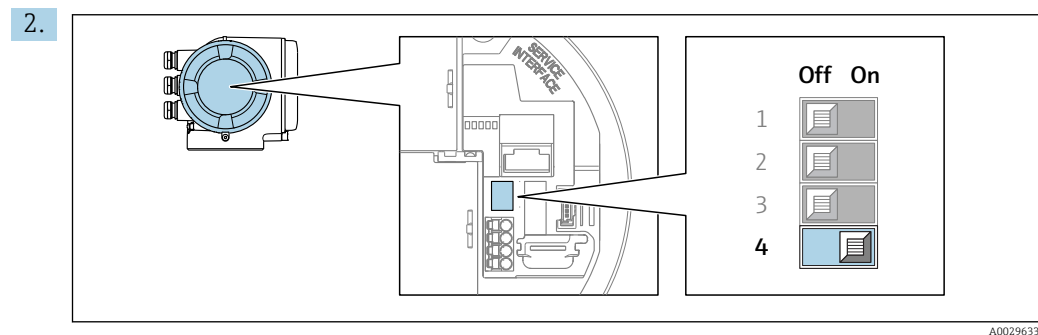
### 7.5.1 Setting the device address

The device address must always be configured for a Modbus slave. The valid device addresses are in the range from 1 to 247. Each address may only be assigned once in a Modbus RS485 network. If an address is not configured correctly, the measuring device is not recognized by the Modbus master. All measuring devices are delivered from the factory with the device address 247 and with the "software addressing" address mode.

#### Hardware addressing



Set the desired device address using the DIP switches in the connection compartment.



To switch addressing from software addressing to hardware addressing: set the DIP switch to **On**.

↳ The change of device address takes effect after 10 seconds.

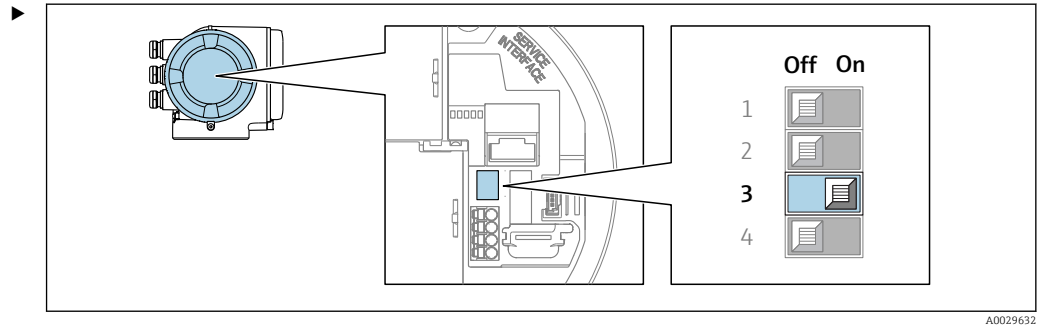
#### Software addressing

► To switch addressing from hardware addressing to software addressing: set the DIP switch to **Off**.

↳ The device address configured in the **Device address** parameter takes effect after 10 seconds.

### 7.5.2 Enabling the terminating resistor

To avoid incorrect communication transmission caused by impedance mismatch, terminate the Modbus RS485 cable correctly at the start and end of the bus segment.



A0029632

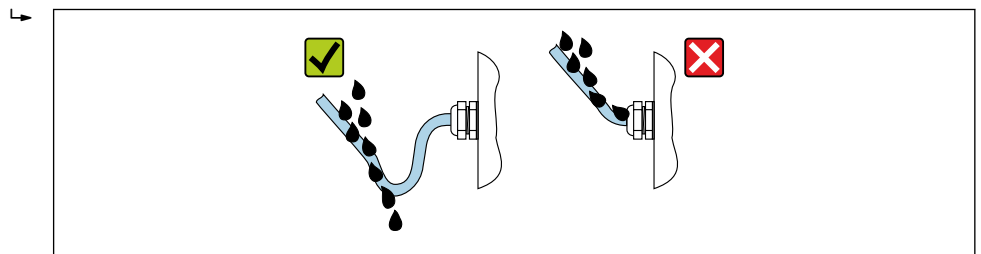
Switch DIP switch No. 3 to **On**.

## 7.6 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").



A0029278

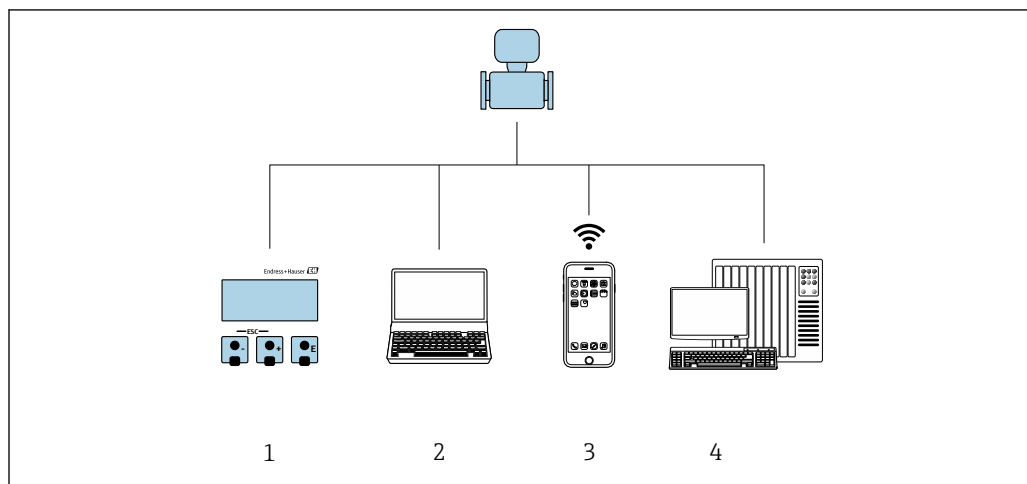
6. Insert dummy plugs into unused cable entries.

## 7.7 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables used meet the requirements?	<input type="checkbox"/>
Do the cables have adequate strain relief?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 47 ?	<input type="checkbox"/>
If supply voltage is present, do values appear on the display module?	<input type="checkbox"/>
Is the potential equalization established correctly ?	<input type="checkbox"/>

## 8 Operation options

### 8.1 Overview of operation options





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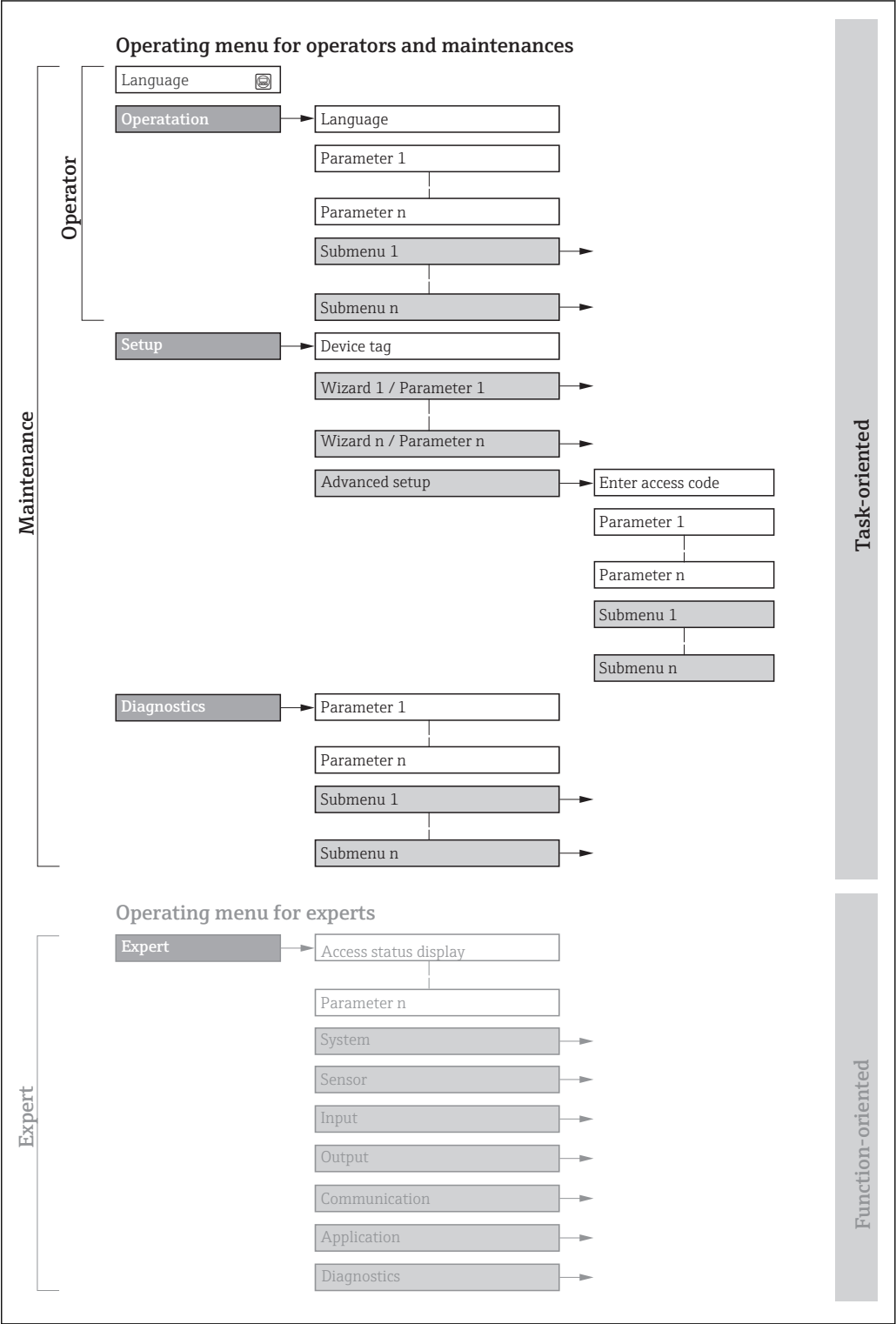
- 1 Local operation via display module
- 2 Computer with Web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
- 3 Mobile handheld terminal with SmartBlue App
- 4 Control system (e.g. PLC)




## 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 →  179



 22 Schematic structure of the operating menu

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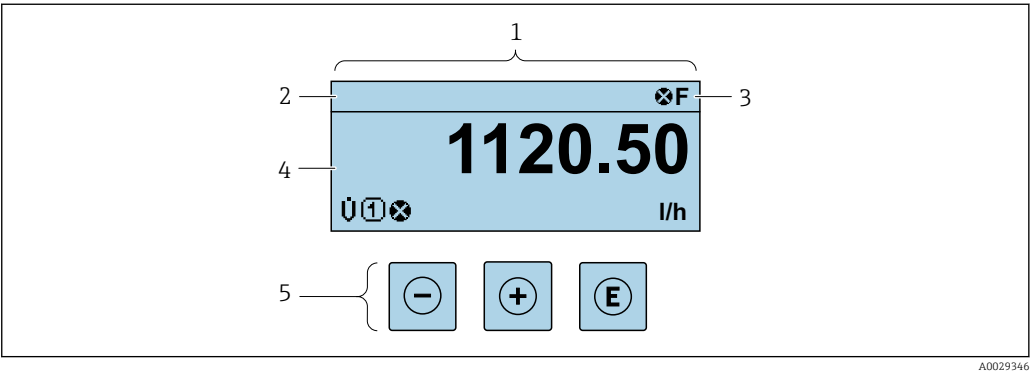
## 8.2.2 Operating philosophy

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	<b>Role "Operator", "Maintenance"</b> Tasks during operation: <ul style="list-style-type: none"> <li>■ Configuring the operational display</li> <li>■ Reading measured values</li> </ul>	<ul style="list-style-type: none"> <li>■ Defining the operating language</li> <li>■ Defining the Web server operating language</li> <li>■ Resetting and controlling totalizers</li> </ul>
Operation			<ul style="list-style-type: none"> <li>■ Configuring the operational display (e.g. display format, display contrast)</li> <li>■ Resetting and controlling totalizers</li> </ul>
Setup		<b>"Maintenance" role</b> Commissioning: <ul style="list-style-type: none"> <li>■ Configuration of the measurement</li> <li>■ Configuration of the inputs and outputs</li> <li>■ Configuration of the communication interface</li> </ul>	Wizards for fast commissioning: <ul style="list-style-type: none"> <li>■ Set the system units</li> <li>■ Display I/O/configuration</li> <li>■ Configure the inputs</li> <li>■ Configure the outputs</li> <li>■ Configuring the operational display</li> <li>■ Define the output conditioning</li> <li>■ Set the low flow cut off</li> <li>■ Configure empty pipe detection</li> </ul> Advanced setup <ul style="list-style-type: none"> <li>■ For more customized configuration of the measurement (adaptation to special measuring conditions)</li> <li>■ Configuration of totalizers</li> <li>■ Configuration of electrode cleaning (optional)</li> <li>■ Configure the WLAN settings</li> <li>■ Administration (define access code, reset measuring device)</li> </ul>
Diagnostics		<b>"Maintenance" role</b> Fault elimination: <ul style="list-style-type: none"> <li>■ Diagnostics and elimination of process and device errors</li> <li>■ Measured value simulation</li> </ul>	Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> <li>■ Diagnostic list Contains up to 5 currently pending diagnostic messages.</li> <li>■ Event logbook Contains event messages that have occurred.</li> <li>■ Device information Contains information for identifying the device.</li> <li>■ Measured values Contains all current measured values.</li> <li>■ <b>Data logging</b> submenu with "Extended HistoROM" order option Storage and visualization of measured values</li> <li>■ Heartbeat The functionality of the device is checked on demand and the verification results are documented.</li> <li>■ Simulation Is used to simulate measured values or output values.</li> </ul>
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device: <ul style="list-style-type: none"> <li>■ Commissioning measurements under difficult conditions</li> <li>■ Optimal adaptation of the measurement to difficult conditions</li> <li>■ Detailed configuration of the communication interface</li> <li>■ Error diagnostics in difficult cases</li> </ul>	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: <ul style="list-style-type: none"> <li>■ System Contains all higher-order device parameters which do not concern the measurement or the communication interface.</li> <li>■ Sensor Configuration of the measurement.</li> <li>■ Input Configuring the status input.</li> <li>■ Output Configuring of the analog current outputs as well as the pulse/frequency and switch output.</li> <li>■ Communication Configuration of the digital communication interface and the Web server.</li> <li>■ Application Configure the functions that go beyond the actual measurement (e.g. totalizer).</li> <li>■ Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.</li> </ul>

### 8.3 Access to the operating menu via the local display

#### 8.3.1 Operational display



- 1 Operational display
- 2 Device tag → 80
- 3 Status area
- 4 Display area for measured values (4-line)
- 5 Operating elements → 56

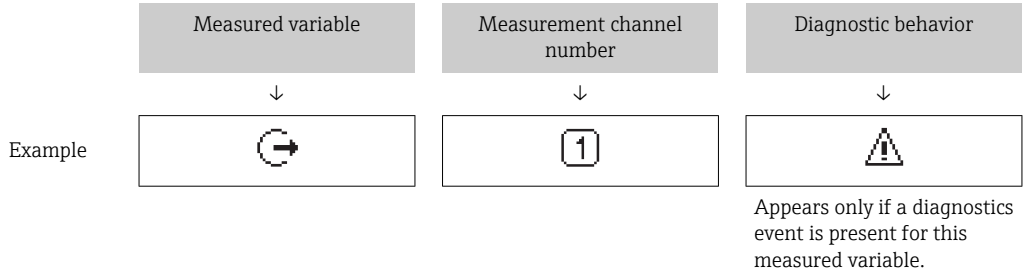
##### Status area

The following symbols appear in the status area of the operational display at the top right:

- Status signals → 131
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior → 132
  - : Alarm
  - : Warning
- : Locking (the device is locked via the hardware )
- : Communication (communication via remote operation is active)

##### Display area

In the display area, each measured value is prefaced by certain symbol types for further description:



##### Measured values

Symbol	Meaning
U	Volume flow
G	Conductivity

	Mass flow
	Totalizer The measurement channel number indicates which of the three totalizers is displayed.
	Output The measurement channel number indicates which of the outputs is displayed.
	Status input

Measurement channel numbers

Symbol	Meaning
	Measurement channel 1 to 4
The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. Totalizer 1 to 3).	

Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable.  
For information on the symbols → 132

The number and display format of the measured values can be configured via the **Format display** parameter (→ 96).

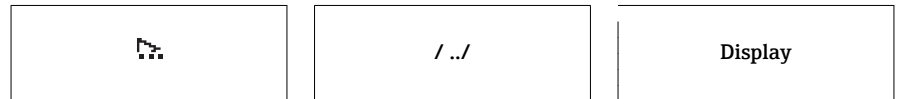
8.3.2 Navigation view



In the submenu	In the wizard
<div>1 Navigation view</div> <div>2 Navigation path to current position</div> <div>3 Status area</div> <div>4 Display area for navigation</div> <div>5 Operating elements →  56</div>	

Navigation path

The navigation path - displayed at the top left in the navigation view - consists of the following elements:

	<div>▪ In the submenu: Display symbol for menu</div> <div>▪ In the wizard: Display symbol for wizard</div>	Omission symbol for operating menu levels in between	Name of current ▪ Submenu ▪ Wizard ▪ Parameters
	↓	↓	↓
Examples			






 For more information about the icons in the menu, refer to the "Display area" section  
→  53

### Status area





The following appears in the status area of the navigation view in the top right corner:

- In the submenu
  - The direct access code for the parameter you are navigating to (e.g. 0022-1)
  - If a diagnostic event is present, the diagnostic behavior and status signal
- In the wizard
  - If a diagnostic event is present, the diagnostic behavior and status signal





-  ■ For information on the diagnostic behavior and status signal →  131
- For information on the function and entry of the direct access code →  58

### Display area


#### Menus

Symbol	Meaning
	<b>Operation</b> Appears: <ul style="list-style-type: none"> <li>■ In the menu next to the "Operation" selection</li> <li>■ At the left in the navigation path in the <b>Operation</b> menu</li> </ul>
	<b>Setup</b> Appears: <ul style="list-style-type: none"> <li>■ In the menu next to the "Setup" selection</li> <li>■ At the left in the navigation path in the <b>Setup</b> menu</li> </ul>
	<b>Diagnostics</b> Appears: <ul style="list-style-type: none"> <li>■ In the menu next to the "Diagnostics" selection</li> <li>■ At the left in the navigation path in the <b>Diagnostics</b> menu</li> </ul>
	<b>Expert</b> Appears: <ul style="list-style-type: none"> <li>■ In the menu next to the "Expert" selection</li> <li>■ At the left in the navigation path in the <b>Expert</b> menu</li> </ul>




#### Submenus, wizards, parameters

Symbol	Meaning
	Submenu
	Wizard
	Parameters within a wizard  No display symbol exists for parameters in submenus.

#### Locking

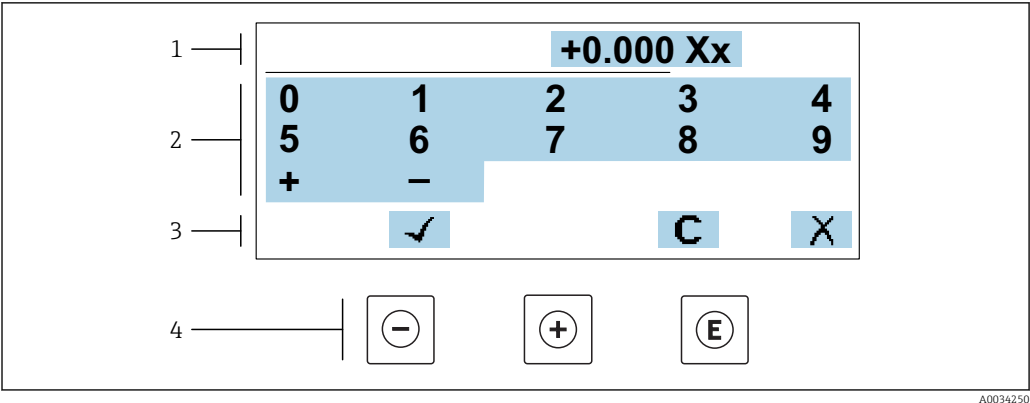
Symbol	Meaning
	<b>Parameter locked</b> When displayed in front of a parameter name, indicates that the parameter is locked. <ul style="list-style-type: none"> <li>■ By a user-specific access code</li> <li>■ By the hardware write protection switch</li> </ul>

Wizard operation

Symbol	Meaning
	Switches to the previous parameter.
	Confirms the parameter value and switches to the next parameter.
	Opens the editing view of the parameter.

8.3.3 Editing view

Numeric editor

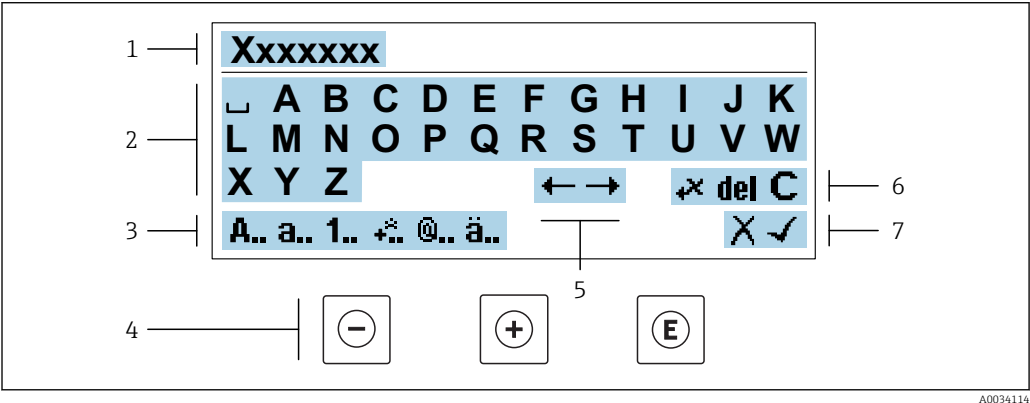


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23 For entering values in parameters (e.g. limit values)

- 1 Entry display area
- 2 Input screen
- 3 Confirm, delete or reject entry
- 4 Operating elements

Text editor



A0034114

24 For entering text in parameters (e.g. tag name)

- 1 Entry display area
- 2 Current input screen
- 3 Change input screen
- 4 Operating elements
- 5 Move entry position
- 6 Delete entry
- 7 Reject or confirm entry

*Using the operating elements in the editing view*

Operating key(s)	Meaning
	<b>Minus key</b> Move the entry position to the left.
	<b>Plus key</b> Move the entry position to the right.
	<b>Enter key</b> <ul style="list-style-type: none"> <li>Press the key briefly: confirm your selection.</li> <li>Press the key for 2 s: confirm the entry.</li> </ul>
	<b>Escape key combination (press keys simultaneously)</b> Close the editing view without accepting the changes.






*Input screens*

Symbol	Meaning
<b>A..</b>	Upper case
<b>a..</b>	Lower case
<b>1..</b>	Numbers
<b>+..</b>	Punctuation marks and special characters: = + - * / <sup>2</sup> <sup>3</sup> ¼ ½ ¾ ( )     < > { }
<b>@..</b>	Punctuation marks and special characters: ' " ^ . , ; : ? ! % μ ° € \$ £ ¥ § @ # / \   ~ & _
<b>ä..</b>	Umlauts and accents

*Controlling data entries*

Symbol	Meaning
	Move entry position
	Reject entry
	Confirm entry
	Delete character immediately to the left of the entry position
<b>del</b>	Delete character immediately to the right of the entry position
<b>C</b>	Clear all the characters entered

### 8.3.4 Operating elements

Operating key(s)	Meaning
	<b>Minus key</b> <i>In a menu, submenu</i> Moves the selection bar upwards in a choose list. <i>With a Wizard</i> Confirms the parameter value and goes to the previous parameter. <i>With a text and numeric editor</i> Move the entry position to the left.
	<b>Plus key</b> <i>In a menu, submenu</i> Moves the selection bar downwards in a choose list. <i>With a Wizard</i> Confirms the parameter value and goes to the next parameter. <i>With a text and numeric editor</i> Move the entry position to the right.
	<b>Enter key</b> <i>For operational display</i> <ul style="list-style-type: none"> <li>Pressing the key briefly opens the operating menu.</li> <li>Pressing the key for 2 s opens the context menu including the option for activating the keypad lock.</li> </ul> <i>In a menu, submenu</i> <ul style="list-style-type: none"> <li>Pressing the key briefly:               <ul style="list-style-type: none"> <li>Opens the selected menu, submenu or parameter.</li> <li>Starts the wizard.</li> <li>If help text is open, closes the help text of the parameter.</li> </ul> </li> <li>Pressing the key for 2 s for parameter:               <ul style="list-style-type: none"> <li>If present, opens the help text for the function of the parameter.</li> </ul> </li> </ul> <i>With a Wizard</i> Opens the editing view of the parameter. <i>With a text and numeric editor</i> <ul style="list-style-type: none"> <li>Press the key briefly: confirm your selection.</li> <li>Press the key for 2 s: confirm the entry.</li> </ul>
	<b>Escape key combination (press keys simultaneously)</b> <i>In a menu, submenu</i> <ul style="list-style-type: none"> <li>Pressing the key briefly:               <ul style="list-style-type: none"> <li>Exits the current menu level and takes you to the next higher level.</li> <li>If help text is open, closes the help text of the parameter.</li> </ul> </li> <li>Pressing the key for 2 s returns you to the operational display ("home position").</li> </ul> <i>With a Wizard</i> Exits the wizard and takes you to the next higher level. <i>With a text and numeric editor</i> Close the editing view without accepting the changes.
	<b>Minus/Enter key combination (press the keys simultaneously)</b> Press the key for 3 s: deactivate the keypad lock.

### 8.3.5 Opening the context menu


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

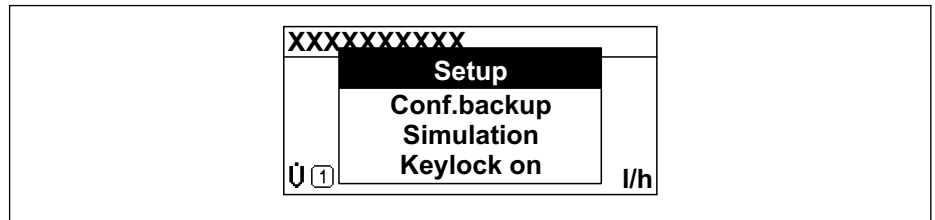
- Setup
- Data backup
- Simulation





**Calling up and closing the context menu**

The user is in the operational display.



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



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

**Calling up the menu via the context menu**

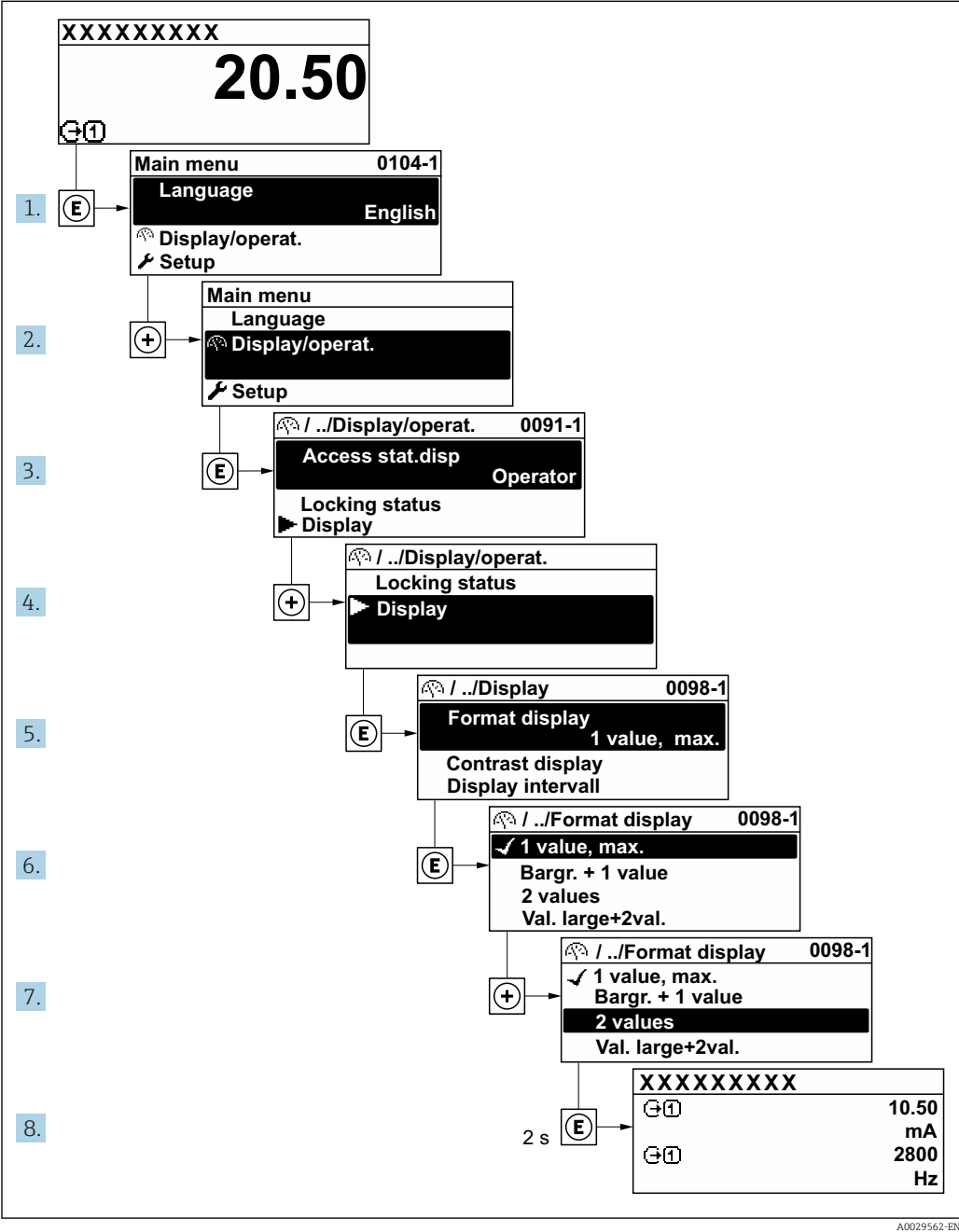
1. Open the context menu.
2. Press  to navigate to the desired menu.
3. Press  to confirm the selection.  
↳ The selected menu opens.

8.3.6 Navigating and selecting from list

Different operating elements are used to navigate through the operating menu. The navigation path is displayed on the left in the header. Icons are displayed in front of the individual menus. These icons are also shown in the header during navigation.

 For an explanation of the navigation view with symbols and operating elements  
→  52

Example: Setting the number of displayed measured values to "2 values"



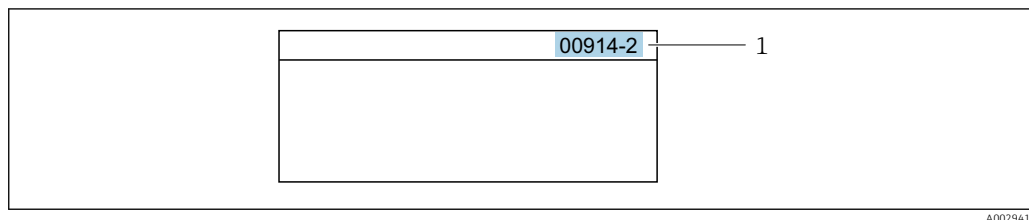
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8.3.7 Calling the parameter directly

A parameter number is assigned to every parameter to be able to access a parameter directly via the onsite display. Entering this access code in the **Direct access** parameter calls up the desired parameter directly.

Navigation path  
Expert → Direct access

The direct access code consists of a 5-digit number (at maximum) and the channel number, which identifies the channel of a process variable: e.g. 00914-2. In the navigation view, this appears on the right-hand side in the header of the selected parameter.



1 Direct access code

Note the following when entering the direct access code:

- The leading zeros in the direct access code do not have to be entered.  
Example: Enter "914" instead of "00914"
- If no channel number is entered, channel 1 is accessed automatically.  
Example: Enter 00914 → **Assign process variable** parameter
- If a different channel is accessed: Enter the direct access code with the corresponding channel number.  
Example: Enter 00914-2 → **Assign process variable** parameter



For the direct access codes of the individual parameters, see the "Description of Device Parameters" document for the device

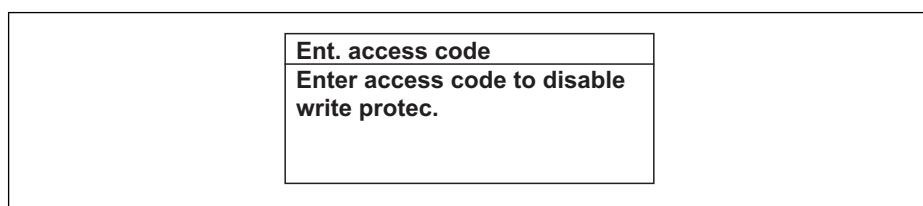
### 8.3.8 Calling up help text

Help text is available for some parameters and can be called up from the navigation view. The help text provides a brief explanation of the parameter function and thereby supports swift and safe commissioning.

#### Calling up and closing the help text

The user is in the navigation view and the selection bar is on a parameter.

1. Press for 2 s.  
↳ The help text for the selected parameter opens.



25 Example: Help text for parameter "Enter access code"

2. Press + simultaneously.  
↳ The help text is closed.

### 8.3.9 Changing the parameters




Parameters can be changed via the numeric editor or text editor.

- Numeric editor: Change values in a parameter, e.g. specifications for limit values.
- Text editor: Enter text in a parameter, e.g. tag name.


A message is displayed if the value entered is outside the permitted value range.

Ent. access code  
Invalid or out of range input  
value  
Min:0  
Max:9999

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 For a description of the editing view - consisting of the text editor and numeric editor - with symbols →  54, for a description of the operating elements →  56

8.3.10 User roles and related access authorization

The two user roles "Operator" and "Maintenance" have different write access to the parameters if the customer defines a user-specific access code. This protects the device configuration via the local display from unauthorized access →  116.

Defining access authorization for user roles

An access code is not yet defined when the device is delivered from the factory. Access authorization (read and write access) to the device is not restricted and corresponds to the "Maintenance" user role.

- ▶ Define the access code.
  - ↳ The "Operator" user role is redefined in addition to the "Maintenance" user role. Access authorization differs for the two user roles.

Access authorization to parameters: "Maintenance" user role


Access code status	Read access	Write access
An access code has not yet been defined (factory setting).	✓	✓
After an access code has been defined.	✓	✓ <sup>1)</sup>

1) The user only has write access after entering the access code.



Access authorization to parameters: "Operator" user role


Access code status	Read access	Write access
After an access code has been defined.	✓	-- <sup>1)</sup>


1) Despite the defined access code, certain parameters can always be modified and thus are excepted from the write protection, as they do not affect the measurement. Refer to the "Write protection via access code" section


 The user role with which the user is currently logged on is indicated by the **Access status** parameter. Navigation path: Operation → Access status

8.3.11 Disabling write protection via access code

If the -symbol appears on the local display in front of a parameter, the parameter is write-protected by a user-specific access code and its value cannot be changed at the moment using local operation →  116.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter (→  103) via the respective access option.

1. After you press , the input prompt for the access code appears.


2. Enter the access code.
  - ↳ The -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

### 8.3.12 Enabling and disabling the keypad lock


The keypad lock makes it possible to block access to the entire operating menu via local operation. As a result, it is no longer possible to navigate through the operating menu or change the values of individual parameters. Users can only read the measured values on the operational display.


The keypad lock is switched on and off via the context menu.

#### Switching on the keypad lock


-  The keypad lock is switched on automatically:
- If the device has not been operated via the display for > 1 minute.
  - Each time the device is restarted.

#### To activate the keylock manually:

1. The device is in the measured value display.  
Press  for at least 2 seconds.  
↳ A context menu appears.
2. In the context menu select the **Keylock on** option.  
↳ The keypad lock is switched on.

-  If the user attempts to access the operating menu while the keypad lock is active, the **Keylock on** message appears.

#### Switching off the keypad lock


1. The keypad lock is switched on.  
Press  for at least 2 seconds.  
↳ A context menu appears.
2. In the context menu select the **Keylock off** option.  
↳ The keypad lock is switched off.

## 8.4 Access to the operating menu via the Web browser

### 8.4.1 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) or via a WLAN interface. The structure of the operating menu is the same as for the local display. 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.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display; operation", option **G** "4-line, illuminated; touch control + WLAN". The device acts as an Access Point and enables communication by computer or a mobile handheld terminal.


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

## 8.4.2 Prerequisites



### Computer hardware

Hardware	Interface	
	CDI-RJ45	WLAN
Interface	The computer must have an RJ45 interface.	The operating unit must have a WLAN interface.
Connection	Standard Ethernet cable with RJ45 connector.	Connection via Wireless LAN.
Screen	Recommended size: ≥12" (depends on the screen resolution)	

### Computer software

Software	Interface	
	CDI-RJ45	WLAN
Recommended operating systems	<ul style="list-style-type: none"> <li>▪ Microsoft Windows 7 or higher.</li> <li>▪ Mobile operating systems: <ul style="list-style-type: none"> <li>– iOS</li> <li>– Android</li> </ul> </li> </ul> <p> Microsoft Windows XP is supported.</p>	
Web browsers supported	<ul style="list-style-type: none"> <li>▪ Microsoft Internet Explorer 8 or higher</li> <li>▪ Microsoft Edge</li> <li>▪ Mozilla Firefox</li> <li>▪ Google Chrome</li> <li>▪ Safari</li> </ul>	



### Computer settings

Settings	Interface	
	CDI-RJ45	WLAN
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 <i>Use a Proxy Server for Your LAN</i> must be <b>deselected</b> .	
JavaScript	<p>JavaScript must be enabled.</p> <p> If JavaScript cannot be enabled: enter <code>http://192.168.1.212/basic.html</code> in the address line of the Web browser. A fully functional but simplified version of the operating menu structure starts in the Web browser.</p> <p> When installing a new firmware version: To enable correct data display, clear the temporary memory (cache) of the Web browser under <b>Internet options</b>.</p>	
Network connections	Only the active network connections to the measuring device should be used.	
	Switch off all other network connections such as WLAN.	Switch off all other network connections.





In the event of connection problems: →  128

*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  For information on enabling the Web server →  67

*Measuring device: via WLAN interface*

Device	WLAN interface
Measuring device	The measuring device has a WLAN antenna: <ul style="list-style-type: none"> <li>▪ Transmitter with integrated WLAN antenna</li> <li>▪ Transmitter with external WLAN antenna</li> </ul>
Web server	Web server and WLAN must be enabled; factory setting: ON  For information on enabling the Web server →  67


**8.4.3 Establishing a connection****Via service interface (CDI-RJ45)***Preparing the measuring device*

1. Depending on the housing version:  
Release the securing clamp or securing screw of the housing cover.
2. Depending on the housing version:  
Unscrew or open the housing cover.
3. The location of the connection socket depends on the measuring device and the communication protocol:  
Connect the computer to the RJ45 connector via the standard Ethernet connecting cable .

*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 →  68.
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

### Via WLAN interface

*Configuring the Internet protocol of the mobile terminal*

#### NOTICE

**If the WLAN connection is lost during the configuration, settings made may be lost.**

- Make sure that the WLAN connection is not disconnected while configuring the device.

#### NOTICE

**In principle, avoid simultaneous access to the measuring device via the service interface (CDI-RJ45) and the WLAN interface from the same mobile terminal. This could cause a network conflict.**

- Only activate one service interface (CDI-RJ45 service interface or WLAN interface).
- If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

*Preparing the mobile terminal*

- Enable WLAN reception on the mobile terminal.

*Establishing a connection from the mobile terminal to the measuring device*

1. In the WLAN settings of the mobile terminal:  
Select the measuring device using the SSID (e.g. EH\_Promag\_300\_A802000).
2. If necessary, select the WPA2 encryption method.
3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).
  - ↳ LED on display module flashes: it is now possible to operate the measuring device with the Web browser, FieldCare or DeviceCare.



The serial number can be found on the nameplate.



To ensure the safe and swift assignment of the WLAN network to the measuring point, it is advisable to change the SSID name. It should be possible to clearly assign the new SSID name to the measuring point (e.g. tag name) because it is displayed as the WLAN network.

*Disconnecting*

- After configuring the device:  
Terminate the WLAN connection between the operating unit and measuring device.

### 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.

The screenshot shows the login page of the Proline Promag P 300 Modbus RS485. It features a top section with device information and a bottom section with login options. Numbered callouts identify the following elements:

- 1: Picture of device
- 2: Device name
- 3: Device tag
- 4: Status signal
- 5: Current measured values (Volume flow, Mass flow, Conductivity)
- 6: Operating language (English)
- 7: User role (Maintenance)
- 8: Access code input field
- 9: Login button
- 10: Reset access code button

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- 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 (→ 113)

If a login page does not appear, or if the page is incomplete → 128

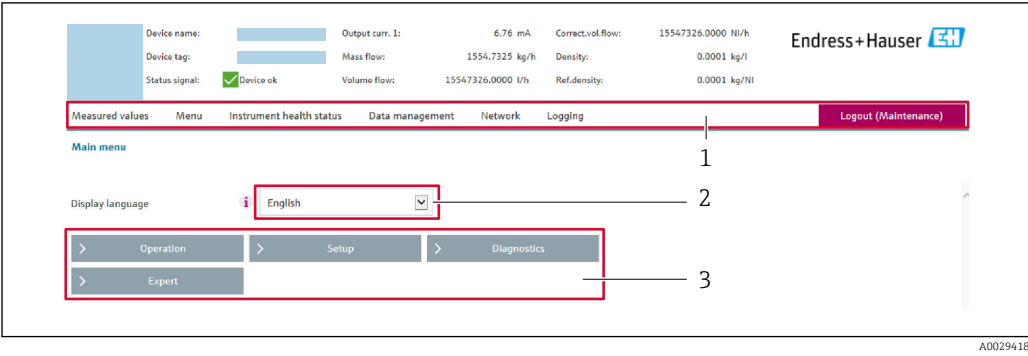
#### 8.4.4 Logging on

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.

8.4.5 User interface




- 1 Function row
- 2 Local display language
- 3 Navigation area

Header

The following information appears in the header:

- Device tag
- Device status with status signal → 134
- Current measured values

Function row

Functions	Meaning
Measured values	Displays the measured values of the measuring device
Menu	<ul style="list-style-type: none"> <li>■ Access to the operating menu from the measuring device</li> <li>■ The structure of the operating menu is the same as for the local display</li> </ul> <p> For detailed information on the structure of the operating menu, see the Operating Instructions for the measuring device</p>
Device status	Displays the diagnostic messages currently pending, listed in order of priority
Data management	<p>Data exchange between PC and measuring device:</p> <ul style="list-style-type: none"> <li>■ Device configuration: <ul style="list-style-type: none"> <li>– Load settings from the device (XML format, save configuration)</li> <li>– Save settings to the device (XML format, restore configuration)</li> </ul> </li> <li>■ Logbook - Export Event logbook (.csv file)</li> <li>■ Documents - Export documents: <ul style="list-style-type: none"> <li>– Export backup data record (.csv file, create documentation of the measuring point configuration)</li> <li>– Verification report (PDF file, only available with the "Heartbeat Verification" application package)</li> </ul> </li> <li>■ Firmware update - Flashing a firmware version</li> </ul>
Network configuration	<p>Configuration and checking of all the parameters required for establishing the connection to the measuring device:</p> <ul style="list-style-type: none"> <li>■ Network settings (e.g. IP address, MAC address)</li> <li>■ Device information (e.g. serial number, firmware version)</li> </ul>
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

## 8.4.6 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.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	On

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


Option	Description
Off	<ul style="list-style-type: none"> <li>■ The web server is completely disabled.</li> <li>■ Port 80 is locked.</li> </ul>
On	<ul style="list-style-type: none"> <li>■ The complete functionality of the web server is available.</li> <li>■ JavaScript is used.</li> <li>■ The password is transferred in an encrypted state.</li> <li>■ Any change to the password is also transferred in an encrypted state.</li> </ul>


### 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 local display
- Via Bedientool "FieldCare"
- Via "DeviceCare" operating tool

## 8.4.7 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) →  63.

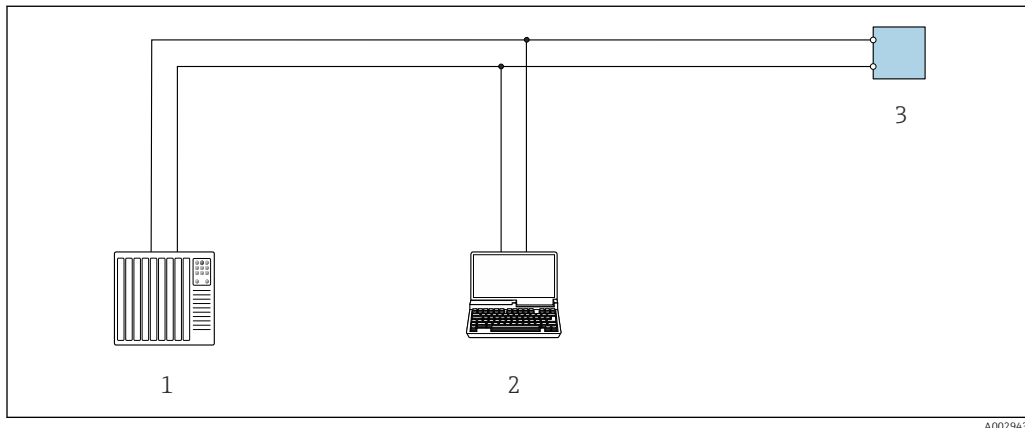
## 8.5 Access to the operating menu via the operating tool

The structure of the operating menu in the operating tools is the same as for operation via the local display.

### 8.5.1 Connecting the operating tool

#### Via Modbus RS485 protocol

This communication interface is available in device versions with a Modbus-RS485 output.



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26 Options for remote operation via Modbus-RS485 protocol (active)

- 1 Control system (e.g. PLC)
- 2 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP" or Modbus DTM
- 3 Transmitter

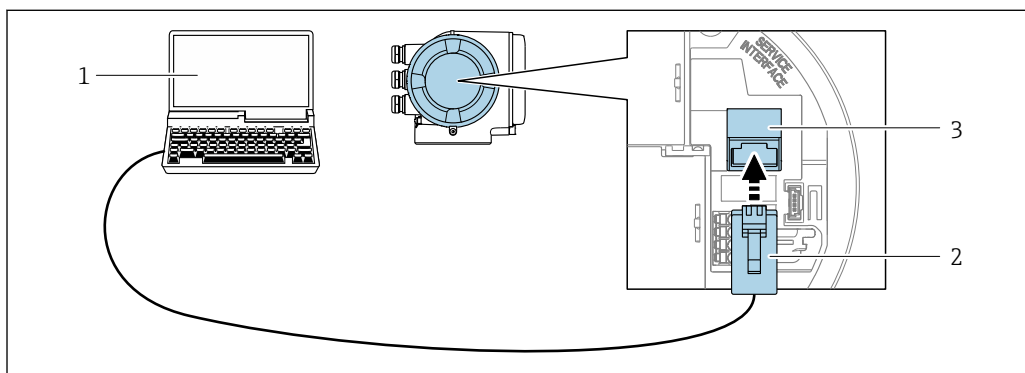
#### Service interface

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

A point-to-point connection can be established to configure the device onsite. With the housing open, the connection is established directly via the service interface (CDI-RJ45) of the device.

**i** An adapter for RJ45 and the M12 connector is optionally available:  
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 connector mounted in the cable entry. Therefore the connection to the service interface can be established via an M12 connector without opening the device.



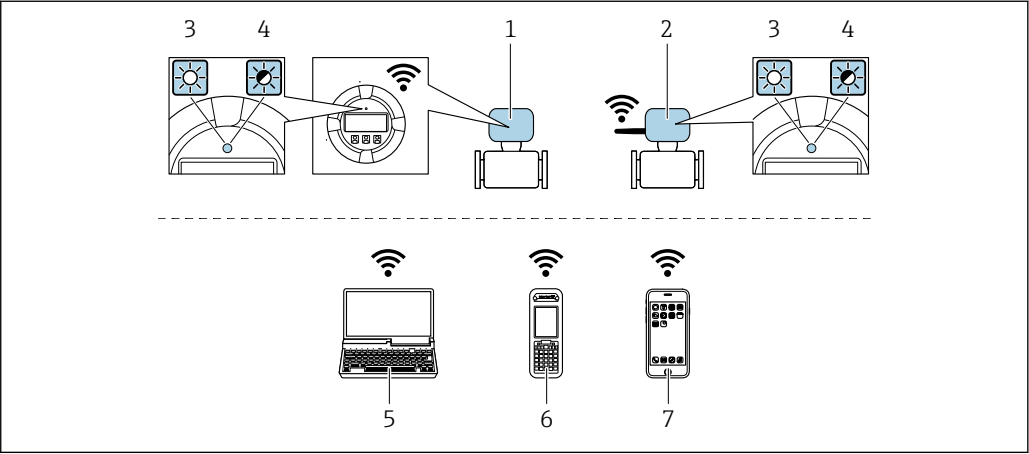
A0027563

27 Connection via service interface (CDI-RJ45)


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

Via WLAN interface

The optional WLAN interface is available on the following device version:  
Order code for "Display; operation", option **G** "4-line, illuminated, graphic display; touch control + WLAN"



- 1 Transmitter with integrated WLAN antenna
- 2 Transmitter with external WLAN antenna
- 3 LED lit constantly: WLAN reception is enabled on measuring device
- 4 LED flashing: WLAN connection established between operating unit and measuring device
- 5 Computer with WLAN interface and Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or with operating tool (e.g. FieldCare, DeviceCare)
- 6 Mobile handheld terminal with WLAN interface and Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or operating tool (e.g. FieldCare, DeviceCare)
- 7 Smartphone or tablet

Function	WLAN: IEEE 802.11 b/g (2.4 GHz)
Encryption	WPA2-PSK/AES 128 bit
Configurable WLAN channels	1 to 11
Degree of protection	IP67
Available antennas	<ul style="list-style-type: none"><li>■ Internal antenna</li><li>■ External antenna (optional)</li></ul> In the event of poor transmission/reception conditions at the place of installation.  Only one antenna active in each case!
Max. range	50 m (164 ft)
Materials: External WLAN antenna	<ul style="list-style-type: none"><li>■ Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass</li><li>■ Adapter: Stainless steel and nickel-plated brass</li><li>■ Cable: Polyethylene</li><li>■ Connector: Nickel-plated brass</li><li>■ Angle bracket: Stainless steel</li></ul>

Configuring the Internet protocol of the mobile terminal

**NOTICE**

**If the WLAN connection is lost during the configuration, settings made may be lost.**  
► Make sure that the WLAN connection is not disconnected while configuring the device.

**NOTICE**

**In principle, avoid simultaneous access to the measuring device via the service interface (CDI-RJ45) and the WLAN interface from the same mobile terminal. This could cause a network conflict.**

- ▶ Only activate one service interface (CDI-RJ45 service interface or WLAN interface).
- ▶ If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

*Preparing the mobile terminal*

- ▶ Enable WLAN reception on the mobile terminal.

*Establishing a connection from the mobile terminal to the measuring device*

1. In the WLAN settings of the mobile terminal:  
Select the measuring device using the SSID (e.g. EH\_Promag\_300\_A802000).
2. If necessary, select the WPA2 encryption method.
3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).  
↳ LED on display module flashes: it is now possible to operate the measuring device with the Web browser, FieldCare or DeviceCare.



The serial number can be found on the nameplate.



To ensure the safe and swift assignment of the WLAN network to the measuring point, it is advisable to change the SSID name. It should be possible to clearly assign the new SSID name to the measuring point (e.g. tag name) because it is displayed as the WLAN network.

*Disconnecting*

- ▶ After configuring the device:  
Terminate the WLAN connection between the operating unit and measuring device.

## 8.5.2 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 → 68
- WLAN interface → 69

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**

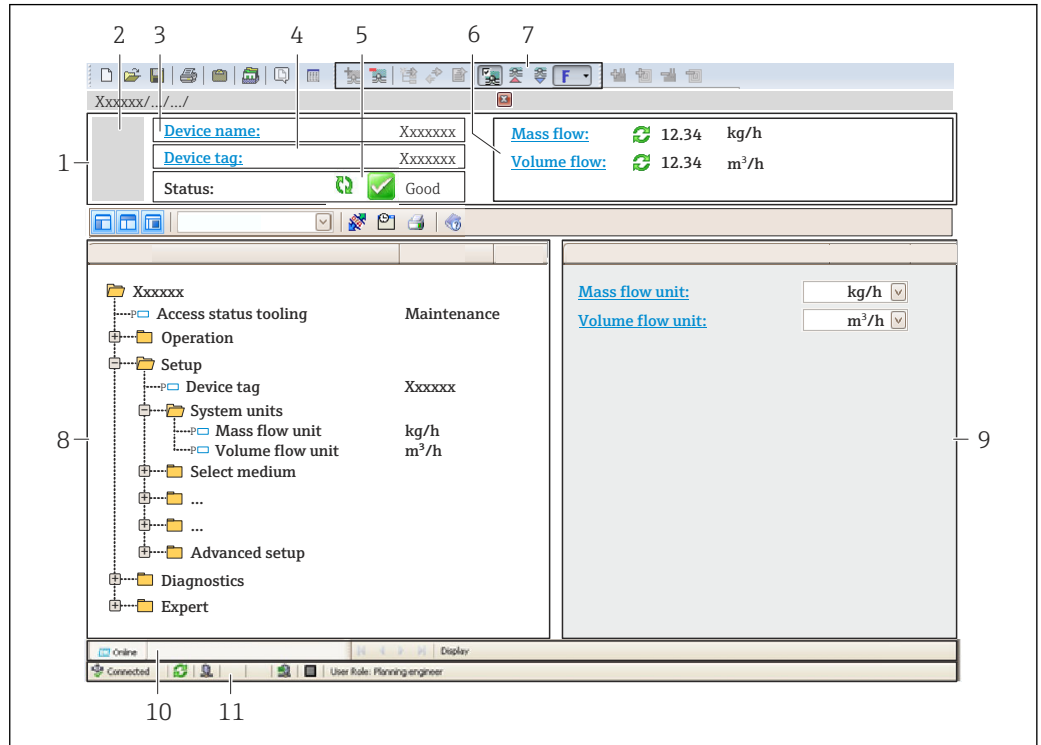
See information → 72

## Establishing a connection



For additional information, see Operating Instructions BA00027S and BA00059S

## User interface



A0021051-EN

- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal → 134
- 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

## 8.5.3 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 → 72

## 9 System integration

### 9.1 Overview of device description files

#### 9.1.1 Current version data for the device

Firmware version	01.01.zz	<ul style="list-style-type: none"> <li>■ On the title page of the Operating Instructions</li> <li>■ On the transmitter nameplate</li> <li>■ Firmware version Diagnostics → Device information → Firmware version</li> </ul>
Release date of firmware version	10.2017	---



For an overview of the different firmware versions for the device → 147

#### 9.1.2 Operating tools

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

Operating tool via service interface (CDI) or Modbus interface	Sources for obtaining device descriptions
FieldCare	<ul style="list-style-type: none"> <li>■ <a href="http://www.endress.com">www.endress.com</a> → Download Area</li> <li>■ CD-ROM (contact Endress+Hauser)</li> <li>■ DVD (contact Endress+Hauser)</li> </ul>
DeviceCare	<ul style="list-style-type: none"> <li>■ <a href="http://www.endress.com">www.endress.com</a> → Download Area</li> <li>■ CD-ROM (contact Endress+Hauser)</li> <li>■ DVD (contact Endress+Hauser)</li> </ul>

### 9.2 Compatibility with earlier model

If the device is replaced, the measuring device Promag 300 supports the compatibility of the Modbus registers for the process variables and the diagnostic information with previous models Promag 53. It is not necessary to change the engineering parameters in the automation system.

*Compatible Modbus registers: process variables*

Process variable	Compatible Modbus registers
Mass flow	2007
Volume flow	2009
Totalizer 1	2610
Totalizer 2	2810
Totalizer 3	3010



*Compatible Modbus registers: diagnostic information*

Diagnostic information	Compatible Modbus registers
Diagnostic code (data type: String), e.g. F270	6821
Diagnostic number (data type: Integer), e.g. 270	6859





The Modbus registers are compatible but the diagnostic numbers are not. Overview of the new diagnostic numbers → 137.


## 9.3 Modbus RS485 information

### 9.3.1 Function codes



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

Code	Name	Description	Application
03	Read holding register	<p>Master reads one or more Modbus registers from the device. A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes</p> <p> The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.</p>	<p>Read device parameters with read and write access</p> <p>Example: Read volume flow</p>
04	Read input register	<p>Master reads one or more Modbus registers from the device. A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes</p> <p> The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.</p>	<p>Read device parameters with read access</p> <p>Example: Read totalizer value</p>
06	Write single registers	<p>Master writes a new value to <b>one</b> Modbus register of the measuring device.</p> <p> Use function code 16 to write multiple registers with just 1 telegram.</p>	<p>Write only 1 device parameter</p> <p>Example: reset totalizer</p>
08	Diagnostics	<p>Master checks the communication connection to the measuring device. The following "Diagnostics codes" are supported:</p> <ul style="list-style-type: none"> <li>▪ Sub-function 00 = Return query data (loopback test)</li> <li>▪ Sub-function 02 = Return diagnostics register</li> </ul>	

Code	Name	Description	Application
16	Write multiple registers	Master writes a new value to multiple Modbus registers of the device. A maximum of 120 consecutive registers can be written with 1 telegram.  If the required device parameters are not available as a group, yet must nevertheless be addressed with a single telegram, use Modbus data map →  75	Write multiple device parameters
23	Read/Write multiple registers	Master reads and writes a maximum of 118 Modbus registers of the measuring device simultaneously with 1 telegram. Write access is executed <b>before</b> read access.	Write and read multiple device parameters Example: <ul style="list-style-type: none"><li>▪ Read mass flow</li><li>▪ Reset totalizer</li></ul>

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

9.3.2 Register information

 For an overview of device parameters with their respective Modbus register information, please refer to the "Modbus RS485 register information" section in the "Description of device parameters" documentation →  179.

9.3.3 Response time

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

9.3.4 Data types

The measuring device supports the following data types:

<b>FLOAT</b> (floating point number IEEE 754) Data length = 4 bytes (2 registers)			
Byte 3	Byte 2	Byte 1	Byte 0
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
S = sign, E = exponent, M = mantissa			

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

<b>STRING</b> Data length = depends on the device parameter, e.g. presentation of a device parameter with a data length = 18 bytes (9 registers)				
Byte 17	Byte 16	...	Byte 1	Byte 0
Most significant byte (MSB)		...		Least significant byte (LSB)

### 9.3.5 Byte transmission sequence

Byte addressing, i.e. the transmission sequence of the bytes, is not specified in the Modbus specification. For this reason, it is important to coordinate or match the addressing method between the master and slave during commissioning. This can be configured in the measuring device using the **Byte order** parameter.

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

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

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

STRING					
Presentation taking the example of a device parameter with a data length of 18 bytes.					
	Sequence				
Options	1.	2.	...	17.	18.
1 - 0 - 3 - 2 * 3 - 2 - 1 - 0	Byte 17 (MSB)	Byte 16	...	Byte 1	Byte 0 (LSB)
0 - 1 - 2 - 3 2 - 3 - 0 - 1	Byte 16	Byte 17 (MSB)	...	Byte 0 (LSB)	Byte 1
* = factory setting, MSB = most significant byte, LSB = least significant byte					

### 9.3.6 Modbus data map

#### Function of the Modbus data map

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

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

### Structure of the Modbus data map

The Modbus data map consists of two data sets:

- **Scan list: Configuration area**

The device parameters to be grouped are defined in a list in that their Modbus RS485 register addresses are entered in the list.

- **Data area**

The measuring device reads out the register addresses entered in the scan list cyclically and writes the associated device data (values) to the data area.



For an overview of device parameters with their respective Modbus register information, please refer to the "Modbus RS485 register information" section in the "Description of device parameters" documentation → 179.

### Scan list configuration

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

<b>Max. entries</b>	16 device parameters
<b>Supported device parameters</b>	Only parameters with the following characteristics are supported: <ul style="list-style-type: none"> <li>■ Access type: read or write access</li> <li>■ Data type: float or integer</li> </ul>

#### *Configuring the scan list via FieldCare or DeviceCare*

Carried out using the operating menu of the measuring device:

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

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

#### *Configuring the scan list via Modbus RS485*

Carried out using register addresses 5001 - 5016

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

### Reading out data via Modbus RS485

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

<b>Master access to data area</b>	Via register addresses 5051-5081
-----------------------------------	----------------------------------

Data area				
Device parameter value	Modbus RS485 register		Data type*	Access**
	Start register	End register (Float only)		
Value of scan list register 0	5051	5052	Integer/float	Read/write
Value of scan list register 1	5053	5054	Integer/float	Read/write
Value of scan list register ...	...	...	...	...
Value of scan list register 15	5081	5082	Integer/float	Read/write
* Data type depends on the device parameters entered in the scan list.				
** Data access depends on the device parameters entered in the scan list. If the device parameter entered supports read and write access, the parameter can also be accessed via the data area.				

## 10 Commissioning

### 10.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
- "Post-installation check" checklist → 33
- "Post-connection check" checklist → 47

### 10.2 Switching on the measuring device

- ▶ After a successful function check, switch on the measuring device.
  - ↳ After a successful startup, the local display switches automatically from the startup display to the operational display.

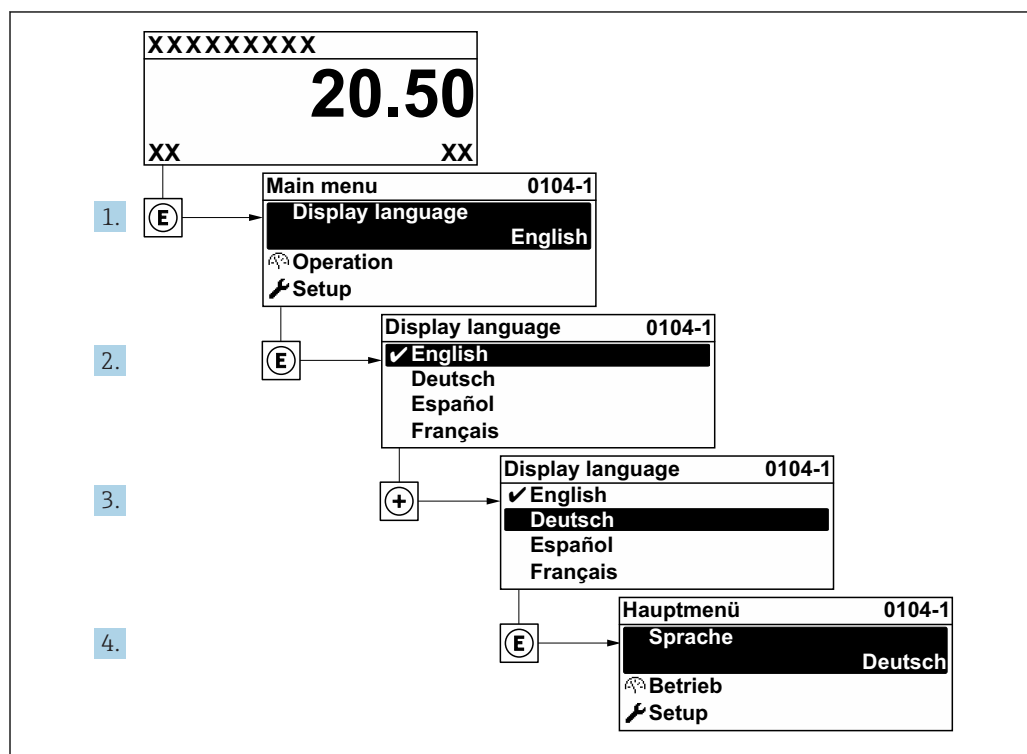
If nothing appears on the local display or a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" → 127.

### 10.3 Connecting via FieldCare

- For FieldCare → 68 connection
- For connecting via FieldCare → 71
- For the FieldCare → 71 user interface

### 10.4 Setting the operating language

Factory setting: English or ordered local language

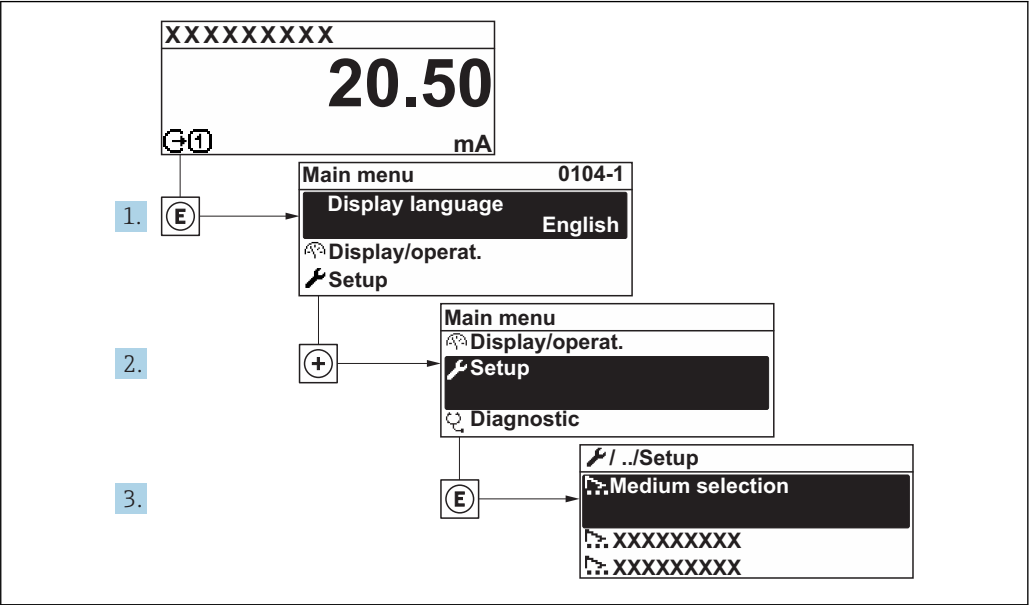


28 Taking the example of the local display

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### 10.5 Configuring the measuring device

- The **Setup** menu with its guided wizards contains all the parameters needed for standard operation.
- Navigation to the **Setup** menu



29 Taking the example of the local display

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

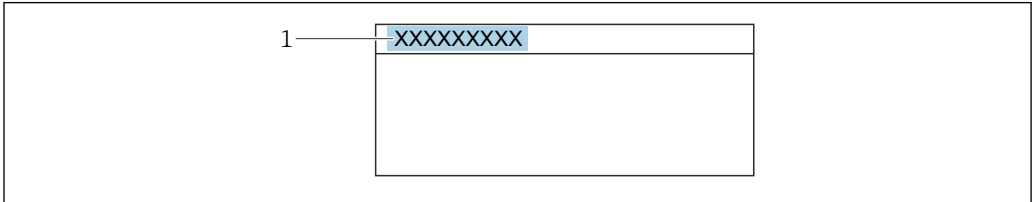
#### Navigation "Setup" menu

Setup		
Device tag		
► System units		→ 80
► Communication		→ 82
► I/O configuration		→ 83
► Current input 1 to n		→ 84
► Status input 1 to n		→ 85
► Current output 1 to n		→ 86
► Pulse/frequency/switch output 1 to n		→ 89
► Relay output 1 to n		→ 98

► Double pulse output	→ 100
► Display	→ 95
► Low flow cut off	→ 96
► Empty pipe detection	→ 98
► Advanced setup	→ 102

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.



30 Header of the operational display with tag name

1 Tag name

Enter the tag name in the "FieldCare" operating tool → 71

**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

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 → System units


► System units
Volume flow unit → 81



Volume unit	→  81
Conductivity unit	→  81
Temperature unit	→  81
Mass flow unit	→  81
Mass unit	→  81
Density unit	→  82
Corrected volume flow unit	→  82
Corrected volume unit	→  82

### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Volume flow unit	–	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>Output</li> <li>Low flow cut off</li> <li>Simulation process variable</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>l/h</li> <li>gal/min (us)</li> </ul>
Volume unit	–	Select volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>m<sup>3</sup></li> <li>gal (us)</li> </ul>
Conductivity unit	The <b>On</b> option is selected in the <b>Conductivity measurement</b> parameter.	Select conductivity unit. <i>Effect</i> The selected unit applies for: Simulation process variable	Unit choose list	µS/cm
Temperature unit	–	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li><b>Temperature</b> parameter</li> <li><b>Maximum value</b> parameter</li> <li><b>Minimum value</b> parameter</li> <li><b>External temperature</b> parameter</li> <li><b>Maximum value</b> parameter</li> <li><b>Minimum value</b> parameter</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>°C</li> <li>°F</li> </ul>
Mass flow unit	–	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>Output</li> <li>Low flow cut off</li> <li>Simulation process variable</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>kg/h</li> <li>lb/min</li> </ul>
Mass unit	–	Select mass unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>kg</li> <li>lb</li> </ul>

Parameter	Prerequisite	Description	Selection	Factory setting
Density unit	–	Select density unit. <i>Result</i> The selected unit applies for: ■ Output ■ Simulation process variable	Unit choose list	Country-specific: ■ kg/l ■ lb/ft <sup>3</sup>
Corrected volume flow unit	–	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: <b>Corrected volume flow</b> parameter (→  120)	Unit choose list	Country-specific: ■ l/h ■ Sft <sup>3</sup> /h
Corrected volume unit	–	Select corrected volume unit.	Unit choose list	Country-specific: ■ Nm <sup>3</sup> ■ Sft <sup>3</sup>

### 10.5.3 Configuring the 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

► Communication


Bus address

→  82


Baudrate

→  82


Data transfer mode

→  82


Parity

→  83

Byte order

→  83

Failure mode

→  83

#### Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Bus address	Enter device address.	1 to 247	247
Baudrate	Define data transfer speed.	■ 1200 BAUD ■ 2400 BAUD ■ 4800 BAUD ■ 9600 BAUD ■ 19200 BAUD ■ 38400 BAUD ■ 57600 BAUD ■ 115200 BAUD	19200 BAUD
Data transfer mode	Select data transfer mode.	■ ASCII ■ RTU	RTU

Parameter	Description	User entry / Selection	Factory setting
Parity	Select parity bits.	Picklist <b>ASCII</b> option: <ul style="list-style-type: none"> <li>0 = <b>Even</b> option</li> <li>1 = <b>Odd</b> option</li> </ul> Picklist <b>RTU</b> option: <ul style="list-style-type: none"> <li>0 = <b>Even</b> option</li> <li>1 = <b>Odd</b> option</li> <li>2 = <b>None / 1 stop bit</b> option</li> <li>3 = <b>None / 2 stop bits</b> option</li> </ul>	Even
Byte order	Select byte transmission sequence.	<ul style="list-style-type: none"> <li>0-1-2-3</li> <li>3-2-1-0</li> <li>1-0-3-2</li> <li>2-3-0-1</li> </ul>	1-0-3-2
Failure mode	Select measured value output behavior when a diagnostic message occurs via Modbus communication. NaN <sup>1)</sup>	<ul style="list-style-type: none"> <li>NaN value</li> <li>Last valid value</li> </ul>	NaN value

1) Not a Number

### 10.5.4 Displaying the I/O configuration

The **I/O configuration** submenu guides the user systematically through all the parameters in which the configuration of the I/O modules is displayed.

#### Navigation

"Setup" menu → I/O configuration

► I/O configuration

I/O module 1 to n terminal numbers

→ 83

I/O module 1 to n information

→ 83

I/O module 1 to n type

→ 84

Apply I/O configuration

→ 84

Alteration code

→ 84

#### Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
I/O module 1 to n terminal numbers	Shows the terminal numbers used by the I/O module.	<ul style="list-style-type: none"> <li>Not used</li> <li>26-27 (I/O 1)</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> </ul>	–
I/O module 1 to n information	Shows information of the plugged I/O module.	<ul style="list-style-type: none"> <li>Not plugged</li> <li>Invalid</li> <li>Not configurable</li> <li>Configurable</li> <li>MODBUS</li> </ul>	–

Parameter	Description	User interface / Selection / User entry	Factory setting
I/O module 1 to n type	Shows the I/O module type.	<ul style="list-style-type: none"> <li>Off</li> <li>Current output *</li> <li>Current input *</li> <li>Status input *</li> <li>Pulse/frequency/switch output *</li> </ul>	Off
Apply I/O configuration	Apply parameterization of the freely configurable I/O module.	<ul style="list-style-type: none"> <li>No</li> <li>Yes</li> </ul>	No
Alteration code	Enter the code in order to change the I/O configuration.	Positive integer	0

\* Visibility depends on order options or device settings

### 10.5.5 Configuring the current input

The "**Current input**" wizard guides the user systematically through all the parameters that have to be set for configuring the current input.

#### Navigation

"Setup" menu → Current input

► Current input 1 to n

Terminal number

→ 84

Signal mode

→ 84

0/4 mA value

→ 84

20 mA value

→ 85

Current span

→ 85

Failure mode

→ 85

Failure value

→ 85

#### Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the current input module.	<ul style="list-style-type: none"> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> </ul>	–
Signal mode	The measuring device is <b>not</b> approved for use in the hazardous area with type of protection Ex-i.	Select the signal mode for the current input.	<ul style="list-style-type: none"> <li>Passive</li> <li>Active</li> </ul>	Active
0/4 mA value	–	Enter 4 mA value.	Signed floating-point number	0

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
20 mA value	–	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	<ul style="list-style-type: none"> <li>■ 4...20 mA</li> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> <li>■ 0...20 mA</li> </ul>	Country-specific: <ul style="list-style-type: none"> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> </ul>
Failure mode	–	Define input behavior in alarm condition.	<ul style="list-style-type: none"> <li>■ Alarm</li> <li>■ Last valid value</li> <li>■ Defined value</li> </ul>	Alarm
Failure value	In the <b>Failure mode</b> parameter, the <b>Defined value</b> option is selected.	Enter value to be used by the device if input value from external device is missing.	Signed floating-point number	0

### 10.5.6 Configuring the status input

The **Status input** submenu guides the user systematically through all the parameters that have to be set for configuring the status input.

#### Navigation

"Setup" menu → Status input

▶ Status input 1 to n

Assign status input

Terminal number

Active level

Terminal number

Response time status input

Terminal number

→ ⓘ 85

→ ⓘ 85

→ ⓘ 86

→ ⓘ 85

→ ⓘ 86

→ ⓘ 85

#### Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
Terminal number	Shows the terminal numbers used by the status input module.	<ul style="list-style-type: none"> <li>■ Not used</li> <li>■ 24-25 (I/O 2)</li> <li>■ 22-23 (I/O 3)</li> </ul>	–
Assign status input	Select function for the status input.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Reset totalizer 1</li> <li>■ Reset totalizer 2</li> <li>■ Reset totalizer 3</li> <li>■ Reset all totalizers</li> <li>■ Flow override</li> </ul>	Off

Parameter	Description	User interface / Selection / User entry	Factory setting
Active level	Define input signal level at which the assigned function is triggered.	<ul style="list-style-type: none"> <li>High</li> <li>Low</li> </ul>	High
Response time status input	Define the minimum amount of time the input signal level must be present before the selected function is triggered.	5 to 200 ms	50 ms

### 10.5.7 Configuring the current output

The **Current output** wizard guides you systematically through all the parameters that have to be set for configuring the current output.

#### Navigation

"Setup" menu → Current output

► Current output 1 to n

Terminal number

→ 86

Signal mode

→ 86

Assign current output 1 to n

→ 87

Current span

→ 87

0/4 mA value

→ 87

20 mA value

→ 87

Fixed current

→ 87

Damping output 1 to n

→ 87

Failure mode

→ 88

Failure current

→ 88

#### Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the current output module.	<ul style="list-style-type: none"> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> </ul>	–
Signal mode	–	Select the signal mode for the current output.	<ul style="list-style-type: none"> <li>Passive</li> <li>Active</li> </ul>	Active

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Assign current output 1 to n	–	Select process variable for current output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Volume flow
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	<ul style="list-style-type: none"> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> <li>■ 4...20 mA</li> <li>■ 0...20 mA</li> <li>■ Fixed current</li> </ul>	Country-specific: <ul style="list-style-type: none"> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> </ul>
0/4 mA value	One of the following options is selected in the <b>Current span</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> <li>■ 4...20 mA</li> <li>■ 0...20 mA</li> </ul>	Enter 4 mA value.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>■ 0 l/h</li> <li>■ 0 gal/min (us)</li> </ul>
20 mA value	One of the following options is selected in the <b>Current span</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> <li>■ 4...20 mA</li> <li>■ 0...20 mA</li> </ul>	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter
Fixed current	The <b>Fixed current</b> option is selected in the <b>Current span</b> parameter (→ 87).	Defines the fixed output current.	0 to 22.5 mA	22.5 mA
Damping output 1 to n	One of the following options is selected in the <b>Assign current output</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul> One of the following options is selected in the <b>Current span</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> <li>■ 4...20 mA</li> <li>■ 0...20 mA</li> </ul>	Set reaction time for output signal to fluctuations in the measured value.	0.0 to 999.9 s	1.0 s

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Failure mode	<p>One of the following options is selected in the <b>Assign current output</b> parameter (→ 87):</p> <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul> <p>One of the following options is selected in the <b>Current span</b> parameter (→ 87):</p> <ul style="list-style-type: none"> <li>■ 4...20 mA NAMUR</li> <li>■ 4...20 mA US</li> <li>■ 4...20 mA</li> <li>■ 0...20 mA</li> </ul>	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>■ Min.</li> <li>■ Max.</li> <li>■ Last valid value</li> <li>■ Actual value</li> <li>■ Defined value</li> </ul>	Max.
Failure current	The <b>Defined value</b> option is selected in the <b>Failure mode</b> parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

\* Visibility depends on order options or device settings



10.5.8 Configuring the pulse/frequency/switch output

The **Pulse/frequency/switch output** wizard guides you systematically through all the parameters that can be set for configuring the selected output type.

Navigation

"Setup" menu → Advanced setup → Pulse/frequency/switch output

► Pulse/frequency/switch output  
1 to n

Operating mode

→ 89

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	<div>■ Pulse</div> <div>■ Frequency</div> <div>■ Switch</div>	Pulse

Configuring the pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output

► Pulse/frequency/switch output  
1 to n

Operating mode

Terminal number

Signal mode

Assign pulse output

Value per pulse

Pulse width

Failure mode

Invert output signal

→ 90

→ 90

→ 90

→ 90

→ 90

→ 90

→ 90

→ 90

## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> <li>■ Pulse</li> <li>■ Frequency</li> <li>■ Switch</li> </ul>	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	<ul style="list-style-type: none"> <li>■ Not used</li> <li>■ 24-25 (I/O 2)</li> <li>■ 22-23 (I/O 3)</li> </ul>	–
Signal mode	–	Select the signal mode for the PFS output.	<ul style="list-style-type: none"> <li>■ Passive</li> <li>■ Active</li> </ul>	Passive
Assign pulse output 1 to n	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter.	Select process variable for pulse output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>	Off
Value per pulse	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected, and one of the following options is selected in the <b>Assign pulse output</b> parameter (→ 90): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected, and one of the following options is selected in the <b>Assign pulse output</b> parameter (→ 90): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms
Failure mode	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected, and one of the following options is selected in the <b>Assign pulse output</b> parameter (→ 90): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ No pulses</li> </ul>	No pulses
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> <li>■ No</li> <li>■ Yes</li> </ul>	No

## Configuring the frequency output

## Navigation

"Setup" menu → Pulse/frequency/switch output










► Pulse/frequency/switch output 1 to n

Operating mode



→ 91

Terminal number

→ 91

Signal mode	→  91
Assign frequency output	→  91
Minimum frequency value	→  91
Maximum frequency value	→  92
Measuring value at minimum frequency	→  92
Measuring value at maximum frequency	→  92
Failure mode	→  92
Failure frequency	→  92
Invert output signal	→  92

### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> <li>■ Pulse</li> <li>■ Frequency</li> <li>■ Switch</li> </ul>	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	<ul style="list-style-type: none"> <li>■ Not used</li> <li>■ 24-25 (I/O 2)</li> <li>■ 22-23 (I/O 3)</li> </ul>	–
Signal mode	–	Select the signal mode for the PFS output.	<ul style="list-style-type: none"> <li>■ Passive</li> <li>■ Active</li> </ul>	Passive
Assign frequency output	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→  89).	Select process variable for frequency output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Off
Minimum frequency value	One of the following options is selected in the <b>Assign current output</b> parameter (→  87): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz















Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Maximum frequency value	One of the following options is selected in the <b>Assign current output</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	One of the following options is selected in the <b>Assign current output</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	One of the following options is selected in the <b>Assign current output</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	One of the following options is selected in the <b>Assign current output</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ Defined value</li> <li>■ 0 Hz</li> </ul>	0 Hz
Failure frequency	One of the following options is selected in the <b>Assign current output</b> parameter (→ 87): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> <li>■ Electronic temperature</li> </ul>	Enter frequency output value in alarm condition.	0.0 to 12 500.0 Hz	0.0 Hz
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> <li>■ No</li> <li>■ Yes</li> </ul>	No

\* Visibility depends on order options or device settings

## Configuring the switch output

### Navigation

"Setup" menu → Pulse/frequency/switch output

► Pulse/frequency/switch output 1 to n		
Operating mode	→ 	93
Terminal number	→ 	93
Signal mode	→ 	93
Switch output function	→ 	94
Assign diagnostic behavior	→ 	94
Assign limit	→ 	94
Assign flow direction check	→ 	94
Assign status	→ 	94
Switch-on value	→ 	94
Switch-off value	→ 	94
Switch-on delay	→ 	94
Switch-off delay	→ 	95
Failure mode	→ 	95
Invert output signal	→ 	95

### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> <li>■ Pulse</li> <li>■ Frequency</li> <li>■ Switch</li> </ul>	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	<ul style="list-style-type: none"> <li>■ Not used</li> <li>■ 24-25 (I/O 2)</li> <li>■ 22-23 (I/O 3)</li> </ul>	–
Signal mode	–	Select the signal mode for the PFS output.	<ul style="list-style-type: none"> <li>■ Passive</li> <li>■ Active</li> </ul>	Passive

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch output function	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Select function for switch output.	<ul style="list-style-type: none"> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Status</li> </ul>	Off
Assign diagnostic behavior	<ul style="list-style-type: none"> <li>In the <b>Operating mode</b> parameter, the <b>Switch</b> option is selected.</li> <li>In the <b>Switch output function</b> parameter, the <b>Diagnostic behavior</b> option is selected.</li> </ul>	Select diagnostic behavior for switch output.	<ul style="list-style-type: none"> <li>Alarm</li> <li>Alarm or warning</li> <li>Warning</li> </ul>	Alarm
Assign limit	<ul style="list-style-type: none"> <li>The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.</li> <li>The <b>Limit</b> option is selected in the <b>Switch output function</b> parameter.</li> </ul>	Select process variable for limit function.	<ul style="list-style-type: none"> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity*</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> <li>Electronic temperature</li> </ul>	Volume flow
Assign flow direction check	<ul style="list-style-type: none"> <li>The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.</li> <li>The <b>Flow direction check</b> option is selected in the <b>Switch output function</b> parameter.</li> </ul>	Select process variable for flow direction monitoring.	<ul style="list-style-type: none"> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> </ul>	Volume flow
Assign status	<ul style="list-style-type: none"> <li>The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.</li> <li>The <b>Status</b> option is selected in the <b>Switch output function</b> parameter.</li> </ul>	Select device status for switch output.	<ul style="list-style-type: none"> <li>Empty pipe detection</li> <li>Low flow cut off</li> </ul>	Empty pipe detection
Switch-on value	<ul style="list-style-type: none"> <li>In the <b>Operating mode</b> parameter, the <b>Switch</b> option is selected.</li> <li>In the <b>Switch output function</b> parameter, the <b>Limit</b> option is selected.</li> </ul>	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>0 l/h</li> <li>0 gal/min (us)</li> </ul>
Switch-off value	<ul style="list-style-type: none"> <li>In the <b>Operating mode</b> parameter, the <b>Switch</b> option is selected.</li> <li>In the <b>Switch output function</b> parameter, the <b>Limit</b> option is selected.</li> </ul>	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>0 l/h</li> <li>0 gal/min (us)</li> </ul>
Switch-on delay	<ul style="list-style-type: none"> <li>The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.</li> <li>The <b>Limit</b> option is selected in the <b>Switch output function</b> parameter.</li> </ul>	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch-off delay	<ul style="list-style-type: none"> <li>The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.</li> <li>The <b>Limit</b> option is selected in the <b>Switch output function</b> parameter.</li> </ul>	Define delay for the switch-off of status output.	0.0 to 100.0 s	0.0 s
Failure mode	–	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>Actual status</li> <li>Open</li> <li>Closed</li> </ul>	Open
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> <li>No</li> <li>Yes</li> </ul>	No

\* Visibility depends on order options or device settings

### 10.5.9 Configuring the local display

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

#### Navigation

"Setup" menu → Display

► Display

Format display

→ 96

Value 1 display

→ 96

0% bargraph value 1

→ 96

100% bargraph value 1

→ 96

Value 2 display

→ 96

Value 3 display

→ 96

0% bargraph value 3

→ 96

100% bargraph value 3

→ 96

Value 4 display

→ 96

## 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.	<ul style="list-style-type: none"> <li>■ 1 value, max. size</li> <li>■ 1 bargraph + 1 value</li> <li>■ 2 values</li> <li>■ 1 value large + 2 values</li> <li>■ 4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> <li>■ Current output 1</li> <li>■ Current output 2 *</li> <li>■ Electronic temperature</li> </ul>	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>■ 0 l/h</li> <li>■ 0 gal/min (us)</li> </ul>
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.	<ul style="list-style-type: none"> <li>■ None</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity *</li> <li>■ Electronic temperature</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> <li>■ Current output 1</li> <li>■ Current output 2 *</li> <li>■ Current output 3 *</li> <li>■ Current output 4 *</li> </ul>	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 <b>Value 2 display</b> parameter (→ 96)	None
0% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>■ 0 l/h</li> <li>■ 0 gal/min (us)</li> </ul>
100% bargraph value 3	A selection was made in the <b>Value 3 display</b> 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 <b>Value 2 display</b> parameter (→ 96)	None

\* Visibility depends on order options or device settings

## 10.5.10 Configuring the low flow cut off

The **Low flow cut off** wizard systematically guides the user through all the parameters that must be set to configure low flow cut off.



**Navigation**

"Setup" menu → Low flow cut off

► Low flow cut off		
Assign process variable		→ 97
On value low flow cutoff		→ 97
Off value low flow cutoff		→ 97
Pressure shock suppression		→ 97

**Parameter overview with brief description**

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>	Volume flow
On value low flow cutoff	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 97): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> </ul>	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 97): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>	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 <b>Assign process variable</b> parameter (→ 97): <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

10.5.11 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

► Empty pipe detection

Empty pipe detection

→ 98

New adjustment

→ 98

Progress

→ 98

Switch point empty pipe detection

→ 98

Response time empty pipe detection

→ 98

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.	<div><div>Off</div><div>On</div></div>	Off
New adjustment	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Select type of adjustment.	<div><div>Cancel</div><div>Empty pipe adjust</div><div>Full pipe adjust</div></div>	Cancel
Progress	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Shows the progress.	<div><div>Ok</div><div>Busy</div><div>Not ok</div></div>	–
Switch point empty pipe detection	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Enter hysteresis in %, below this value the measuring tube will be detected as empty.	0 to 100 %	10 %
Response time empty pipe detection	In the <b>Empty pipe detection</b> parameter (→ 98), the <b>On</b> option is selected.	Enter the time before diagnostic message S862 'Pipe empty' is displayed for empty pipe detection.	0 to 100 s	1 s

10.5.12 Configuring the relay output








The **Relay output** wizard guides the user systematically through all the parameters that have to be set for configuring the relay output.

**Navigation**  
"Setup" menu → Relay output 1 to n

► RelaisOutput 1 to n

Switch output function

→ 99

Assign flow direction check	→  99
Assign limit	→  99
Assign diagnostic behavior	→  99
Assign status	→  99
Switch-off value	→  99
Switch-on value	→  100
Failure mode	→  100

### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Relay output function	–	Select the function for the relay output.	<ul style="list-style-type: none"> <li>■ Closed</li> <li>■ Open</li> <li>■ Diagnostic behavior</li> <li>■ Limit</li> <li>■ Flow direction check</li> <li>■ Digital Output</li> </ul>	Closed
Terminal number	–	Shows the terminal numbers used by the relay output module.	<ul style="list-style-type: none"> <li>■ Not used</li> <li>■ 24-25 (I/O 2)</li> <li>■ 22-23 (I/O 3)</li> </ul>	–
Assign flow direction check	In the <b>Relay output function</b> parameter, the <b>Flow direction check</b> option is selected.	Select process variable for flow direction monitoring.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>	Volume flow
Assign limit	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Select process variable for limit function.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity*</li> <li>■ Conductivity*</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> <li>■ Electronic temperature</li> </ul>	Volume flow
Assign diagnostic behavior	In the <b>Relay output function</b> parameter, the <b>Diagnostic behavior</b> option is selected.	Select diagnostic behavior for switch output.	<ul style="list-style-type: none"> <li>■ Alarm</li> <li>■ Alarm or warning</li> <li>■ Warning</li> </ul>	Alarm
Assign status	In the <b>Relay output function</b> parameter, the <b>Digital Output</b> option is selected.	Select device status for switch output.	<ul style="list-style-type: none"> <li>■ Partially filled pipe detection</li> <li>■ Low flow cut off</li> </ul>	Partially filled pipe detection
Switch-off value	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>■ 0 l/h</li> <li>■ 0 gal(us)/min</li> </ul>

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch-off delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Define delay for the switch-off of status output.	0.0 to 100.0 s	0.0 s
Switch-on value	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"><li>■ 0 l/h</li><li>■ 0 gal(us)/min</li></ul>
Switch-on delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s
Failure mode	–	Define output behavior in alarm condition.	<ul style="list-style-type: none"><li>■ Actual status</li><li>■ Open</li><li>■ Closed</li></ul>	Open

\* Visibility depends on order options or device settings

10.5.13 Configuring the double pulse output

The **Double pulse output** submenu guides the user systematically through all the parameters that have to be set for configuring the double pulse output.

Navigation

"Setup" menu → Double pulse output

► Double pulse output

Master terminal number

→ ⓘ 101

Slave terminal number

→ ⓘ 101

Signal mode

→ ⓘ 101

Assign pulse output 1

→ ⓘ 101

Measuring mode

→ ⓘ 101

Value per pulse

→ ⓘ 101

Pulse width

→ ⓘ 101

Failure mode

→ ⓘ 101

Invert output signal

→ ⓘ 101

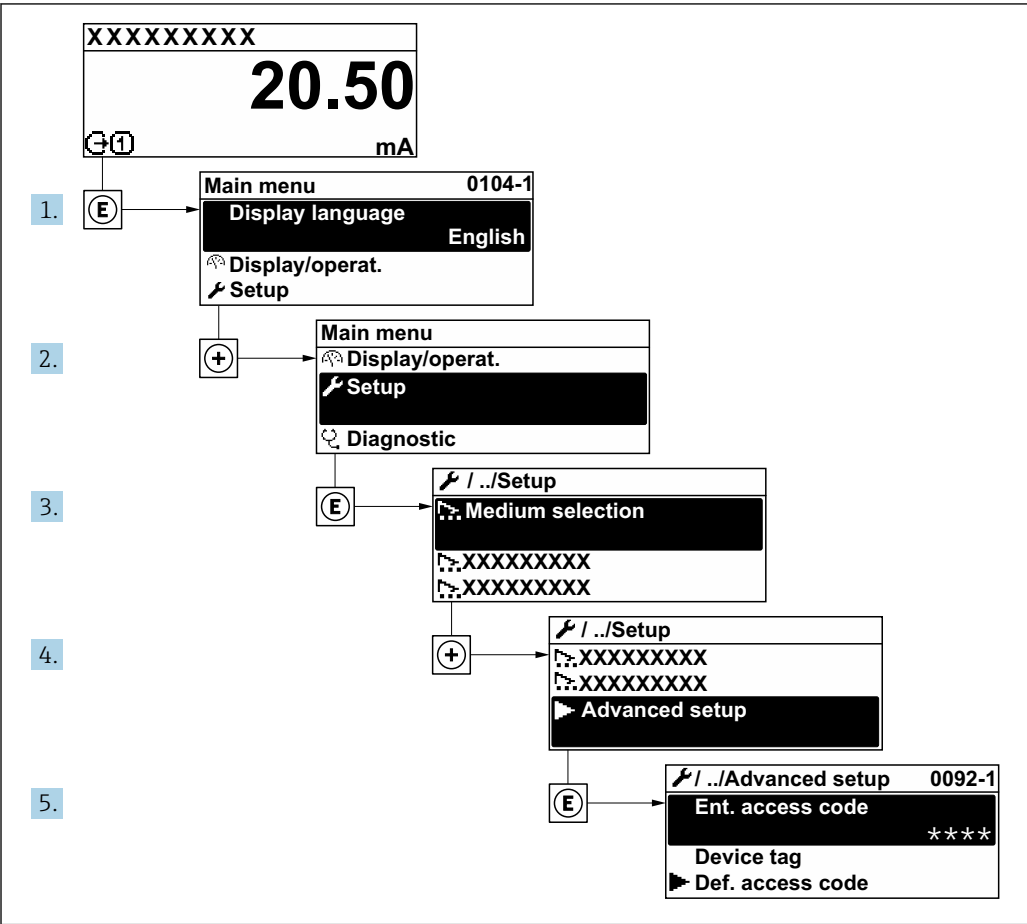
**Parameter overview with brief description**

Parameter	Description	Selection / User interface / User entry	Factory setting
Signal mode	Select the signal mode for the double pulse output.	<ul style="list-style-type: none"> <li>■ Passive</li> <li>■ Active</li> <li>■ Passive NAMUR</li> </ul>	Passive
Master terminal number	Shows the terminal numbers used by the master of the double pulse output module.	<ul style="list-style-type: none"> <li>■ Not used</li> <li>■ 24-25 (I/O 2)</li> <li>■ 22-23 (I/O 3)</li> </ul>	–
Slave terminal number		<ul style="list-style-type: none"> <li>■ Not used</li> <li>■ 24-25 (I/O 2)</li> <li>■ 22-23 (I/O 3)</li> </ul>	–
Assign pulse output 1	Select process variable for pulse output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>	Off
Measuring mode	Select measuring mode for pulse output.	<ul style="list-style-type: none"> <li>■ Forward flow</li> <li>■ Forward/Reverse flow</li> <li>■ Reverse flow</li> <li>■ Reverse flow compensation</li> </ul>	Forward flow
Value per pulse	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	Define time width of the output pulse.	0.5 to 2 000 ms	0.5 ms
Failure mode	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ No pulses</li> </ul>	No pulses
Invert output signal	Invert the output signal.	<ul style="list-style-type: none"> <li>■ No</li> <li>■ Yes</li> </ul>	No

## 10.6 Advanced settings

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

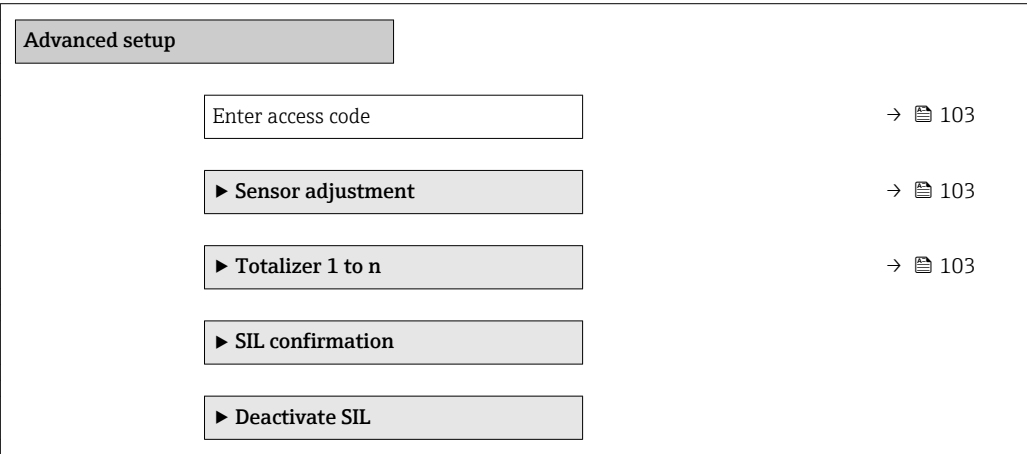
*Navigation to the "Advanced setup" submenu*



**i** The number of submenus can vary depending on the device version. Some submenus are not dealt with in the Operating Instructions. These submenus and the parameters they contain are explained in the Special Documentation for the device.

### Navigation

"Setup" menu → Advanced setup



► Display	→ ⓘ 105
► Electrode cleaning circuit	→ ⓘ 108
► WLAN settings	→ ⓘ 109
► Heartbeat setup	
► Configuration backup	→ ⓘ 110
► Administration	→ ⓘ 111

10.6.1 Using the parameter to enter the access code

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

Parameter overview with brief description

Parameter	Description	User entry
Enter access code	Enter access code to disable write protection of parameters.	0 to 9999

10.6.2 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

► Sensor adjustment	
Installation direction	→ ⓘ 103

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.	<ul style="list-style-type: none"><li>▪ Flow in arrow direction</li><li>▪ Flow against arrow direction</li></ul>	Flow in arrow direction

10.6.3 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

► <b>Totalizer 1 to n</b>		
Assign process variable	→	📄 104
Unit totalizer 1 to n	→	📄 104
Totalizer operation mode	→	📄 104
Failure mode	→	📄 104

**Parameter overview with brief description**

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> </ul>	Volume flow
Unit totalizer 1 to n	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 📄 104) of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> </ul>	Select process variable totalizer unit.	Unit choose list	1
Totalizer operation mode	–	Select totalizer calculation mode.	<ul style="list-style-type: none"> <li>▪ Net flow total</li> <li>▪ Forward flow total</li> <li>▪ Reverse flow total</li> </ul>	Net flow total
Failure mode	–	Define totalizer behavior in alarm condition.	<ul style="list-style-type: none"> <li>▪ Stop</li> <li>▪ Actual value</li> <li>▪ Last valid value</li> </ul>	Stop























### 10.6.4 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

► Display		
Format display	→ 	106
Value 1 display	→ 	106
0% bargraph value 1	→ 	106
100% bargraph value 1	→ 	106
Decimal places 1	→ 	106
Value 2 display	→ 	106
Decimal places 2	→ 	106
Value 3 display	→ 	106
0% bargraph value 3	→ 	106
100% bargraph value 3	→ 	106
Decimal places 3	→ 	107
Value 4 display	→ 	107
Decimal places 4	→ 	107
Display language	→ 	107
Display interval	→ 	107
Display damping	→ 	107
Header	→ 	107
Header text	→ 	107
Separator	→ 	108
Backlight	→ 	108

## 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.	<ul style="list-style-type: none"> <li>■ 1 value, max. size</li> <li>■ 1 bargraph + 1 value</li> <li>■ 2 values</li> <li>■ 1 value large + 2 values</li> <li>■ 4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> <li>■ Current output 1</li> <li>■ Current output 2 *</li> <li>■ Electronic temperature</li> </ul>	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>■ 0 l/h</li> <li>■ 0 gal/min (us)</li> </ul>
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 <b>Value 1 display</b> parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> <li>■ None</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity *</li> <li>■ Conductivity</li> <li>■ Electronic temperature</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> <li>■ Current output 1</li> <li>■ Current output 2 *</li> <li>■ Current output 3 *</li> <li>■ Current output 4 *</li> </ul>	None
Decimal places 2	A measured value is specified in the <b>Value 2 display</b> parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	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 <b>Value 2 display</b> parameter (→ 96)	None
0% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>■ 0 l/h</li> <li>■ 0 gal/min (us)</li> </ul>
100% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 3	A measured value is specified in the <b>Value 3 display</b> parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	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 <b>Value 2 display</b> parameter (→ 96)	None
Decimal places 4	A measured value is specified in the <b>Value 4 display</b> parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	x.xx
Display language	A local display is provided.	Set display language.	<ul style="list-style-type: none"> <li>■ English</li> <li>■ Deutsch *</li> <li>■ Français *</li> <li>■ Español *</li> <li>■ Italiano *</li> <li>■ Nederlands *</li> <li>■ Portuguesa *</li> <li>■ Polski *</li> <li>■ русский язык (Russian) *</li> <li>■ Svenska *</li> <li>■ Türkçe *</li> <li>■ 中文 (Chinese) *</li> <li>■ 日本語 (Japanese) *</li> <li>■ 한국어 (Korean) *</li> <li>■ العربية (Arabic) *</li> <li>■ Bahasa Indonesia *</li> <li>■ ภาษาไทย (Thai) *</li> <li>■ tiếng Việt (Vietnamese) *</li> <li>■ čeština (Czech) *</li> </ul>	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.	<ul style="list-style-type: none"> <li>■ Device tag</li> <li>■ Free text</li> </ul>	Device tag
Header text	In the <b>Header</b> parameter, the <b>Free text</b> option is selected.	Enter display header text.	Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /)	-----

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	<ul style="list-style-type: none"> <li>▪ . (point)</li> <li>▪ , (comma)</li> </ul>	. (point)
Backlight	One of the following conditions is met: <ul style="list-style-type: none"> <li>▪ Order code for "Display; operation", option <b>F</b> "4-line, illum.; touch control"</li> <li>▪ Order code for "Display; operation", option <b>G</b> "4-line, illum.; touch control +WLAN"</li> <li>▪ Order code for "Display; operation", option <b>O</b> "Separate 4-line display, illum.; 10m/30ft cable; touch control"</li> </ul>	Switch the local display backlight on and off.	<ul style="list-style-type: none"> <li>▪ Disable</li> <li>▪ Enable</li> </ul>	Enable

\* Visibility depends on order options or device settings






### 10.6.5 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

► Electrode cleaning circuit	
Electrode cleaning circuit	→  108
ECC duration	→  108
ECC recovery time	→  109
ECC cleaning cycle	→  109
ECC Polarity	→  109

#### 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 <b>EC</b> "ECC electrode cleaning"	Enable the cyclic electrode cleaning circuit.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ On</li> </ul>	Off
ECC duration	For the following order code: "Application package", option <b>EC</b> "ECC electrode cleaning"	Enter the duration of electrode cleaning in seconds.	0.01 to 30 s	2 s

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
ECC recovery time	For the following order code: "Application package", option <b>EC</b> "ECC electrode cleaning"	Define recovery time after electrode cleaning. During this time the current output values will be held at last valid value.	1 to 600 s	60 s
ECC cleaning cycle	For the following order code: "Application package", option <b>EC</b> "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 <b>EC</b> "ECC electrode cleaning"	Select the polarity of the electrode cleaning circuit.	<ul style="list-style-type: none"> <li>■ Positive</li> <li>■ Negative</li> </ul>	Depends on the electrode material: <ul style="list-style-type: none"> <li>■ Platinum: <b>Negative</b> option</li> <li>■ Tantalum, Alloy C22, stainless steel: <b>Positive</b> option</li> </ul>

### 10.6.6 WLAN configuration

The **WLAN Settings** submenu guides the user systematically through all the parameters that have to be set for the WLAN configuration.

#### Navigation

"Setup" menu → Advanced setup → WLAN Settings

▶ WLAN settings

WLAN IP address

→ ⓘ 109

Security type

→ ⓘ 109

WLAN passphrase

→ ⓘ 110

Assign SSID name

→ ⓘ 110

SSID name



→ ⓘ 110

Apply changes

→ ⓘ 110

#### Parameter overview with brief description

Parameter	Prerequisite	Description	User entry / Selection	Factory setting
WLAN IP address	–	Enter IP address of the device WLAN interface.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
Network security	–	Select the security type of the WLAN network.	<ul style="list-style-type: none"> <li>■ Unsecured</li> <li>■ WPA2-PSK</li> <li>■ EAP-PEAP with MSCHAPv2</li> <li>■ EAP-PEAP MSCHAPv2 no server authentic.</li> <li>■ EAP-TLS</li> </ul>	Unsecured

Parameter	Prerequisite	Description	User entry / Selection	Factory setting
WLAN passphrase	The <b>WPA2-PSK</b> option is selected in the <b>Security type</b> parameter.	Enter the network key (8 to 32 characters).  The network key supplied with the device should be changed during commissioning for security reasons.	8 to 32-digit character string comprising numbers, letters and special characters	Serial number of the measuring device (e.g. L100A802000)
Assign SSID name	–	Select which name will be used for SSID: device tag or user-defined name.	<ul style="list-style-type: none"> <li>Device tag</li> <li>User-defined</li> </ul>	User-defined
SSID name	<ul style="list-style-type: none"> <li>The <b>User-defined</b> option is selected in the <b>Assign SSID name</b> parameter.</li> <li>The <b>WLAN access point</b> option is selected in the <b>WLAN mode</b> parameter.</li> </ul>	Enter the user-defined SSID name (max. 32 characters).  The user-defined SSID name may only be assigned once. If the SSID name is assigned more than once, the devices can interfere with one another.	Max. 32-digit character string comprising numbers, letters and special characters	EH_device designation_last 7 digits of the serial number (e.g. EH_Promag_300_A 802000)
Apply changes	–	Use changed WLAN settings.	<ul style="list-style-type: none"> <li>Cancel</li> <li>Ok</li> </ul>	Cancel






## 10.6.7 Configuration management

After commissioning, you can save the current device configuration or restore the previous device configuration.

You can do so using the **Configuration management** parameter and the related options found in the **Configuration backup** submenu.

### Navigation

"Setup" menu → Advanced setup → Configuration backup

► Configuration backup	
Operating time	→  110
Last backup	→  110
Configuration management	→  111
Backup state	→  111
Comparison result	→  111

### Parameter overview with brief description

Parameter	Description	User interface / Selection	Factory setting
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	–
Last backup	Shows when the last data backup was saved to HistoROM backup.	Days (d), hours (h), minutes (m) and seconds (s)	–

Parameter	Description	User interface / Selection	Factory setting
Configuration management	Select action for managing the device data in the HistoROM backup.	<ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Execute backup</li> <li>■ Restore</li> <li>■ Compare</li> <li>■ Clear backup data</li> </ul>	Cancel
Backup state	Shows the current status of data saving or restoring.	<ul style="list-style-type: none"> <li>■ None</li> <li>■ Backup in progress</li> <li>■ Restoring in progress</li> <li>■ Delete in progress</li> <li>■ Compare in progress</li> <li>■ Restoring failed</li> <li>■ Backup failed</li> </ul>	None
Comparison result	Comparison of current device data with HistoROM backup.	<ul style="list-style-type: none"> <li>■ Settings identical</li> <li>■ Settings not identical</li> <li>■ No backup available</li> <li>■ Backup settings corrupt</li> <li>■ Check not done</li> <li>■ Dataset incompatible</li> </ul>	Check not done

### Function scope of the "Configuration management" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
Execute backup	A backup copy of the current device configuration is saved from the HistoROM backup to the memory of the device. The backup copy includes the transmitter data of the device.
Restore	The last backup copy of the device configuration is restored from the device memory to the device's HistoROM backup. The backup copy includes the transmitter data of the device.
Compare	The device configuration saved in the device memory is compared with the current device configuration of the HistoROM backup.
Clear backup data	The backup copy of the device configuration is deleted from the memory of the device.



#### *HistoROM backup*

A HistoROM is a "non-volatile" device memory in the form of an EEPROM.



While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

### 10.6.8 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

▶ Administration

▶ Define access code

→ 112

Define access code

→ 112

Confirm access code

→ 112

▶ Reset access code

→ 113

Operating time

→ 113

Reset access code

→ 113

Device reset

→ 113

Using the parameter to define the access code

Navigation

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

▶ Define access code

Define access code

→ 112

Confirm access code

→ 112

Parameter overview with brief description

Parameter	Description	User entry
Define access code	Restrict write-access to parameters to protect the configuration of the device against unintentional changes.	Max. 16-digit character string comprising numbers, letters and special characters
Confirm access code	Confirm the entered access code.	Max. 16-digit character string comprising numbers, letters and special characters



### Using the parameter to reset the access code

#### Navigation

"Setup" menu → Advanced setup → Administration → Reset access code

▶ Reset access code


Operating time

→ 113

Reset access code

→ 113

### Parameter overview with brief description

Parameter	Description	User interface / User entry	Factory setting
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	–
Reset access code	Reset access code to factory settings.  For a reset code, contact your Endress+Hauser service organization. The reset code can only be entered via: <ul style="list-style-type: none"> <li>Web browser</li> <li>DeviceCare, FieldCare (via service interface CDI-RJ45)</li> <li>Fieldbus</li> </ul>	Character string comprising numbers, letters and special characters	0x00

### Using the parameter to reset the device

#### Navigation

"Setup" menu → Advanced setup → Administration

### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<ul style="list-style-type: none"> <li>Cancel</li> <li>To delivery settings</li> <li>Restart device</li> <li>Restore S-DAT backup</li> </ul>	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


▶ Simulation


Assign simulation process variable

→ 115

Process variable value	→  115
Status input simulation	→  115
Input signal level	→  115
Current input 1 to n simulation	→  115
Value current input 1 to n	→  115
Current output 1 to n simulation	→  115
Value current output 1 to n	→  115
Frequency output simulation 1 to n	→  115
Frequency value 1 to n	→  115
Pulse output simulation 1 to n	→  115
Pulse value 1 to n	→  115
Switch output simulation 1 to n	→  115
Switch status 1 to n	→  115
Relay output 1 to n simulation	→  115
Switch status 1 to n	→  115
Pulse output simulation	→  116
Pulse value	→  116
Device alarm simulation	→  116
Diagnostic event category	→  116
Diagnostic event simulation	→  116

## Parameter overview with brief description




Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity*</li> </ul>	Off
Process variable value	–	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Status input simulation	–	Switch simulation of the status input on and off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	Off
Input signal level	In the <b>Status input simulation</b> parameter, the <b>On</b> option is selected.	Select the signal level for the simulation of the status input.	<ul style="list-style-type: none"> <li>■ High</li> <li>■ Low</li> </ul>	High
Current input 1 to n simulation	–	Switch simulation of the current input on and off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	Off
Value current input 1 to n	In the <b>Current input 1 to n simulation</b> parameter, the <b>On</b> option is selected.	Enter the current value for simulation.	0 to 22.5 mA	0 mA
Current output 1 to n simulation	–	Switch the simulation of the current output on and off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	Off
Value current output 1 to n	In the <b>Current output 1 to n simulation</b> parameter, the <b>On</b> option is selected.	Enter the current value for simulation.	3.59 to 22.5 mA	3.59 mA
Frequency output simulation 1 to n	In the <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Switch the simulation of the frequency output on and off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	Off
Frequency value 1 to n	In the <b>Frequency output simulation 1 to n</b> parameter, the <b>On</b> option is selected.	Enter the frequency value for the simulation.	0.0 to 12 500.0 Hz	0.0 Hz
Pulse output simulation 1 to n	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected.	Set and switch off the pulse output simulation.  For <b>Fixed value</b> option: <b>Pulse width</b> parameter (→ 90) defines the pulse width of the pulses output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Fixed value</li> <li>■ Down-counting value</li> </ul>	Off
Pulse value 1 to n	In the <b>Pulse output simulation 1 to n</b> parameter, the <b>Down-counting value</b> option is selected.	Enter the number of pulses for simulation.	0 to 65 535	0
Switch output simulation 1 to n	In the <b>Operating mode</b> parameter, the <b>Switch</b> option is selected.	Switch the simulation of the switch output on and off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	Off
Switch status 1 to n	–	Select the status of the status output for the simulation.	<ul style="list-style-type: none"> <li>■ Open</li> <li>■ Closed</li> </ul>	Open
Relay output 1 to n simulation	–	Switch simulation of the relay output on and off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	Off
Switch status 1 to n	The <b>On</b> option is selected in the <b>Switch output simulation 1 to n</b> parameter.	Select status of the relay output for the simulation.	<ul style="list-style-type: none"> <li>■ Open</li> <li>■ Closed</li> </ul>	Open

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Pulse output simulation	–	Set and switch off the pulse output simulation.  For <b>Fixed value</b> option: <b>Pulse width</b> parameter defines the pulse width of the pulses output.	<ul style="list-style-type: none"> <li>Off</li> <li>Fixed value</li> <li>Down-counting value</li> </ul>	Off
Pulse value	In the <b>Pulse output simulation</b> parameter, the <b>Down-counting value</b> option is selected.	Set and switch off the pulse output simulation.	0 to 65 535	0
Device alarm simulation	–	Switch the device alarm on and off.	<ul style="list-style-type: none"> <li>Off</li> <li>On</li> </ul>	Off
Diagnostic event category	–	Select a diagnostic event category.	<ul style="list-style-type: none"> <li>Sensor</li> <li>Electronics</li> <li>Configuration</li> <li>Process</li> </ul>	Process
Diagnostic event simulation	–	Select a diagnostic event to simulate this event.	<ul style="list-style-type: none"> <li>Off</li> <li>Diagnostic event picklist (depends on the category selected)</li> </ul>	Off
Logging interval	–	Define the logging interval tlog for data logging. This value defines the time interval between the individual data points in the memory.	1.0 to 3 600.0 s	–

\* Visibility depends on order options or device settings

## 10.8 Protecting settings from unauthorized access

The following write protection options exist in order to protect the configuration of the measuring device from unintentional modification:




- Protect access to parameters via access code →  116
- Protect access to local operation via key locking →  61
- Protect access to measuring device via write protection switch →  118

### 10.8.1 Write protection via access code

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

- Via local operation, the parameters for the measuring device configuration are write-protected and their values can no longer be changed.
- Device access is protected via the Web browser, as are the parameters for the measuring device configuration.
- Device access is protected via FieldCare or DeviceCare (via CDI-RJ45 service interface), as are the parameters for the measuring device configuration.

#### Defining the access code via local display

- Navigate to the **Define access code** parameter (→  112).
- Define a max. 16-digit character string comprising numbers, letters and special characters as the access code.
- Enter the access code again in the **Confirm access code** parameter (→  112) to confirm the code.
  - The -symbol appears in front of all write-protected parameters.

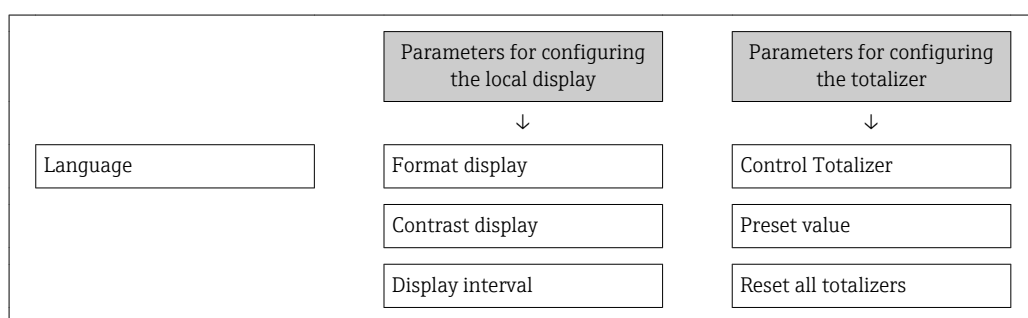
The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. The device locks the write-protected parameters automatically after 60 s if the user skips back to the operational display mode from the navigation and editing view.



- If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 60.
- The user role with which the user is currently logged on via the local display is indicated by the → 60 **Access status** parameter. Navigation path: Operation → Access status

### Parameters which can always be modified via the local display

Certain parameters that do not affect the measurement are excepted from parameter write protection via the local display. Despite the user-specific access code, they can always be modified, even if the other parameters are locked.



### Defining the access code via the Web browser

1. Navigate to the **Define access code** parameter (→ 112).
2. Define a max. 16-digit numeric code as an access code.
3. Enter the access code again in the **Confirm access code** parameter (→ 112) 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 → 60.
- The user role with which the user is currently logged on via Web browser is indicated by the **Access status** parameter. Navigation path: Operation → Access status

### Resetting the access code

If you misplace the user-specific access code, it is possible to reset the code to the factory setting. A reset code must be entered for this purpose. The user-specific access code can then be defined again afterwards.

### Via Web browser, FieldCare, DeviceCare (via CDI-RJ45 service interface), fieldbus



For a reset code, contact your Endress+Hauser service organization.

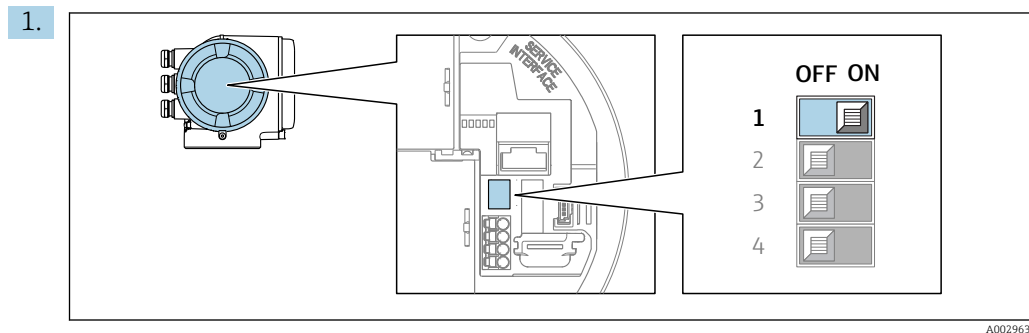
1. Navigate to the **Reset access code** parameter (→ 113).
2. Enter the reset code.
  - ↳ The access code has been reset to the factory setting **0000**. It can be redefined → 116.

### 10.8.2 Write protection via write protection switch

Unlike parameter write protection via a user-specific access code, this allows write access to the entire operating menu - except for the **"Contrast display" parameter** - to be locked.

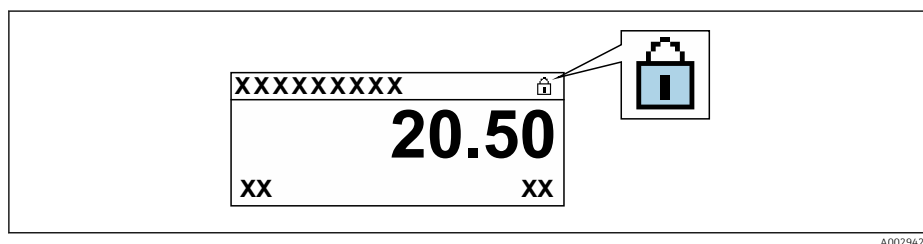
The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):

- Via local display
- Via MODBUS RS485 protocol



Setting the write protection (WP) switch on the main electronics module to the **ON** position enables hardware write protection.

- ↳ In the **Locking status** parameter the **Hardware locked** option is displayed → 119. In addition, on the local display the -symbol appears in front of the parameters in the header of the operational display and in the navigation view.



2. Setting the write protection (WP) switch on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.

- ↳ No option is displayed in the **Locking status** parameter → 119. On the local display, the -symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

# 11 Operation

## 11.1 Reading the device locking status

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

Operation → Locking status

*Function scope of the "Locking status" parameter*

Options	Description
None	The access status displayed in the <b>Access status</b> parameter applies → 60. Only appears on local display.
Hardware locked	The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) .
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

► Measured values	
► Process variables	→ 119
► Input values	→ 121
► Output values	→ 122
► Totalizer	→ 121







### 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

► Process variables	
Volume flow	→ 120
Mass flow	→ 120

Corrected volume flow	→  120
Flow velocity	→  120
Conductivity	→  120
Corrected conductivity	→  120
Temperature	→  121
Density	→  121

### Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Volume flow	–	Displays the volume flow currently measured. <i>Dependency</i> The unit is taken from the <b>Volume flow unit</b> parameter (→  81).	Signed floating-point number
Mass flow	–	Displays the mass flow currently calculated. <i>Dependency</i> The unit is taken from the <b>Mass flow unit</b> parameter (→  81).	Signed floating-point number
Corrected volume flow	–	Displays the corrected volume flow currently calculated. <i>Dependency</i> The unit is taken from the <b>Corrected volume flow unit</b> parameter (→  82).	Signed floating-point number
Flow velocity	–	Displays the flow velocity currently calculated.	Signed floating-point number
Conductivity	–	Displays the conductivity currently measured. <i>Dependency</i> The unit is taken from the <b>Conductivity unit</b> parameter (→  81).	Signed floating-point number
Corrected conductivity	One of the following conditions is met: ■ Order code for "Sensor option", option <b>CI</b> "Medium temperature measurement" or ■ The temperature is read into the flowmeter from an external device.	Displays the conductivity currently corrected. <i>Dependency</i> The unit is taken from the <b>Conductivity unit</b> parameter (→  81).	Positive floating-point number



Parameter	Prerequisite	Description	User interface
Temperature	One of the following conditions is met: <ul style="list-style-type: none"> <li>Order code for "Sensor option", option <b>CI</b> "Medium temperature measurement"</li> <li>or</li> <li>The temperature is read into the flowmeter from an external device.</li> </ul>	Displays the temperature currently calculated.  <i>Dependency</i> The unit is taken from the <b>Temperature unit</b> parameter (→ 81).	Positive floating-point number
Density	–	Displays the current fixed density or density read in from an external device.  <i>Dependency</i> The unit is taken from the <b>Density unit</b> parameter.	Signed floating-point number

### 11.2.2 "Totalizer" submenu

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

#### Navigation

"Diagnostics" menu → Measured values → Totalizer

► <b>Totalizer</b>	
Totalizer value 1 to n	→ 121
Totalizer overflow 1 to n	→ 121

#### Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Totalizer value 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 104) of the <b>Totalizer 1 to n</b> submenu.	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 104) of the <b>Totalizer 1 to n</b> submenu.	Displays the current totalizer overflow.	Integer with sign

### 11.2.3 "Input values" submenu

The **Input values** submenu guides you systematically to the individual input values.

#### Navigation

"Diagnostics" menu → Measured values → Input values

► <b>Input values</b>	
► <b>Current input 1 to n</b>	→ 122
► <b>Status input 1 to n</b>	→ 122

Input values of current input

The **Current input 1 to n** submenu contains all the parameters needed to display the current measured values for every current input.

Navigation

"Diagnostics" menu → Measured values → Input values → Current input 1 to n

► Current input 1 to n

Measured values 1 to n

→ 122

Measured current 1 to n

→ 122

Parameter overview with brief description

Parameter	Description	User interface
Measured values 1 to n	Displays the current input value.	Signed floating-point number
Measured current 1 to n	Displays the current value of the current input.	0 to 22.5 mA

Input values of status input

The **Status input 1 to n** submenu contains all the parameters needed to display the current measured values for every status input.

Navigation

"Diagnostics" menu → Measured values → Input values → Status input 1 to n

► Status input 1 to n

Value status input

→ 122

Parameter overview with brief description

Parameter	Description	User interface
Value status input	Shows the current input signal level.	<div><div>■ High</div><div>■ Low</div></div>

11.2.4 Output values

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

Navigation

"Diagnostics" menu → Measured values → Output values

► Output values

► Current output 1 to n

→ 123

► Pulse/frequency/switch output 1 to n	→ 123
► Relay output 1 to n	→ 124
► Double pulse output	→ 124

Output values of current output

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

Navigation

"Diagnostics" menu → Measured values → Output values → Value current output 1 to n

► Current output 1 to n	
Output current 1 to n	→ 123
Measured current 1 to n	→ 123

Parameter overview with brief description

Parameter	Description	User interface
Output current 1	Displays the current value currently calculated for the current output.	3.59 to 22.5 mA
Measured current	Displays the current value currently measured for the current output.	0 to 30 mA

Output values for pulse/frequency/switch output

The **Pulse/frequency/switch output 1 to n** submenu contains all the parameters needed to display the current measured values for every pulse/frequency/switch output.

Navigation

"Diagnostics" menu → Measured values → Output values → Pulse/frequency/switch output 1 to n

► Pulse/frequency/switch output 1 to n	
Output frequency 1 to n	→ 124
Pulse output 1 to n	→ 124
Switch status 1 to n	→ 124

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Output frequency 1 to n	In the <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Displays the value currently measured for the frequency output.	0.0 to 12 500.0 Hz
Pulse output 1 to n	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected.	Displays the pulse frequency currently output.	Positive floating-point number
Switch status 1 to n	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Displays the current switch output status.	<div><div>■ Open</div><div>■ Closed</div></div>

Output values for relay output

The **Relay output 1 to n** submenu contains all the parameters needed to display the current measured values for every relay output.

Navigation

"Diagnostics" menu → Measured values → Output values → Relay output 1 to n

► Relay output 1 to n

Switch status

→ ⓘ 124

Switch cycles

→ ⓘ 124

Max. switch cycles number

→ ⓘ 124

Parameter overview with brief description

Parameter	Description	User interface
Switch status	Shows the current relay switch status.	<div><div>■ Open</div><div>■ Closed</div></div>
Switch cycles	Shows number of all performed switch cycles.	Positive integer
Max. switch cycles number	Shows the maximal number of guaranteed switch cycles.	Positive integer

Output values for double pulse output

The **Double pulse output** submenu contains all the parameters needed to display the current measured values for every double pulse output.

Navigation

"Diagnostics" menu → Measured values → Output values → Double pulse output

► Double pulse output

Pulse output



→ ⓘ 124

Parameter overview with brief description

Parameter	Description	User interface
Pulse output	Shows the currently output pulse frequency.	Positive floating-point number

## 11.3 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→  79)
- Advanced settings using the **Advanced setup** submenu (→  102)




## 11.4 Performing a totalizer reset

The totalizers are reset in the **Operation** submenu:





- Control Totalizer
- Reset all totalizers

### Navigation

"Operation" menu → Totalizer handling

► Totalizer handling	
Control Totalizer 1 to n	→  125
Preset value 1 to n	→  125
Reset all totalizers	→  125

### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer 1 to n	One of the following options is selected in the <b>Assign process variable</b> parameter (→  104) of the <b>Totalizer 1 to n</b> submenu: Volume flow	Control totalizer value.	<ul style="list-style-type: none"> <li>■ Totalize</li> <li>■ Reset + hold</li> <li>■ Preset + hold</li> <li>■ Reset + totalize</li> <li>■ Preset + totalize</li> <li>■ Hold</li> </ul>	Totalize
Preset value 1 to n	One of the following options is selected in the <b>Assign process variable</b> parameter (→  104) of the <b>Totalizer 1 to n</b> submenu: Volume flow	Specify start value for totalizer. <i>Dependency</i>  The unit of the selected process variable is specified for the totalizer in the <b>Unit totalizer</b> parameter (→  104).	Signed floating-point number	0.1
Reset all totalizers	–	Reset all totalizers to 0 and start.	<ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Reset + totalize</li> </ul>	Cancel

### 11.4.1 Function scope of the "Control Totalizer" parameter

Options	Description
Totalize	The totalizer is started or continues running.
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 <b>Preset value</b> parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.

Options	Description
Preset + totalize	The totalizer is set to the defined start value from the <b>Preset value</b> parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

#### 11.4.2 Function scope of the "Reset all totalizers" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
Reset + totalize	Resets all totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totaled.

## 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 → 37.
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. Terminals are not plugged into the main electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective. Main electronics module is defective.	Order spare part → 149.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul style="list-style-type: none"> <li>Set the display brighter by simultaneously pressing <math>\boxed{+}</math> + <math>\boxed{E}</math>.</li> <li>Set the display darker by simultaneously pressing <math>\boxed{-}</math> + <math>\boxed{E}</math>.</li> </ul>
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 → 149.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	<ol style="list-style-type: none"> <li>Press <math>\boxed{-}</math> + <math>\boxed{+}</math> for 2 s ("home position").</li> <li>Press <math>\boxed{E}</math>.</li> <li>Set the desired language in the <b>Display language</b> parameter (→ 107).</li> </ol>
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul style="list-style-type: none"> <li>Check the cable and the connector between the main electronics module and display module.</li> <li>Order spare part → 149.</li> </ul>

*For output signals*

Error	Possible causes	Solution
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 149.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Configuration error	Check and correct the parameter configuration.
Device measures incorrectly.	Configuration error or device is operated outside the application.	<ol style="list-style-type: none"> <li>Check and correct parameter configuration.</li> <li>Observe limit values specified in the "Technical Data".</li> </ol>

*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 <b>OFF</b> position → 118.
No write access to parameters	Current user role has limited access authorization	1. Check user role → 60. 2. Enter correct customer-specific access code → 60.
No connection via Modbus RS485	Modbus RS485 bus cable connected incorrectly	Check terminal assignment → 37.
No connection via Modbus RS485	Modbus RS485 cable incorrectly terminated	Check terminating resistor → 46.
No connection via Modbus RS485	Incorrect settings for the communication interface	Check the Modbus RS485 configuration → 82.
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 → 67.
	Incorrect setting for the Ethernet interface of the computer	1. Check the properties of the Internet protocol (TCP/IP) → 63. 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 → 63
Not connecting to Web server	Incorrect WLAN access data	<ul style="list-style-type: none"> <li>Check WLAN network status.</li> <li>Log on to the device again using WLAN access data.</li> <li>Verify that WLAN is enabled on the measuring device and operating device.</li> </ul>
	WLAN communication disabled	–
Not connecting to Web server, FieldCare or DeviceCare	No WLAN network available	<ul style="list-style-type: none"> <li>Check if WLAN reception is present: LED on display module is lit blue</li> <li>Check if WLAN connection is enabled: LED on display module flashes blue</li> <li>Switch on instrument function.</li> </ul>
Network connection not present or unstable	WLAN network is weak.	<ul style="list-style-type: none"> <li>Operating device is outside of reception range: Check network status on operating device.</li> <li>To improve network performance, use an external WLAN antenna.</li> </ul>
	Parallel WLAN and Ethernet communication	<ul style="list-style-type: none"> <li>Check network settings.</li> <li>Temporarily enable only the WLAN as an interface.</li> </ul>
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. 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. 2. Clear the Web browser cache and restart the Web browser.

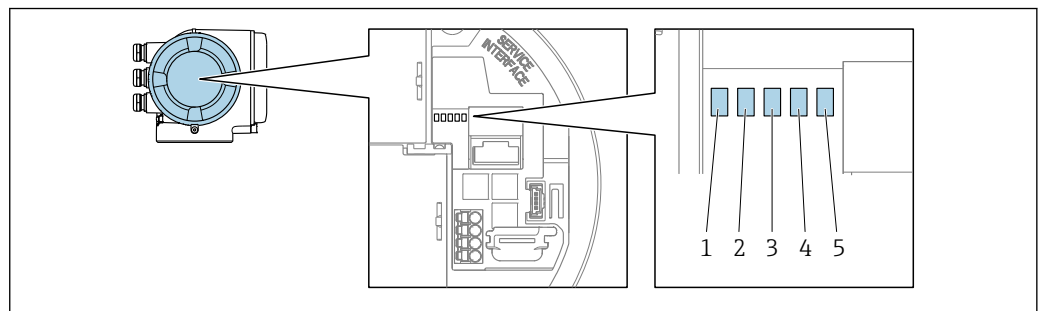


Error	Possible causes	Solution
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
No or incomplete display of contents in the Web browser	<ul style="list-style-type: none"> <li>JavaScript not enabled</li> <li>JavaScript cannot be enabled</li> </ul>	<ol style="list-style-type: none"> <li>1. Enable JavaScript.</li> <li>2. Enter <code>http://XXX.XXX.X.XXX/basic.html</code> as the IP address.</li> </ol>
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.



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- 1 Supply voltage
- 2 Device status
- 3 Not used
- 4 Communication
- 5 Service interface (CDI) active

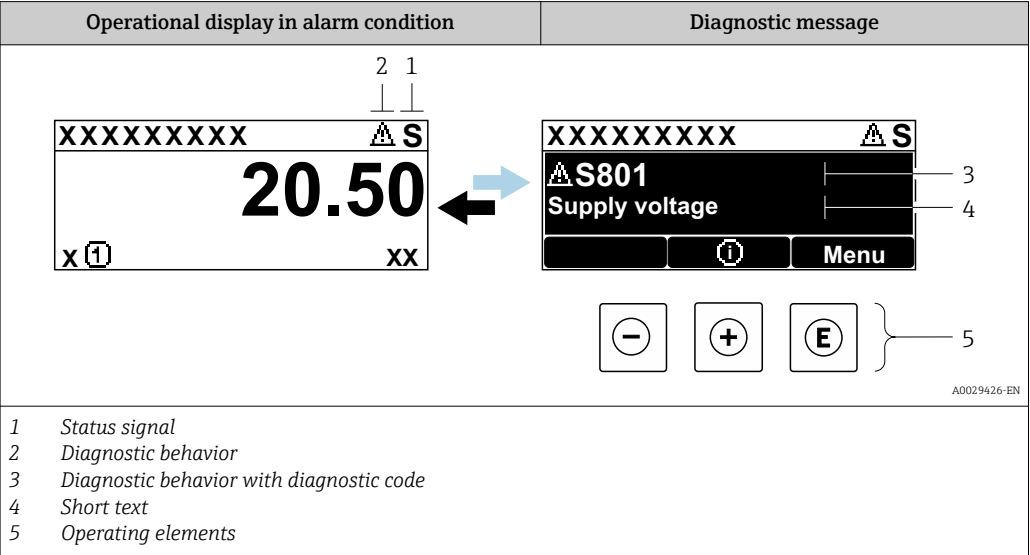
LED	Color	Meaning
1 Supply voltage	Off	Supply voltage is off or too low.
	Green	Supply voltage is ok.
2 Device status	Off	Firmware error
	Green	Device status is ok.
	Flashing green	Device is not configured.
	Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
	Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
	Flashing red/green	The device restarts.
3 Not used	–	–
4 Communication	White	Communication active.
	Off	Communication not active.

LED	Color	Meaning
5    Service interface (CDI)	Off	Not connected or no connection established.
	Yellow	Connected and connection established.
	Flashing yellow	Service interface active.



## 12.3 Diagnostic information on local display

### 12.3.1 Diagnostic message

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




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

-  Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
  - Via parameter
  - Via submenus →  141



#### Status signals

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

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

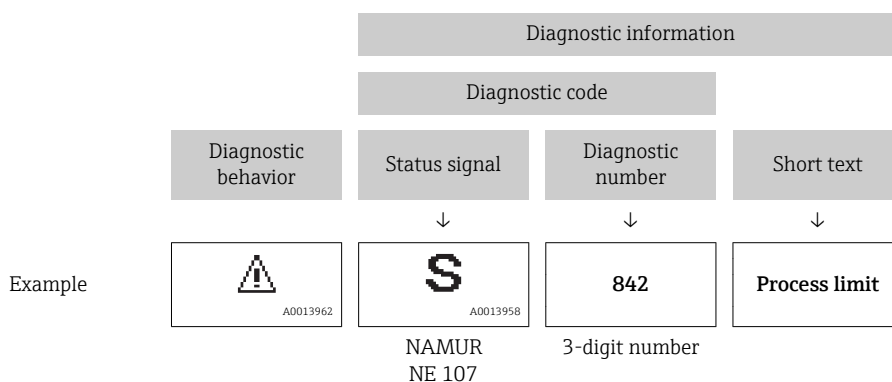
Symbol	Meaning
F	<b>Failure</b> A device error has occurred. The measured value is no longer valid.
C	<b>Function check</b> The device is in service mode (e.g. during a simulation).
S	<b>Out of specification</b> The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)
M	<b>Maintenance required</b> Maintenance is required. The measured value remains valid.

## Diagnostic behavior



Symbol	Meaning
	<b>Alarm</b> <ul style="list-style-type: none"> <li>■ Measurement is interrupted.</li> <li>■ Signal outputs and totalizers assume the defined alarm condition.</li> <li>■ A diagnostic message is generated.</li> </ul>
	<b>Warning</b> Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

## Diagnostic information

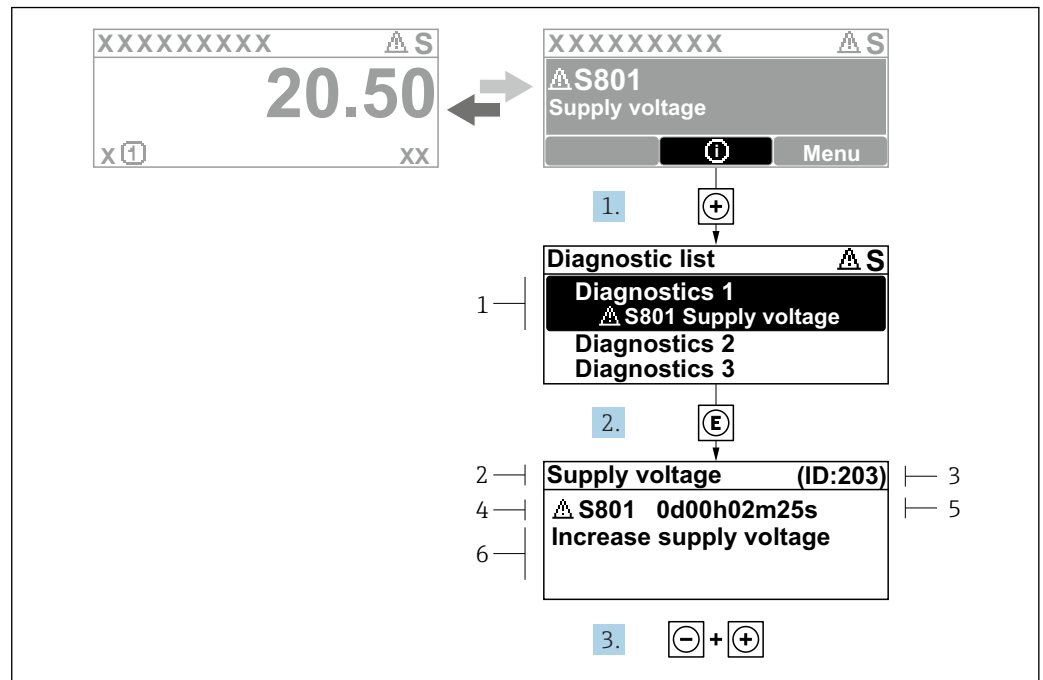
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



## Operating elements

Key	Meaning
	<b>Plus key</b> <i>In a menu, submenu</i> Opens the message about remedy information.
	<b>Enter key</b> <i>In a menu, submenu</i> Opens the operating menu.

### 12.3.2 Calling up remedial measures



31 Message about remedial measures

- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time of occurrence
- 6 Remedial measures

1. The user is in the diagnostic message.  
Press  $\oplus$  (① symbol).  
↳ The **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with  $\oplus$  or  $\ominus$  and press  $\boxplus$ .  
↳ The message about the remedial measures opens.
3. Press  $\ominus + \oplus$  simultaneously.  
↳ The message about the remedial measures closes.

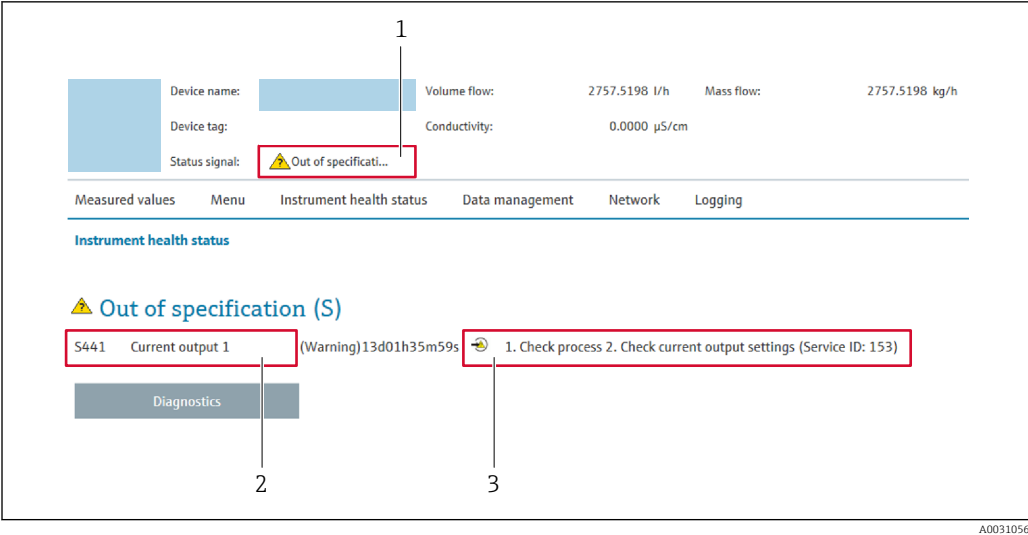
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

1. Press  $\boxplus$ .  
↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press  $\ominus + \oplus$  simultaneously.  
↳ The message for the remedial measures closes.

## 12.4 Diagnostic information in the Web browser

### 12.4.1 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 → 132
- 3 Remedy information with Service ID

**i** In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:

- Via parameter
- Via submenu → 141

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

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

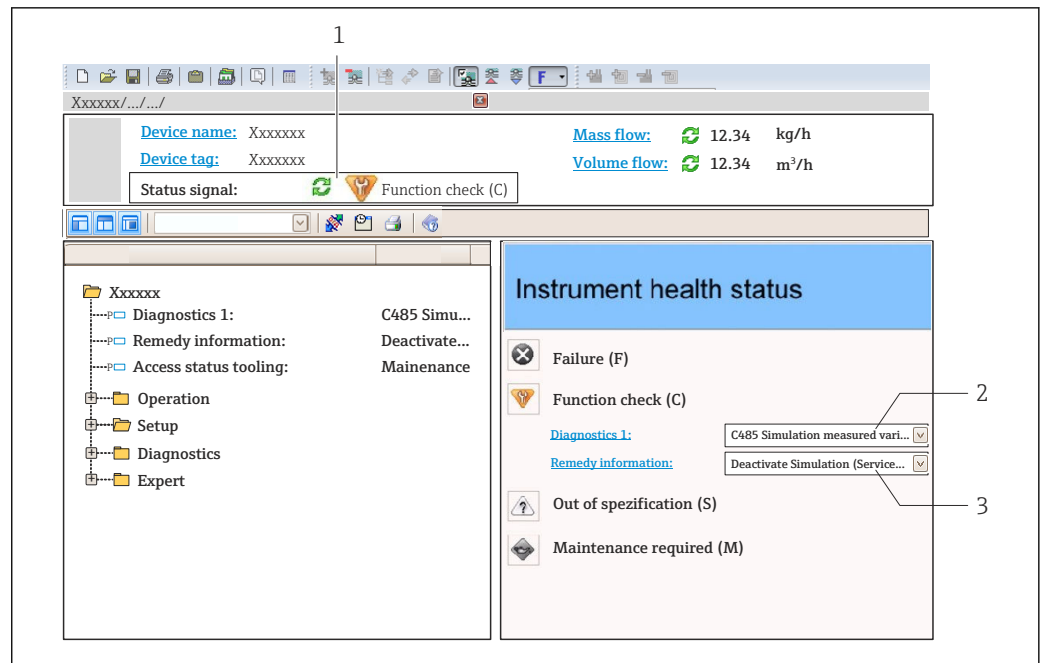
12.4.2 Calling up remedy information

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.

12.5 Diagnostic information in DeviceCare or FieldCare

12.5.1 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.



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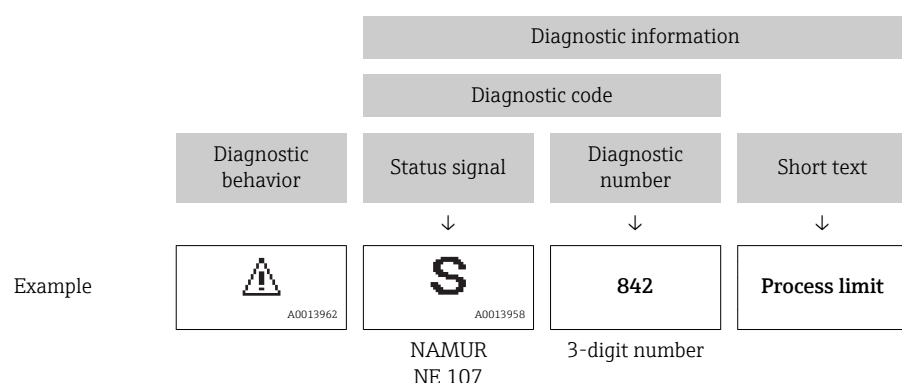
- 1 Status area with status signal → 131
- 2 Diagnostic information → 132
- 3 Remedy information with Service ID

**i** In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:

- Via parameter
- Via submenu → 141

### Diagnostic information

The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



### 12.5.2 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.

12.6 Diagnostic information via communication interface

12.6.1 Reading out diagnostic information

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

- Via register address **6821** (data type = string): diagnosis code, e.g. F270
- Via register address **6859** (data type = integer): diagnosis number, e.g. 270



 For an overview of diagnostic events with diagnosis number and diagnosis code  
→  137

12.6.2 Configuring error response mode

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

**Navigation path**  
Setup → Communication

*Parameter overview with brief description*

Parameters	Description	Selection	Factory setting
Failure mode	Select measured value output behavior when a diagnostic message occurs via Modbus communication. <div> This effect of this parameter depends on the option selected in the <b>Assign diagnostic behavior</b> parameter.</div>	<ul style="list-style-type: none"><li>▪ NaN value</li><li>▪ Last valid value</li></ul> <div> NaN ≡ not a number</div>	NaN value

12.7 Adapting the diagnostic information

12.7.1 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


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



Options	Description
Alarm	The device stops measurement. The measured value output via Modbus RS485 and the totalizers assume the defined alarm condition. A diagnostic message is generated. The background lighting changes to red.
Warning	The device continues to measure. The measured value output via Modbus RS485 and the totalizers are not affected. A diagnostic message is generated.



Options	Description
Logbook entry only	The device continues to measure. The diagnostic message is displayed only in the <b>Event logbook</b> submenu ( <b>Event list</b> submenu) and is not displayed in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

## 12.8 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 →  136

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
<b>Diagnostic of sensor</b>				
043	Sensor short circuit	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	S	Warning <sup>1)</sup>
082	Data storage	1. Check module connections 2. Contact service	F	Alarm
083	Memory content	1. Restart device 2. Restore HistoROM S-DAT backup ('Device reset' parameter) 3. Replace HistoROM S-DAT	F	Alarm
169	Conductivity measurement failed	1. Check grounding conditions 2. Deactivate conductivity measurement	M	Warning
170	Coil resistance	Check ambient and process temperature	F	Alarm
180	Temperature sensor defective	1. Check sensor connections 2. Replace sensor cable or sensor 3. Turn off temperature measurement	F	Warning
181	Sensor connection	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	F	Alarm
<b>Diagnostic of electronic</b>				
201	Device failure	1. Restart device 2. Contact service	F	Alarm
242	Software incompatible	1. Check software 2. Flash or change main electronics module	F	Alarm
252	Modules incompatible	1. Check electronic modules 2. Change electronic modules	F	Alarm
252	Modules incompatible	1. Check if correct electronic modul is plugged 2. Replace electronic module	F	Alarm
262	Sensor electronic connection faulty	1. Check or replace connection cable between sensor electronic module (ISEM) and main electronics 2. Check or replace ISEM or main electronics	F	Alarm
270	Main electronic failure	Change main electronic module	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
271	Main electronic failure	1. Restart device 2. Change main electronic module	F	Alarm
272	Main electronic failure	1. Restart device 2. Contact service	F	Alarm
273	Main electronic failure	Change electronic	F	Alarm
275	I/O module 1 to n defective	Change I/O module	F	Alarm
276	I/O module 1 to n faulty	1. Restart device 2. Change I/O module	F	Alarm
283	Memory content	1. Reset device 2. Contact service	F	Alarm
302	Device verification active	Device verification active, please wait.	C	Warning
311	Electronic failure	1. Do not reset device 2. Contact service	M	Warning
332	Writing in embedded HistoROM failed	Replace user interface board Ex d/XP: replace transmitter	F	Alarm
361	I/O module 1 to n faulty	1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics	F	Alarm
372	Sensor electronic (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	F	Alarm
373	Sensor electronic (ISEM) faulty	1. Transfer data or reset device 2. Contact service	F	Alarm
375	I/O- 1 to n communication failed	1. Restart device 2. Check if failure recurs 3. Replace module rack inclusive electronic modules	F	Alarm
376	Sensor electronic (ISEM) faulty	1. Replace sensor electronic module (ISEM) 2. Turn off diagnostic message	S	Warning <sup>1)</sup>
377	Sensor electronic (ISEM) faulty	1. Check sensor cable and sensor 2. Perform Heartbeat Verification 3. Replace sensor cable or sensor	S	Warning <sup>1)</sup>
382	Data storage	1. Insert T-DAT 2. Replace T-DAT	F	Alarm
383	Memory content	1. Restart device 2. Delete T-DAT via 'Reset device' parameter 3. Replace T-DAT	F	Alarm
387	HistoROM backup failed	Contact service organization	F	Alarm
512	Sensor electronic (ISEM) faulty	1. Check ECC recovery time 2. Turn off ECC	F	Alarm
<b>Diagnostic of configuration</b>				
303	I/O 1 to n configuration changed	1. Apply I/O module configuration (parameter 'Apply I/O configuration') 2. Afterwards reload device description and check wiring	M	Warning
330	Flash file invalid	1. Update firmware of device 2. Restart device	M	Warning


Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
331	Firmware update failed	1. Update firmware of device 2. Restart device	F	Warning
410	Data transfer	1. Check connection 2. Retry data transfer	F	Alarm
412	Processing download	Download active, please wait	C	Warning
431	Trim 1 to n	Carry out trim	C	Warning
437	Configuration incompatible	1. Restart device 2. Contact service	F	Alarm
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
441	Current output 1 to n	1. Check process 2. Check current output settings	S	Warning
442	Frequency output 1 to n	1. Check process 2. Check frequency output settings	S	Warning
443	Pulse output 1 to n	1. Check process 2. Check pulse output settings	S	Warning
444	Current input 1 to n	1. Check process 2. Check current input settings	S	Warning
453	Flow override	Deactivate flow override	C	Warning
484	Failure mode simulation	Deactivate simulation	C	Alarm
485	Measured variable simulation	Deactivate simulation	C	Warning
486	Current input 1 to n simulation	Deactivate simulation	C	Warning
491	Current output 1 to n simulation	Deactivate simulation	C	Warning
492	Simulation frequency output 1 to n	Deactivate simulation frequency output	C	Warning
493	Simulation pulse output 1 to n	Deactivate simulation pulse output	C	Warning
494	Switch output simulation 1 to n	Deactivate simulation switch output	C	Warning
495	Diagnostic event simulation	Deactivate simulation	C	Warning
496	Status input simulation	Deactivate simulation status input	C	Warning
502	CT activation/deactivation failed	Follow the sequence of the custody transfer activation/deactivation: First authorized user login, then set the DIP switch on the main electronic module	C	Warning
511	ISEM settings faulty	1. Check measuring period and integration time 2. Check sensor properties	C	Alarm
520	I/O 1 to n hardware configuration invalid	1. Check I/O hardware configuration 2. Replace wrong I/O module 3. Plug the module of double pulse output on correct slot	F	Alarm
530	Electrode cleaning is running	Turn off ECC	C	Warning





Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
531	Empty pipe adjustment faulty	Execute EPD adjustment	S	Warning <sup>1)</sup>
537	Configuration	1. Check IP addresses in network 2. Change IP address	F	Warning
540	Custody transfer mode failed	1. Check electronic components 2. Check parameter settings 3. Deactivate custody transfer mode 4. Reactivate custody transfer mode	F	Alarm
543	Double pulse output	1. Check process 2. Check pulse output settings	S	Warning
593	Double pulse output simulation	Deactivate simulation pulse output	C	Warning
594	Relay output simulation	Deactivate simulation switch output	C	Warning
599	Custody transfer logbook full	1. Deactivate custody transfer mode 2. Clear custody transfer logbook (all 30 entries) 3. Activate custody transfer mode	F	Warning
<b>Diagnostic of process</b>				
803	Current loop	1. Check wiring 2. Change I/O module	F	Alarm
832	Electronic temperature too high	Reduce ambient temperature	S	Warning <sup>1)</sup>
833	Electronic temperature too low	Increase ambient temperature	S	Warning <sup>1)</sup>
834	Process temperature too high	Reduce process temperature	S	Warning <sup>1)</sup>
835	Process temperature too low	Increase process temperature	S	Warning <sup>1)</sup>
842	Process limit	Low flow cut off active! 1. Check low flow cut off configuration	S	Warning
882	Input signal	1. Check input configuration 2. Check external device or process conditions	F	Alarm
937	Sensor symmetry	1. Eliminate external magnetic field near sensor 2. Turn off diagnostic message	S	Warning <sup>1)</sup>
938	EMC interference	1. Check ambient conditions regarding EMC influence 2. Turn off diagnostic message	F	Alarm <sup>1)</sup>
961	Electrode potential out of specification	1. Check process conditions 2. Check ambient conditions	S	Warning
962	Pipe empty	1. Perform full pipe adjustment 2. Perform empty pipe adjustment 3. Turn off empty pipe detection	S	Warning <sup>1)</sup>



1) Diagnostic behavior can be changed.

## 12.9 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 local display →  133
- Via Web browser →  134
- Via "FieldCare" operating tool →  135
- Via "DeviceCare" operating tool →  135


 Other pending diagnostic events can be displayed in the **Diagnostic list** submenu  
→  141

### Navigation

"Diagnostics" menu

 <b>Diagnostics</b>	
Actual diagnostics	→  141
Previous diagnostics	→  141
Operating time from restart	→  141
Operating time	→  141

### Parameter overview with brief description

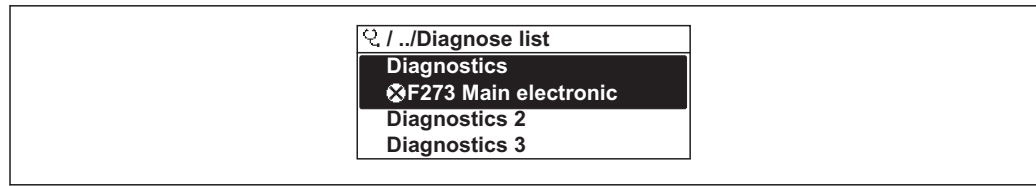
Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occurred diagnostic event along with its diagnostic information.  If two or more messages occur simultaneously, the message with the highest priority is shown on the display.	Symbol 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)

## 12.10 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



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32 Taking the example of the local display

**i** To call up the measures to rectify a diagnostic event:

- Via local display → 133
- Via Web browser → 134
- Via "FieldCare" operating tool → 135
- Via "DeviceCare" operating tool → 135

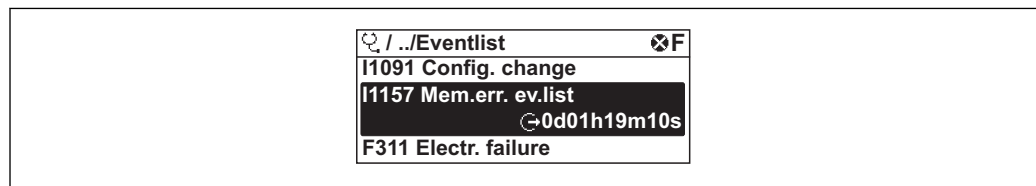
## 12.11 Event logbook

### 12.11.1 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



A0014008-EN

33 Taking the example of the local display

- A maximum of 20 event messages can be displayed in chronological order.
- If the **Extended HistoROM** application package (order option) is enabled in the device, the event list can contain up to 100 entries .

The event history includes entries for:

- Diagnostic events → 137
- Information events → 143

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

**i** To call up the measures to rectify a diagnostic event:

- Via local display → 133
- Via Web browser → 134
- Via "FieldCare" operating tool → 135
- Via "DeviceCare" operating tool → 135

**i** For filtering the displayed event messages → 143

### 12.11.2 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)


### 12.11.3 Overview of information events

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

Info number	Info name
I1000	----- (Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I1092	HistoROM backup deleted
I1137	Electronic changed
I1151	History reset
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1184	Display connected
I1256	Display: access status changed
I1278	I/O module reset detected
I1335	Firmware changed
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1361	Web server: login failed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1443	Coating thickness not determined
I1444	Device verification passed
I1445	Device verification failed
I1457	Measured error verification failed
I1459	I/O module verification failed
I1461	Sensor verification failed
I1462	Sensor electronic module verif. failed
I1512	Download started

Info number	Info name
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1517	Custody transfer active
I1518	Custody transfer inactive
I1618	I/O module 2 replaced
I1619	I/O module 3 replaced
I1621	I/O module 4 replaced
I1622	Calibration changed
I1624	Reset all totalizers
I1625	Write protection activated
I1626	Write protection deactivated
I1627	Web server: login successful
I1628	Display: login successful
I1629	CDI: login successful
I1631	Web server access changed
I1632	Display login failed
I1633	CDI: login failed
I1634	Reset to factory settings
I1635	Reset to delivery settings
I1639	Max. switch cycles number reached
I1643	Custody transfer logbook cleared
I1649	Hardware write protection activated
I1650	Hardware write protection deactivated
I1651	Custody transfer parameter changed
I1712	New flash file received
I1725	Sensor electronic module (ISEM) changed
I1726	Configuration backup failed

## 12.12 Resetting the measuring device

Using the **Device reset** parameter (→  113) it is possible to reset the entire device configuration or some of the configuration to a defined state.

### 12.12.1 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.
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.
Restore S-DAT backup	Restore the data that are saved on the S-DAT. The data record is restored from the electronics memory to the S-DAT.



### 12.13 Device information

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



**Navigation**

"Diagnostics" menu → Device information

► Device information		
Device tag		→ ⓘ 145
Serial number		→ ⓘ 145
Firmware version		→ ⓘ 145
Device name		→ ⓘ 145
Order code		→ ⓘ 145
Extended order code 1		→ ⓘ 145
Extended order code 2		→ ⓘ 146
Extended order code 3		→ ⓘ 146
ENP version		→ ⓘ 146

**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
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. ⓘ The name can be found on the nameplate of the transmitter.	Promag300/500	–
Order code	Shows the device order code. ⓘ 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. ⓘ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–

Parameter	Description	User interface	Factory setting
Extended order code 2	Shows the 2nd part of the extended order code.  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.  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

## 12.14 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
08.2016	01.00.zz	Option 74	Original firmware	Operating Instructions	BA01395D/06/EN/01.16
10.2017	01.01.zz	Option 67	<ul style="list-style-type: none"> <li>■ Local display - enhanced performance and data entry via text editor</li> <li>■ Optimized keypad lock for local display</li> <li>■ Web server feature update               <ul style="list-style-type: none"> <li>– Support for trend data function</li> <li>– Heartbeat function enhanced to include detailed results (page 3/4 of the report)</li> <li>– Device configuration as PDF (parameter log, similar to FDT print)</li> </ul> </li> <li>■ Network capability of Ethernet (service) interface</li> <li>■ Comprehensive Heartbeat feature update</li> <li>■ Local display - support for WLAN infrastructure mode</li> <li>■ Implementation of reset code</li> </ul>	Operating Instructions	BA01395D/06/EN/02.17



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](http://www.endress.com) → Downloads
- Specify the following details:
  - Product root: e.g. 5P3B  
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) →  178

### 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: →  151

### 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](http://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 (→  145) 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](http://www.endress.com).

### 15.1 Device-specific accessories



#### 15.1.1 For the transmitter

Accessories	Description
Transmitter Promag 300	<p>Transmitter for replacement or storage. Use the order code to define the following specifications:</p> <ul style="list-style-type: none"> <li>▪ Approvals</li> <li>▪ Output</li> <li>▪ Input</li> <li>▪ Display / operation</li> <li>▪ Housing</li> <li>▪ Software</li> </ul> <p> Order code: 5X3BXX</p> <p> For details, see Installation Instructions EA01150</p>
Remote display and operating module DKX001	<ul style="list-style-type: none"> <li>▪ If ordered directly with the measuring device: Order code for "Display; operation", option <b>O</b> "Separate 4-line display, illum.; 10 m (30 ft) Cable; touch control".</li> <li>▪ If ordered separately: <ul style="list-style-type: none"> <li>– Measuring device: order code for "Display; operation", option <b>M</b> "None, prepared for separate display".</li> <li>– DKX001: Via the separate product structure DKX001.</li> </ul> </li> <li>▪ If ordered subsequently: DKX001: Via the separate product structure DKX001.</li> </ul> <p><b>Mounting bracket for DKX001</b></p> <ul style="list-style-type: none"> <li>▪ Ordered directly with the DKX001: Order code for "Enclosed accessories", option <b>RA</b> "Mounting bracket, 1 1/2" pipe".</li> <li>▪ If ordered subsequently: order number: 71340960</li> </ul> <p><b>Connecting cable (replacement cable)</b> Via the separate product structure: DKX002</p> <p> Further information on display and operating module DKX001 →  172.</p> <p> For details, see Special Documentation SD01763D</p>
External WLAN antenna	<p>External WLAN antenna with 2 m (6.6 ft) connecting cable and two angle brackets. Order code for "Enclosed accessories", option <b>P8</b> "Wireless antenna wide area".</p> <p> Further information on the WLAN interface →  69.</p>
Protective cover	<p>Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.</p> <p> Order number: 71343505</p> <p> For details, see Installation Instructions EA01160</p>
Ground cable	Set, consisting of two ground cables for potential equalization.


### 15.1.2 For the sensor

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

## 15.2 Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> <li>Choice of measuring devices for industrial requirements</li> <li>Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy.</li> <li>Graphic illustration of the calculation results</li> <li>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.</li> </ul> <p>Applicator is available:</p> <ul style="list-style-type: none"> <li>Via the Internet: <a href="https://wapps.endress.com/applicator">https://wapps.endress.com/applicator</a></li> <li>As a downloadable DVD for local PC installation.</li> </ul>
W@M	<p>W@M Life Cycle Management</p> <p>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.</p> <p>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.</p> <p>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit <a href="http://www.endress.com/lifecyclemanagement">www.endress.com/lifecyclemanagement</a></p>
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>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.</p> <p> For details, see Operating Instructions BA00027S and BA00059S</p>
DeviceCare	<p>Tool for connecting and configuring Endress+Hauser field devices.</p> <p> For details, see Innovation brochure IN01047S</p>

## 15.3 System components

Accessories	Description
Memograph M graphic data manager	<p>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.</p> <p> For details, see "Technical Information" TI00133R and Operating Instructions BA00247R</p>



## 16 Technical data

### 16.1 Application


The measuring device is only suitable for flow measurement of liquids with a minimum conductivity of 5  $\mu\text{S}/\text{cm}$ .

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 <i>Faraday's law of magnetic induction</i> .
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Measuring system	<p>The device consists of a transmitter and a sensor.</p> <p>The device is available as a compact version: The transmitter and sensor form a mechanical unit.</p> <p>For information on the structure of the device →  15</p>
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### 16.3 Input

Measured variable	<p><b>Direct measured variables</b></p> <ul style="list-style-type: none"> <li>■ Volume flow (proportional to induced voltage)</li> <li>■ Electrical conductivity</li> </ul> <p><b>Calculated measured variables</b></p> <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>
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Measuring range	Typically $v = 0.01$ to $10 \text{ m/s}$ ( $0.03$ to $33 \text{ ft/s}$ ) with the specified accuracy
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*Flow characteristic values in SI units*

Nominal diameter		Recommended flow	Factory settings		
[mm]	[in]	min./max. full scale value ( $v \sim 0.3/10 \text{ m/s}$ )	Full scale value current output ( $v \sim 2.5 \text{ m/s}$ )	Pulse value ( $\sim 2 \text{ pulse/s}$ )	Low flow cut off ( $v \sim 0.04 \text{ m/s}$ )
		[ $\text{dm}^3/\text{min}$ ]	[ $\text{dm}^3/\text{min}$ ]	[ $\text{dm}^3$ ]	[ $\text{dm}^3/\text{min}$ ]
15	$\frac{1}{2}$	4 to 100	25	0.2	0.5
25	1	9 to 300	75	0.5	1
32	–	15 to 500	125	1	2
40	$1 \frac{1}{2}$	25 to 700	200	1.5	3
50	2	35 to 1100	300	2.5	5
65	–	60 to 2000	500	5	8

Nominal diameter		Recommended flow min./max. full scale value (v ~ 0.3/10 m/s)	Factory settings		
			Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
80	3	90 to 3 000	750	5	12
100	4	145 to 4 700	1200	10	20
125	–	220 to 7 500	1850	15	30
150	6	20 to 600 m³/h	150 m³/h	0.03 m³	2.5 m³/h
200	8	35 to 1 100 m³/h	300 m³/h	0.05 m³	5 m³/h
250	10	55 to 1 700 m³/h	500 m³/h	0.05 m³	7.5 m³/h
300	12	80 to 2 400 m³/h	750 m³/h	0.1 m³	10 m³/h
350	14	110 to 3 300 m³/h	1 000 m³/h	0.1 m³	15 m³/h
400	16	140 to 4 200 m³/h	1 200 m³/h	0.15 m³	20 m³/h
450	18	180 to 5 400 m³/h	1 500 m³/h	0.25 m³	25 m³/h
500	20	220 to 6 600 m³/h	2 000 m³/h	0.25 m³	30 m³/h
600	24	310 to 9 600 m³/h	2 500 m³/h	0.3 m³	40 m³/h

*Flow characteristic values in US units*

Nominal diameter		Recommended flow min./max. full scale value (v ~ 0.3/10 m/s)	Factory settings		
			Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
½	15	1.0 to 27	6	0.1	0.15
1	25	2.5 to 80	18	0.2	0.25
1 ½	40	7 to 190	50	0.5	0.75
2	50	10 to 300	75	0.5	1.25
3	80	24 to 800	200	2	2.5
4	100	40 to 1 250	300	2	4
6	150	90 to 2 650	600	5	12
8	200	155 to 4 850	1 200	10	15
10	250	250 to 7 500	1 500	15	30
12	300	350 to 10 600	2 400	25	45
14	350	500 to 15 000	3 600	30	60
16	400	600 to 19 000	4 800	50	60
18	450	800 to 24 000	6 000	50	90
20	500	1 000 to 30 000	7 500	75	120
24	600	1 400 to 44 000	10 500	100	180

**Recommended measuring range**

"Flow limit" section →  166

## 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:

- Medium temperature to increase the accuracy of the electrical conductivity (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 → 152

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

Corrected volume flow

*Current input*

The measured values are written from the automation system to the measuring device via the current input → 155.

*Digital communication*

The measured values are written from the automation system to the measuring device via Modbus RS485.

**Current input 0/4 to 20 mA**

<b>Current input</b>	0/4 to 20 mA (active/passive)
<b>Current span</b>	<ul style="list-style-type: none"> <li>■ 4 to 20 mA (active)</li> <li>■ 0/4 to 20 mA (passive)</li> </ul>
<b>Resolution</b>	1 µA
<b>Voltage drop</b>	Typically: 0.6 to 2 V for 3.6 to 22 mA (passive)
<b>Maximum input voltage</b>	≤ 30 V (passive)
<b>Open-circuit voltage</b>	≤ 28.8 V (active)
<b>Possible input variables</b>	<ul style="list-style-type: none"> <li>■ Pressure</li> <li>■ Temperature</li> <li>■ Density</li> </ul>

**Status input**

<b>Maximum input values</b>	<ul style="list-style-type: none"> <li>■ DC –3 to 30 V</li> <li>■ If status input is active (ON): <math>R_i &gt; 3 \text{ k}\Omega</math></li> </ul>
<b>Response time</b>	Adjustable: 5 to 200 ms
<b>Input signal level</b>	<ul style="list-style-type: none"> <li>■ Low signal: DC –3 to +5 V</li> <li>■ High signal: DC 12 to 30 V</li> </ul>
<b>Assignable functions</b>	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Reset the individual totalizers separately</li> <li>■ Reset all totalizers</li> <li>■ Flow override</li> </ul>


## 16.4 Output

### Output signal


#### Modbus RS485

Physical interface	RS485 in accordance with EIA/TIA-485 standard
Terminating resistor	Integrated, can be activated via DIP switches

#### Current output 0/4 to 20 mA

Current output	0/4 to 20 mA
Maximum output values	22.5 mA
Current span	Can be set to: <ul style="list-style-type: none"> <li>■ 4 to 20 mA (active)</li> <li>■ 0/4 to 20 mA (passive)</li> </ul>  Ex-i, passive
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	0 to 700 Ω
Resolution	0.38 µA
Damping	Adjustable: 0.07 to 999 s
Assignable measured variables	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity</li> <li>■ Corrected conductivity</li> <li>■ Temperature</li> <li>■ Electronic temperature</li> </ul>

#### Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Open collector Can be set to: <ul style="list-style-type: none"> <li>■ Active</li> <li>■ Passive</li> </ul>  Ex-i, passive
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
<b>Pulse output</b>	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Pulse width	Adjustable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable

Assignable measured variables	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>
<b>Frequency output</b>	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Output frequency	Adjustable: end value frequency 2 to 10 000 Hz ( $f_{\max} = 12\,500$ Hz)
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity</li> <li>■ Corrected conductivity</li> <li>■ Temperature</li> <li>■ Electronic temperature</li> </ul>
<b>Switch output</b>	
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> <li>■ Diagnostic behavior</li> <li>■ Limit value: <ul style="list-style-type: none"> <li>- Off</li> <li>- Volume flow</li> <li>- Mass flow</li> <li>- Corrected volume flow</li> <li>- Flow velocity</li> <li>- Conductivity</li> <li>- Corrected conductivity</li> <li>- Totalizer 1-3</li> <li>- Temperature</li> <li>- Electronic temperature</li> </ul> </li> <li>■ Flow direction monitoring</li> <li>■ Status <ul style="list-style-type: none"> <li>- Empty pipe detection</li> <li>- Low flow cut off</li> </ul> </li> </ul>

### Double pulse output

Function	Double pulse
Version	Open collector Can be set to: <ul style="list-style-type: none"> <li>■ Active</li> <li>■ Passive</li> </ul>
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: $\leq$ DC 2 V
Output frequency	Adjustable: 0 to 1 000 Hz

<b>Damping</b>	Adjustable: 0 to 999 s
<b>Pulse/pause ratio</b>	1:1
<b>Assignable measured variables</b>	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Conductivity</li> <li>■ Corrected conductivity</li> <li>■ Temperature</li> <li>■ Electronic temperature</li> </ul>

### Relay output

<b>Function</b>	Switch output
<b>Version</b>	Relay output, galvanically isolated
<b>Switching behavior</b>	Can be set to: <ul style="list-style-type: none"> <li>■ NO (normally open), factory setting</li> <li>■ NC (normally closed)</li> </ul>
<b>Maximum switching capacity (passive)</b>	<ul style="list-style-type: none"> <li>■ DC 30 V, 0.1 A</li> <li>■ AC 30 V, 0.5 A</li> </ul>
<b>Assignable functions</b>	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> <li>■ Diagnostic behavior</li> <li>■ Limit value:               <ul style="list-style-type: none"> <li>– Off</li> <li>– Volume flow</li> <li>– Mass flow</li> <li>– Corrected volume flow</li> <li>– Flow velocity</li> <li>– Conductivity</li> <li>– Corrected conductivity</li> <li>– Totalizer 1-3</li> <li>– Temperature</li> <li>– Electronic temperature</li> </ul> </li> <li>■ Flow direction monitoring</li> <li>■ Status               <ul style="list-style-type: none"> <li>– Empty pipe detection</li> <li>– Low flow cut off</li> </ul> </li> </ul>

### User configurable input/output

**One** specific input or output is assigned to a user-configurable input/output (configurable I/O) during device commissioning.

The following inputs and outputs are available for assignment:

- Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Pulse/frequency/switch output
- Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Status input

The technical values correspond to those of the inputs and outputs described in this section.

Signal on alarm

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

### Modbus RS485

<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ NaN value instead of current value</li> <li>■ Last valid value</li> </ul>
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**Current output 0/4 to 20 mA***4 to 20 mA*

<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ 4 to 20 mA in accordance with NAMUR recommendation NE 43</li> <li>■ 4 to 20 mA in accordance with US</li> <li>■ Min. value: 3.59 mA</li> <li>■ Max. value: 22.5 mA</li> <li>■ Freely definable value between: 3.59 to 22.5 mA</li> <li>■ Actual value</li> <li>■ Last valid value</li> </ul>
---------------------	--

*0 to 20 mA*

<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Maximum alarm: 22 mA</li> <li>■ Freely definable value between: 0 to 20.5 mA</li> </ul>
---------------------	---

**Pulse/frequency/switch output**

Pulse output	
<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ No pulses</li> </ul>
Frequency output	
<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ 0 Hz</li> <li>■ Defined value (<math>f_{\max}</math> 2 to 12 500 Hz)</li> </ul>
Switch output	
<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Current status</li> <li>■ Open</li> <li>■ Closed</li> </ul>

**Relay output**

<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Current status</li> <li>■ Open</li> <li>■ Closed</li> </ul>
---------------------	---

**Local display**

<b>Plain text display</b>	With information on cause and remedial measures
<b>Backlight</b>	Red backlighting indicates a device error.



Status signal as per NAMUR recommendation NE 107

**Interface/protocol**


- Via digital communication:  
Modbus RS485
- Via service interface
  - CDI-RJ45 service interface
  - WLAN 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	<p>Status indicated by various light emitting diodes</p> <p>The following information is displayed depending on the device version:</p> <ul style="list-style-type: none"> <li>■ Supply voltage active</li> <li>■ Data transmission active</li> <li>■ Device alarm/error has occurred</li> </ul> <p> Diagnostic information via light emitting diodes</p>
--------------------	--

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

Galvanic isolation                      The outputs are galvanically isolated from one another and from earth (PE).

Protocol-specific data	Protocol	Modbus Applications Protocol Specification V1.1
	Response times	<ul style="list-style-type: none"> <li>■ Direct data access: typically 25 to 50 ms</li> <li>■ Auto-scan buffer (data range): typically 3 to 5 ms</li> </ul>
	Device type	Slave
	Slave address range	1 to 247
	Broadcast address range	0
	Function codes	<ul style="list-style-type: none"> <li>■ 03: Read holding register</li> <li>■ 04: Read input register</li> <li>■ 06: Write single registers</li> <li>■ 08: Diagnostics</li> <li>■ 16: Write multiple registers</li> <li>■ 23: Read/write multiple registers</li> </ul>
	Broadcast messages	<p>Supported by the following function codes:</p> <ul style="list-style-type: none"> <li>■ 06: Write single registers</li> <li>■ 16: Write multiple registers</li> <li>■ 23: Read/write multiple registers</li> </ul>
	Supported baud rate	<ul style="list-style-type: none"> <li>■ 1 200 BAUD</li> <li>■ 2 400 BAUD</li> <li>■ 4 800 BAUD</li> <li>■ 9 600 BAUD</li> <li>■ 19 200 BAUD</li> <li>■ 38 400 BAUD</li> <li>■ 57 600 BAUD</li> <li>■ 115 200 BAUD</li> </ul>
	Data transfer mode	<ul style="list-style-type: none"> <li>■ ASCII</li> <li>■ RTU</li> </ul>



<b>Data access</b>	Each device parameter can be accessed via Modbus RS485.  For Modbus register information
<b>Compatibility with earlier model</b>	If the device is replaced, the measuring device Promag 300 supports the compatibility of the Modbus registers for the process variables and the diagnostic information with previous models Promag 53. It is not necessary to change the engineering parameters in the automation system.
<b>System integration</b>	Information on system integration →  73. <ul style="list-style-type: none"> <li>■ Modbus RS485 information</li> <li>■ Function codes</li> <li>■ Register information</li> <li>■ Response time</li> <li>■ Modbus data map</li> </ul>

## 16.5 Power supply

Terminal assignment →  37

Supply voltage	Order code for "Power supply"	terminal voltage		Frequency range
	Option D	DC24 V	±20%	–
	Option E	AC100 to 240 V	–15...+10%	50/60 Hz, ±4 Hz
	Option I	DC24 V	±20%	–
		AC100 to 240 V	–15...+10%	50/60 Hz, ±4 Hz


Power consumption **Transmitter**  
Max. 10 W (active power)


Current consumption **Transmitter**

- Max. 400 mA (24 V)
- Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)

Power supply failure

- Totalizers stop at the last value measured.
- Configuration is retained in the plug-in memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

Electrical connection →  37

Potential equalization →  40

terminals Spring-loaded terminals: Suitable for strands and strands with ferrules.  
Conductor cross-section 0.2 to 2.5 mm<sup>2</sup> (24 to 12 AWG).

Cable entries

- Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½"
  - M20

Cable specification → 34

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

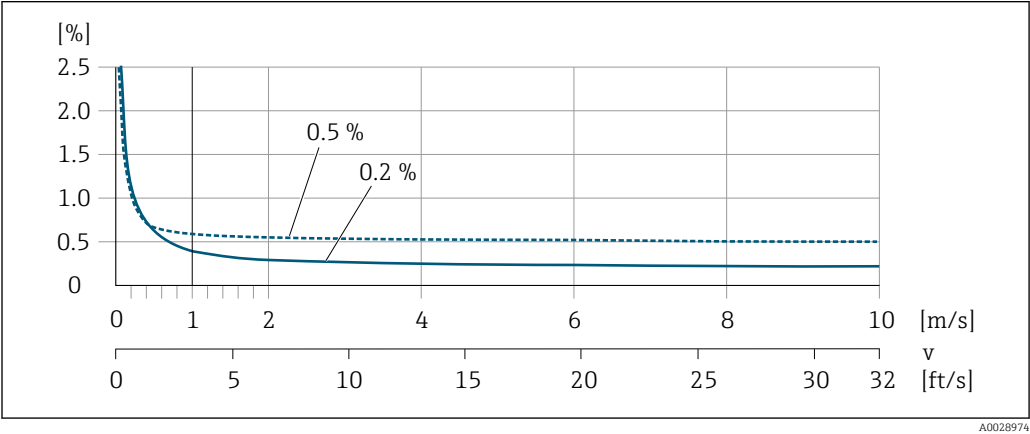
o.r. = of reading

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)

i

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



34 Maximum measured error in % o.r.

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

**Accuracy of outputs**  
The outputs have the following base accuracy specifications.

Current output

Accuracy	±5 µA
----------	-------

Pulse/frequency output

o.r. = of reading

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

Repeatability

o.r. = of reading

Volume flow

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

**Electrical conductivity**Max.  $\pm 5$  % o.r.

Influence of ambient temperature

**Current output**

Temperature coefficient	Max. 1 $\mu\text{A}/^{\circ}\text{C}$
-------------------------	---------------------------------------

**Pulse/frequency output**

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

## 16.7 Installation

"Mounting requirements"

## 16.8 Environment

Ambient temperature range

→  24**Temperature tables**

Observe the interdependencies between the permitted ambient and fluid temperatures when operating the device in hazardous areas.



For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

Storage temperature

-50 to +80 °C (-58 to +176 °F)

- Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner.
- If protection caps or protective covers are mounted these should never be removed before installing the measuring device.

Degree of protection

**Measuring device**

- As standard: IP66/67, type 4X enclosure
- When housing is open: IP20, type 1 enclosure
- Display module: IP20, type 1 enclosure

**External WLAN antenna**

IP67

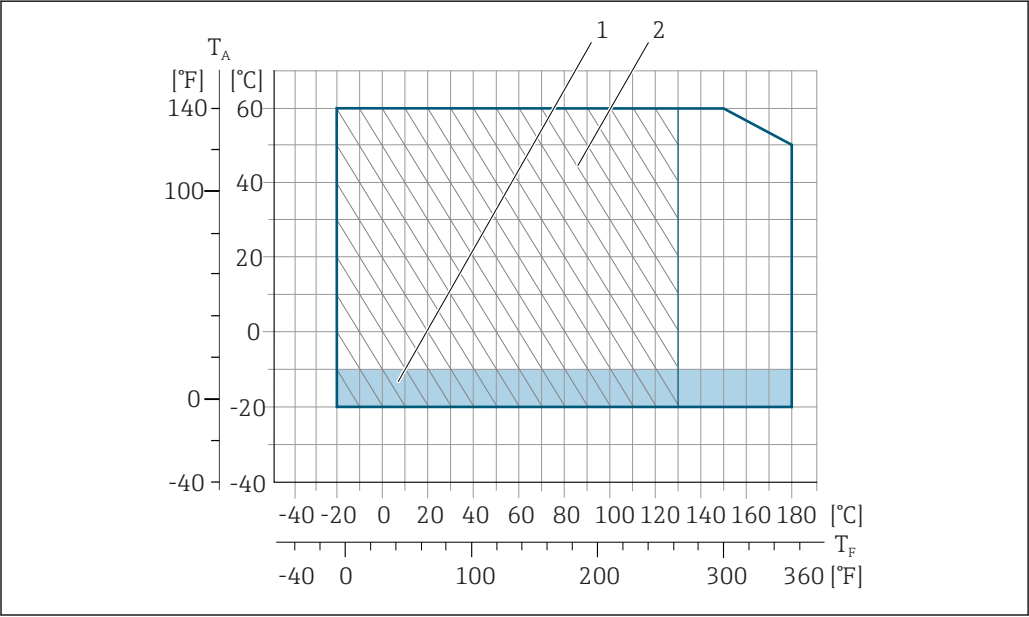
Vibration resistance

- Vibration, sinusoidal according to IEC 60068-2-6
  - 2 to 8.4 Hz, 3.5 mm peak
  - 8.4 to 2 000 Hz, 1 g peak
- Vibration broad-band random, according to IEC 60068-2-64
  - 10 to 200 Hz, 0.003  $\text{g}^2/\text{Hz}$
  - 200 to 2 000 Hz, 0.001  $\text{g}^2/\text{Hz}$
  - Total: 1.54 g rms

Shock resistance	Shock, half-sine according to IEC 60068-2-27 6 ms 50 g
Impact resistance	Rough handling shocks according to IEC 60068-2-31
Mechanical load	<div><div></div><div>■ Protect the transmitter housing against mechanical effects, such as shock or impact. ■ Never use the transmitter housing as a ladder or climbing aid.</div></div>
Electromagnetic compatibility (EMC)	<div>As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)</div> <div><div></div>Details are provided in the Declaration of Conformity.</div>

16.9 Process

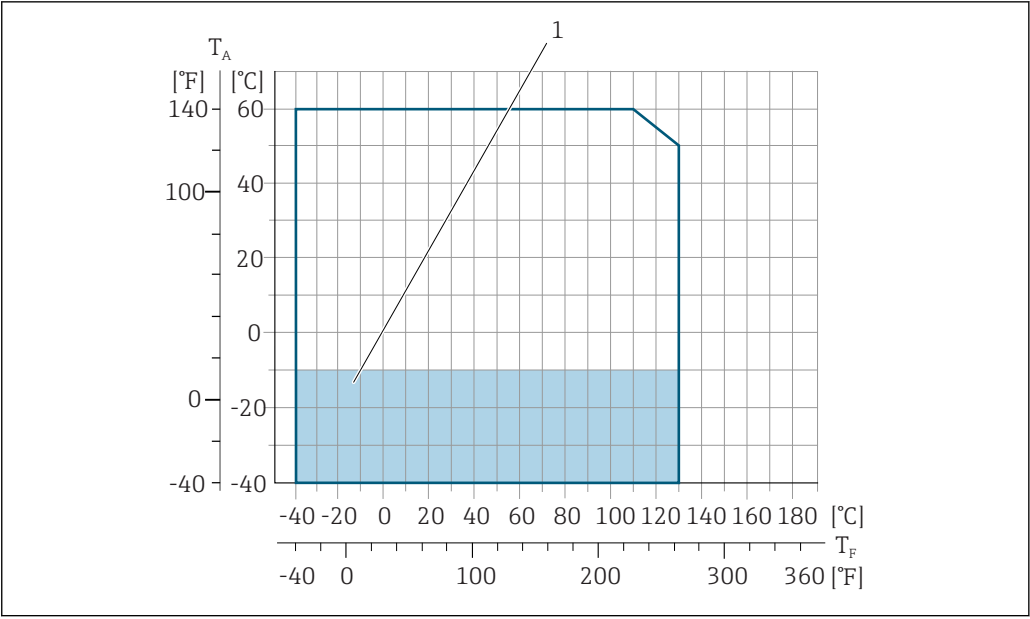
Medium temperature range	<div><div></div><div>■ -20 to +150 °C (-4 to +302 °F) for PFA, DN 25 to 200 (1 to 8") ■ -20 to +180 °C (-4 to +356 °F) for PFA high-temperature, DN 25 to 200 (1 to 8") ■ -40 to +130 °C (-40 to +266 °F) for PTFE, DN 15 to 600 (½ to 24")</div></div>
--------------------------	---




35 PFA


$T_A$  Ambient temperature range  
 $T_F$  Fluid temperature

1 Colored area: the ambient temperature range -10 to -20 °C (+14 to -4 °F) applies to stainless flanges only  
2 Hatched area: harsh environment only for fluid temperature range -20 to +130 °C (-4 to +266 °F)



 36 PTFE

$T_A$  Ambient temperature range  
 $T_F$  Fluid temperature  
1 Colored area: the ambient temperature range of -10 to -40 °C (+14 to -40 °F) applies to stainless flanges only

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: PFA

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:		
[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 to +180 °C (+212 to +356 °F)
25	1	0 (0)	0 (0)	0 (0)
32	–	0 (0)	0 (0)	0 (0)
40	1 ½	0 (0)	0 (0)	0 (0)
50	2	0 (0)	0 (0)	0 (0)
65	–	0 (0)	0 (0)	0 (0)
80	3	0 (0)	0 (0)	0 (0)
100	4	0 (0)	0 (0)	0 (0)
125	–	0 (0)	0 (0)	0 (0)
150	6	0 (0)	0 (0)	0 (0)
200	8	0 (0)	0 (0)	0 (0)

Liner: PTFE

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:			
[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 °C (+212 °F)	+130 °C (+266 °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)
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:

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



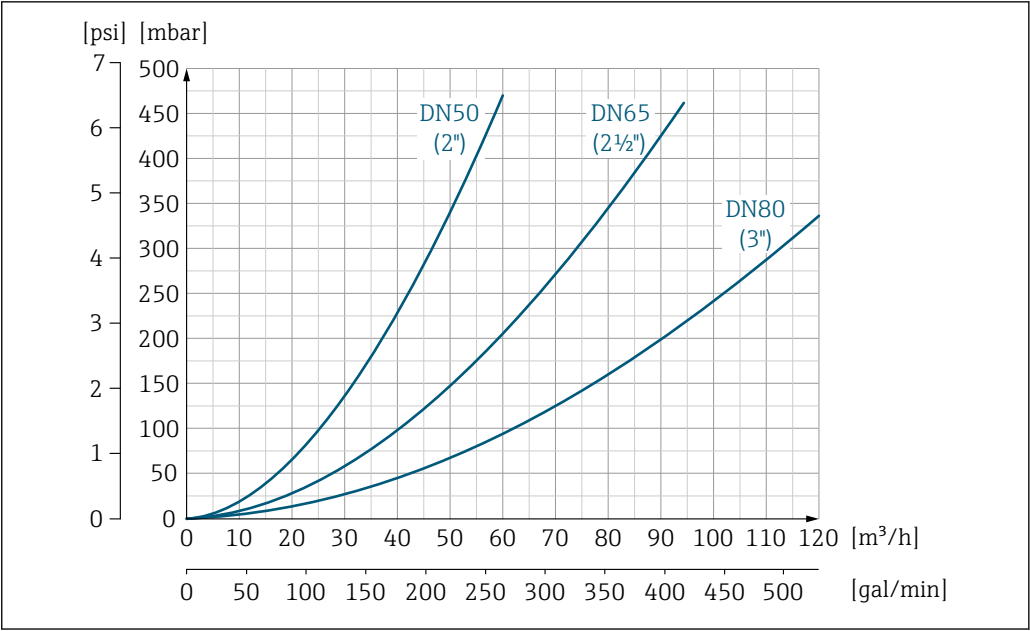
A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.



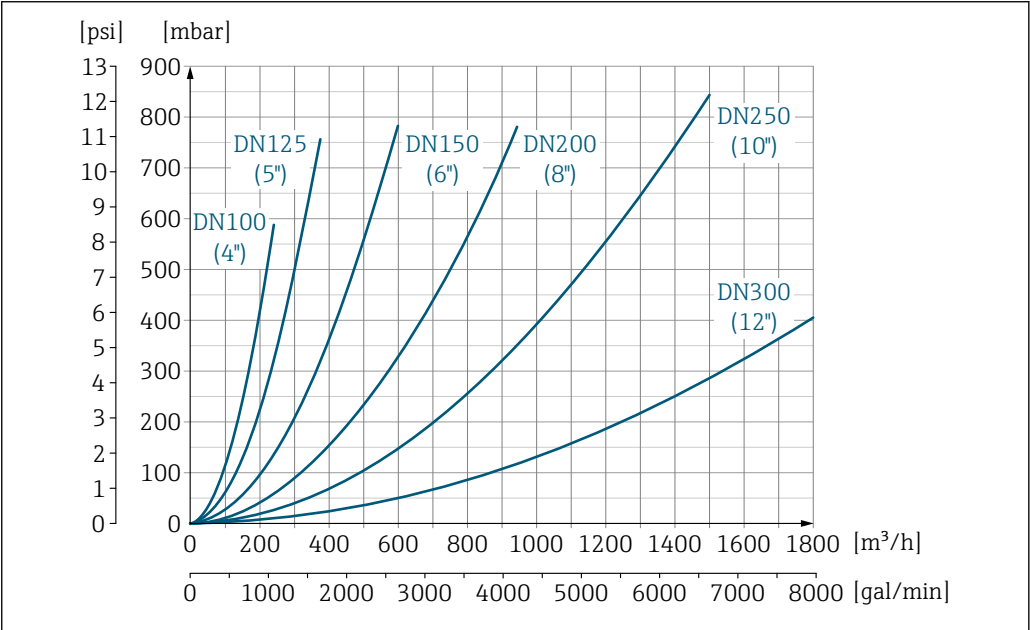
For an overview of the full scale values for the measuring range, see the "Measuring range" section → 153

#### Pressure loss

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



37 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"



38 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 → 25

Vibrations → 25

## 16.10 Mechanical construction

Design, dimensions

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

## Weight

All values (weight exclusive of packaging material) refer to devices for standard pressure ratings. Weight specifications including transmitter as per order code for "Housing", option A "Aluminum, coated".

Different values due to different transmitter versions:

Transmitter version for the hazardous area

(Order code for "Housing", option A "Aluminum, coated"; Ex d): +2 kg (+4.4 lbs)

## Weight in SI units

Nominal diameter		EN (DIN), AS <sup>1)</sup>		ASME		JIS	
[mm]	[in]	Pressure rating	[kg]	Pressure rating	[kg]	Pressure rating	[kg]
15	½	PN 40	7.2	Class 150	7.2	10K	4.5
25	1	PN 40	8.0	Class 150	8.0	10K	5.3
32	–	PN 40	8.7	Class 150	–	10K	5.3
40	1 ½	PN 40	10.1	Class 150	10.1	10K	6.3
50	2	PN 40	11.3	Class 150	11.3	10K	7.3
65	–	PN 16	12.7	Class 150	–	10K	9.1
80	3	PN 16	14.7	Class 150	14.7	10K	10.5
100	4	PN 16	16.7	Class 150	16.7	10K	12.7
125	–	PN 16	22.2	Class 150	–	10K	19
150	6	PN 16	26.2	Class 150	26.2	10K	22.5
200	8	PN 10	45.7	Class 150	45.7	10K	39.9
250	10	PN 10	65.7	Class 150	75.7	10K	67.4
300	12	PN 10	70.7	Class 150	111	10K	70.3
350	14	PN 10	105.7	Class 150	176	10K	79
400	16	PN 10	120.7	Class 150	206	10K	100
450	18	PN 10	161.7	Class 150	256	10K	128
500	20	PN 10	156.7	Class 150	286	10K	142
600	24	PN 10	208.7	Class 150	406	10K	188

1) For flanges to AS, only DN 25 and 50 are available.

## Weight in US units

Nominal diameter		ASME	
[mm]	[in]	Pressure rating	[lbs]
15	½	Class 150	15.9
25	1	Class 150	17.6
40	1 ½	Class 150	22.3
50	2	Class 150	24.9
80	3	Class 150	32.4
100	4	Class 150	36.8
150	6	Class 150	57.7
200	8	Class 150	101
250	10	Class 150	167
300	12	Class 150	244



Nominal diameter		ASME	
[mm]	[in]	Pressure rating	[lbs]
350	14	Class 150	387
400	16	Class 150	454
450	18	Class 150	564
500	20	Class 150	630
600	24	Class 150	895

### Measuring tube specification

Nominal diameter		Pressure rating					Process connection internal diameter			
		EN (DIN)	ASME	AS 2129	AS 4087	JIS	PFA		PTFE	
[mm]	[in]	[bar]	[psi]	[bar]	[bar]	[bar]	[mm]	[in]	[mm]	[in]
15	½	PN 40	Class 150	–	–	20K	–	–	15	0.59
25	1	PN 40	Class 150	Table E	–	20K	23	0.91	26	1.02
32	–	PN 40	–	–	–	20K	32	1.26	35	1.38
40	1 ½	PN 40	Class 150	–	–	20K	36	1.42	41	1.61
50	2	PN 40	Class 150	Table E	PN 16	10K	48	1.89	52	2.05
65	–	PN 16	–	–	–	10K	63	2.48	67	2.64
80	3	PN 16	Class 150	–	–	10K	75	2.95	80	3.15
100	4	PN 16	Class 150	–	–	10K	101	3.98	104	4.09
125	–	PN 16	–	–	–	10K	126	4.96	129	5.08
150	6	PN 16	Class 150	–	–	10K	154	6.06	156	6.14
200	8	PN 10	Class 150	–	–	10K	201	7.91	202	7.95
250	10	PN 10	Class 150	–	–	10K	–	–	256	10.1
300	12	PN 10	Class 150	–	–	10K	–	–	306	12.0
350	14	PN 10	Class 150	–	–	10K	–	–	337	13.3
400	16	PN 10	Class 150	–	–	10K	–	–	387	15.2
450	18	PN 10	Class 150	–	–	10K	–	–	432	17.0
500	20	PN 10	Class 150	–	–	10K	–	–	487	19.2
600	24	PN 10	Class 150	–	–	10K	–	–	593	23.3

### Materials

#### Transmitter housing

Order code for "Housing":

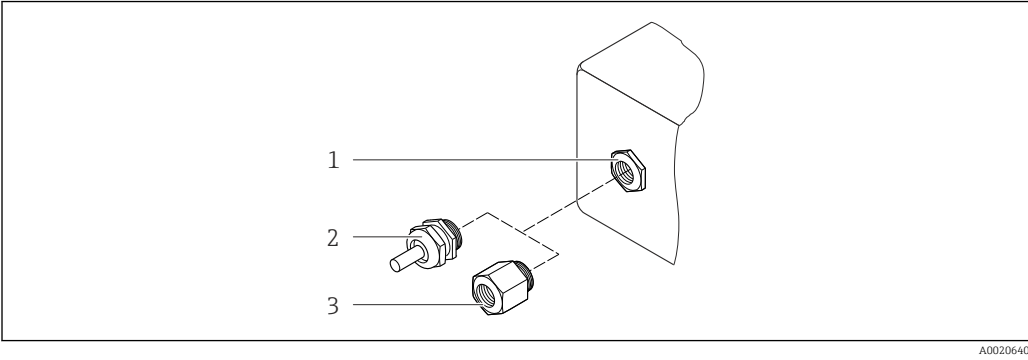
Option **A** "Aluminum, coated": aluminum, AlSi10Mg, coated

#### Window material

Order code for "Housing":

Option **A** "Aluminum, coated": glass

Cable entries/cable glands



39 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 "Aluminum, coated"

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

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Plastic/nickel-plated brass
Adapter for cable entry with internal thread G ½"	Nickel-plated brass
Adapter for cable entry with internal thread NPT ½"	
Device plug connectors	Plug M12 × 1 <ul style="list-style-type: none"><li>Socket: Stainless steel, 1.4404 (316L)</li><li>Contact housing: Polyamide</li><li>Contacts: Gold-plated brass</li></ul>

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

- PFA
- PTFE

Process connections

EN 1092-1 (DIN 2501)  
Stainless steel, 1.4571 (F316L); carbon steel, E250C<sup>1)</sup>/S235JRG2/P245GH  
ASME B16.5  
Stainless steel, F316L; carbon steel, A105<sup>1)</sup>  
JIS B2220  
Stainless steel, 1.0425 (F316L)<sup>1)</sup>; carbon steel, A105/A350 LF2

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

AS 2129 Table E

- DN 25 (1"): carbon steel, A105/S235JRG2
- DN 40 (1 ½"): carbon steel, A105/S275JR

AS 4087 PN 16

Carbon steel, A105/S275JR

### Electrodes

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

### Seals

As per DIN EN 1514-1, form IBC

### Accessories

*Protective cover*

Stainless steel, 1.4404 (316L)

*External WLAN antenna*

- Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass
- Adapter: Stainless steel and nickel-plated brass
- Cable: Polyethylene
- Plug: Nickel-plated brass
- Angle bracket: Stainless steel

*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, titanium
- Optional: only platinum measuring electrodes

#### Surface roughness

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

≤ 0.3 to 0.5 µm (11.8 to 19.7 µin)

(All data relate to parts in contact with fluid)

Liner with PFA:

≤ 0.4 µm (15.7 µin)

(All data relate to parts in contact with fluid)

## 16.11 Operability

#### Languages

Can be operated in the following languages:

- Via local operation  
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Bahasa (Indonesian), Vietnamese, Czech, Swedish
- Via Web browser  
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Bahasa (Indonesian), Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

## Local operation

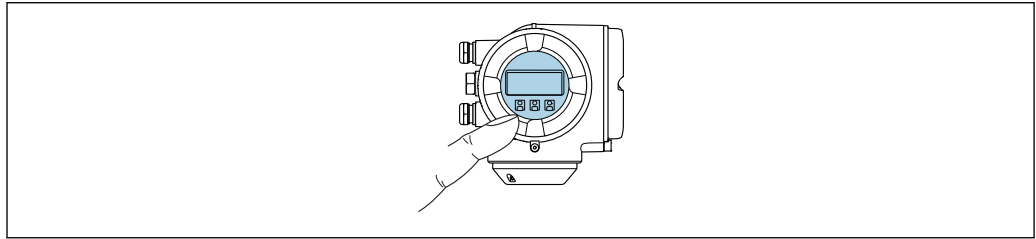
**Via display module**

Two display modules are available:

- Order code for "Display; operation", option **F** "4-line, illuminated, graphic display; touch control"
- Order code for "Display; operation", option **G** "4-line, illuminated, graphic display; touch control + WLAN"



Information about WLAN interface → 69






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40 Operation with touch control

*Display elements*

- 4-line, illuminated, graphic display
- 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.

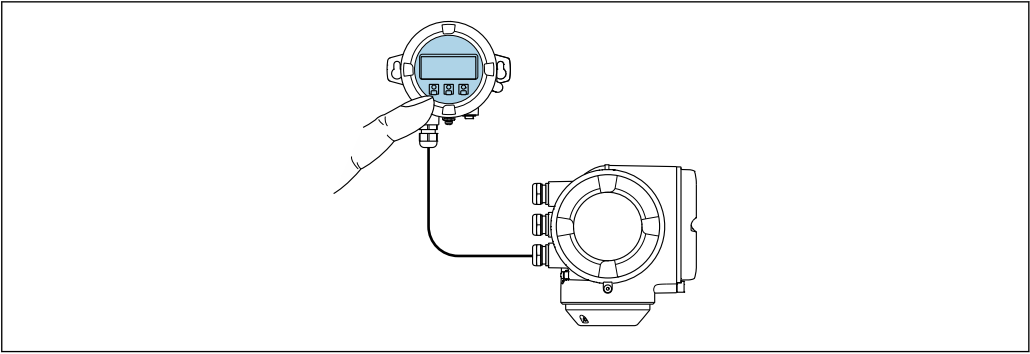
*Operating elements*

- External operation via touch control (3 optical keys) without opening the housing: , , 
- Operating elements also accessible in the various zones of the hazardous area

**Via remote display and operating module DKX001**

The remote display and operating module DKX001 is available as an optional extra → 151.

- The measuring device is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring device. Display or operation at the transmitter is not possible in this case.
- If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring device display module. Only one display or operation unit may be connected to the transmitter at any one time.



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41 Operation via remote display and operating module DKX001

Display and operating elements

The display and operating elements correspond to those of the display module .

Material

The housing material of the display and operating module DKX001 depends on the choice of transmitter housing material.

Transmitter housing		Remote display and operating module
Order code for "Housing"	Material	Material
Option A "Aluminum, coated"	AlSi10Mg, coated	AlSi10Mg, coated

Cable entry

Corresponds to the choice of transmitter housing, order code for "Electrical connection".

Connecting cable



Dimensions



Information on the dimensions:

"Mechanical construction" section of the "Technical Information" document.

Remote operation	→ 68
Service interface	→ 68
Supported operating tools	Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	<ul style="list-style-type: none"> <li>■ CDI-RJ45 service interface</li> <li>■ WLAN interface</li> </ul>	Special Documentation for device
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> <li>■ CDI-RJ45 service interface</li> <li>■ WLAN interface</li> <li>■ Fieldbus protocol</li> </ul>	→  152
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> <li>■ CDI-RJ45 service interface</li> <li>■ WLAN interface</li> <li>■ Fieldbus protocol</li> </ul>	→  152

 Other operating tools based on FDT technology with a device driver such as DTM/iDTM or DD/EDD can be used for device operation. These operating tools are available from the individual manufacturers. Integration into the following operating tools, among others, is supported:

- Field Device Manager (FDM) by Honeywell → [www.honeywellprocess.com](http://www.honeywellprocess.com)
- FieldMate by Yokogawa → [www.yokogawa.com](http://www.yokogawa.com)
- PACTWare → [www.pactware.com](http://www.pactware.com)

The associated device description files are available at: [www.endress.com](http://www.endress.com) → Downloads


### Web server


Thanks to the integrated Web server, the device can be operated and configured via a Web browser and via a service interface (CDI-RJ45) or via a WLAN interface. The structure of the operating menu is the same as for the local display. 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.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display; operation", option **G** "4-line, illuminated; touch control + WLAN". The device acts as an Access Point and enables communication by computer or a mobile handheld terminal.

#### Supported functions

Data exchange between the operating unit (such as a notebook for example) and the measuring device:

- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)
- Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package →  178)

 Webserver special documentation →  180

**HistoROM  
data management**

The measuring device features HistoROM data management. HistoROM data management comprises both the storage and import/export of key device and process data, making operation and servicing far more reliable, secure and efficient.



When the device is delivered, the factory settings of the configuration data are stored as a backup in the device memory. This memory can be overwritten with an updated data record, for example after commissioning.

### Additional information on the data storage concept

*There are different types of data storage units in which device data are stored and used by the device:*

	Device memory	T-DAT	S-DAT
<b>Available data</b>	<ul style="list-style-type: none"> <li>■ Event logbook such as diagnostic events for example</li> <li>■ Parameter data record backup</li> <li>■ Device firmware package</li> </ul>	<ul style="list-style-type: none"> <li>■ Measured value logging ("Extended HistoROM" order option)</li> <li>■ Current parameter data record (used by firmware at run time)</li> <li>■ Maximum indicators (min/max values)</li> <li>■ Totalizer values</li> </ul>	<ul style="list-style-type: none"> <li>■ Sensor data: nominal diameter etc.</li> <li>■ Serial number</li> <li>■ Calibration data</li> <li>■ Device configuration (e.g. SW options, fixed I/O or multi I/O)</li> </ul>
<b>Storage location</b>	Fixed on the user interface board in the connection compartment	Attachable to the user interface board in the connection compartment	In the sensor plug in the transmitter neck part

### Data backup

#### Automatic

- The most important device data (sensor and transmitter) are automatically saved in the DAT modules
- If the transmitter or measuring device is replaced: once the T-DAT containing the previous device data has been exchanged, the new measuring device is ready for operation again immediately without any errors
- If the sensor is replaced: once the sensor has been replaced, new sensor data are transferred from the S-DAT in the measuring device and the measuring device is ready for operation again immediately without any errors
- If exchanging the electronics module (e.g. I/O electronics module): Once the electronics module has been replaced, the software of the module is compared against the current device firmware. The module software is upgraded or downgraded where necessary. The electronics module is available for use immediately afterwards and no compatibility problems occur.

#### Manual

Additional parameter data record (complete parameter settings) in the integrated device memory HistoROM backup for:

- Data backup function  
Backup and subsequent restoration of a device configuration in the device memory HistoROM backup
- Data comparison function  
Comparison of the current device configuration with the device configuration saved in the device memory HistoROM backup

### Data transfer

#### Manual

Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)

**Event list****Automatic**


- Chronological display of up to 20 event messages in the events list
- If the **Extended HistoROM** application package (order option) is enabled: up to 100 event messages are displayed in the events list along with a time stamp, plain text description and remedial measures
- The events list can be exported and displayed via a variety of interfaces and operating tools e.g. DeviceCare, FieldCare or Web server

**Data logging****Manual**


If the **Extended HistoROM** application package (order option) is enabled:

- Record up to 1 000 measured values via 1 to 4 channels
- User configurable recording interval
- Record up to 250 measured values via each of the 4 memory channels
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

## 16.12 Certificates and approvals

CE mark	<p>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.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p>
C-Tick symbol	<p>The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".</p>
Ex approval	<p>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.</p>
Pharmaceutical compatibility	<ul style="list-style-type: none"> <li>■ FDA</li> <li>■ USP Class VI</li> <li>■ TSE/BSE certificate of suitability</li> </ul>
Radio approval	<p>The measuring device has radio approval.</p> <p> For detailed information on the radio approval, see the Special Documentation</p>
Pressure Equipment Directive	<ul style="list-style-type: none"> <li>■ 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.</li> <li>■ 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.</li> </ul>
Measuring instrument approval	<p>The measuring device is qualified to OIML R117 and has an OIML Certificate of Conformity (optional).</p>



Additional certification	<p><b>PWIS-free</b></p> <p>PWIS = paint-wetting impairment substances</p> <p>Order code for "Service":</p> <ul style="list-style-type: none"> <li>■ Option <b>HC</b>: PWIS-free (version A)</li> <li>■ Option <b>HD</b>: PWIS-free (version B)</li> <li>■ Option <b>HE</b>: PWIS-free (version C)</li> </ul> <p> For more information on PWIS-free certification, see "Test specification" document TS01028D</p>
Other standards and guidelines	<ul style="list-style-type: none"> <li>■ EN 60529 Degrees of protection provided by enclosures (IP code)</li> <li>■ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements</li> <li>■ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).</li> <li>■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment</li> <li>■ NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors</li> <li>■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.</li> <li>■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics</li> <li>■ NAMUR NE 105 Specifications for integrating fieldbus devices in engineering tools for field devices</li> <li>■ NAMUR NE 107 Self-monitoring and diagnosis of field devices</li> <li>■ NAMUR NE 131 Requirements for field devices for standard applications</li> <li>■ ETSI EN 300 328 Guidelines for 2.4 GHz radio components.</li> <li>■ EN 301489 Electromagnetic compatibility and radio spectrum matters (ERM).</li> </ul>

## 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](http://www.endress.com).

## Diagnostics functions

Package	Description
Extended HistoROM	<p>Comprises extended functions concerning the event log and the activation of the measured value memory.</p> <p>Event log: Memory volume is extended from 20 message entries (standard version) to up to 100 entries.</p> <p>Data logging (line recorder):</p> <ul style="list-style-type: none"> <li>Memory capacity for up to 1000 measured values is activated.</li> <li>250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.</li> <li>Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.</li> </ul>



## Heartbeat Technology

Package	Description
Heartbeat Verification +Monitoring	<p><b>Heartbeat Verification</b> Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> <li>Functional testing in the installed state without interrupting the process.</li> <li>Traceable verification results on request, including a report.</li> <li>Simple testing process via local operation or other operating interfaces.</li> <li>Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.</li> <li>Extension of calibration intervals according to operator's risk assessment.</li> </ul> <p><b>Heartbeat Monitoring</b> 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:</p> <ul style="list-style-type: none"> <li>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.</li> <li>Schedule servicing in time.</li> <li>Monitor the process or product quality, e.g. gas pockets.</li> </ul>


## Cleaning

Package	Description
Electrode cleaning circuit (ECC)	The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite ( $\text{Fe}_3\text{O}_4$ ) 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).

## OPC-UA server

Package	Description
OPC-UA-Server	<p>The application package provides the user with an integrated OPC-UA server for comprehensive instrument services for IoT and SCADA applications.</p> <p> Special Documentation for the "OPC-UA-Server" application package →  180.</p>

## 16.14 Accessories

 Overview of accessories available for order →  151

## 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](http://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 for the sensor*

Measuring device	Documentation code
Proline Promag P	KA01290D

*Brief Operating Instructions for transmitter*

Measuring device	Documentation code
Proline 300	KA01310D

### Technical Information

Measuring device	Documentation code
Promag P 300	TI01224D

### Description of device parameters

Measuring device	Documentation code
Promag 300	GP01053D

Device-dependent  
additional documentation

### Safety instructions

Safety instructions for electrical devices for hazardous areas.

Contents	Documentation code
ATEX/IECEX Ex d/Ex de	XA01414D
ATEX/IECEX Ex ec	XA01514D
cCSAus XP	XA01515D
cCSAus Ex d/ Ex de	XA01516D
cCSAus Ex nA	XA01517D
INMETRO Ex d/Ex de	XA01518D
INMETRO Ex ec	XA01519D
NEPSI Ex d/Ex de	XA01520D
NEPSI Ex nA	XA01521D

*Remote display and operating module DKX001*

Contents	Documentation code
ATEX/IECEX Ex i	XA01494D
ATEX/IECEX Ex ec	XA01498D
cCSAus IS	XA01499D
cCSAus Ex nA	XA01513D
INMETRO Ex i	XA01500D
INMETRO Ex ec	XA01501D
NEPSI Ex i	XA01502D
NEPSI Ex nA	XA01503D

**Special Documentation**

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
Remote display and operating module DKX001	SD01763D

Contents	Documentation code
Heartbeat Technology	SD01743D
Web server	SD01655D

**Installation Instructions**

Contents	Comment
Installation instructions for spare part sets and accessories	<ul style="list-style-type: none"> <li>Access the overview of all the available spare part sets via <i>W@M Device Viewer</i> → 📖 149</li> <li>Accessories available for order with Installation Instructions → 📖 151</li> </ul>

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